

COURSEBOOK

POST GRADUATE PROGRAMMES

2019-20



G. H. RAISONI COLLEGE OF ENGINEERING, NAGPUR

(An Autonomous Institution affiliated to RTM Nagpur University, Nagpur)

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G H RAISONI COLLEGE OF ENGINEERING

(An Autonomous Institute affiliated to Rashtrasant Tukdoji Maharaj Nagpur University,
Nagpur)

Accredited by NAAC with 'A+' Grade

CRPF Gate No. 3, Hingna Road, Digdoh Hills, Nagpur – 440 016. (INDIA)

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COURSE-BOOK-2019-20

POST GRADUATE PROGRAMMES

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Engineering

Management

Law

Schools

Other Courses

■ NAGPUR ■ PUNE ■ JALGAON ■ AMRAVATI ■ AHMEDNAGAR ■ CHHINDWARA



RAISONI
GROUP OF INSTITUTIONS



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M. Tech in Structural Engineering

VISION & MISSION OF INSTITUTE

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges

MISSION

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake-holders. Our strength is directed to create competent professionals. Our endeavour is to provide all possible support to promote research and development activities

Programme: PG in Structural Engineering

VISION & MISSION OF CIVIL ENGINEERING PROGRAM

VISION

To achieve excellent standards of quality education in Civil Engineering by keeping pace with rapidly changing technologies & to create technical manpower of Global Standards in Civil Engineering with capabilities of accepting new challenges.

MISSION

1. To impart quality and value based education to raise satisfaction of all stake holders.
2. To serve society and nation for providing professional leadership in Civil Engineering for solving the problems consistent with rapidly changing technologies.
3. To create competent Civil Engineering professionals who are trained in the design and implementation of Civil Engineering systems.
4. To promote Research & Development Activities in the field of Civil Engineering and allied areas.

Programme Educational Objectives (PEOs)

Student shall be able to

1. Apply fundamental technical knowledge and practice structural engineering proficiently for the benefits of industry and society.
2. Analyze and design complex and real world engineering problem and implementation of sustainable technology for the benefits of industry and society.
3. Actively participate in research and development & to engage themselves in continue lifelong learning

Programme Outcomes (POs)

The programme is aimed to developing competencies, skills, Handiness and abilities amongst students. They shall be able to:

- PO 1:** Independently carry out research / investigation and development work to solve practical problems.
- PO 2:** Write and present a substantial technical report/ document.
- PO 3:** Demonstrate a degree of mastery over the area as per the specialization of the programme. The mastery should be at a level higher than the requirements in the appropriate bachelor programme
- PO 4:** Function as a member of multidisciplinary environment to understand engineering management and finance principles to achieve economical and financial factors.
- PO 5:** Provide technical solutions to society with integrity, ethical behavior and commitment to code of conduct of professional practices and standards.

PROGRAM SPECIFIC OUTCOMES (PSO's)

A graduate of the Civil Engineering Program will demonstrate:

- PSO1:** An ability to recognize the importance of Civil Engineering professional development by pursuing postgraduate studies
- PSO2:** An ability to apply design, develop and execution of projects in the construction of various Civil Engineering disciplines
- PSO3:** An ability to face competitive examinations that offer challenging and rewarding careers and demonstrating leadership to emerged as potential entrepreneur.

M.TECH STRUCTURAL ENGINEERING SCHEME (CIVIL ENGINEERING)

SUBJECT CODE	NAME OF THE COURSE	TEACHING SCHEME				CREDITS	EVALUATION SCHEME						ESE DURATION (HRS)	MODE OF EXAM (ONLINE / OFF LINE)
		TH.	TU.	PR.	TOTAL HOURS		THEORY			PRACTICAL		TOTAL		
							TAE	CAE	ESE	INT.	EXT.			
SEM-I														
STRL408	COMPUTATIONAL TECHNIQUES	3	-	0	3	3	20	30	50	-	-	100	3	OFF LINE
STRL409	STRUCTURAL DYNAMICS	3	-	0	3	3	20	30	50	-	-	100	3	OFF LINE
STRP409	STRUCTURAL DYNAMICS	-	-	2	2	1	-	-	-	25	25	50	-	OFF LINE
STRLXXX	ELECTIVE – I	3	-	0	3	3	20	30	50	-	-	100	3	OFF LINE
STRPXXX	ELECTIVE – I	-	-	2	2	1	-	-	-	25	-	25	-	OFF LINE
STRLXXX	ELECTIVE – II	3	-	0	3	3	20	30	50	-	-	100	3	OFF LINE
STRLXXX	ELECTIVE – III	3	-	0	3	3	20	30	50	-	-	100	3	OFF LINE
MBA602	ADVANCED COMMUNICATION SKILLS	-	-	2	2	1	-	-	-	25	-	25	-	OFF LINE
	TOTAL	15	00	06	21	18	100	150	250	75	25	600	-	

LIST OF ELECTIVE I				
1.	STRL523	MECHANICS OF COMPOSITE STRUCTURES	STRP523	MECHANICS OF COMPOSITE STRUCTURES
2.	STRL524	DESIGN OF ENVIRONMENTAL STRUCTURES	STRP524	DESIGN OF ENVIRONMENTAL STRUCTURES
3.	STRL525	MATRIX ANALYSIS OF STRUCTURES	STRP525	MATRIX ANALYSIS OF STRUCTURES
LIST OF ELECTIVE II				
1.	STRL526	DESIGN OF STEEL STRUCTURES		
2.	STRL527	STRUCTURAL STABILITY		
3.	STRL528	NEW ENGINEERING MATERIALS AND TECHNIQUES		
LIST OF ELECTIVE – III				
1.	STRL529	THEORY OF ELASTICITY AND ELASTIC STABILITY		
2.	STRL530	DISASTER MANAGEMENT		
3.	STRL531	DESIGN OF BRIDGES & RETAINING WALLS		
4.	STRL532	WIND EFFECTS ON STRUCTURES		

M.TECH STRUCTURAL ENGINEERING SCHEME (CIVIL ENGINEERING)

SUBJECT CODE	NAME OF THE COURSE	TEACHING SCHEME				CREDITS	EVALUATION SCHEME						ESE DURATION (HRS)	MODE OF EXAM (ONLINE / OFF LINE)
							THEORY			PRACTICAL				
		TH.	TU.	PR.	TOTAL HOURS		TAE	CAE	ESE	INT.	EXT.	TOTAL		
SEM-II														
STRL 410	THEORY OF PLATES AND SHELLS	3	-	-	3	3	20	30	50	-	-	100	3	OFF LINE
STRL 411	FINITE ELEMENT METHOD	3	-	-	3	3	20	30	50	-	-	100	3	OFF LINE
STRP 411	FINITE ELEMENT METHOD	-	-	2	2	1	-	-	-	25	25	50	-	OFF LINE
STRL XXX	ELECTIVE – IV	3	-	-	3	3	20	30	50	-	-	100	3	OFF LINE
STRPXXX	ELECTIVE – IV	-	-	2	2	1	-	-	-	25	-	25	-	OFF LINE
STRL XXX	ELECTIVE – V	3	-	-	3	3	20	30	50	-	-	100	3	OFF LINE
STRL XXX	ELECTIVE – VI	3	-	-	3	3	20	30	50	-	-	100	3	OFF LINE
IDA403	RESEARCH METHODOLOGY	-	-	2	2	1	-	-	-	25	-	25	-	OFF LINE
	TOTAL	15	00	06	21	18	100	150	250	75	25	600	-	

	LIST OF ELECTIVE – IV				
1.	STRL 533	DESIGN OF SUBSTRUCTURE		STRP 533	DESIGN OF SUBSTRUCTURE
2.	STRL 534	PRESTRESSED CONCRETE STRUCTURES		STRP 534	PRESTRESSED CONCRETE STRUCTURES
3.	STRL 535	ADVANCED DESIGN OF STEEL STRUCTURES		STRP 535	ADVANCED DESIGN OF STEEL STRUCTURES
	LIST OF ELECTIVE – V				
1.	STRL 536		SOIL-STRUCTURE INTERACTION		
2.	STRL 537		EARTHQUAKE RESISTANT DESIGN OF RC STRUCTURE		
3.	STRL 538		GEOGRAPHIC INFORMATION SYSTEM AND APPLICATIONS		
	LIST OF ELECTIVE – VI				
1.	STRL 539		ANALYSIS AND DESIGN OF INDUSTRIAL STRUCTURES		
2.	STRL 540		FORENSIC ENGINEERING AND REHABILITATION OF STRUCTURES		
3.	STRL 541		ADVANCED STRUCTURAL DYNAMICS		
4.	STRL 542		ADVANCE DESIGN OF RCC STRUCTURES		

**M.TECH STRUCTURAL ENGINEERING SCHEME
(CIVIL ENGINEERING)**

SUBJECT CODE	NAME OF THE COURSE	TEACHING SCHEME				CREDITS	EVALUATION SCHEME						ESE DURATION (HRS)	MODE OF EXAM (ONLINE / OFF LINE)
		TH.	TU.	PR.	TOTAL HOURS		THEORY			PRACTICAL		TOTAL		
							TAE	CAE	ESE	INT.	EXT.			
SEM-III														
STRP 543	INDUSTRY PROJECT/ RESEARCH PROJECT (PHASE –I)	-	-	09	09	09	-	-	-	150	-	150	-	OFF LINE
	TOTAL	-	-	09	09	09	-	-	-	150	-	150	-	

**M.TECH STRUCTURAL ENGINEERING SCHEME
(CIVIL ENGINEERING)**

SUBJECT CODE	NAME OF THE COURSE	TEACHING SCHEME				CREDITS	EVALUATION SCHEME						ESE DURATION (HRS)	MODE OF EXAM (ONLINE / OFF LINE)
		TH.	TU.	PR.	TOTAL HOURS		THEORY			PRACTICAL				
							TAE	CAE	ESE	INT.	EXT.			
SEM-IV														
STRP 544	INDUSTRY PROJECT/ RESEARCH PROJECT (PHASE –II)	-	-	15	15	15	-	-	-	150	150	300	-	OFF LINE
	TOTAL	-	-	15	15	15	-	-	-	150	150	300	-	

SEMESTER-I

STRL408 COMPUTATIONAL TECHNIQUES **(Offline)**

Teaching Scheme				Credits	Evaluation Scheme				Total Marks
					Theory			Practical	
T	T	P	Total	Hours	T	C	E	Co	nt. Evaluation
h	u	r	s		A	A	S	nt.	
3	0	-	3	3	20	30	50	--	100

Course-Prerequisite	Applied Mathematics -III
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Course Objective:

1. To understand basics of probability and statistics related to structural engineering
2. To learn linear programming and numerical methods.
3. Develop numerical solution by using algebraic and Transcendental Equations.

Modes of Delivery of Courses:

1	Conventional Teaching (Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to –

1. Use the concepts of probability in structural engineering problem.
2. To apply the knowledge of statistics in structural engineering problem.
3. Know the standard ways in which the linear programming problems can be approached.
4. Able to apply the concepts of structural problem & numerical method for various problem.
5. To solve algebraic & transcendental equations using Numerical method.

6. Use the concepts of Numerical method to solve differential equations.

Details of Course:

1. Probability: Random Variables-discrete and continuous, cumulative distribution function and probability density function, concept of most probable member, elementary ideas of joint probability distributions, mathematical expectations, moment, Moment generating function. **9**
2. Statistics: Fitting of curve and correlation, Sampling, Linear and Multiple regressions, hypotheses, t-test, F-test and Chi-square test for hypothesis testing. **8**
3. Linear Programming: Formation and model, Graphical method, Simplex method, Dual Simplex method. **9**
4. Structural Problem: Computer Implementation of Matrices, Guidelines for development of a large sized problem. NUMERICAL METHODS-Solution of Linear Simultaneous equations – Method of Gauss Elimination, Cholesky's, , Solution based on Band width and its Variants **7**
5. Numerical Solution of algebraic and Trnscedental Equations: Error Analysis, Solution of system of linear algebraic equations by Gauss-seidel method & Crout's method. **7**
6. Numerical Solution of linear differential Equations: Solution of linear differential equation by Taylor's series method, Euler modified method and R-K method of 4th order and Milne's Predictor-Corrector method **7**

Suggested Books

1. Numerical Mathematical Analysis Scarborough J. B. Oxford and IBH publishers 1996
2. Applied Numerical Analysis Gerald C. F. Addison – Wesley Publishing Company 1970
3. Numerical Methods for Scientific and Engineering Computations Jain M. K., lyengar S. R. K. and Jain R. K New Age International Limited 1993
4. Numerical Methods Balgurusamy E Mc-Graw Hill Book Co. 2001

STRL409 STRUCTURAL DYNAMICS **(Offline)**

Semester: 1st **Subject Area: Structural Engineering**

Course Objective:

1. To understand the concepts of free and forced vibration.
2. To interpret the response of structure considering lumped mass and continuous mass system.
3. To study the different codal provision for dynamic analysis of the structure.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to –

1. Calculate the response for free and forced vibrations of SDOF systems
2. Evaluate response of SDOF systems under different types of loading
3. Apply the various numerical schemes and methods to find the mode shapes of MDOF structures
4. Evaluate response of MDOF systems under the dynamic loading
5. Analyze beams and plates having different boundary conditions using various approach
6. Understand the various clauses given in IS codes for the Seismic Analysis.

Details of Course:

1. Single degree freedom system, free vibrations, damped free vibrations, critical damping, and response, periodic loading expressed in harmonics, dynamic load factor **7**
2. Single degree freedom system, response to impulsive loading, rectangular, triangular pulses, Duhamel Integral, Response to general dynamic loading, Numerical schemes such as Wilson-Theta, Newmark-Beta, constant linear acceleration, time domain and frequency domain analysis **7**
3. Multi-degree freedom system, stiffness and flexibility approaches, Lumped-mass matrix, free vibrations fundamental

Frequencies and mode shapes, orthogonality of modes, numerical schemes to find mode shapes and frequencies. **7**

4. Multi degree freedom systems, response to dynamic loading, Formulations of equations of motion, normal coordinates mode superposition method, modal matrix, numerical scheme of Wilson and Newmark **7**
5. Distributed systems, free vibrations of uniform beams, differential equation and Solution, boundary conditions, finite difference solution, finite element, Ritz approach, and free vibrations of simply supported plate. (Transverse vibrations) **6**
6. Study of IS 1893-1984 and 2000 applicable to buildings and water tanks, Response spectra, Introduction to vibrations due to earthquake **6**

STRP409 Structural Dynamics

Teaching Scheme: 02 P Total 02

Credit: 01

Evaluation Scheme:

25 Internal + 25 External Total Marks: 50

Minimum Eight experiments based on above syllabus

Suggested Books:

1. Dynamics of Structures R.W. Clough and J. Penzian Tata McGraw Hill Publishing Company Limited, New Delhi 1993 2nd edition
2. Introduction to Structural Dynamics J. M. Biggs Tata McGraw Hill Publishing Company Limited, New Delhi 1964
3. Vibration Problems in Engineering W. Weaver, Jr., S. P. Timoshenko and D. H. Young. Chichester John Wiley & Sons Limited 1990 5th edition
4. Elements of Vibration Analysis James M. Gere and William Weaver Jr. McGraw Hill International Edition, Singapore 1986 2nd Edition

(Elective I) STRL523 MECHANICS OF COMPOSITE STRUCTURES

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA	CA	ESE	Int. Ext.	
3	0	2	5	4	20	30	50	25 25	100/50

Course-Prerequisite	---
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(Offline)

Teaching Scheme				Credits	Evaluation Scheme				Total Marks
					Theory			Practical	
					T A E	C A E	E S E	Con t. Evaluation	
T h	T u	P r	T o t a l H o u r s						
3	0	-	3	3	20	30	50	--	100

Semester: 1st

Subject Area: Structural Engineering

Course Objective:

1. To study the basic concepts of composite structure
2. To identify the various analytical methods for analyzing the composite structures.
3. To identify the various loads acting on composite sections.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Understand the basic concepts, types of composite construction
2. Describe various types of composite materials and their advantages in engineering design
3. Demonstrate an understanding of the fundamental building components for composite systems
4. Use various micro-mechanics models to calculate macroscopic properties including stiffness and strength.
5. Develop an understanding of the linear elastic analysis of composite materials
6. Design the steel concrete composite columns subjected to different loadings

Details of Course:

1. Introduction to composite construction, basic concepts, types of composite constructions **7**

2. Steel concrete composite, Analysis and of composite beams **7**
3. Composite floors, shear connectors: functions & types **7**
4. Steel concrete composite columns, columns subjected to axial loads and moments **7**
5. Encased composite construction of beams and columns, concepts and design **6**
6. Study of IS: 11384, IRC-22 and their applications **6**

Suggested Books

1. Engineering Mechanics of Composite Materials M. Daniel & O. Ishai Oxford University Press 1999
2. Introduction to Composite Materials S. W. Tsai & H. T. Hahn Technomic Publishing Co.INC, USA 2002
3. Mechanics of Composite Structures László P. Kollár, George S. Springer, Cambridge University Press 2000
4. A short term course on Composite Materials and Structures P. K. Sinha 1996

(Elective I) STRP523 MECHANICS OF COMPOSITE STRUCTURES

Teaching Scheme: 02 P Total 02 Credit: 01

Evaluation Scheme: 25 Internal

Total Marks: 25

Minimum Eight experiments based on above syllabus

(Elective I) STRL524 Design of Environmental Structures (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
					T A E	C A E	E S E	In t. Ex t.	
T h	T u	P r	T o t a l H o u r s						
3	0	2	5	4	20	30	50	25	100

Semester: 1st

Subject Area: Structural Engineering

Course Objective:

1. To understand different boundary conditions of reservoirs.
2. To investigate the behavior of seismic effect on water tank

- To consider various parameters for analyzing environmental structures.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

- Analyze and design circular & rectangular water tanks with different boundary conditions.
- Conduct Earthquake analysis and design of water tanks.
- Analyze and design different water treatment plant units.
- Student shall conduct Analysis and design of jack well, WTP units and GSR.
- Student shall be able to Analysis and design of ESR
- To introduce to codal provisions of IS: 13920.

Details of Course:

- Analysis of circular water tanks with various boundary conditions at base slab, variation of hoop tension, moment and deflection of wall with various H/RT ratios, deep and shallow tanks. **8**
- Analysis of rectangular water tanks with various boundary conditions at base slab, variation of moments with respect to height/span ratio, Design (un-cracked and cracked design) of water tank sections subjected to moment, Moment and compression, moment and tension. **8**
- Earthquake Analysis of water tanks on ground and overhead tanks, SDOF and MDOF model **8**
- Analysis and design of jack well, WTP units and GSR etc. **8**
- Analysis and design of ESR (container and staging) **8**

STRP524 Design of Environmental Structures

Teaching Scheme : 02 P Credit : 01

Total 02

Evaluation Scheme : 25 Total Marks :25
Internal External

Minimum Eight practical based on above syllabus

Suggested Books

- Design of Reinforced Concrete Structures Ramamrutham S Dhanpat Rai & Sons Publications 1995 12TH Ed.
- Reinforced Concrete limit state design Jain A.K Nem Chand & Bros. Roorkee 1993 4TH
- Circular Storage Tanks and Silos Ghali, AE & F N Spon, London, 1979
- Guidelines for seismic design of liquid storage tanks Jain, S.K. & Jaiswal, O.RNICEE, IITK 2004

(Elective – I) STRL525 MATRIX ANALYSIS OF STRUCTURES (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	P	Total Hours		TA	CA	SE		
3	0	2	5	4	20	30	50	--	100

Course Objective:

- To understand local and global coordinates of structures.
- To analyze the different structural members using flexibility and stiffness method.
- To introduce software's for analyzing the different structures program for the analysis.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Understand the fundamental concepts and modern methods of Structural analysis.
2. Understand the importance of Transformation matrices, Global stiffness matrix and load vectors
3. Apply matrix methods to pin jointed trusses, continuous beams, grids and frames.
4. Apply flexibility methods (Structure approach) to pin jointed trusses, continuous beams and frames.
5. Analyze the structures for lack of fit and temperature variations.
6. Understand and use the concept used in band minimization and storage techniques.

Details of Course:

1. Introduction to stiffness and flexibility approach, Stiffness matrix for spring, Bar, torsion, Beam (including 3D), Frame and Grid elements, Displacement vectors, Local and Global co-ordinate system, Transformation matrices, Global stiffness matrix and load vectors **8**
2. Flexibility method (Structure approach): Flexibility coefficients, physical Meaning, basic determinate or released structure, choice of redundant, Geometrical compatibility conditions. Matrix formulations, Hand Solution of simple problems on truss, Beams, frames with loads. **8**
3. Stiffness methods (structure & member approach): Stiffness co-efficient, restrained structure, Unknown displacements, Joint equilibrium conditions Hand solution of simple problems on beam, frames, grids **8**
4. Analysis for member loading (self, temperature & Imposed), inclined supports, lack of fit, initial joint displacements **8**
5. Solution technique with banded & skyline technique, band minimization, frontal techniques, finite size joint correction **8**

(Elective I) STRP525 MATRIX ANALYSIS OF STRUCTURES

Teaching Scheme: 02 P Total 02

Credit: 01

Evaluation Scheme:

25 Internal

Total Marks: 25

Minimum Eight practical based on above syllabus

Suggested Books

1. Matrix Methods of Structural Analysis Dr A.S. Meghre and S. K. Deshmukh Charotar Publishing House, Anand, India 2003

2. Structural Analysis, A Matrix Approach G. S. Pandit and S. P. Gupta Tata McGraw Hill Publishing Company Limited, New Delhi 1986
3. Introduction to Matrix Method of Structural Analysis B Martin, H.C McGraw Hill Book Co 1996
4. Analysis of framed structures James M. Gere and William Weaver Jr. D Van Nostran Company Inc., Affiliated East West Press Pvt. Ltd 1965

(Elective II) STRL526

DESIGN OF STEEL STRUCTURES (Offline)

Teaching Scheme				Cr edi ts	Evaluation Scheme				
Th	Tu	Pr	Total Hours		Theory			Prac tical	To tal M arks
					TA E	CA E	ES E	Cont · Eval uation	
3	0	-	3	3	20	30	50	--	100

Semester: 1st

Subject Area: Structural Engineering

Course-Prerequisite	---
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Course Objective:

1. To identify the loading effects on different types of connections.
2. To understand the different parameters in the design of tubular structures, steel chimneys and storage vessels.
3. To know the basic concepts of industrial sheds, highway and railway bridges.

Modes of Delivery of Courses:

1	Conventional Teaching (Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures / Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Design different types of connections
2. Recognize the design philosophy of steel structures and have concept on limit state design
3. Apply the principles, procedures and current code requirements to the analysis

and design of steel tension members, beams, columns, beam-columns and connections

- Understand the behavior of steel structures, in particular the various forms of failure for members and connections under tension, compression, bending and combined actions
- Design tubular structures, steel chimneys and storage vessels
- Design industrial sheds, highway and railway bridges.

Details of Course:

- Design of connections **10**
- Design of round tubular structures, Design of steel chimneys, Design of storage vessels **10**
- Design of industrial sheds bridges of crane / gantry Girders **10**
- Design of bridges – highway and railways, Foot Bridge **10**

Suggested Books

- Design of steel Structures N. Subramanian, Oxford University Press, New Delhi 2008^{1ST}
- Design of Steel Structures S.K. Duggal Tata McGraw Hill Publishing Company Limited, New Delhi 2008^{3RD}
- Design of steel Structures A S Arya and J L Ajmani Nem Chand & Brothers, Roorkee 2007
- Designs of Steel Structures Raghupati, Tata McGraw Hill Publishing Company Ltd, New Delhi 2007^{1ST}

(Elective II) STRL527 STRUCTURAL STABILITY (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA	CA	EE		
3	0	-	3	3	20	30	50	--	100

Semester: 1st
Engineering

Subject Area: Structural

Course-Prerequisite	---
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Course Objective:

- To Study the various effects on thin and open sections due to torsional loading.

- To analyze the behavior of beams due to buckling using various methods.
- To study the effect on compression member under different loading.

Modes of Delivery of Courses:

1	Conventional Teaching (Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures / Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

- Understand the behavior of structural components and systems that suffer from failure
- Understand the fundamental basis of design rules concerned with structural instability
- Analyze geometrically perfect and imperfect systems for structural stability
- Understand the General Principles and Methods of Analysis in Stability.
- Understand the concept of Effects of shearing force on the critical load.
- Understand the concept of Buckling of thin rectangular plates in compression, shear and bending.

Details of Course:

- Torsion of thin walled open sections, warping displacements under pure torsion, -Warping constants for rolled steel section, Strain energy in bending and torsion of members of thin walled open section including the effects of warping, Torsional buckling including the effects of Wagner's effect, flexural torsional buckling (with centroid and shear centers coincident) **10**
- Lateral buckling of beams under pure bending central point load through center of gravity of the section, Cantilever beams with point load at the free end, Application of Rayleigh-Ritz method; Beam-columns on rigid supports-concentrated and continuous lateral loads with simply supported and built in-ends **10**
- Continuous beam with as axial loads, Application of trigonometric series, In plane buckling of bars ; Approximate calculation of critical loads for bar structures by energy method- a bar on elastic foundation, a bar with intermediate

compressive forces, bar under distributed axial loads, a bar with changes in cross section **10**

- Effects of shearing force on the critical load, Buckling of built-up columns, In-elastic in-plane buckling of columns, Tangent and reduced modulus concept, Shanley's contribution, elastic critical loads for rigid frames and triangulated structures, stability functions, Bending of thin plate, Buckling of thin rectangular plates in compression, shear and bending **10**

Suggested Books

- Theory of Elastic Stability S.P. Timoshenko and J. M. Gere MC Graw Hill 1967 -
- Stability of Structures A. Kumar Allied Publishers Ltd., New Delhi 1998
- The stability of frames M. R. Horns and W. Merchang Pergamon press 1965
- Elastic Instability, M. Gregoryson's Civil Engineering series 1967

(Elective II) STRL528 NEW ENGINEERING MATERIALS & TECHNIQUES (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	Pr	Total Hours		Theory			Practical	
					TAE	CAE	ESE	Int.	Ext.
3	0	2	5	4	20	30	50	25	

Semester: 1st

Subject Area: Structural Engineering

Course-Prerequisite	---
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Course Objective:

- To introduce various types of tests on concrete ingredients.
- To understand concept of mix design & access techniques of quality check.
- Conduct various tests on fibers.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome: - At the end of course work, Student shall be able to

- Understand concrete mix design and validation as per project needs.

- Have exposure to instrumentation tools for structural testing.
- Summaries the fibers reinforced concrete and their applications.
- understand the importance of Light weight concrete, foam concrete on modifying fresh, hardened and durability properties of concrete
- understand the importance of construction chemicals(admixtures) on properties of concrete
- Have the capability to use Modern trends in concrete manufacturing and Industrial waste materials in concrete, their influence durability of concrete.

Details of Course:

- Study of Indian standards and there specification for concrete ingredients, Principles of concrete mix design, methods of concrete mix design, design of high strength, high performance concrete, trimix concrete.

7

- Stress-strain measurement, strain gauges static and dynamics strain measurement, Calculation of stresses from measurement of strain, deflections etc.

7

- Steel fibers reinforced concrete, Properties, Aspect ratio, strength, Durability of fiber reinforced plastics, other types of fibers and their applications.

6

- Light weight concrete, foam concrete, workability, durability, and composition, application, Fly ash blended concrete, replacement procedures, effect of admixtures, adhesives, bond strength, durability, applications.

6

- Concrete admixtures, accelerators, retreads, non-destructive testing and quality control of materials

7

- Modern trends in concrete manufacturing, placement techniques, methods of transportation, placing of concrete, Industrial waste materials in concrete, their influence on physical mechanical properties of concrete and durability of concrete.

Suggested Books

- Concrete Technology Neville, A.M. and Brookes, J.J Pearson Publishers, New Delhi 1994 -
- Properties of Concrete Neville, A.M. and Brookes, J. J Pearson Publishers, New Delhi 2004 -
- Instrumentation in Industry Soissons, H. E John Wiley & Sons, NY 1975

4. Experimental Stress Analysis Singh,
Sadhu Khanna Publishers 1998 -

**(Elective –III) STRL529 THEORY OF
ELASTICITY AND ELASTIC STABILITY
(Offline)**

Teaching Scheme				Cr edi ts	Evaluation Scheme				
					Theory			Prac tical	To tal M ar ks
T h	T u	P r	To tal Ho ur s		T A E	C A E	E S E	Cont · Eval uation	
3	0	-	3	3	2 0	3 0	5 0	--	10 0

Semester: 1st Subject Area: Structural Engineering

Course-Prerequisite	---
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Course Objective:

1. To introduce the errands of theory of elasticity and methods of solving the structural problems.
2. To introduce the basic concepts and the state of the art of static and dynamic stability of structures

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Students shall be able to

1. Analyze 2D Stress and strain problems
2. Analyze 3D Stress- Strain problems with different boundary condition.
3. Solve the torsional problems on different elements.
4. Analyze differential equations for beam-column.
5. Analyze the approximate methods like virtual energy for different elements.
6. Solve various forces on built-up beams.

Details of Course:

1. Analysis of stress and strain in 2 dimensions: Introduction, Types of forces, Components of stresses and strains, Stress-strain relation, Plane stress and plane strain, Strain at a point, Differential equation of equilibrium, Boundary conditions and compatibility equations(rectangular coordinates), Airy's stress function 7

2. Analysis of stress and strain in 3 dimensions: Components of stress, Principal stresses, Stress invariants, Maximum shearing stress, Differential equation of equilibrium, Boundary conditions and compatibility equations 7
3. Bending of cantilever of narrow rectangular section loaded at end, bending of simply Supported beam with uniform load, torsion of non-circular sections, Elliptical cross section 6
4. Differential equation for beams columns with concentrated loads, continuous lateral loads and couples for simply supported ends, Application of trigonometric series, Lateral buckling of beams. 6
5. Energy method for elastic buckling of columns, approximate method, buckling of columns on elastic foundation, Columns with intermediate compressive forces and distributed axial load, Columns with changes in cross section 7
6. Effect of shearing force on critical load, buckling of built up columns, buckling of simply supported rectangular plates uniformly compressed in middle plane. 7

Suggested Books

1. Theory of Elastic Stability Timoshenko, S.P Tata Mc-Graw Hill Publsihing Co. New Delhi,19612ND Edition
2. Flexural Torsional Buckling of Structures Trahair, N.SE & FM SPON, London1969
3. Theory of Beam-Columns-Space Behaviour and Design Chen, W.F Tata McGraw Hill International 19962ND Edition
4. Principles of Structural Stability Theory Alexander Chajes Prentice Hall College Division 19747TH Edition

(Elective III) STRL530 DISASTER MANAGEMENT

Teaching Scheme				Cr edi ts	Evaluation Scheme				
					Theory			Prac tical	To tal M ar ks
T h	T u	P r	To tal Ho ur s		T A E	C A E	E S E	Cont · Eval uation	
3	0	-	3	3	2 0	3 0	5 0	--	10 0

Course Objective:

1. Understand various types of disaster situation to mitigate related work
2. To know basics of rescue and relief during pre/post disaster periods.

- To identify the various processes of risk management

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

- Affirm the usefulness of integrating management principles in disaster mitigation work.
- Analyze the statistical approach for disaster preparedness.
- Distinguish between the different approaches needed to manage pre-during and post- disaster periods.
- Analyze different methods to prevent land sliding.
- Explain the process of risk management.
- Use modern tools usage to solve the global construction methods with sustainable technology.

Details of Course:

- Concept of disaster management, types of disasters, disaster mitigating agencies and their organizational structure at different levels. Overview of disaster situations in India: vulnerability profile of India and vulnerability mapping including disaster – prone areas, communities, places. **7**
- Disaster preparedness – ways and means, skills and strategies, rescue, relief, reconstruction and rehabilitation. Case studies: Lessons and experiences from various important disasters in India. Seismic vulnerability of urban areas **7**
- Seismic response of R.C. frames buildings with soft first storey. Preparedness for natural disasters in urban areas. Sulbh technology for sanitation improvement in urban habitat. Landslide hazards zonation mapping and geo-environmental problems associated with the occurrence of landslides. **6**
- A statistical approach to study landslides, Landslide casual factors in urban areas. Roads and landslide hazards in Himalaya. The use of electrical resistivity method in the study of landslide. Studies in Rock-

mass classification and landslide management in a part of Garhwal-Himalaya, India. **7**

- Urban earthquake disaster risk management. Using risks-time charts to plan for the future. Lateral strength of masonry walls. A numerical model for post-earthquake fire response of structures. Cyclone resistant house for coastal areas. **7**
- Disaster resistant construction role of insurance sector. Response of buried steel pipelines carrying water subjected to earthquake ground motion. Preparedness and planning for an urban earthquake disaster. Urban settlements and natural hazards. Role of knowledge based expert systems in hazard scenario. **6**

Suggested Books

- Natural Hazards in the Urban Habitat Iyengar, C.B.R.I Tata McGraw Hill
- Natural Disaster management Jon Ingleton (Ed), Tumor Rose Tumor Rose 1999
- Disaster Management R.B. Singh (Ed), Rawat Publications 2000
- Anthropology of Disaster management Sachindra Narayan Gyan Publishing House 2000

(Elective III) STRL531 DESIGN OF BRIDGES & RETAINING WALLS

Teaching Scheme				Cr ed its	Evaluation Scheme			
					Theory			Prac tical Cont . Eval uation
T h	T u	P r	To tal Ho urs		T A E	C A E	E S E	
3	0	-	3	3	20	30	50	--
								100

Course Objective:

- To classify various IRC loadings and codal provisions for bridges and retaining walls.
- To identify the various components of bridge viz. substructure and superstructure.
- To understand the methods to calculate dynamic response of bridge structure.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
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2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to –

1. Summarize the principles and criteria of bridge design and bridge evaluation.
2. Describe the responsibilities and work products of bridge engineers.
3. Perform conventional analysis and design of Prestressd RCC Box girder, prestressd Cantilever Bridge as per IRC Bridge Design Specifications.
4. Possess fundamental knowledge in a wide range of state – of – the-art practices, including code specifications, in bridge engineering.
5. Learn the analysis and design of bridge superstructures, foundations, bearings and deck joints.
6. To choose the appropriate bridge type for a given project, and to analyses and design the main components of the chosen bridge.

Details of Course:

1. IRC / IRS loading standards of balanced cantilever bridge, design of prestressed concrete girder and box girder bridges considering only primary torsion, design of end block. **7**
2. Bridge Bearing: Types of bearings, Elastomeric bearing **7**
3. Piers, Abutments, Wing walls factors effecting and stability, Well foundations. Design of well, Construction, Open sinking of walls, Plugging, Sand filling and casting of well cap. **7**
4. Types of bridge superstructure and introduction to their design, sub-structure, bearings, IRC / IRS Bridge loadings and other codal recommendations, Performance of Bridges in past earthquakes **6**
5. Seismic design philosophy for Bridges, State of art modeling of bridges, Seismic Design of Substructures, Capacity design of substructures and ductile detailing, Seismic design of well and pile foundations, Modeling soil flexibility. **6**
6. Earthquake behavior and Design of retaining wall and Abutments, IS code recommendations. Design of Bearings

(Free, Guided and Restrained).

7

Suggested Books

1. Bridge Engineering Handbook Chen, W.F. and Duan, L MCGraw Hill 1999
2. Fintel, M Handbook of Concrete Engineering CBS Publishers Delhi 1986 2nd Edition
3. Design of Steel Structures Gaylord, E.H. & Gaylord, C.N McGraw Hill Pulb 1998
4. Composite Structures of Steel and Concrete, Vol-I Johnson, R.P. Granado Publishing Ltd., London 1994

(Elective III) STRL532 WIND EFFECTS ON STRUCTURES

Teaching Scheme				Credits	Evaluation Scheme				Total Marks
					Theory			Practical	
T	U	P	Total Hours		T A E	C A E	E S E	Co nt. Ev alu ati on	
3	0	-	3	3	20	30	50	--	100

Course Objective:

1. To understand basic wind characteristics and codal provisions.
2. To identify various analytical methods for the calculation of wind forces.
3. To study various wind tunnel testing methods for various models.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Understand the characteristics of wind loads
2. Study the dynamic effect of wind in all directions on the buildings
3. Perform wind tunnel tests on rigid and aero elastic models

4. In depth knowledge of IS 875(Part 3), Indian Standard Code for wind load on structures
5. Knowledge about wind tunnels and various aspects of wind flow
6. Ability to do static and dynamic analysis for wind loading

Details of Course:

1. Wind Characteristics: Variation of wind velocity, atmospheric circulations – pressure gradient force, coriolis force, frictionless wind balance, geostrophic flow, boundary layer. Extra ordinary winds – Foehn, Bora, Cyclones, Tornadoes etc.
7
2. Static wind effects and building codes with particular reference to IS 875 (Part-III), wind speed map of India, introduction to the proposed revisions of IS 875 (Part III).
7
3. Dynamic wind effects: Wind induced vibrations, flow around bluff bodies, along wind and across wind response, flutter, galloping, vortex shedding, locking, ovaling; analysis of dynamic wind loads, codal provisions – gust factor, dynamic response factor; vibration control and structural monitoring; exposure to perturbation method, averaging techniques
7
4. Wind tunnel testing: Open circuit and closed circuit wind tunnels, rigid and aero elastic models, wind tunnel measurements and instruments along with site visit. Case studies: low rise buildings, parking sheds, workshop building, multistory building, water tanks, towers, chimneys, bridges.
7

Suggested Books

1. An Introduction to Wind Effects on Structures C. Scruton Oxford University Press, Oxford, UK 1981
2. Wind Forces in Engineering Peter Sachs Pergamon Press. Oxford UK 1972.
3. Wind Effects on Buildings Lawson T. VApplied Science Publishers, London, UK 1980.
4. Wind Effects on Structures: fundamentals and applications to design Simiu, E., Scanlan, R. H., John Wiley & Sons, New York 1996 3rd Edition

MBA 602 ADVANCED COMMUNICATION SKILLS (Online/Offline)

Teaching Scheme				Cr edi ts	Evaluation Scheme					
					Theory			Pract ical		T ot al M
T h	T u	P r	T ot		T A	C A E	E S	In t.	E x	

				al		E		E		t	ar
				H						.	ks
				o							
				u							
				r							
				s							
0	0	2	2		1	0	0	0	25		25

Semester: 1st

Subject Area: Structural Engineering

Course-Prerequisite	---
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Course Objective:

1. To enhance the quality of the undergraduates by introducing to them effective and advanced techniques of public speaking, one to one interaction and social ethics.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars		
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Deliver the thoughts in an effective way
2. How to communicate uncertainty
3. Analyze and utilize body language to their advantage
4. Enhance their professionalism at work
5. Have the confidence to make more of an impact on their audience.
6. Understand the social ethics and implement them to become a more acceptable professional by the industry, institute and society in general.

SEMESTER-II

STRL410 THEORY OF PLATES AND SHELLS (Offline)

Teaching Scheme				C r e d i t s	Evaluation Scheme				
					Theory			Pra ctic al	Tot al Marks
T h	T u	P r	To tal Ho u r s		T A E	C A E	E S E		
3	0	-	3	3	20	30	50	--	

Semester: 2nd Subject Area: Structural Engineering

Course-Prerequisite

Course Objective:

1. To understand the different boundary conditions for plate & shell elements.
2. To study the various methods for analyzing the plate and shell element.
3. To apply the concept of pure bending.

Modes of Delivery of Courses:

1	Conventional Teaching (Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to –

1. Understanding various properties of uniformly loaded circular plate and its behavior
2. Understanding laterally loaded rectangular plate and their boundary conditions
3. Apply the basic differential equation to bent surface of anisotropic plates
4. Understand the general shell geometry and membrane theory of cylindrical shell
5. Apply concepts of bending theory of cylindrical shell.
6. Grasp the approximate analysis of cylindrical shell.

Details of Course:

1. Introduction, Moment curvature relation in pure bending, Symmetrical bending of laterally loaded circular plates, Uniformly loaded circular plates with clamped and Governing differential equations of thin rectangular plates with various boundary conditions & loading **7**
2. Laterally loaded rectangular plates, Differential equation of the deflection surface (Lagrange's equation), Boundary conditions, simply supported plates under sinusoidal loading, Navier's solution **6**
3. Finite difference method, Differential equation to bent surface of anisotropic plate, Application to grid **7**
4. General shell geometry, classifications, Membrane theory of cylindrical shells, equation of equilibrium, stress resultants under dead load and snow load for circular, cycloidal, catenary, and parabolic cylindrical shells **7**

5. Bending theory of cylindrical shells, Finsterwalder theory, Schorer's theory **6**
6. Approximate analysis of cylindrical shells by beam arch method **7**

Suggested Books:

1. Theory of Plates and Shells S. P. Timoshenko and W. Kriger TMH 1987 2nd edition
2. Elementary Theory of Plates L. G. Jaeger Macmillan 1964
3. Analysis of Plates Szilard Rudolp PHI1974
4. Design and Construction of Concrete Shell Roofs G. S. Ramaswamy CBS1986

STRL411 FINITE ELEMENT METHOD (Offline)

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	P	Total Hours		TA	CA	ESE	Int.	Ext.	
3	0	2	5	4	20	30	50	25	25	100 /50

Semester: 2nd

Subject Area: Structural Engineering

Course-Prerequisite

Course Objective:

1. To understand the discretization technique of different elements.
2. To know the basic concepts of shape function, natural coordinate and isoperimetric function.
3. To develop analytical programmes by using FEM.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Identify mathematical model for solution of common engineering problems.
2. Develop comprehensive knowledge in the fundamental mathematical and physical basis of FEM.
3. Understand the Applications, Principles and discretization techniques used in Finite Element Analysis
4. Understand the concept of Shape function, convergence for rectangular, triangular and bar elements
5. Identify the application and characteristics of FEA elements such as bars, beams, planar elements, and common 3-D elements.
6. Appreciate the importance of professional responsibility and ethical issues pertaining to the effective utilization of FEA for analysis, design and research.

Details of Course:

1. Introduction to Finite element method, History, Applications, Principles and discretization, Elements stiffness/ mass formulation based on direct, variational and weighted residual techniques
7
2. Shape function, convergence, displacement formulation for rectangular, triangular elements in Cartesian coordinates, Application to 2D stress analysis
7
3. Natural coordinates, Isoperimetric elements, Numerical integration, Convergence of Isoperimetric elements, application to 1D problems
6
4. Isoperimetric elements for two-dimensional and axisymmetric stress analysis for plane stress/ strain problems
6
5. Isoperimetric formulation for thin and thick plates and shells
7
6. Modeling techniques, application of FEM packages to general engineering structures
7

STRP411 Finite Element Method

Teaching Scheme: 02 P Total 02

Cre

dit: 01

Evaluation Scheme: 25 Internal + 25

External

Total Marks: 50

Minimum Eight experiments based on above syllabus

Suggested Books:

1. Finite Element Method Zienkiewicz, O. C. & Taylor, R. L Elsevier, 2000 Vol-I, II & III
2. Finite Element Method Hughes, T .R. J Dover Publication 2000 -
3. Finite Element Procedures Bathe, K.J Springer 2002 2nd Edition
4. Finite Element Method Reddy, J. N., John Wiley & Sons 1982 -

(Elective IV) STRL533 DESIGN OF SUBSTRUCTURES (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA	CA	ES	Int. Ex.	
3	0	2	5	4	20	30	50	25	100

Semester: 2nd

Subject Area: Structural Engineering

Course-Prerequisite	---
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Course Objective:

1. To understand basic design parameters of substructures
2. To understand design philosophy of earth retaining structures
3. To interpret the different failure profiles of substructures.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to –

1. Understand design of composite foundation systems for shallow/deep foundations.
2. Analysis and design of earth retaining structures.

3. Analyze and understand various foundation failures.
4. Student will be able to analyzed transfer and development length of concrete reinforcement
5. Student will be able to analyzed and design problems on major civil engineering structures.
6. To introduce to codal provisions of IS: 13920.

Details of Course:

1. Design of different isolated and combined footings including eccentric loading **7**
2. Design of raft foundation **7**
3. Design of deep foundation such as pile and well foundation **6**
4. Introduction to analysis and design of simple machine foundation **6**
5. Theory of sub grade reaction, beam on elastic foundation. **7**
6. Analysis and design of Abutments, Pier and retaining walls **7**

(Elective IV) STRP533 Design of Substructures

Teaching Scheme: 02 P Total 02

Credit: 01

Evaluation Scheme: 25 Internal

Total Marks: 25

Minimum Eight practical based on above syllabus

Suggested Books

1. Analysis and Design of Substructures Limit State Design Swami Saran Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi 2007 -
2. Design of Foundation Systems- Principles and Practices Kurian N.PNarosa Publishing House, New Delhi 2006
3. Reinforced Concrete Design Verghese P.C Prentice hall of India, New Delhi 2001
Modern Foundations, Introduction to Advanced Techniques Kurian N.P Tata McGraw-Hill, New Delhi 1982

(Elective –IV) STRL534 PRESTRESSED CONCRETE STRUCTURES (Offline)

Teaching Scheme				Credits			Evaluation Scheme			
Th	Tu	Pr	Total Hours		Theory			Practical		Total Marks
					TA	CA	EE	Int.	Ext.	
3	0	2	5	4	20	30	50	25	25	100/50

Semester: 2nd

Subject Area: Structural Engineering

Course-Prerequisite	---
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Course Objective:

1. To identify the various causes of failure in pre-stress concrete structures.
2. To understand the concept of deflection and shear resistance in pre-stressing.
3. To identify various analytical methods and dynamic behavior of pre-stressed concrete

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Understand the general mechanical behavior of pre-stressed concrete.
2. Understand the behavior and design of pre-stressed concrete members.
3. Analyze the stresses in anchorage zones and design end anchorages for pre-stressed concrete beams and slabs
4. Understand the short-term and long-term losses in prestressing and design prestressed structures considering these losses
5. Analyze and design prestressed concrete flexural members.
6. Analyze and design for vertical and horizontal shear in prestressed concrete.

Details of Course:

1. Design of high strength concrete mixes, Loss of prestress in single span and continuous beams, Use of IS 1343- 1980, Analysis Limit State Design of beams for Tension Type II and III problems, Cracking moment, untensioned reinforcement, Partial prestressing, Stress Corrosion **7**
2. Transfer of prestress by bond, Transverse tensile stresses, End zone reinforcement, Behaviour of Bonded and unbonded prestress concrete beams **7**

3. Deflection of Prestressed concrete members, short and long term, control of deflections, Crack width considerations, Flexural strength of prestressed concrete sections: Types of flexural failures, Limit state concept **6**
4. Shear resistance of prestressed concrete members: Principal stresses and ultimate shear Resistance, Design of shear reinforcement, prestressed concrete, members in Torsion, Design of reinforcement in torsion shear and bending **6**
5. Stress distribution in end block, Analysis and Anchorage Zone reinforcement. Composite Construction of prestressed precast and cast in situ concrete, Statically Indeterminate structures: Continuous beams, primary and secondary moments, Continuity, concordant cable profile, Analysis and Design of continuous beams **7**
6. Prestressed concrete pipes and poles, Design of Prestressed concrete tanks, Prestressing of dams and bridges: Method of construction, Stage prestressing, Dynamic and Fatigue behaviour of prestressed concrete **7**

STRP534 Prestressed Concrete Structures

Teaching Scheme: 02 P Total 02

Credit: 01

Evaluation Scheme: 25 Internal

Total Marks: 25

Minimum Eight experiments based on above syllabus

Suggested Books:

1. Prestressed Concrete Bridge, Design and construction Nigel R Hewon Thomas Telford London 2003
2. Plan Cast Precast and Prestressed concrete (A Design Guide) Devid A. Sheppard & William R. Phillips Mcgraw Hill Publication Co 1989
3. Prestressed Concrete N. Krishnaraju Tata McGraw Hill 1981 3rd Edition
4. Design of Prestressed Concrete Structures Lin T.Y, Burns N.H, John Wiley & sons Oxford & IBH 1996 5th edition

(Elective IV) STRL535 ADVANCED DESIGN OF STEEL STRUCTURES (Offline)

Teaching Scheme	Cr ed	Evaluation Scheme
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				its	Theory			Prac tical		To tal M arks
T h	T u	P r	T ot al H o u r s		T A E	C A E	E S E	I n t.	E x t.	
3	0	2	5	4	20	30	50	25	25	100/50

Semester: 2nd

Subject Area : Structural Engineering

Course-Prerequisite	---
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Course Objective:

1. To understand different codal provisions use in steel structures.
2. To understand the different parameters in the design of tubular structures, steel chimneys and storage vessels.
3. To know the basic concepts of bearings and web sections

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Understand the design philosophy and IS codes ,IRC recommendations
2. Understand the design beams subjected to biaxial bending and beam columns as per current code
3. Have an experience in the complete design of an Industrial building
4. Utilized the concept of design of transmission towers
5. Design round tubular structures, steel chimneys and storage vessels
6. Design the different types of bearings and web sections

Details of Course:

1. Design philosophy & IS codes IRC recommendations. Design of connections.

10

2. Design of round tubular structures, Design of steel chimneys, Design of storage vessels. **10**
3. Types of Bearing, Design of Bearing. **10**
4. Design of bridges – highway and railways, Foot Bridge. Design of Web Sections. **10**

STRP535 ADVANCED DESIGN OF STEEL STRUCTURES

Teaching Scheme: 02 P Total 02

Credit: 01

Evaluation Scheme: 25 Internal

Total Marks: 25

Minimum Eight experiments based on above syllabus

Suggested Books:

1. Steel Designers Manual Owens, G.W. & Knowles, P.R. Blackwell 1994
2. Design of Steel Structures Gaylord, E.H. & Gaylord, C. N. McGraw Hill Publ 1998
3. Composite Structures of Steel and Concrete, Vol-I Johnson, R. P. Granada Publishing Ltd., London 1994
4. Steel Structures-Design and Behavior Salmon and Johnson Harper and Collins Publishers.

(Elective V) STRL536 SOIL-STRUCTURE INTERACTION (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	P	Total Hours		TA	CA	ESE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Semester: 2nd

Subject Area: Structural Engineering

Course-Prerequisite	Geotechnical Engineering I&II
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Course Objective:

1. To understand the behavior of various soil under different conditions.
2. To know the software's used to model different soil systems.

Modes of Delivery of Courses:

1	Conventional Teaching (Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to-

1. Prepare realistic material models for structural materials, soils and interfaces/joints.
2. Understand modeling of engineering systems and Soil-Structure Interaction (SSI) using computer methods
3. The present methods of static and dynamic wind analysis of multistoried buildings
4. To identify preliminary sizing for mathematical modeling of RC/steel structures
5. Indian codes/Standards for RCC and PSC structures
6. Various shear wall analysis

Details of Course:

1. Introduction to soil foundation interaction problems, soil behavior, foundation behavior, interface behavior, scope of soil foundation interaction analysis, soil response models, Winkler, Elastic continuum, two parameter elastic model, Elastic Plastic behavior, Time dependent behavior. **8**
2. Beam on Elastic foundation-soil models: Infinite beam, two parameters, Isotropic elastic half space, analysis of beams of finite length, classification of finite beams in relation to their stiffness **8**
3. Plate on Elastic medium: Infinite plate, Winkler, two parameters, isotropic elastic medium, thin and thick plates, analysis of finite plates: rectangular and circular plates, Numerical analysis of finite plates, simple solutions **8**
4. Elastic analysis of piles: Elastic analysis of single pile, theoretical solutions for settlement and load distributions, analysis of pile group, interaction analysis, load distribution in groups with rigid cap **8**
5. Laterally loaded pile: Load deflection prediction for laterally loaded piles, sub-grade reaction and elastic analysis, interaction analysis, pile raft system, solution through influence charts. **8**

Suggested Books

1. Elastic analysis of soil foundation interaction A.P.S. Selvadurai, Elsevier Science 1979 First
2. Pile Foundation Analysis and Design
3. Poulos, H.G. & Davis E. HWiley Series1980 First
4. Foundation Analysis Scott, R.F Prentice Hall; First Edition March 1981 First
5. Structure Soil Interaction- State of Art Report, Institution of Structural Engineers, 1978 Geotechnical Earthquake Engineering Kramer, S.L
6. Design of Foundation Sytems : Principles & Practices N.P. Kurien Narosa, New Delhi 1992 2001Second
7. Design Analysis of Beams, Circular Plates and Cylindrical Tanks on Elastic Foundation, E.S. Melerski Taylor and Francis, 2006.

**(Elective V) STRL537 EARTHQUAKE
RESISTANT DESIGN OF RC STRUCTURES
(Offline)**

Teaching Scheme				Credits	Evaluation Scheme			
					Theory			Total Marks
T	h	T	P	ur	T	C	E	Con
					A	A	S	t.
					E	E	E	Eval
								uation
								on
3	0	-	3	3	20	30	50	--
								100

Semester: 2nd

Subject Area: Structural Engineering

Course-Prerequisite	
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Course Objective:

1. To study geological strata of earth and movement of plate tectonics
2. To develop the response spectra for a different regions.
3. To understand various codal provision for seismic design.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Understand earth geology, movements of the plates, earthquakes
2. Understand the causes and damages of earthquake
3. Apply the guidelines for achieving efficient seismic resistant design
4. Apply the ductile detailing guidelines to strengthen the energy absorption capacity of beams and columns
5. Understand the impact of architectural aspects on performance of multi-storey building
6. Understand the various clauses given in IS codes for the Seismic Analysis.

Details of Course:

1. Engineering geology of earthquakes, faults, Propagation of earthquake waves, quantification of earthquake, magnitude, energy, intensity of earthquake, accelerograph, accelogram, recording and analysis of earthquake records, seismocity of the world, Analysis and interpretation of earthquake data, determination of magnitude, epicenter, epicenter distances, focal depth, focal mechanism, seismic zoning **6**
2. Causes or sources of earthquake damage, damage due to ground failure, History of past earthquakes, generation of response spectrum from available earthquake records, Evolution of seismic risk, Concept of response spectra, generation of site-specific spectrum, characteristics of earthquake ground motion **6**
3. Guideline for achieving efficient seismic resistant design, geotechnical design consideration, determination of average shear wave velocity, average SPT etc **6**
4. Strength, ductility and energy absorption, ductility of reinforced members subjected to flexure, axial loads & shear. Detailing of RCC members, beam column, Beam-column joints for ductile behaviors, IS code provisions **6**
5. Special aspects in Multi-storey buildings, Effect of torsion, flexible first story, P-delta effect, soil-structure, interaction on building response, drift limitation **6**
6. Study of IS: 1893, IS: 13920 for analysis and ductile design of RCC structures and other related codes **6**

Suggested Books

1. Earthquake resistant Design of Structures Pankaj Agrawal and Manish Shrikhande Prentice Hall of India Pvt, Ltd. Publications, 2006First

2. Earthquake Resistant Design of Structures S. K. Duggal, Oxford University Press Publications 2007 First
3. IS 1893:2002, Criteria for Earthquake Resistant Design of Structures Bureau of Indian Standards Bureau of Indian Standards 2002 First
4. IS 13920: 1993, Ductile Detailing of Reinforced Concrete Structures subjected to Seismic forces - Code of practice, Bureau of Indian Standards Bureau of Indian Standards 1993 First
5. Earthquake Spectra & Design, Earthquake Design Criteria "Newmark, N.M. & Hall, W.J. Earthquake Engineering Research Institute, Oakland, California, USA, 1982 First

(Elective V) STRL538 GEOGRAPHIC INFORMATION SYSTEM AND (Offline)

INFORMATION SYSTEM AND <u>Training</u>									
Teaching Scheme				Cr edi ts	Evaluation Scheme				
					Theory			Prac tical	To tal M ar ks
Th	Tu	Pr	Total Hours		TA E	CA E	EE	Cont · Eval uation	
3	0	-	3	3	20	30	50	--	100

Semester: 2nd

Subject Area: Structural Engineering

Course Objective:

1. To study the GIS tools for the analysis of geographical data.
2. To understand the real world situation using GIS modern tools.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Use GIS tools to access, display, manipulate, edit, and analyze geographic data
2. Experience with real-world activity-based scenarios covering such operations as data acquisition and preparation, raster calculations, surface analysis, statistical analysis, and interpolation

3. Design a small research project, outlining the problem, hypothesis, objectives, and methods (based primarily on the use of remote sensing data sets).
4. Search order/retrieve and, import remote sensing data relevant to their project.
5. Analyze and interpret the spectral signatures in the remote sensing images.
6. Apply the acquired theoretical and practical knowledge in remote sensing to complete an independent term project on a topic of their choice.

Details of Course:

1. GIS Definition–Map and map analysis–Automated cartography – History and development of GIS – Hardware requirement – Type of data – Spatial and non- spatial data – Data structure – Vector and raster – Files and data formats – Data compression. **10**
2. Spatial analysis – Data retrieval – Query – Overlay – Vector data analysis – Raster data analysis – Modelling in GIS – Digital Elevation Model – DTM – Types of output data –Output devices – Sources of errors – Types of errors – Elimination – Accuracies – **10**
3. The Global Positioning system and its applications. Data Acquisition and interpretation - Visual Image Interpretation – Visual Image Interpretation Equipment - Digital Image Processing – **10**
4. Classification. Applications in Survey, mapping and monitoring of land use/land cover – Transportation planning - Infrastructure development - Natural resources management - Urban Planning, Environment - Coastal Zone Management – Air Quality - Development of Resources Information Systems **10**

Suggested Books

1. Principles of Geographical Information Systems. Burrough P.A. and Rachel A. McDonell Oxford Publication 2004 First
2. Concepts and Techniques of Geographical Information Systems, C.P. Lo and Albert K. W. Yeung Prentice-Hall India, 2006 First
3. Remote Sensing and Image Interpretation. Thomas. M. Lillesand and Ralph. W. Kiefer, John Wiley and Sons, 2003 First

(Elective VI) STRL539 ANALYSIS AND DESIGN OF INDUSTRIAL STRUCTURES(Offline)

Teaching	Cr	Evaluation Scheme
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Scheme				Credits	Theory			Practical Cont. Evaluation	Total Marks
T	h	T	u		T	A	E		
3	0	-	3	3	20	30	50	--	100

Semester: 2nd

Subject Area: Structural Engineering

Course-Prerequisite	---
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Course Objective:

1. To study different parameters of planning used in industrial structures.
2. To identify the real world problem for pressure vessels and cooling towers.
3. To understand the behavior of machine foundation.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Plan the industrial structures by using different parameters.
2. Design the pressure vessels and cooling towers on real world situations.
3. Design the machine foundation and suspended roof structures.
4. Develop mathematical models for various special structures
5. Apply various analysis techniques for special structures
6. Apply the principles and provisions for seismic design and detailing for special structures

Details of Course:

1. Planning of industrial structures. Design of single and multibay industrial structures in steel and concrete **10**
2. Bunkers and silos. Pressure vessels and chimneys. **10**

3. The Global Positioning system and its applications. Data Acquisition and interpretation - Visual Image Interpretation – Visual Image Interpretation Equipment - Digital Image Processing – **10**
4. Cooling towers. Large span roof structures. **10**

Suggested Books

1. Steel Designers Manual Owens, G.W. & Knowles, P.R.Blackwell1994 First
2. Design of Steel structures Gaylord, E.H. & Gaylord, C.N McGraw Hill Publ1998.First
3. Steel Design Manual ELBS and Granada Publishers, London. ELB Sand Granada Publishers, London.
4. Composite Structures of Steel and Concrete Johnson, R.P Granada Publishing Ltd, London, 1975First
5. Steel Structures-Design and Behaviour Salmon and Johnson Harper and Collins Publishers

(Elective VI) STRL540 FORENSIC ENGINEERING AND REHABILITATION OF STRUCTURES (Offline)

Teaching Scheme				Credits	Evaluation Scheme				Total Marks
T	h	T	u		Theory			Practical Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Semester: 2nd Subject Area : Structural Engineering

Course-Prerequisite	---
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Course Objective:

1. To determine causes of distress in structural member.
2. To investigate using various methods of deterioration of RC Concrete structures
3. To understand various alternative repair strategies.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest

			lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Describe and evaluate the use of structural forensics in creating and maintaining urban civil infrastructure.
2. Identify common failure modes of structures and classify them according to criticality/risk.
3. Classify an observed structural failure as a technical or procedural failure or a combination.
4. Implement structural design/construction/procurement process with an understanding of key weak elements and methods of addressing the weaknesses.
5. Investigate failures of structures, lessons learnt and produce technical notes – simulating a mechanism of reporting of structural.
6. Know the strategies of maintenance and repair.

Details of Course:

1. Failure of Structures: Review of the construction theory – performance problems –responsibility and accountability – case studies – learning from failures – causes of distress in structural members – design and material deficiencies – over loading **10**
2. Diagnosis and Assessment of Distress: Visual inspection – nondestructive tests – ultrasonic pulse velocity method – rebound hammer technique – ASTM classifications –pullout tests – Bremor test – Windsor probe test – crack detection techniques – case studies – single and multistory buildings – Fiber optic method for prediction of structural weakness. **10**
3. Environmental Problems and Natural Hazards: Effect of corrosive, chemical and marine environment – pollution and carbonation problems – durability of RCC structures – damage due to earthquakes and strengthening of buildings – provisions of BIS 1893 and 4326. **10**
4. Modern Techniques of Retrofitting: Structural first aid after a disaster – guniting, jacketing – use of chemicals in repair – application of polymers – Ferro cement and fiber concretes as rehabilitation materials – strengthening by pre-stressing – case studies –bridges – water tanks – cooling towers – heritage buildings – high rise buildings. **10**

Suggested Books

1. Design and Construction Failures Dovkaminetzky Galgotia Publication, New Delhi, 2001First
2. Structural Failures, Jacob Feld and Kenneth L Carper Wiley Europe

(Elective VI) STRL541 ADVANCED STRUCTURAL DYNAMICS (Offline)

Teaching Scheme				Cr edi ts	Evaluation Scheme				
					Theory			Prac tical	To tal M ar ks
T h	T u	P r	To tal Ho ur s		T A E	C A E	E S E	Cont · Eval uation	
3	0	-	3	3	2 0	3 0	5 0	--	10 0

Semester: 2nd

Subject Area: Structural Engineering

Course Objective:

1. To understand the concepts of free and forced vibration.
2. To interpret the response of structure considering lumped mass and continuous mass system.
3. To study the different codal provision for dynamic analysis of the structure.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

1. Calculate the response for harmonic loading with concept of transmissibility.
2. Apply the codal provisions for MDOF analysis of lumped mass.
3. To study the distribution properties of dynamic analysis.
4. Capable to correlate information from various engineering and scientific discipline to understand complex behavior of RC structure subjected to seismic forces
5. Apply capacity design principle Capable to design RC structures in accordance with

the provisions of Indian and International Building Codes considering seismic forces

- Capable to use performance based design framework and nonlinear analysis techniques

Details of Course:

- Fundamentals of rigid / deformable body dynamics, Analysis of undamped and viscously damped, single degree freedom systems. 6
- Response of single degree freedom systems to harmonic loading, support motion and transmissibility, Duhamel's integral 6
- Study of IS 1893-1984 and 2000 applicable to buildings and water tanks 6
- Free vibrations of lumped mass multi degree freedom systems, shear buildings, orthogonality criteria, Rayleigh's method 6
- Dynamic analysis of systems with distributed properties, approximate design method,
- transformation factors 6
- Response spectra, introduction to vibrations due to earthquake 6

Suggested Books

- Dynamics of Structures R.W. Clough and J. Penzian McGraw-Hill Inc, 1993 Second
- Introduction to Structural Dynamics J.M. Biggs McGraw-Hill Book Co. 1964 First
- Vibration Problems in Engineering W. Weaver, Jr., S. P. Timoshenko and D. H. Young. Chichester John Wiley & Sons Limited 1990 Fifth
- Elements of Vibration Analysis Meirovitch, L McGraw Hill International Edition, Singapore 1986 Second
- Introduction of Structural Dynamics Biggs, J.M., McGraw Hill, NY 1964 First

(Elective VI) STRL542 ADVANCED DESIGN OF RCC STRUCTURES (Offline)

Teaching Scheme				Cr edi ts	Evaluation Scheme				
Th	Tu	Pr	Total Hours		Theory			Prac tical	To tal Mar ks
					TA E	CA E	EE	Cont · Eval uation	
3	0	-	3	3	20	30	50	--	100
Semester: 2 nd					Subject Area: Structural Engineering				
Course-Prerequisite					---				

Course Objective:

- To understand clauses of IS codes and IRC recommendations.
- To carry out load calculation, analysis, design and detailing of flat slabs, grid floor, water tanks, bunker and silos, folded plate and domes as per relevant IS code of practice
- To Analysis and design of raft foundation, strip footing and pile caps
- To introduce methodologies for service reservoirs as per codal provisions.
- To analyze and design special structures with different methods, codes of practice.
- To ensure serviceability criteria for reinforced concrete structural elements.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	5	Activity based learning (Paper Review, Poster, etc.)
2	Assignments	6	Special guest lectures /Industry Visit
3	Seminars	7	NPTEL Lecture
4	Audio visual aids		

Course Outcome:

Upon successful completion of the course, students shall be able to -

- Understand the IS codes of practices & IRC recommendations in loading and design of reinforced concrete structures.
- Analyze and design Elevated Service Reservoir for wind and earthquake loading.
- Analyze and design the special structures like pipes, silos, Bunkers, chimneys.

Details of Course:

- Analysis and Design of Slab type & T - Beam bridges, IRC Recommendations 10
- Analysis and Design of Elevated service Reservoirs, IS Recommendations for wind & earthquake, Ductile detailing. 10
- Analysis and design of Multistoried buildings, calculation of loads, Approximate analysis, Preliminary sizing, IS: 875, IS: 1893 recommendations, Ductile detailing. 10
- Analysis and design of special structures i.e. pipes (underground, on ground, Elevated), silos, Bunkers, chimneys, IS recommendations 10

Suggested Books:

1. Plain & reinforced concrete Structures Jain & Jaikrishna Nem Chand & brother Volumel
2. Handbook on seismic analysis and design of structures Farzadnaaim
3. Seismic design of R C & masonry Buildings paulay & Prestiley
4. Earthquake resistant Design for engineers & Architects Dowrick D

THIRD SEMESTER**STRL543 - Industry project/ Research Project (Phase-I)**

Teaching Scheme				Cr edi ts	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TA	CA	SE	INT	EXT	
		09	09	09				150		150

Course Objectives :

1. To develop the ability to analyze and use scientific approach in solving complex engineering problems.
2. To develop an attitude of continuous and lifelong learning
3. To develop oral and written communication and presentation skills, critical review of the existing literature.
4. To develop design skills and the ability to conduct planned experimentation.

Course Outcomes:

1. Upon successful completion of phase –I of dissertation, students shall be able to:
2. Analyze complex engineering problems, develop action plan and apply appropriate research methodologies to find workable solution.
3. Develop oral and written communication and presentation skills, critical review of the existing literature, experimental and design skills
4. Develop an attitude of continuous and lifelong learning

FOURTH SEMESTER**STRP544****Industry project/ Research Project (Phase-II)**

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TA	CA	EE	INT	EXT	
		15	15	15				150	150	300

Course Objectives :

1. To develop the ability and skill sets to analyze and solve complex engineering problems, independently or as a team member, using modern tools and computational techniques.
2. To develop oral and written communication and presentation skills, critical review of the existing literature, experimental and design skills
3. To develop an attitude of continuous and lifelong learning

Course Outcomes:

Upon successful completion of the dissertation, students will be able to:

1. Analyze and solve a complex engineering problem posed for investigative study, independently or as a team member, using modern tools and computational techniques.
2. Develop oral and written communication and presentation skills, critical review of the existing literature, experimental and design skills and showcase research findings through publications.
3. Develop an attitude of continuous and lifelong learning.



G H RAISONI COLLEGE OF ENGINEERING

(An Autonomous Institute affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)

Accredited by NAAC with 'A+' Grade

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VISION & MISSION OF INSTITUTE

VISION

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges

MISSION

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake-holders. Our strength is directed to create competent professionals. Our endeavour is to provide all possible support to promote research and development activities

VISION & MISSION OF CIVIL ENGINEERING PROGRAM

VISION

To achieve excellent standards of quality education in Civil Engineering by keeping pace with rapidly changing technologies & to create technical manpower of Global Standards in Civil Engineering with capabilities of accepting new challenges.

MISSION

To impart quality and value based education to raise satisfaction of all stake holders.

To serve society and nation for providing professional leadership in Civil Engineering for solving the problems consistent with rapidly changing technologies.

To create competent Civil Engineering professionals who are trained in the design and implementation of Civil Engineering systems.

To promote Research & Development Activities in the field of Civil Engineering and allied areas.

M. TECH. (TRANSPORTATION ENGG.)

Programme Educational Objectives (PEOs)

The educational objectives of the programme are designed to produce competent engineers who shall:

1. Apply knowledge of Transportation system analysis, design, modeling and simulation to provide solutions to industrial problems in diverse domains.
2. Undertake the professional career by developing system and services to address social, technical and economical challenges and needs.
3. To do research under collaborative and multidisciplinary environments using modern tools, processes and creative efforts.

Programme Outcomes (POs)

On completion of the M. Tech. (Transportation Engineering) programme, the students shall be able to:

PO1: Independently carry out research /investigation and development work to solve practical problems.

PO2: Write and present a substantial technical report/document.

PO3: Demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program.

PO4: Develop ability to learn reflectively from mistakes, engage in lifelong learning, adapt new developments and participate in continuing education opportunities to foster personal and organizational growth..

PO5: Provide technical solutions to society with integrity, ethical behavior and commitment to code of conduct of professional practices and standards.

PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO1: An ability to recognize the importance of Civil Engineering professional development by pursuing postgraduate studies

PSO2: An ability to apply design, develop and execution of projects in the construction of various Civil Engineering disciplines

PSO3: An ability to face competitive examinations that offer challenging and rewarding careers and demonstrating leadership to emerged as potential entrepreneur.

M.TECH TRANSPORTATION ENGINEERING SCHEME (CIVIL ENGINEERING)

Subject Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						ESE Duration (Hrs)	Mode of Exam (Online / Off Line)
		Th.	Tu.	Pr.	Total Hours		Theory			Practical		Total		
							TAE	CAE	ESE	Int.	Ext.			
SEM-I														
TNSL 421	Applied Statistics & Optimization Methods	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Off Line
TNSL 422	Traffic Engineering	3	-	-	3	3	20	30	50			100	3 hrs	Off Line
TNSP 423	Traffic and Highway Engineering Laboratory	-	-	2	2	1	-	-	-	25	25	50	--	practical
TNSL XXX	Elective – I	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Off Line
TNSP XXX	Elective – I	-	-	2	2	1	-	-	-	25	-	25	-	Off Line
TNSL XXX	Elective – II	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Off Line
TNSL XXX	Elective – III	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Off Line
MBA 602	Advanced Communication Skills	-	-	2	2	1	-	-	-	25	-	25	-	Off Line
	TOTAL	15	00	06	21	18	100	150	250	75	25	600		

List of Elective I

1.	TNSL 551	Advanced Highway Materials	TNSP 551	Advanced Highway Materials
2.	TNSL 552	Transportation and Traffic Infrastructure Design	TNSP 552	Transportation and Traffic Infrastructure Design
3.	TNSL553	Transportation System Analysis and Modeling	TNSP553	Transportation System Analysis and Modeling

List of Elective-II

1.	TNSL 554	Environmental impact on Various Transportation system
2.	TNSL 555	Transportation Safety and management
3.	TNSL 556	Bridge Engineering

List of Elective-III

1.	TNSL 557	Advanced Traffic Management System
2.	TNSL 558	Communication Standards used in Transportation
3.	TNSL559	Transportation Network Analysis
4.	TNSL560	Ground Improvement Techniques

M.TECH TRANSPORTATION ENGINEERING SCHEME (CIVIL ENGINEERING)

Subject Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						ESE Duration (Hrs)	Mode of Exam (Online / Off Line)
		Th.	Tu.	Pr.	Total Hours		Theory			Practical		Total		
							TAE	CAE	ESE	Int.	Ext.			
SEM-II														
TNSL 424	Traffic Flow Theory	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Offline
TNSP 425	Traffic Flow Theory	-	-	2	2	1	-	-	-	25	-	25	-	Practical
TNSL 426	Intelligent Transportation System	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Online
TNSL XXX	Elective - IV	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Offline
TNSL XXX	Elective - V	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Offline
TNSL XXX	Elective - VI	3	-	-	3	3	20	30	50	-	-	100	3 hrs	Offline
TNSP 427	Transportation System Software Laboratory	-	-	2	2	1	-	-	-	25	25	50	--	Practical
IDA403	Research Methodology	-	-	2	2	1	-	-	-	25	-	25	--	
	TOTAL	15	-	06	21	18	100	150	250	75	25	600		

List of Elective IVI		
1.	TNSL561	Transducers & Sensors
2.	TNSL562	Soft Computing
3.	TNSL563	Urban Transportation Planning
4.	TNSL 564	Computer Aided Transportation Engineering
List of Elective V		
1.	TNSL 565	Highway Traffic Analysis and Pavement Design
2.	TNSL 566	Transportation Economics and Finance
3.	TNSL 567	Public Transportation Planning and Design
4.	TNSL 568	Railway Infrastructure Planning and Design
List of Elective VI		
1	TNSL569	Waterway Infrastructure Planning and Design
2	TNSL570	Airport Planning and Design
3	TNSL571	GIS and Remote Sensing
4	TNSL572	Pavement Design and Analysis
5	TNSL573	Project Management

M.TECH TRANSPORTATION ENGINEERING SCHEME (CIVIL ENGINEERING)

Subject Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						ESE Duration (Hrs)	Mode of Exam (Online / Off Line)
		Th.	Tu.	Pr.	Total Hours		Theory			Practical				
							TAE	CAE	ESE	Int.	Ext.			
SEM-III														
TNSP 574	Industry project/ Research Project (Phase –I)	-	-	09	09	09	-	-	-	150	-	150	-	Off Line
	TOTAL	-	-	09	09	09	-	-	-	150	-	150	-	

M.TECH TRANSPORTATION ENGINEERING SCHEME (CIVIL ENGINEERING)

Subject Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						ESE Duration (Hrs)	Mode of Exam (Online / Off Line)
		Th.	Tu.	Pr.	Total Hours		Theory			Practical				
							TAE	CAE	ESE	Int.	Ext.			
SEM-IV														
TNSP 575	Industry project/ Research Project(Phase –II)	-	-	15	15	15	-	-	-	150	150	300	-	Off Line
	TOTAL	-	-	15	15	15	-	-	-	150	150	300	-	

SEMESTER-I

TNSL 421 APPLIED STATISTICS & OPTIMIZATION METHODS

Teaching Scheme				Credits	Evaluation Scheme				Total Marks
					Theory			Practical	
Th	Tu	Pr	Total Hours		TA	CE	EE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand various types of flow distributions in traffic flow theory.
2. Understand different tests of significance and correlation of the data.
3. Apply various mathematical modelling techniques to traffic engineering problems.
4. Understand problems associated to find optimal solutions.
5. Solve optimization problems using various methods.
6. Perform optimization problems such as route optimization, transit schedule optimization etc.

Unit 1. [7 Hrs]

Collection and presentation of data; Measures of central tendency; Elementary probability theory; Random events; Baye's theorem; Random variables and distributions; Derived Distributions; Moments and Expectations;

Unit 2. [7 Hrs]

Common probabilistic models; Statistical inference; Estimation of parameters; Tests of hypotheses and significance; Goodness of fit tests; Regression and correlation analysis;

Unit 3. [7 Hrs]

Design of Experiments, Basics of engineering analysis and design, need for optimal design, formulation of optimal design problems

Unit 4. [7 Hrs]

Basic difficulties associated with solution of optimal problems, classical optimization methods, necessary and sufficient optimality criteria for unconstrained and constrained problems Global optimality and convex analysis, linear optimal problems, Simplex method

Unit 5.

[7 Hrs]

Numerical methods for nonlinear unconstrained and constrained problems, Sensitivity analysis, linear post optimal analysis, sensitivity analysis of discrete and distributed systems

Unit 6. [7 Hrs]

Introduction to integer programming, dynamic programming, stochastic programming and geometric programming, introduction to genetic algorithm.

Reference Books

1. Benjamin, J.R. Benjamin and C.A. Cirbekk, Probability Statistics and Decision for Civil Engineers, McGraw-Hill, 1970.
2. H.S. Ang and W. H. Tang, Probability Concepts in Engineering, Planning and Design, John Wiley, 1975.
3. Erwin Kreyszig, Introductory Mathematical Statistics, John Wiley, 1970
4. K. Deb., Optimization for Engineering Design: Algorithms and Examples, PHI Pvt Ltd., 1998.
5. R. C. Larson and A. R. Odoni, Urban Operations Research (Available at: http://web.mit.edu/urban_or_book/www/book/)
6. Ravindran, Philips and Solberg, Operations Research: Principles and Practices, 2nd Edition, Wiley, 2006

TNSL422

TRAFFIC ENGINEERING

Teaching Scheme				Credits	Evaluation Scheme				Total Marks
					Theory			Practical	
Th	Tu	Pr	Total Hours		TA	CE	EE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand the fundamental traffic flow theories and identify basic traffic variables and their relationships including speed, density and flow.
2. Analyze a variety of traffic facilities and evaluate capacity and level of service (LOS).
3. Design signalized intersections including isolated, coordinated and roundabouts.
4. Assess, evaluate and justify methods of traffic management and control.
5. Understand the use of advanced simulation methods for the analysis of traffic systems and software tools for the design of traffic control strategies.
6. Understand the implementation of recent advances in traffic engineering for the society benefits.

Unit 1. [10 Hrs]

Driver behaviour, traffic information and control systems Traffic studies- volume, speed and delay studies

Unit 2.

[08 Hrs]

Elements of traffic flow theory, Characteristics of uninterrupted traffic, Capacity and LOS of uninterrupted facilities

Unit 3.

[08 Hrs]

Characteristics of interrupted traffic Traffic characteristics at un-signalized intersections Design of

signalized intersections Capacity and LOS of signalized intersections

Unit 4. [08 Hrs]

Actuated signal control, signal coordination, Ramp Metering, Design of parking, lighting and terminal facilities

Unit 5. [08 Hrs]

Simulation of traffic systems, Trends in traffic engineering

Reference Books

1. Roger P. Roess, William R. McShane & Elena S. Prassas, Traffic Engineering, 4th Edition, Prentice-Hall, 2010
2. Fred Mannering, Walter Kileraski and Scott Washburn, Principles Of Highway Engineering And Traffic Analysis, 3rd Ed, Wiley India, 2007
3. L. R. Kadiyali, Traffic Engineering and Transportation Planning, Khanna Publishers, 2008.
4. Highway Capacity Manual 2000, MORTH Codes, All relevant IRC codes

TNSP423 TRAFFIC AND HIGHWAY ENGINEERING LABORATORY

Teaching Scheme				Credits	Evaluation Scheme					
Th	Tu	Pr	Total Hours		Theory			Practical		Total Marks
					TA	CA	EE	INT	EXT	
		02	02	01				25	25	50

1. Traffic inventory surveys – Classified Volume count surveys, Speed studies, Headway studies, Delay studies, Gap acceptance studies, Parking studies, Accident investigation studies
2. Road geometric design – Cross sectional elements design, Horizontal and vertical alignment design, Intersection design, Overview of MX roads
3. Pavement design for flexible and rigid pavements – Soil characterization, Pavement material characterization tests, Traffic characterization
4. Quality control and Quality assurance issues: Blending of aggregates, Job Mix formula design, Pre-construction, During construction and Post construction quality control tests
5. Traffic impact assessment on mixed land use environment

Reference Books

1. MORTH Specifications of Road Construction and Bridge Works
2. Ajay K. Duggal & Vijay Puri, Laboratory Manual in Highway Engineering, New Age International

TNSL551 ADVANCED HIGHWAY MATERIALS

Teaching Scheme	Credits	Evaluation Scheme		
		Theory	Practi	Tot

Th	Tu	Pr	Total Hours					cal	al Marks
					TA	CA	EE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. Select the appropriate materials for use in different road layers.
2. To select appropriate binder for flexible pavement depending upon the traffic and climatic conditions
3. Determine the proportions of ingredients required for the mix design of both asphalt mixtures and cement concrete.
4. To carry out tests on cement and cement concrete
5. Demonstrate application of geosynthesis in pavements
6. Demonstrate application of waste materials in pavements

Unit-1. (8 Hrs)

Aggregate: Nature and properties – aggregate requirements – types and processing – aggregates for pavement base – aggregate for bituminous mixture – aggregate for Portland Cement Concrete – light weight aggregate – tests on aggregate – specification.

Unit-2. (8 Hrs)

Bituminous Materials: conventional and modified binders – production – types and grade – physical and chemical properties and uses – types of asphalt pavement construction – principles of bituminous pavement construction – tests on bituminous materials. Bituminous

Unit-3. (6 Hrs)

Mix design – modified mixtures – temperature susceptibility and performance. Cement /concrete based materials: Cement – properties – PCC mix design and properties – modified PCC – Mix Design

Unit-4. (6 Hrs)

Behaviour – Performance – Tests on Cement and Concrete mixes. High Performance Concrete – low shrinkage – increased strength. Composites, **Unit-5.** (6 Hrs)

Plastics and Geosynthetics: Plastics and polymerization process – properties – durability and chemical composition – Reinforced Polymer Composites – Geosynthetics – Dry Powdered Polymers – Enzymes.

Unit-6. (6 Hrs)

Reclaimed/Recycled Waste Products: Reclaimed Materials – waste products in civil engineering applications – effect of waste products on materials, structure and properties – self healing and smart materials – locally available materials.

REFERENCE BOOKS:

1. P. T. Sherwood, *Alternative Materials in Road Construction*, Thomas Telford Publication, London, 1997.

2. RRL, DSIR, *Soil Mechanics for Road Engineers*, HMSO, London, 1995
3. Koerner, R. M. *Designing with Geosynthetics*, Prentice Hall, Englewood Cliffs, New Jersey, U.S.A.
4. Shan Somayaji, *Civil Engineering Materials*, second edition, Prentice Hall Inc., 2001.

TNSL552 TRANSPORTATION AND TRAFFIC INFRASTRUCTURE DESIGN

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA	CA	ES	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand driver, vehicular and pavement surface characteristics.
2. Design road alignment manually and using MX road for hilly region
3. Design an intersection by considering advantages and disadvantages of each and every element of intersection
4. Design pedestrian facility and cycle tracks for road users.
5. Design different types of parking systems.
6. Understand the concept behind the runway design and railway alignment.

Unit1. [10Hrs]

Functional Classification of Highway System; Design Controls Topography, Driver characteristics, Vehicle Characteristics, Traffic, Capacity and Level of Service, Design Speed. Objectives of Geometric Design, Cross Section Elements: Design specifications; Pavement Surface characteristics Skid Resistance, Road Roughness; Camber, Objectives, design standards. Specifications for hill roads

Unit 2 : [10Hrs]

Horizontal Alignment and Vertical Alignment of roads: Sight Distances – Stopping Sight Distance, Overtaking Sight Distance and Intermediate Sight Distance ; Objectives of horizontal curves; Super elevation; Extra-widening on Curves; Transition Curves – Objectives and Design. Transition Curve setting methods and calculations , Introduction to MX Roads software ; Vertical Alignment : Gradients – Types of Gradients, Design Standards; Vertical Curves – Summit Curves, Valley Curves and Design criteria for Vertical Curves; Importance of Sight Distances for Horizontal and Vertical Curves ; Combination of Vertical and Horizontal Curves – Grade Compensation

Unit 3 : [10Hrs]

Geometric Design of Intersections : Types of Intersections; Design Principles for Intersections; Design of At-grade Intersections – Channelization, Objectives; Traffic Islands and Design standards; Rotary Intersection – Concept, Advantages and Disadvantages; Grade separated Interchanges – Types, warrants and Design standards.

Unit 4 : [10Hrs]

Miscellaneous Elements: Requirements of Pedestrians; Pedestrian facilities on Urban Roads; Cycle Tracks – Guidelines and Design standards; Bus bays –Types and Guide lines; Design of On-street and Off street Parking facilities – Guidelines for lay out Design.; Design of Ramp

Unit 5 : [10Hrs]

Airport and Railway Infrastructure Design – Runway orientation, Site selection, Wind rose analysis Geometric design standards for runways, taxiways, aprons , Airport capacity analysis, Terminal design; GEOMETRIC DESIGN OF RAILWAY TRACK: Gradients- Grade Compensation- Cant and Negative Superelevation- Cant Deficiency – Degree of Curve – Crossings and Turn outs .

REFERENCE BOOKS:

1. Principles and Practice of Highway Engineering, L.R.Kadiyali and N.B.Lal, Khanna
2. Traffic Engineering and Transportation Planning, L.R.Kadiyali, Khanna Publications
3. Highway Engineering, C.E.G.Justo and S.K.Khanna, Nem Chand and Brothers.
4. IRC Codes for Signs, Markings and Mixed Traffic Control in Urban Areas.

TNSL553 TRANSPORTATION SYSTEMS, ANALYSIS AND MODELLING

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	Pr	Total Hours		Theory			Practical	Total Marks
					TA	CA	ES	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. Optimize using classical methods and evolutionary algorithms for transportation system.
2. Design Route, Stop location for highway
3. Apply current practices for design of Transportation demand; Transportation models
4. Collect field data using different method and analyse it get key parameters for traffic study.

5. Calibrate the parameters using optimization techniques
6. Predict transportation system model using key parameters.

Unit1 (8Hrs)
Introduction to optimization: classical methods and evolutionary algorithms;

Unit2 (8Hrs)
Transit systems: street transit systems, rapid transit systems and para-transit systems;

Unit3 (8Hrs)
Route development; Stop location and stopping policy; Schedule development; capacity of transit systems;

Unit 4 (8Hrs)
Transportation demand analysis; Transportation models;

Unit 4 (8Hrs)
Data collection and calibration of models. Essential Reading:

Reference Books-

1. L.R. Kadiyalli, Traffic Engineering and Transport Planning, Khanna Publishers, 7th edition, 2008.
2. V.R. Vuchic, Urban Transit Systems and Technology, John Wiley & Sons, 2007.
3. C.A.O'Flaherty, Transport Planning and Traffic Engineering, Arnold, 1997.
4. C. S. Papacostas, P. D. Prevedouros, Transportation Engineering and Planning, PHI Publication, 3rd Edition, 2002.
5. M.D. Meyer, E. J. Miller, Urban Transportation Planning, McGraw-Hill Book Company, 1984.
6. K. Deb, Multi-Objective Optimization using Evolutionary Algorithms, John Wiley & Sons, 2002.
7. H.A. Taha, Operations Research, Prentice Hall of India, 7th Edition, 2003.
8. Kanafani, Transportation Demand Analysis, McGraw-Hill Book Company

Elective II and Elective III

TNSL554 ENVIRONMENTAL IMPACT ON VARIOUS TRANSPORTATION SYSTEM

Teaching Scheme				Credits	Evaluation Scheme				Total Marks
T	h	T	u	P	Theory			Practical	
					T	C	E	Cont. Evaluation	
					A	A	S		
					E	E	E		
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand the different aspects of impacts of different transportation system on environment
2. Perform cost benefit analysis of transportation facility.
3. Describe GIS applications, and clearance problems in India.

4. Different techniques to promote non-motorized transport systems.
5. Write a brief Environmental Impact Assessment report.
6. Study towards the reduction of noise and air pollution related to transportation systems.

Unit 1. (7Hrs)

Evolution of EIA; EIA at project; Regional and policy levels; Strategic EIA; EIA process; Screening and scoping Criteria; Rapid and comprehensive EIA;

Unit 2. (7Hrs)

Specialized areas like environmental health impact assessment; Environmental risk analysis; Economic valuation methods; Cost-benefit analysis;

Unit 3. (7Hrs)

Expert system and GIS applications; Uncertainties. Legislative and environmental clearance procedures in India and other countries Sitting criteria; CRZ;

Unit 4. (7Hrs)

Public participation; Resettlement and rehabilitation. Practical applications of EIA; EIA methodologies;

Unit 5. (7Hrs)

Baseline data collection; Prediction and assessment of impacts on physical, biological and socio-economic environment; Environmental management plan; Post project monitoring, EIA report and EIS; Review process.

Unit 6. (5Hrs)

Case studies on project, regional and sectoral EIA. Risk assessment fundamentals and methodology, case studies

Reference Books:

1. A.Chadwick, Introduction to Environmental Impact Assessment, Taylor & Francis, 2007.
2. Larry, W. Canter, Environmental Impact Assessment, McGraw Hill Inc. Singapore, 1996.
3. R.Therirvel, E. Wilson, S. Hompson, D. Heaney, D.Pritchard, Strategic Environmental Assessment
4. Earthscan, London, 1992.
5. A.Gilpin, Environmental Impact Assessment- Cutting edge for the 21st century, CUP, London, 1994.
6. Paul, A Erickson, A Practical Guide to Environmental Impact Assessment, Academic Press, 1994

TNSL555 TRANSPORTATION SAFETY AND MANAGEMENT

Teaching Scheme				Credits	Evaluation Scheme			
T	h	T	u	P	Theory			Practical
					T	C	E	Cont. Evaluation
					A	A	S	
					E	E	E	
3	0	-	3	3	20	30	50	--

Course Outcomes

After the course students should be able to:

1. Understand safety parameters for different transportation facilities.
2. Investigate the reasons of road crashes and respective counter-measures to reduce them.
3. Perform safety audits for transportation facilities at different levels of operation.
4. Design safety elements for pedestrians and cyclists.
5. Understand law enforcement methods to increase road traffic safety.
6. Prepare effective action report for risk management.

Unit 1. [08 Hrs]

Transportation Safety scenario in India and World, Accident Characteristics, Distribution among different modes. Need of Planning for Network, Land Use and Road Environment for Safety, Designing for Safety: Road Link Design, Junctions. Introduction to Road Safety Engineering and Crash Investigation, Human Factors Relating to Crashes/Accidents, Crash/Accident Unit 2. [06 Hrs]

Investigation & Crash Problem Diagnosing, Crash Problems into Solutions & Crash, Investigation Reporting, Crash/Accident, Costing, Economic , Appraisal. Safety at Construction Site: Safety provisions for workers at construction site, Construction Zone markings, signs.

Unit 3. [08 Hrs]

Road Safety Auditing: An Introduction, Concept and need of Road Safety Audit (RSA). Procedures in RSA, design standards, audit tasks, stages of road safety audit, Road Safety Audit Types, key legal aspects, process, audit team and requirements, Checklist, how to use Checklists Road Safety inspection.

Unit 4. [06 Hrs]

Road design issues in RSA's. Overview of Road Safety Hazards. Report Writing including deficiency identification, corrective actions recommendations, prioritization. Structuring RSA report. Street Lighting & Traffic Signals, Provisions for NMT Vehicles in India, Safety Provisions for Pedestrians & Cyclists, Road Signs and Pavement Markings.

Unit 5. [07 Hrs]

Safe System Approach: A Global Perspective, Speed Management & safety, Safe System and Speed & Assessing speed limit, Type of speed limit & Speed zone signing Infrastructure to support safe speed feedback and enforcement.

Unit 6. [07 Hrs]

Hazard Identification and Management, Organizational commitment & encouraging RSA. Risk Assessment & Prioritization of audit recommendations, Solutions and effectiveness & Corrective, Action Report.

Reference Books

1. Ruediger Lamm, Basil Psarianos, Theodor Mailaender, *Highway Design and Traffic Safety Engineering Handbook*, McGraw Hill Publishing, 1999
2. Road Safety Audit Manual

TNSL556 BRIDGE ENGINEERING

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Develop appropriate bridge solutions given site, geometric, functional and aesthetic constraints and drawing on other professional disciplines as required.
2. Complete detailed design of bridge structures in steel and concrete.
3. Assess the whole life costs of bridge structures.
4. Evaluate the substructures like pier, abutments, bridge slabs, etc
5. Understand the importance of bearings.
6. Construct and understand the maintenance parameters for bridges

Unit 1 [10 Hrs]

Components of Bridges – Classification – Importance of Bridges – Investigation for Bridges – Selection of Bridge site – Economical span – Location of piers and abutments – Subsoil exploration – Scour depth – Traffic projection – Choice of bridge type

Unit 2. [08 Hrs]

Specification of road bridges – width of carriageway – loads to be considered – dead load – IRC standard live load – Impact effect

Unit 3. [08 Hrs]

General design considerations – Design of culvert – Foot bridge - slab bridge – T-beam bridge – Introduction to Pre-stressed concrete bridge, Box Culvert and Fly over bridges

Unit 4. [08 Hrs]

Evaluation of sub structures – Pier and abutments caps – Design of pier – Abutments – Type of foundations Importance of Bearings – Bearings for slab bridges – Bearings for girder bridges – Joints – Expansion joints

Unit 5. [08 Hrs]

Construction and Maintenance of bridges – Lessons from bridge failures

Reference Books

1. Ponnuswamy, S., *Bridge Engineering*, 2nd Edition, Tata McGraw - Hill, New Delhi, 2007
2. N. Rajagopalan, *Bridge Superstructure*, Narosa Publishing House, New Delhi, 2006.

TNSL557 ADVANCED TRAFFIC MANAGEMENT SYSTEM

Teaching Scheme	Credits	Evaluation Scheme		
		Theory	Practical	Total

T h	T u	P r	Tot al Ho urs		T A E	C A E	E S E	Cont. Evalu ation	Ma rks
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. Understand principles for design, management and control of operation of transport systems
2. Analyse various measure of effectiveness for a highway corridor
3. Modify intersection design to control various parameters like LOS and delay.
4. Investigate and analyse accidents for a system
5. Design traffic safety management system
6. Suggest a system with low cost traffic management techniques

Unit 1: [8Hrs]

Basic concepts of traffic characteristics: Speed, Volume and concentration – their basic relationship, Traffic measurement surveys like volume studies, speed studies, headway studies, delay studies, gap acceptance studies, intersection studies, travel time studies, accident studies, parking studies etc – Methods of computation, their presentation of data and analysis, Traffic studies for planning bypasses around towns

Unit2: [8Hrs]

Highway Corridor analysis: Traffic capacity analysis concepts, segment capacity, Queue delay, travel time sub period analysis, bus stop capacity for transit and highway corridors , performance measures.

Unit3: [8Hrs]

Intersection control and analysis: Roundabouts , Signal design- Methods, types, LOS and capacity determination, Uniform and incremental delay, Adjustment factors, Saturation flow rate, lane grouping analysis, signal coordination, signal controllers, ITS application and system architecture, timing plan design for pretimed control and traffic actuated control, queue accumulation polygons, coordinated semi actuated operation unsignalised intersection, 2 way Stop controlled intersection, LOS criteria, critical gap, potential and movement capacity, All way stop controlled intersection, overview with planning and design applications

Unit4: [8Hrs]

Traffic safety Management : Accident investigation and analysis, Road accident collection and record system, Post accident reconstruction, Road safety auditing , Traffic impact analysis of landuse, Approaches to highway safety , Traffic calming measures , analysis of accident data and mathematical

formulation , traffic control devices, Markings, Signs, Access management

Unit5: [8Hrs]

Transportation System Management: Guidelines for low cost traffic management techniques for urban areas – IRC Specifications, Advanced transit technologies, Bus route network planning and management

REFERENCE BOOKS:

1. Traffic Engineering by Roger P. Roess, William R. Mc. Shane, Elena S. Prassas , Prentice hall
2. IRC Codes
3. Traffic Engineering - Theory & Practice - Louis J. Pignataro, Prentice Hall Publication.
4. Principles of Highways Engineering and Traffic Analysis - Fred Mannering & Walter Kilareski, John Wiley & Sons Publication.
5. Transportation Engineering - An Introduction - C. Jotin Khisty, Prentice Hall Publication Fff
6. Fundamentals of Transportation Engineering - C. S. Papacostas, Prentice Hall India.
7. I.T.E. Traffic Engineering Hand Book.
8. Fundamentals of Traffic Engineering – McShane & Rogers
9. Traffic Engineering and Transportation Planning – L.R. Kadiyali, Khanna Publishers
10. Metropolitan Transportation Planning, John W Dickey, Tata McGraw Hill

TNSL 558 COMMUNICATION STANDARDS USED IN TRANSPORTATION

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	Pr	Total Hours		Theory			Practical	Total Marks
					TA E	CA E	ES E	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand the communicating standards and concept related to transportation engineering
2. Implement the communicating standards for development of transportation infrastructural planning
3. Understand the Manual simulation of simple queuing system
4. Learn to prepare report, event scheduling, create transactions, etc
5. Learn the application of GPSS
6. Solve the inventory problems in railway ports, level crossing, etc.

Unit1. [10Hrs]

Introduction to systems approach - Typical transportation systems - Mathematical models.

Fundamentals of simulation - Monte Carlo method - Analog and digital simulation -Continuous and discrete models - Simulation languages - Introduction to CSMP.

Unit2. [10Hrs]

Probability concepts - Random numbers - Pseudo random generators - Arrival patterns -Service time distributions, Queue discipline – Manual simulation of simple queuing system

Unit3. [10Hrs]

Creating and moving transactions - Queues and facilities - Event scheduling - Internal logic of GPSS processor - Program control statements. Priority - Preemption - Functions – Parameters and save values – Standard numerical attributes - Collection of statistics - Report preparation.

Unit4. [10Hrs]

Applications of GPSS - Simple queuing problems - Inventory problems - Simulation of ports - Railway platforms and level crossings - Traffic signals. Analysis of simulation results - Model validation - Replication of random conditions - Time series analysis.

Reference Books-

1. Gordon, G., System Simulation, Prentice-Hall of India, 1992
2. GPSS/PC, User Manual, Minuteman Software, USA, 1985

TNSL559 TRANSPORTATION NETWORK ANALYSIS

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	P	Total Hours		TA	CA	SE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. Simulate new ways of thinking about the dynamics of network development.
2. Enhance the ability to draw implications of alternative policies on transportation network form
3. Develop understanding of transportation network development process, the influencing factors and players.
4. Understand travel demand modeling process
5. Do minimum cost network assignment
6. Do the analysis using computer software like TRIPS, SATURN, EMME/2, CUBE, etc.

Unit1. [8Hrs]

Network flows: Applications, definitions, graphs, paths, trees, cycles, loops, walk, network representation (adjacency list and matrices) and basic network transformations; Network algorithms; Complexity,

Search Algorithms, Strategies for designing polynomial algorithms.

Unit2. [8Hrs]

Shortest Path Algorithms: Label setting, Dijkstra's and Dial's algorithms, Optimality conditions, label correcting algorithms and optimality conditions, detecting negative cycles, all-pair shortest path algorithms; pre-flow push polynomial time algorithms, capacity scaling techniques.

Unit3. [8Hrs]

Minimum cost network assignment: optimality conditions, cycle-canceling algorithm, Successive shortest path algorithm, other polynomial time variants; Network equilibrium analysis; principles and optimisation formulations, Frank-Wolfe algorithm; Special cases and variants.

Unit4. [8Hrs]

Applications: Applications of min-cost, max-flow, and shortest path algorithms to transportation and infrastructure networks: transportation networks, airline, freight, facility location, logistics, network design, project scheduling, reliability of distribution systems, telecommunication/power networks etc.

Unit5. [8Hrs]

Computer Software: Principles of TRIPS, SATURN, EMME/2, CUBE; Demo Versions, Case studies

Reference Books-

1. Ahuja, R., Magnanti, T.L., and Orlin, J.B., Network Flows: Theory, Algorithms and Application, Prentice Hall, New Jersey, 1993.
2. Bell, M.G., Transportation Networks, Elsevier Science Publishers, 1999.

TNSL560 GROUND IMPROVEMENT TECHNIQUES

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	Pr	Total Hours		Theory			Practical	Total Marks
					TA	CA	SE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand basic principles of various ground improvement techniques.
2. To demonstrate the use of verticle draining
3. Understand the significance of various ground improvement techniques in Highway engineering.
4. To demonstrate various premixing method used in Hoghway Engineering
5. Understand principle Grounting Technique
6. Understand in-sit method of ground reinforcement

Unit 1: [7Hrs]

INTRODUCTION-Introduction, Need for Ground Improvement, Classification of ground Improvement Techniques

MECHANICAL MODIFICATIONS-Introduction, Terminology, Methods of Compactions , Principles of Soil Compaction, Properties of Compaction Soil, Compaction Control Tests , Dynamic Compaction , Liquefaction of Soil and its Remedial Measures ,Expansive Soil and its Remedy

Unit 2: . [7Hrs)

PRELOADING AND THE USE OF VERTICAL DRAINS-Need for Preloading, Preloading without Vertical Drains, Preloading with Vertical Drains, Effect of Smear, Assessment of Ground Conditions

Unit3: . [7Hrs)

GEOSYNTHETICS-Introduction, Function of Geosynthetics, Selection of Geosynthetics, Application Areas, Design of Geotextiles, Design of Geogrids, Design of Geonets, Design of Geomembranes,

Unit4: . [7Hrs)

THE PREMIXING METHOD-Introduction, Factors Influencing the Increase in Strength , Engineering Properties of Treated Soil , Design Methods

Unit5: . [7Hrs)

MODIFICATION BY GROUTING-Introduction, Categories of Grouting, Grout Materials, Grouting with Cement , Jet Grouting , Compaction Grouting , Chemical Grouts, Grouting Theory, Grouting Technology, Field Equipment, Applications of Grouting ,

Unit6: . [5Hrs)

IN-SITU GROUND REINFORCEMENT

Introduction, Ground Anchors , Rock Blots , Soil Nailing , Elastic Models of Soil behavior

REFERENCE BOOKS-

1. Hausmann, M.R., Engineering Principles of Ground Modification, McGraw – Hill International Editions,1990.
2. Purushotham Raj, Ground Improvement Techniques, Laxmi Publications, New Delhi
3. Sharma.S.K., Principles, Practice and Design of Highway Engineering, S.Chand & Co. New Delhi,1985.
4. Jones C. J. F. P, Earth Reinforcement and Soil Structures, Butterworths, London.

SEMESTER- II

TNSL424 TRAFFIC FLOW THEORY

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	P	Total Hours		TA	CA	EE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand aspects of measurement, statistical distributions, models, information processing, noise and simulations.

2. Develop the application /various methods of measurement currently available to the traffic flow characteristics..
3. Understand, delays at intersections and unsignalized intersections.
4. Understand the car following models and its analysis
5. Conduct the queuing analysis at different location on different road networks
6. Perform simulation of traffic flow by digital computers in detail.

Unit 1. [8 Hrs]

Traffic stream parameters - Fundamental diagram of volume-speed-density surface. Discrete and continuous probability distributions. Merging maneuvers - critical gaps and their distribution.

Unit 2. [08 Hrs]

Macroscopic models - Heat flow and fluid flow analogies - Shock waves and bottleneck control approach.

Unit 3 [08 Hrs]

Microscopic models - Application of queuing theory - regular, random and Erlang arrival and service time distributions - Waiting time in single channel queues and extension to multiple channels.

Unit 4. [08 Hrs]

Linear and non-linear car following models - Determination of car following variables

Unit 5. [08 Hrs]

Modeling Signalized Intersections,Simulation and Modeling

Reference Books

1. TRB, Revised Monograph on Traffic Flow Theory, 2001.
2. Adolf May, Traffic Flow Fundamentals
3. Carlos F. Daganzo, Fundamentals of Transportation and Traffic Operations, Pergamon, 1997

TNSL426 INTELLIGENT TRANSPORTATION SYSTEMS

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	Pr	Total Hours		Theory			Practical	Total Marks
					TA	CA	ES	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

1. Understand the role of ITS and understand policy conflicts and where technology solutions have succeeded and failed.

2. Develop ability to assess how technology solutions can be used to deliver a transport policy or address a transport problem
3. Learn the travel and traffic management, public transportation management
4. learn the ITS data collection techniques
5. Learn Advance Vehicle Safety System
6. Learn the application of ITS

Unit 1 [08 Hrs]

Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI), Geographic Information Systems (GIS), video data collection.

Unit 2. [08 Hrs]

Telecommunications in ITS – Importance of telecommunications in the ITS system, Information Management, Traffic Management Centres (TMC). Vehicle – Road side communication – Vehicle Positioning System

Unit 3. [08 Hrs]

ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS).

Unit 4. [08 Hrs]

ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management.

Unit 5. [08 Hrs]

Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries. Case Studies in India.

Reference Books

1. Sussman, J. M., Perspective on ITS, Artech House Publishers, 2005.
2. National ITS Architecture Documentation, US Department of Transportation, 2007

TNSP427 Transportation System Software Laboratory

Teaching Scheme				Credits	Evaluation Scheme					
Th	Tu	Pr	Total		Theory			Practical		Total Marks
					TA	CA	ES	IN	EX	

			Ho		E	E	E	T	T	rks
		02	02	01				25	25	50

Data processing and graphical presentation using ms excel & access:

Creation of Data Processing Templates, Usage of standard functions, Statistical Analysis, Macros, Graphical Presentation of Data.

Basics of AutoCAD: 2D Drawing and Advance Features, Modeling and Imaging in 3D

Use of MXROAD.Traffic Simulation using TSIS 5.0, VISSIM etc. Introduction to TransCAD.

Project Design

Project Design related to traffic and highway engineering.

Reference Books

1. Thomas A. Stellman, G. V. Krishnan, Harnessing AutoCAD, AutoDesk Progress.
2. TSIS 5.0 User Guide

ELECTIVE – IV, ELECTIVE – VI AND ELECTIVE – VI
(SELECT THREE DIFFERENT SUBJECTS AS ELECTIVE IV , ELECTIVE IV AND ELECTIVE VI)

TNSL561 TRANSDUCERS AND SENSORS

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	Pr	Total Hours		Theory			Practical	Total Marks
					TA	CA	ES	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. To demonstrate various measurement technique for traffic measurement
2. Design and operation of resistive transducer
3. Design and operation of Inductive and resistive transducer
4. Understand the use of various sensors for traffic engineering purpose
5. Understand hall effect and Radiation sensors
6. Understand the application of communication technologies in transportation

Unit 1 [07 Hrs]

Science of Measurement: Measurement systems – methods of measurement-direct-deflection and null

type, definition of sensor/transducer-classification of sensors/transducers-selection criteria-static characteristics-dynamic characteristics

Unit 2. [07 Hrs]

Resistive transducers: Resistance potentiometer-loading effect-strain gauges-gauge factor-types of strain gauges-rosettes-resistance thermometers-construction, characteristics-thermistors-thermocouples -thermowells- hot wire anemometer-constant current and constant temperature operation.

Unit 3. [07 Hrs]

Inductive and capacitive transducers: Basic principle-self-inductance- mutual inductance, LVDT -signal conditioning Unit-methods of null reduction- RVDT-synchros-induction potentiometer-variable reluctance transducer.

Unit 4. [07 Hrs]

Capacitive transducers: Introduction-Variable area type-variable air gap type-variable permittivity type-capacitive level sensor-capacitor microphone-frequency response.

Unit 5. [07 Hrs]

Piezoelectric, Hall Effect and Radiation Sensors: Introduction of piezoelectricity-piezoelectric crystals-accelerometer-charge amplifier-Hall Effect transducers-introduction- applications. Basic characteristics of Radiation Sensors-types of photodetectors-photoemissive cell-photovoltaic cell-photo conductive cell-LDR.

Unit 6. [07 Hrs]

Digital and Smart Sensors: Introduction to fiber-optic sensors-temperature sensors-liquid level sensing-fluid flow sensing-Microbend sensors.

Digital SensorsIntroduction to digital encoding transducer- classification-digital displacement transducers- shaft encoder-optical encoder; Smart Sensors: Introduction-primary sensors-excitation-amplification-filters-compensation-thin film sensors.

Reference Books

1. Measurement Systems, Application and design, E.O. Doebelin, Tata McGraw Hill, 2004.
2. Transducers and Instrumentation, D.V.S.Murthy, PHI, 1995.
3. Sensors and Transducers, D.Patranabis, PHI, 2004.

TNSL562 SOFT COMPUTING

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	Pr	Total Hours		Theory			Practical	Total Marks
					TA	CA	ES	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Perform analysis using computing data for transportation planning and design

2. Implement the knowledge for transportation simulation through various processing methods
3. Apply Artificial Neural Network for Transportation Planning and Management
4. Apply Fuzzy Logic and do fuzzy modelling for Transportation Planning and Management
5. Apply fundamentals of genetic algorithm for Transportation Planning and Management
6. Apply swarm intelligence technique for Transportation Planning and Management

Unit 1. [10Hrs]

Neural Networks: Introduction to Biological Neural Networks : Neuron physiology, Neuronal diversity, specification of the brain, the eye's Neural Network.Artificial Neural Network Concepts: Neural attributes, Modeling learning in ANN, characteristics of ANN, ANN topologies, learning algorithm.

Unit 2. [08Hrs]

Neural Network Paradigm: McCulloch-Pitts, Model, the perception, Back-propagation networks. Associative Memory, Adaptive Resonance (ART) paradigm, Hopfield Model, Competitive learning Model, Kohonen Self-Organizing Network.

Unit 3. [08Hrs]

Fuzzy Logic: Introduction to Fuzzy sets: Fuzzy set theory Vs Probability Theory, classical set theory, properties of Fuzzy sets, Operation on Fuzzy sets. Fuzzy relations, Operations of Fuzzy relation, the extension principle. Fuzzy Arithmetic, Approximate reasoning: Introduction, linguistic variables, Fuzzy proposition, Fuzzy if-then rules. Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

Unit 4. [08Hrs]

Genetic Algorithms: Fundamentals of Genetic Algorithms. Encoding, Fitness function, Reproduction, Genetic modeling: Cross over, Inversion & Deletion, Mutation Operator, Bit wise Operators, Convergence of Genetic Algorithm

Unit 5. [08Hrs]

Swarm Intelligence: Introduction to swarm intelligence and key principles (e.g. self organization, stigmergy), neural and artificial examples, Computational and embedded SI, Foraging, trail laying, Open space, multi source foraging experiments: biological data, microscopic experiments.Ant-Colony Optimization, Recent trends in soft computing

Reference Books

1. Introduction to Artificial Neural Systems: Jacek M. Zurada, Jaico Publishing House
2. Fuzzy sets & fuzzy logic, George J Klir, B. Yuan, PHI
3. Neural Network, Fuzzy Logic and Genetic Algorithm, S. Rajshekharan, G.A. Vijaylaxmi Pai, PHI
4. "Swarm Intelligence: From Natural to Artificial Systems", E. Bonabeau, M. Dorigo, and G. Theraulaz, Santa Fe Studies in the Sciences of Complexity, Oxford University Press, 1999.

TNSL563 URBAN TRANSPORTATION PLANNING

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	P	Total Hours		TA	CA	ES	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students should be able to:

1. Understand the concept and scenario of urban transportation
2. Determine contemporary issues and approaches in, urban transport planning and policy-making.
3. Carry out transport modeling, to plan road networks and public transport
4. To develop a policy framework in which demand management, traffic management and traffic calming approaches and techniques can be implemented.
5. To discuss transport policies and strategies for sustainable cities.
6. understand the different modes of transportation and their interdependency

Unit 1. [10 Hrs]
Introduction to transportation planning; Systems approach to transportation planning; Types of models;

Unit 2. [08 Hrs]
Concept of travel demand and supply; Socio-economic, land use, network, and transport system characteristics affecting transportation planning;

Unit 3. [08 Hrs]
Study area definition, zoning principles, cordon and screen lines, data collection through primary and secondary sources, sampling techniques; Four-stage sequential modelling approach; trip generation; trip distribution; modal split; trip assignment; land use-transport models;

Unit 4. [08 Hrs]
Activity-Based Modeling, Urban Good Movement

Unit 5. [08 Hrs]

Planning for Non-motorized vehicles .Public transport planning, integration of different modes; Travel demand management

Reference Books

1. C.J. Khisty and B.K. Lall, *Transportation Engineering – An Introduction*, Prentice Hall of India Pvt. Ltd., 2003.
2. Juan De Dios Ort, Luis G Willumsen, and Juan De Dios Ortuzar, *Modeling Transport*, John Wiley and Sons, 2011
3. Michael Meyer and Eric J. Miller, *Urban Transportation Planning*, 2nd Edition, McGraw-Hill Publications, 2000.
4. C. S. Papacostas and P. D. Prevedouros, *Transportation Engineering and Planning*, 3rd Edition, Prentice-Hall, 2000

TNSL564 COMPUTER AIDED TRANSPORTATION ENGINEERING

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	P	Total Hours		TA	CA	ES	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes:

On successful completion of the course, student shall be able to:

1. Analyze and design the flexible & rigid pavements
2. Design different geometric parameters like superelevation, horizontal curves, vertical curves using softwares
3. Use the simulation software for visualizing the different traffic flow measures before they are adopted.
4. Use different softwares for designing the transportation systems
5. Use different softwares for its application in transportation planning
6. Perform statistical analysis of transportation parameters using softwares

Unit-I : [08Hrs]
Introduction to software; Synchro 8, SimTraffic

Unit-II : [08Hrs]
Analysis and Design of flexible pavement using software, Analysis and Design of concrete pavement using software,

Unit-III : [08Hrs]
Design of horizontal curve, vertical curve and superelevation using software (MX-ROAD), Design of intersections, rotaries and inter changes using software (MX-ROAD), Traffic flow simulation using software

Unit-IV : [08Hrs]

(CUBE), Planning of transportation systems using software (TransCAD), Statistical analysis softwares, e.g. SPSS, SAS, Statistic

Reference Books

1. Gordon, G., System Simulation, Prentice-Hall of India, 1992
2. GPSS/PC, User Manual, Minuteman Software, USA, 1985

TNSL565 HIGHWAY TRAFFIC ANALYSIS AND DESIGN

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA	CA	ES	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. Apply concepts of Vehicle characteristics and IRC standards
2. Implement Traffic regulation and control - Signs and markings - Traffic System Management.
3. Use statistical techniques for Horizontal curves - Vertical curves.
4. Design of signal setting - phase diagrams, timing diagram – Signal co-ordination.
5. Understand the concept of street lighting and road furniture.
6. Perform road safety audit.

Unit1. [08Hrs]
Elements of Traffic Engineering - road user, vehicle and road way. Vehicle characteristics -IRC standards - Design speed, volume. Highway capacity and levels of service - capacity of urban and rural roads.

Unit2. [08Hrs]
PCU concept and its limitations - Road user facilities – Parking facilities - Cycle tracks and cycleways - Pedestrian facilities. Traffic volume studies, origin destination studies, speed studies, travel time and delay studies,

Unit3. [08Hrs]
Parking studies, Accident studies. Elements of design - Alignment - Cross sectional elements - Stopping and passing sight distance. Horizontal curves - Vertical curves. Design problems – Hill Roads.

Unit4. [08Hrs]
Traffic regulation and control - Signs and markings - Traffic System Management - Design of at-grade intersections – Principles of design – Channelisation - Design of rotaries – Traffic signals - pre-timed and traffic actuated. Design of signal setting - phase diagrams, timing diagram – Signal co-ordination.

Unit5. [08Hrs]

Grade separated intersections - Geometric elements for divided and access controlled highways and expressways – Road furniture - Street lighting. Traffic Safety – Principles and Practices – Road Safety Audit.

References-

1. ITE Hand Book, Highway Engineering Hand Book, Mc Graw - Hill.
2. AASHTO A Policy on Geometric Design of Highway and Streets
3. R. J. Salter and N. B. Hounsel, Highway Traffic Analysis and Design, Macmillan Press Ltd, 1996.

TNSL566 TRANSPORTATION ECONOMICS AND FINANCE

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA	CA	SE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

1. Perform cost analysis for highway and road facilities
2. Understand concepts and methods of auditing transportation safety and economics.
3. Learn the supply and demand in transport system
4. Analyses the project economy
5. Learn to finance road projects
6. Learn the method of risk analysis

Unit 1 [08Hrs]
Motor Vehicles Act - statutory provision for road transport and connected organisations. Route scheduling, Freight transport, Vehicle scheduling, Optimum fleet size, Headway control strategies, Crew scheduling.

Unit-2. [08Hrs]
Depots and Terminals - Principles and types of layout, Depot location, Twin depot concept, Crew facilities. Design of parking facilities – Bus terminal, bus stops and bus bays

Unit-3. [08Hrs]
Transportation costs - Supply and demand - elasticity of demand; Supply of transport services - Economics of traffic congestion - Pricing policy. Vehicle operating costs – Fuel costs - Maintenance and spares - Depreciation - Crew costs - Value of travel time savings -Accident costs.

Unit-4 [08Hrs]
Economic analysis of projects - Methods of evaluation - Cost-benefit ratio, first year rate of return, net present value, and internal-rate of return methods; Indirect costs and benefits of transport projects.

Unit-5 [08Hrs]

Financing of road projects - methods – Private Public Partnership (PPP) - Toll collection - Economic viability of Build-Operate-Transfer Schemes – Risk Analysis - Case Studies.

Reference Books

1. CRRI, Road User Cost Study in India, New Delhi, 1982
2. PPP documents of Planning Commission of India
3. Kenneth J. Button, Transportation Economics, 2nd Edition, Edward Elgar Pub, 1993
4. IRC, Manual on Economic Evaluation of Highway Projects in India, SP30, 2007

TNSL567 PUBLIC TRANSPORTATION PLANNING AND DESIGN

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	U	P	Total Hours		TA	CA	EE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

Upon successful completion of the course, students will be able to:

1. To understand public transport planning inputs and data required for transit line headway determination and timetable development.
2. Utilize mathematical models for predicting passenger demands and assessing the impacts of alternative public transport improvement measures
3. Apply optimization and analytical techniques for resource allocation and transit network design problems
4. Exercise professional judgment and engineering sense in design and evaluation of public transit improvement measures.
5. use knowledge of the case studies referred in real world.
6. carry out swot analysis of integrated transportation planning

Unit 1. [12Hrs]

Modes of public transportation and application of each to urban travel needs; comparison of transit modes and selection of technology for transit service; transit planning,

Unit 2. [10Hrs]

Estimating demand in transit planning studies, demand modeling, development of generalized cost, RP & SP data and analysis techniques; functional design and costing of transit routes, models for planning of transit routes, scheduling; management and operations of transit systems;

Unit 3. [08Hrs]

Integrated public transport planning; operational, institutional, and physical integration; models for integrated planning;

Unit 4. [10Hrs]

Case studies.

Reference Books

1. Vuchic Vukan R., Urban Transit: Operations, Planning and Economics, Prentice Hall, 2005.
2. Gray G. E., and Hoel L. A., Public Transportation, Prentice Hall, 1992.
3. Tyler N., Accessibility and the Bus System – Concepts and Practice, Thomas Telford, 2002.
4. Tiwari G., Urban Transport for Growing Cities – High Capacity Bus System, MacMillan India Ltd., 2002.
5. Intermediate Public Transport Manuals.

TNSL568 RAILWAY INFRASTRUCTURE PLANNING AND DESIGN

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA	CA	ES	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. To learn the Railway track components.
2. To Understand planning and standards for design the track ,
3. Apply current practices for Metrorail and monorail development.
4. Understand important features of railway curves
5. Modernize the railways according to future trends
6. Have knowledge of track standards and track rehabilitation

Unit 1 (10Hrs)

Track and track stresses, Train resistances and hauling power of locomotives ; Railway track components:

Unit2 (10Hrs)

Important features, Railway curves, Super elevation, Gradients and grade compensation,

Unit 3 (10Hrs)

Points and crossing and their design approaches. ; Construction and maintenance of railway track, Control of train movements;

Unit4 (10Hrs)

Signals and interlocking, Modernization of railways and future trends; Track standards and track rehabilitation.

Reference books:

1. J.S. Mundrey, Railway Track Engineering, Tata McGraw Hill Co. Ltd., 3rd Edition, 2000.
2. M.M. Agarwal, Railway Track Engineering, Standard Publishers, 1st Ed. 2005.

3. S. Chandra and Aqarwal, Railway Engineering, Oxford University Press, 1st Ed. Feb 2008.
4. A.D. Kerr, Fundamentals of Railway Track Engineering, Simmons Boardman Pub Co (December 30, 2003)

TNSL569 WATERWAY INFRASTRUCTURE PLANNING AND DESIGN

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
T	U	P	Total Hours		T A E	C A E	E S E	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. Understand various water transportation modes
2. Understand the port management and operations.
3. To learn the planning and design of ports and terminals
4. To develop the application of Offshore Structures, Simulation modeling, analytical solutions.
5. To understand Physical planning, location and orientation of major port components, access channels, basins, breakwaters
6. Understand the organization, management and operations, functions of port authority and basic operational principles.

Unit 1 [08Hrs]

Ship characteristics and their influence on ports management and operations. Civil engineers concern about ships and shipbuilding,

Unit 2. [08Hrs]

Syncrolift equipment in ports (General definition consideration and aspects in planning and design of ports and terminals)

Unit 3 [08Hrs]

Physical planning, location and orientation of major port components, access channels, basins, breakwaters, wharfs, quays piers, jetties, fenders.

Unit 4. [08Hrs]

Offshore Structures, Simulation modeling, analytical solutions, Cargo handling systems, economic feasibility, evaluation, economic costs and benefits, least cost solutions.

Unit 5. [08Hrs]

Organization, management and operation, function of port authorities, O and M, MIS, basic operational principles.

Reference Books

1. Aegerschou, Lundgren et. al., Planning, Designing of Port and Marine Terminals, John Wiley and Sons, 1983.
2. Port Engineering and Operations: Proc. Conference of British Ports, New Castle upon

Tynes, March, 1985, Thomas Telford, London, 1985.

3. Hennes and Eske, Fundamentals of Transportation Engineering, McGraw-Hill Book Co., 1955.

TNSL570 AIRPORT PLANNING AND DESIGN

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
T	U	P	Total Hours		T A E	C A E	E S E	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. Assess the issues relating to regulation and deregulation of airport
2. Understand airport master planning, standards, airport facilities, terminal planning, functions and operations.
3. Apply current practices for airport development.
4. Adopt design principles for critical, semi critical and non-critical pavements
5. Plan & design airport hangars
6. Provide proper guidelines regarding the amenities to be required at airport terminals

Unit1 (10Hrs)

Classification of airports- ICAO standards ; Planning for airport- Airport components- Zoning laws ; Runways orientation and geometric

Unit2 (10Hrs)

design- Runway patterns ; Taxiways- alignment- geometry and turning radius- exit taxiways ; Aprons- planning and design ; Design principles of critical, semi-critical, non-critical airport pavements-

Unit3 (10Hrs)

FAA and PCA methods ; Airport hangars- their planning and design criteria ; Airport landscaping, grading and drainage- general aspects ;

Unit4 (10Hrs)

Airport terminal and amenities ; Airport lighting and marking.

Reference Books:

1. N.J. Ashford, P.H. Wright, Airport Engineering, 3rd Edition, 1992, John Wiley
2. R.M. Horonjeff, F.X. Mc Kelvey, W.J Sproule, Seth Young, Planning and Design of Airports, TMH International Publishers, Fifth Edition, 2009
3. Khanna, Arora and Jain, Planning and Design of Airports, Nemchand Bros., 2001
4. Wells, Alexander; Young, Seth, Airport Planning & Management, McGraw Hill, 5th Edition, July, 2009
5. De N. Richard, & Odoni, Airport Systems: Planning, Design, and Management, McGraw Hill Amedeo, 1st
6. Edition, 2004.

TNSL571 GIS AND REMOTE SENSING

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
T	h	T	u	P	r	T	A	E	
3	0	-	3	3	20	30	50	--	100

COURSE OUTCOME

After the course students will be able to:

1. Define GIS, type of data and data structure and learn history of GIS
2. Apply various commands for spatial analysis such as query, overlay and data analysis
3. Understand the applications of GIS and basic concepts of photogrammetry
4. To learn the concept of remote sensing, element, passive and active remote sensing
5. To understand GIS/GPS in Transportation, Real World Experiences
6. To Learn application of GIS/GIS map in transportation engineering

Unit 1. (7Hrs)

GIS Definition – Map and map analysis – Automated cartography – History and development of GIS – Hardware requirement – Type of data – Spatial and non-spatial data – Data structure – Vector and raster – Files and data formats – Data compression.

Unit 2. (7Hrs)

Spatial analysis – Data retrieval – Query – Overlay – Vector data analysis – Raster data analysis – Modelling in GIS – Digital Elevation Model – DTM – Types of output data – Output devices – Sources of errors – Types of errors – Elimination – Accuracies –

Unit 3. (7Hrs)

The Global Positioning system and its applications. Concepts and foundations of remote sensing - electromagnetic spectrum - EMR interaction with atmosphere, water vapour, ozone - Basic principles of photogrammetry – Spectral Signature and Spectral Signature curves –

Unit 4. (7Hrs)

Remote sensing platforms and sensors. Satellite system parameters, sensor parameters, earth resources and meteorological satellites, microwave sensors, Data Acquisition and interpretation - Visual Image Interpretation – Visual Image Interpretation Equipment –

Unit 5. (7Hrs)

Digital Image Processing – Classification. Applications in Survey, mapping and monitoring of land use/land cover –

Unit 6. (5Hrs)

Transportation planning - Infrastructure development - Natural resources management - Urban Planning

,Environment - Coastal Zone Management – Air Quality - Development of Resources Information Systems.

Reference Books-

1. Burrough P.A. and Rachel A. McDonell, Principles of Geographical Information Systems, Oxford Publication, 2004.
2. C.P. Lo and Albert K. W. Yeung, Concepts and Techniques of Geographical Information Systems, Prentice-Hall India, 2006.
3. Thomas. M. Lillesand and Ralph. W. Kiefer, Remote Sensing and Image Interpretation, John Wiley and Sons, 2003.

TNSL572 PAVEMENT DESIGN AND ANALYSIS

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
T	h	T	u	P	r	T	A	E	
3	0	-	3	3	20	30	50	--	100

Course Outcomes

After the course students will be able to:

1. To enable students to understand and differentiate between road pavement structures or layers
2. To understand the different design criteria for flexible pavement
3. Design a flexible pavement using IRC, Asphalt Institute, and AASHTO methods.
4. Design a rigid pavement using IRC, and AASHTO methods
5. Select maintenance technique depending upon the intensity of the distresses
6. Evaluate the pavements based on the functional and structural characteristics

Unit1. [08Hrs]

Introduction: Types and component parts of pavements, Factors affecting design and performance of pavements. Highway and airport pavements, functions of pavement Components

Unit2. [08Hrs]

Pavement Design Factors: Design wheel load, strength characteristics of pavement materials, climatic variations, traffic - load equivalence factors and equivalent wheel loads, aircraft loading, gear configuration and tyre pressure. Drainage – Estimation of flow, surface drainage, sub-surface drainage systems, design of sub-surface drainage structures

Unit3. [08Hrs]

Flexible Pavement Design: Empirical, semi-empirical and theoretical approaches, design of highway and airport pavements by IRC, AASHTO Methods, applications of pavement design software

Unit4. [08Hrs]

Rigid Pavement Design: Types of joints and their functions, joint spacing; design of CC pavement for roads, highways and airports as per IRC, AASHTO, design of joints. Design of continuously reinforced concrete pavements. Reliability; Use of software for rigid pavement design

Unit-5. [08Hrs]

Pavement Management: Pavement failures, maintenance of highways, structural and functional condition evaluation of pavements, pavement management system.

Reference Books.

1. Yoder and Witczak, *Principles of Pavement Design*, John Wiley and Sons
2. Yang. H. Huang, *Pavement Analysis and Design*, Second Edition, Prentice Hall Inc.
3. Rajib B. Mallick and Tahar El-Korchi, *Pavement Engineering – Principles and Practice*, CRC Press (Taylorand Francis Group)
4. W. Ronald Hudson, Ralph Haas and Zeniswki , *Modern Pavement Management*, Mc Graw Hill and Co
5. Relevant IRC Codes

TNSL573 PROJECT MANAGEMENT

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA	CA	SE	Cont. Evaluation	
3	0	-	3	3	20	30	50	--	100

Course Outcomes:

After successful completion of this course the students will be able to:

1. understand the concept of project life cycle and factors affecting the project life cycle
2. Solve problems related to network and total duration of the project using different network techniques.
3. Prepare capital budget, estimate cost of capital, develop capital structure and allocate resources.
4. Develop an understanding and ability to use basic business financial management concepts in the context of project execution.
5. Analyse and periodically monitor Financial performance of Project.
6. Understand short term and long term financial policies for business and relate capital investment decisions to project performance.

Unit-1. [08Hrs]

Introduction: Foundations of Project Management, Project Life Cycle, The Project Environment, Project Selection, Project Proposal, Project Scope, Work Breakdown Structure.

Unit-2.. [08Hrs]

Network Scheduling, Critical Path Method, Program Evaluation AND Review Technique, Planning and

Scheduling of Activity Networks, Assumptions in PERT Modelling, Time-cost Trade-offs, Linear Programming and Network Flow Formulations, PERT/COST Accounting. Scheduling with limited resources, Resource Planning, Resource Allocation,

Unit-3. [08Hrs]

Project Schedule Compression, Project Scheduling Software, Precedence Diagrams, Decision CPM,

Unit-4. [08Hrs]

Generalized Activity Networks, GERT. Estimation of Project Costs, Earned Value Analysis,

Unit-5.. [08Hrs]

Monitoring Project Progress, Project Appraisal and Selection, Recent Trends in Project

Reference Books

1. Projects: Planning, Analysis, Selection, Implementation AND Review, Prasanna Chandra, 5th Ed., 2002. •
2. Project Management: A systems approach to planning and controlling, Harold Kerzner, CBS Publisher, New Delhi, 2nd Ed., 2000.

THIRD SEMESTER

TNSP574 - Industry project/ Research Project (Phase-I)

Teaching Scheme				Credits	Evaluation Scheme					
Th	Tu	Pr	Total Hours		Theory			Practical		Total Marks
					TA	CA	EE	INT	EXT	
		09	09	09				150		150

Course Objectives :

5. To develop the ability to analyze and use scientific approach in solving complex engineering problems.
6. To develop an attitude of continuous and lifelong learning
7. To develop oral and written communication and presentation skills, critical review of the existing literature.
8. To develop design skills and the ability to conduct planned experimentation.

Course Outcomes:

5. Upon successful completion of phase –I of dissertation, students shall be able to:
6. Analyze complex engineering problems, develop action plan and apply appropriate research methodologies to find workable solution.
7. Develop oral and written communication and presentation skills, critical review of the existing literature, experimental and design skills
8. Develop an attitude of continuous and lifelong learning

• FOURTH SEMESTER

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TA	CA	ES	INT	EXT	
		15	15	15				150	150	300

TNSP 543- Industry project/ Research Project (Phase-II)

Course Objectives :

- To develop the ability and skill sets to analyze and solve complex engineering problems, independently or as a team member, using modern tools and computational techniques.

- To develop oral and written communication and presentation skills, critical review of the existing literature, experimental and design skills
- To develop an attitude of continuous and lifelong learning

Course Outcomes:

Upon successful completion of the dissertation, students will be able to:

- Analyze and solve a complex engineering problem posed for investigative study, independently or as a team member, using modern tools and computational techniques.
- Develop oral and written communication and presentation skills, critical review of the existing literature, experimental and design skills and showcase research findings through publications.
- Develop an attitude of continuous and lifelong learning.



G H RAISONI COLLEGE OF ENGINEERING

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M.Tech in Computer Science & Engineering

Institute Vision

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges.

Institute Mission

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake-holders. Our strength is directed to create competent professionals. Our Endeavour is to provide all possible support to promote research and development activities

Programme: M.Tech in Computer Science & Engineering

Department Vision

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards in Computer Science Engineering with capabilities of accepting new challenges.

Department Mission

- To develop competent professionals who are proficient in the design, analysis and implementation of computational /computer systems.
- To impart quality and value based education and contribute towards the advancement of computing, science and technology to raise satisfaction level of all stakeholders.
- Our endeavor is to apply new developments in computational hardware and software and to provide all possible support to promote research and development activities.

Program Educational Objectives

The program educational objectives of Computer Science & Engineering program is designed to produce post graduate engineers who are ready to contribute research & development effectively to the advancement of Computer Science & Engineering and to accommodate the needs of the profession. The graduate shall-

1. Engage in professional practice to promote the development of innovative systems and optimized solutions for Computer Science and Engineering.
2. Adapt to different roles and responsibilities in multidisciplinary working environment by respecting professionalism and ethical practices within organization and society at national and international level.
3. Enhance research skills and adapt new computing technologies for professional excellence.

Program Outcomes

On completion of the M.Tech.(Computer Science & Engineering) programme, the students shall be able to:

1. Apply knowledge of mathematics and computer science to evaluate, analyze, synthesize, model and integrate technologies to develop new systems for applying computers to engineering systems.
2. Generate optimized solution by formulating and implementing analytical tools for solving issues in the field of computer science and engineering.
3. Design and develop systems to meet societal needs in respect of economics & environment ethically.
4. Work upon unfamiliar problems through investigative studies and research and contribute to the development of technological knowledge and intellectual property.
5. Effectively transfer technology to engineering community and society at large on broadly defined engineering needs through technical reports, presentations and software technologies.
6. Possess knowledge for functioning effectively, as a member or team leader, in software based projects considering multidisciplinary environments.
7. Develop ability to learn reflectively from mistakes, engage in lifelong learning, adapt new developments and participate in continuing education opportunities to foster personal and organizational growth.
8. Use techniques, skills, and modern computer engineering tools, including simulation and modeling, for addressing the needs of engineering profession and interdisciplinary business.
9. Demonstrate knowledge of project management and finance principles to be able to manage projects efficiently.

Comprehend contemporary developments & continue to improve professionally through lifelong learning and in ethical ways for profession.

Upon successful completion of the dissertation, students will be able to:

1. Analyze and solve a complex engineering problem posed for investigative study, independently or as a team member, using modern tools and computational techniques.
2. Develop oral and written communication and presentation skills, critical review of the existing literature, experimental and design skills and showcase research findings through publications.
3. Develop an attitude of continuous and lifelong learning.

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DEPARTMENT OF COMPUTER SCIENCE &ENGINEERING
SCHEME OF M.TECH (Computer Science & Engineering)-Autonomous

Subject Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						Exam Mode
							Theory			Practical		Total	
		Th.	Tu	Pr.	Total		(TAE) (20)	(CAE) (30)	ESE (50)	Int.	Ext.		
SEM-I													
CSEL547	Advances in Algorithm	3			3	3	20	30	50			100	Online
CSEP547	Advances in Algorithm			2	2	1				25		25	Online
CSEL546	Distributed Operating System	3			3	3	20	30	50			100	Offline
XXXLXX	Elective I	3			3	3	20	30	50			100	Offline
XXXLXX	Elective II	3			3	3	20	30	50			100	Offline
XXXLXX	Elective III	3			3	3	20	30	50			100	Offline
CSEP548	Computing Lab-I			2	2	1				25	25	50	Online
MBA602	Advanced Communication Skill			2	2	1				25		25	Activity Based
		14	-	6	20	18	250	150	100	75	25	600	

Elective –I

CSEL549	NETWORK ENGINEERING AND MANAGEMENT
CSEL550	EMBEDDED SYSTEMS
CSEL551	SOFT COMPUTING
CSEL552	VISUALIZATION TECHNIQUE
CSEL580	PARALLEL PROGRAMMING
CSEL591	DISCRETE STRUCTURES

Elective –II

CSEL553	NETWORK SECURITY & CRYPTOGRAPHY
CSEL554	DATA MINING AND WAREHOUSING
CSEL555	MOBILE & PERVASIVE COMPUTING
CSEL556	PATTERN RECOGNITION
CSEL587	COMPUTER VISION
CSEL589	INTELLIGENT SYSTEMS
CSEL590	COMPUTER LAW AND ETHICS

Elective –III

CSEL558	HUMAN COMPUTER INTERACTION
CSEL559	NATURAL LANGUAGE PROCESSING
CSEL560	CLOUD COMPUTING AND VIRTUALIZATION
CSEL561	RECONFIGURABLE COMPUTING
CSEL584	GRAPH THEORY

Subject Code	Name of the Course	Teaching Scheme				Cre dits	Evaluation Scheme						Exam Mode	
							Theory			Practical		Tot al		
		Th.	Tu	Pr.	Total		(TA E) (20)	(CAE) (30)	ES E (50)	Int.	Ext.			
SEM-II														
CSEL563	High Performance Computer Architecture	3			3	3	20	30	50			100	Offline	
CSEL564	Big Data Analytics	3			3	3	20	30	50			100	Online	
XXXLXX X	Elective IV	3			3	3	20	30	50			100	Offline	
XXXLXX X	Elective V	3			3	3	20	30	50			100	Offline	
XXXLXX X	Elective VI	3			3	3	20	30	50			100	Offline	
CSEP565	Mini Project			4	4	2				50	25	75	Projec t	
IDA403	Research Methodology			2	2	1				25		25	Activit y Based	
Total		15		6	22	18	250	150	100	75	25	600		

Elective –IV

CSE566	ADVANCED DIGITAL IMAGE PROCESSING
CSE567	UBIQUITOUS COMPUTING
CSE568	COMPUTER SIMULATION AND MODELING
CSE569	VOICE OVER IP
CSE585	GAME THEORY
CSE586	ALGORITHMS FOR BIOINFORMATICS
CSE587	DISTRIBUTED COMPUTING

Elective –V

CSEL570	BIOINFORMATICS
CSEL571	RESEARCH METHODOLOGY
CSEL572	OBJECT ORIENTED SOFTWARE DESIGN
CSEL573	MACHINE LEARNING
CSEL574	MOBILE OPERATING SYSTEM
CSEL588	DATA SCIENCE

Elective –VI

CSEL562	ETHICAL HACKING & DIGITAL FORENSICS
CSEL575	ARTIFICIAL INTELLIGENCE
CSEL576	OPTIMIZATION TECHNIQUES
CSEL577	WIRELESS SENSOR NETWORKS
CSEL581	DATA COMPRESSION
CSEL582	QUANTUM COMPUTING
CSEL583	ADVANCE GRAPH THEORY

Subject Code	Name of the Course	Teaching Scheme				Credit s	Evaluation Scheme						Exa m Mod e
							Theory			Practical		Total	
		Th.	Tu	Pr.	Total		(TAE) (20)	(CAE) (30)	ESE (50)	Int.	Ex t.		
SEM-III													
CSEP578	Industry /Research project Dissertation (Phase I)	-	-	8	8	8	-	-	-	150	-	150	Proje ct
Total		-	-	8	8	8						150	

Subject Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						Exam Mode
							Theory			Practical		Total	
		Th .	T u	Pr .	Total		(TAE) (20)	(CAE) (30)	ES E (50)	Int.	Ext .		
SEM-IV													
CSEP579	Industry/Research project Dissertation (Phase II)	-	-	16	16	16	-	-	-	150	150	300	Project
Total				16	16	16				150	150	300	

Pool of Electives

Data Mining and Warehousing	Distributed Computing
Pattern Recognition	Quantum Computation
Human Computer Interaction	Game Theory
Natural Language Processing	Optimization Techniques
Reconfigurable Computing	Wireless Sensor Networks
Cloud Computing & Virtualization	Ethical Hacking & Digital Forensics
Advanced Digital Image Processing	Artificial Intelligence
Computer Simulation & modeling	Data Science
Ubiquitous Computing	Machine Learning
Voice Over IP	Computer Vision
Mobile Operating System	Parallel Programming
Object Oriented Software Design	Embedded Systems
Bioinformatics	Network Engineering & Management
Data Compression	Soft Computing
Computer Law and Ethics	Visualization Techniques
Algorithms for Bioinformatics	Network Security & Cryptography
Advanced Graph Theory	Mobile & Pervasive Computing
Discrete Structures	Intelligent Systems

M.Tech Computer Science Engineering SEMSTER-I

Name of Department: Computer Science & Engineering
Subject Code: CSEL546/CSEP547
Course Title: Advances in Algorithm
Teaching Mode: Offline
Exam Mode: Online

Teaching Scheme				Credits			Evaluation Scheme						
					Theory				Practical			Total	
Th.	Tu	Pr.	Total		TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total		
3	-	2	5	4	20	30	50		-	-	-	100	

Course Objective:

1. Analyze the asymptotic performance of algorithms.
2. Apply important algorithmic design paradigms and methods of analysis.
3. Write rigorous correctness proofs for algorithms.
4. Demonstrate a familiarity with major algorithms and data structures.
5. Synthesize efficient algorithms in common engineering design situations.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5)

):

Upon successful completion of the course, students shall be able to-

1. Discuss the correctness of algorithms using inductive proofs and invariants.
2. Analyze worst-case running times of algorithms using asymptotic analysis.
3. Describe the divide-and-conquer, dynamic-programming, greedy paradigm, randomized

algorithms, shortest path algorithms, Number-Theoretic Algorithms and explain when an algorithmic design situation calls for it.

4. Explain amortized analysis

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction: The Role of Algorithms in Computing, Growth of Functions, Divide & Conquer, Probabilistic Analysis and Randomized Algorithms, Asymptotic notation, Standard notations and common functions, Recurrences, Recursion.	8
2	Dynamic Programming: Elements of Dynamic Programming, Matrix Chain Multiplication, Longest Common subsequences, Greedy Algorithms: An Activity Selection Problem, Elements of Greedy Strategy, Huffman codes, Matroids & Greedy Methods.	8
3	Amortized Analysis: Aggregate Analysis, Accounting Method, Dynamic Tables, Shortest paths: Bellman Ford Algorithm, Acyclic Graphs, Dijkstra's Algorithm, Shortest Paths Properties, Matrix Operations.	8
4	Number-Theoretic Algorithms: GCD, Modular Arithmetic, Chinese remainder theorem, String Matching.	8
5	NP-Completeness: Polynomial time, Polynomial time Verification, NP-completeness & Reducibility. Approximation Algorithms: set-covering Problem, Subset-Sum Problem.	8

Suggested Books (Minimum – 3):

Sr . N o.	Title	Author Name	Publisher	Ye ar of Pu bli cat ion	Editio n
1	Introduc tion to Algorith ms,	Tomas H. Cormen, Aharles E. Leiserson, Ronald L Rivest, Slifford Stein,	PHI	200 9	3 rd editio n

2	Introduction to the design and analysis of Algorithms	S E Goodman, S T Hedetniemi	Mcgraw-Hill	1977	
3	Foundations of Algorithms	Sathe S R, Penram	Penram Intl. Publishing (India) Pvt. Ltd.- Mumbai, ISBN13: 9788187972860	2014	First Edition
4	Fundamentals of algorithms,	Gilles Brassard, Paul Bratley	PHI	1995	
5	Algorithms,	Richard Johnsonbaugh, Marcus Schaefer	Pearson	2003	
6	Fundamentals of Computer Algorithms	Ellis Horowitz and Sartaj Sahni	Universities Press	2008	Second edition

Name of Department: Computer Science & Engineering
Subject Code: CSEL546/CSEP547
Course Title: Advances in Algorithm
Teaching Mode: Practical

Teaching Scheme				Credit s			Evaluation Scheme						
					Theory				Practical			Total	
Th .	T u	Pr .	Total		TA E	CA E	ES E	Exa m Mod e	Int .	Ext .	Total		
-	-	2	2	1	-	-	-	-	25	-	-	25	

Sr. No.	List of Experiment	Course outcome attained

1	Dynamic Programming a. Assembly-line scheduling b. Matrix Chain Multiplication, c. Longest Common subsequences d. Optimal binary search trees	
2	Greedy Algorithms a. An Activity Selection Problem b. Huffman codes c. The Knapsack problem	
3	Amortized Analysis a. Aggregate Analysis b. Accounting Method c. Potential Method d. Dynamic Tables	
4	Shortest Path Graph Algorithms a. Breadth-first search b. Depth-first search c. Implement Kruskal's Algorithm d. Implement Prim's Algorithm e. Implement Bellman Ford Algorithm f. Implement Dijkstra Algorithm g. Floyd-Warshall's Algorithm	
5	Matrix Operations a. Matrix multiplication b. Matrix Inversion c. LUP decomposition	
6	Linear Programming a. Simplex Algorithm	
7	Polynomials and the FFT a. DFT & FFT implementation	
8	Number-Theoretic Algorithms a. GCD, b. Modular Arithmetic, c. Chinese remainder theorem d. Powers of an element e. RSA algorithm f. primarily Testing	
9	String Matching a. Naïve-String-Matching algorithm b. Rabin – Carp algorithm	
10	Approximation Algorithms a. The Vertex Cover Problem b. set-covering Problem, c. Subset-Sum Problem	

Name of Department: Computer Science & Engineering
Subject Code: CSEL546
Course Title: Distributed Operating System
Teaching Mode: Offline
Exam Mode: Offline

Teaching	Credit			Evaluation Scheme
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Scheme				s	Theory				Practical			Total
Th	T	Pr	Total		TA	CA	ES	Exam	Int	Ext	Total	
3	-	-	3	3	20	30	50	Offline	-	-	-	100

Course Objective:

1. To study architecture of distributed systems, distributed mutual exclusion, agreement protocol, distributed shared memory, recovery.
2. To understand distributed technology and as a framework for characterizing the functionalities of a specific distributed system.
3. Identify potential security weaknesses in distributed Operating Systems.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5)

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Upon successful completion of the course, students shall be able to-

1. Able to design applications for controlling distributed environment.
2. Able to design file system for distributed OS.
3. Able to detect deadlock situation for distributed environment
4. Able to implement resource management for distributed environment

Details of Course:

S. No.	Contents	Contact Hours
1	Architectures of Distributed Systems: Issues in Distributed operating System, Communication Networks, Communication Primitives, Limitations of Distributed Systems: Physical and Logical Clocks, Lamport's Logical Clock, Vector Clocks, Casual Ordering of Messages, Global State, Cuts of Distributed Computation.	9 Hrs
2	Distributed Mutual Exclusion: Classification, Preliminaries, A Simple Solution to Distributed Mutual	9 Hrs

	Exclusion, Non-Token-Based Algorithms, The Ricart Agrawala Algorithm, A Generalized Non-Token-Based Algorithms, Token-Based Algorithms, Suzuki-Kasami's Broadcast Algorithm, Raymond's Tree-Based Algorithm, A Comparative Performance Analysis, Distributed Deadlock Detection: Preliminaries, Deadlock Handling Strategies in Distributed System, Issues in Deadlock Detection & Resolution, Control Organizations for Distributed Deadlock Detection, Centralized Deadlock Detection Algorithms, Distributed Deadlock Detection Algorithms, Hierarchical Distributed Deadlock Detection.	
3	Agreement Protocols: The System Model, A Classification of Agreement Problems, Solution to the Byzantine Agreement Problem, Applications of Agreement Algorithms. Distributed File Systems: Architecture, Mechanism for Building Distributed File System, Design Issues, Case Studies, Log-Structured File Systems.	9 Hrs
4	Distributed Shared Memory: Architecture & Motivation, Algorithm for Implementing DSM, Memory Coherence, Coherence Protocols, Design Issues, and Case Studies. Distributed Scheduling: Motivation, Issues in Load Distributing, Components of a Load Distributing Algorithm, Stability, Load Distributing Algorithms, Performance Comparison, Selecting Suitable Load Sharing Algorithm, Requirements of Load Distribution, Load Sharing Policies: Case Studies Task Migration, Issues in Task Migration	9 Hrs
5	Recovery: Introduction, Classification of Failures, Backward & Forward Error Recovery, Recovery in Concurrent Systems, Consistence Set of Checkpoints, Synchronous Checkpoint & Recovery, Asynchronous Checkpoint & Recovery, Checkpointing for Distributed Database Systems, Recovery in Replicated Distributed Database Systems. Fault Tolerance: Issues, Atomic Actions & Committing, Commit Protocols, Nonblocking Commit Protocols, Voting Protocols, Dynamic Voting Protocols, The Majority Based Dynamic Voting Protocols, Dynamic Vote Reassignment Protocols, Failure Resilient Processes, Reliable	9 Hrs

	Communication, Case Studies. Recent Trends in Distributed OS.	
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Suggested Books (Minimum – 3):

S r. N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	Advanced Concepts in Operating Systems	Mukesh Singhal & Niranjana Shrivastri	McGraw-Hill,	1994	1 st
2	Distributed Operating Systems	Andrew S. Tanenbaum	Pearson Education	2008	5th
3	Distributed Operating Systems: Concepts and Design,	Pradeep K. Sinha	IEEE Press	1997	1st
4	Distributed Systems: Concepts and Design,	Jean Dollimore, Tim Kindberg, George Coulouris	Pearson	1988	5th
5	Distributed Systems: Principles and Paradigms	Andrew S. Tanenbaum & Maarten van Steen	Pearson, Prentice Hall	2006	2nd Edition

Name of Department: Computer Science & Engineering
Subject Code: CSEP548
Course Title: Computing Lab 1
Teaching Mode: Practical

Course Objective

Objective of this lab is to learn various tools & advanced technologies by studying available software or by programming with them.

Modes of Delivery of Courses:

Performance of experiment in labs, mini project.

Course Outcomes:

Student shall be able will practice hands-on on various tools & advanced technologies.

Teaching Scheme				Credits			Evaluation Scheme						
					Theory				Practical			Total	
Th.	Tu	Pr.	Total		TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total		
-	-	2	2	1	-	-	-	Practical	25	25	-	50	

Semester II

Name of Department : Computer Science & Engineering
Subject Code : CSEL563
Course Title : High Performance Computer Architecture
Teaching Mode: Offline
Exam Mode: Offline

Teaching Scheme				Credit s			Evaluation Scheme						
					Theory				Practical			Total	
Th .	Tu .	Pr .	Total		TA E	CA E	ES E	Exam Mode	Int .	Ext .	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

1. The course focuses on processor design, pipelining, superscalar, out-of-order execution, caches (memory hierarchies), virtual memory, and storage Systems simulation techniques.
2. Advanced topics include a survey of parallel architectures and future directions in computer architecture.
3. The course focuses on simulation techniques in pipelining.

Course Outcome (Preferably – 3, Maximum – 5)

1:

Upon successful completion of the course, students shall be able to-

1. Able to understand processor design, pipelining, out of order execution, cache (memory hierarchies), virtual memory, storage systems.
2. Able to understand Super Scalar and Super pipeline Design.

3. Able to understand Advanced topics include a survey of parallel architectures.

Details of Course:

S. No	Contents	Contact Hours
1	Introduction: review of basic computer architecture, Parallel Computer Models: Computer Development Milestones, Elements of Modern Computers, Evolution of Computer Architecture, System Attributes to Performance, Shared Memory Multiprocessor and Distributed Memory Multicomputer, Multivector and SIMD Computers, PARAM and VLIS Models.	6 Hrs
2	Program and Network Properties: Conditions of Parallelism: Data and Resource Dependences, Hardware and Software Parallelism, The Role of Compilers, Program Partitioning and Scheduling: Grain Size and Latency, Grain Packing and Scheduling, Static Multiprocessor Scheduling, Program Flow Mechanism: Control Flow, Data Flow, Demand-Driven Mechanisms, Comparison of Flow Mechanisms, System Interconnect Architecture.	6 Hrs
3	Amdahl's Law, Processor and Memory Hierarchy: Advanced Processor Technology: Design Space for Processors, Instruction-Set Architectures, CISC Scalar Processors, RISC Scalar Processors, Super Scalar and Vector Processors: Superscalar Processors, The VLIW Architecture, Vector and Symbolic Processors, Memory Hierarchy Technology: Inclusion, Coherence, Locality Property, Virtual Memory Technology: Virtual Memory Models, TLB, Paging, Segmentation, Memory Replacement Policies.	5 Hrs
4	Bus, Cache and Shared Memory: Backplane Bus System, Cache Memory Organization: Cache Addressing Models, Direct Mapping and Associative Cache, Set-Associative and Sector Cache, Cache Performance Issues, Shared Memory Organization: Interleaved Memory Organization, Sequential and Weak Consistency Model: Atomicity and Event Ordering, Sequential and Weak Consistency Models.	5 Hrs
5	Pipelining and Superscalar Techniques: Linear Pipeline Processors: Asynchronous and Synchronous Models, Clocking and Timing Control, Speedup, Efficiency and Throughput, Nonlinear Pipeline	7 Hrs

	Processors: Reservation and Latency Analysis, Collision-Free Scheduling, Pipeline Schedule Optimization Instruction Pipeline Design: Instruction Execution Phases, Mechanisms for Instruction Pipelining, Dynamic Instruction Scheduling, Branch Handling Techniques, Arithmetic Pipeline Design: Computer Arithmetic Principles, Static Arithmetic Principles, Multifunctional Arithmetic Pipelines, Super Scalar and Super pipeline Design.	
6	Multiprocessors and Multicomputer: Multiprocessor System Interconnects, Cache coherence and Synchronization Mechanism, Three Generations of Multicomputer, Message Passing Mechanism, Vector Processing Principles: Vector Instruction Types, Vector Access Memory Schemes.	6 Hrs

Suggested Books (Minimum – 3):

S r. N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	Advanced Computer Architecture: Parallelism, Scalability, Programmability	Kai Hwang	McGraw Hill	1993	3 rd edition
2	Computer Architecture and Parallel Processing	Kai Hwang and Faye A. Briggs	McGraw, Hill	1985	3 rd edition
3	Computer Architecture – A Quantitative Approach	D. A. Patterson & J. L. Hennessy	Morgan Kaufmann Publishers	1996	2nd edition

Name of Department : Computer Science & Engineering
Subject Code : CSEL564
Course Title : Big Data Analytics
Teaching Mode: Online

Teaching Scheme				Credit s			Evaluation Scheme						
					Theory				Practical			Total	
Th .	T u	Pr .	Total		TA E	CA E	ES E	Exam Mode	Int .	Ext .	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

Course Outcome (Preferably – 3, Maximum – 5) :

Upon successful completion of the course, students shall be able to-

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction to Big Data	6 Hrs
2	Introduction Hadoop & Its Ecosystem	6 Hrs
3	Big Data Analytics - Data Life Cycle	5 Hrs
4	Data Mining & Business Intelligence	5 Hrs
5	Data visualization techniques and tools	7 Hrs
6	Case Studies: (Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics, Statistical Forecasting - Neural Networks - Predictive Analytics)	6 Hrs

Suggested Books (Minimum – 3):

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Data Analytics and Big Data	Soraya Sedkaoui	John Wiley & Sons	isbn=1119528062	
2					

3					
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Electives

Name of Department: Computer Science & Engineering

Subject Code: CSEL550

Course Title: Embedded Systems

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credit s			Evaluation Scheme						
					Theory				Practical			Total	
Th .	T u	Pr .	Total		TA E	CA E	ES E	Exam Mode	Int .	Ext .	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

1. To expose students to techniques and methodology in embedded system design. Students will develop hands on experience in design, simulation, verification and implementation using different tools.
2. This is for students who wish to study a programmed to engage them in system development and design focusing on microcontrollers, both hardware and software.
3. It provides advanced knowledge in areas essential for this type of design and development, while also providing learning in areas closely associated to embedded systems, such as control and communications

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5) :

Upon successful completion of the course, students shall be able to-

1. Understand concept of embedded system.
2. Design implement embedded system.

Details of Course:

S.	Contents	Cont
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No.		act Hours
1	An Embedded system, processor in the system, other hardware units, Designing with Processors, System Architecture, Hardware Design, FPGA Based Design, software embedded into a system, use of software tools for development of an embedded system, exemplary embedded systems, embedded system – on – chip (SOC) and in VLSI circuit.	7 hrs
2	I/O Devices Types and Examples – Synchronous Iso synchronous and Asynchronous Communications from Serial Devices, Examples of Internal Serial Communication Devices UART and HDLC, Parallel Port Devices, Sophisticated interfacing features in Devices/Ports Timer and Counting Devices '12C', 'USB', 'CAN' and advanced I/O Serial high speed buses ISA, PCI, PCI X, PCI and advanced buses. Design Concepts and Principles Designing Embedded Computing Platform Using CPU Bus, Bus Protocols, Bus Organization.	7 hrs
3	RAM, ROM, UVROM, EEPROM, Flash Memory, DRAM, I/O Devices, Timers and Counters, Watchdog Timers, Interrupt Controllers, DMA Controllers, A/D and D/A Converters, Displays Keyboards, Infrared devices, Component Interfacing, Memory Interfacing, I/O Device Interfacing, Interfacing Protocols, GPIB FIREWIRE, USB, IRDA.	7 hrs
4	Program Design, Design Patterns for Embedded Systems, Models of Program, Control and Data flow Graph, Programming Languages Desired Language Characteristics, Introduction to Object Oriented Programming, Data Typing, Overloading and Polymorphism, Control, Multi tasking and Task Scheduling, Timing Specifications Run time Exception handling.	7 hrs
5	Hardware and Software co design in an embedded system, embedded system project management, embedded system design and co design issues in system development process, design cycle in the development phase for an embedded system, use of target systems, use of scopes and logic analysis for system, hardware tests. Issues in embedded system design.	7 hrs

Suggested Books (Minimum – 3):

Sr. N	Title	Author Name	Publisher	Year of Publication	Edition
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o.					on
1	Embedded systems Architecture, programming and design	Rajkamal	Tata McGraw-Hill Education	2003	2 nd Edition
2	Embedded system design	Arnold S Burger	CMP Books	2001	1 st edition
3	An embedded software primer	David Simon	Addison-Wesley Professional	1999	1 st edition
4	Embedded systems design Real world design	Steve Heath; Butterworth, Heinemann,	Newton mass USA	2002	2 nd edition
5	Data communication	Hays	Plenum Press	1992	

Name of Department: Computer Science & Engineering

Subject Code: CSEL549

Course Title: Network Engineering & Management

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credits	Evaluation Scheme							
Th.	Tu	Pr.	Total		Theory				Practical			Total
					TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total	
3	-	-	3	3	20	30	50	Offline	-	-	-	100

Course Objective:

1. Understand the fundamental concepts of network management
2. Exposure to design and maintain network security aspect

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTL Lecture

5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project
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Course Outcome (Preferably – 3, Maximum – 5)

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Upon successful completion of the course, students shall be able to-

1. To understand analysis for networking engineering projects.
2. To do Maintenance and acceptance test also troubleshooting

Details of Course:

S. No	Contents	Contact Hours
1	An overview of network engineering: The basic concepts of network engineering, The concept and model of network engineering, System Integration, The approach of network engineering system integration, The model of System Integration, Document management of System Integration, The bidding for network engineering projects, Case: Using OpenProject, a project management application, to manage network projects. The basics of network engineering design: The composition of network, The structure of Internet network, Layer 2 Switch, Router, High-level transmitter, Ethernet Technology, Case: Design and implementation of a small LAN.	8 Hrs
2	Configure an Ethernet Switch: Be familiar with the basic functions of a switchboard, Configuring the layer two switches to implement the VLAN function, Configuration of routers and layer three switches realizing communication between VLAN host, The basic principle of spanning tree and configuration of spanning tree protocol, Configure the link aggregation of switchboard, The connection between switchboard, Case: The division of VLAN among switchboards; host communication among VLAN. Requirement analysis for networking engineering projects: Analysis of network application, Analysis of constraints of network design, Technical parameters of network analysis, Analysis of network traffic, Case: Design of LAN in the office environment.	10 Hrs

3	Structured cabling system and room design: Conception and system constitution of integrated wiring system, Design of integrated wiring project, Design of network room, Case: the structured cabling system in the teaching building. Router configuration: Be familiar with basic router configuration, Configure the router's routing function, WAN port configuration, Network engineering cases, Case: configure a large-scale enterprise network.	8 Hrs
4	Enterprise network design: Designing a network topology, IP address planning, Select the routing protocol, Select the network management protocol and system, Case: design a large-scale campus network. Design of network security: Select the network security mechanism, Select the data backup and fault-tolerant technology, Design of network security solution, Case: design a high-reliability network.	10 Hrs
5	Configure common intranet server: An introduction of common services of Intranet, DHCP, WWW, FTP server configuration, Network address translation and Internet connection sharing. Maintenance and acceptance test: Fault diagnosis and elimination methods, Ping, test utility, Ipconfig and Winipcfg, Netstat and Nbtstat, Tracert and Pathping.	9 Hrs

Suggested Books (Minimum – 3):

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Network engineering design tutorial - System Integration	Chen Ming,	CHINA MACHINE PRESS	2010	
2	LAN networking technology,	Hou Zhongai	POST & TELECOM PRESS	1991	
3	LAN technology and network engineering Training Course	Zhang Jingfeng	China Water & Power Press		

Name of Department: Computer Science & Engineering
Subject Code: CSEL551
Course Title: Soft Computing
Teaching Mode: Offline
Exam Mode: Offline

Teaching Scheme				Credits			Evaluation Scheme						
					Theory				Practical			Total	
Th.	Tu	Pr.	Total		TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

1. To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience
2. To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems
3. To provide the mathematical background for carrying out the optimization associated with neural network learning
4. To familiarize with genetic algorithms and other random search procedures useful while seeking global optimum in self-learning situations
5. To learn bio inspired algorithms and its applications

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5):

Upon successful completion of the course, students shall be able to-

1. Able to design a neural network to solve any problem
2. Able to design fuzzy controller
3. Able to use genetic algorithm for optimization
4. Identify and select a suitable Soft Computing technology to solve the problem;
5. Construct a solution and implement a Soft Computing solution.

Details of Course:

S. No.	Contents	Contact Hours
1	Neural Networks: Introduction to Biological Neural Networks: Neuron physiology, Neuronal diversity, specification of the brain, the eye's Neural Network. Artificial Neural	9 hrs

	Network Concepts: Neural attributes, modeling learning in ANN, characteristics of ANN, ANN topologies, learning algorithm.	
2	Neural Network Paradigm: McCulloch-Pitts, Model, the perception, Back-propagation networks. Associative Memory, Adaptive Resonance (ART) paradigm, Hopfield Model, Competitive learning Model, Kohonen Self-Organizing Network.	9 hrs
3	Fuzzy Logic: Introduction to Fuzzy sets: Fuzzy set theory Vs Probability Theory, classical set theory, properties of Fuzzy sets, Operation on Fuzzy sets. Fuzzy relations, Operations of Fuzzy relation, the extension principle. Fuzzy Arithmetic, Approximate reasoning: Introduction, linguistic variables, Fuzzy proposition, Fuzzy if-then rules. Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models – Sugeno Fuzzy Models –Tsukamoto Fuzzy Models –Input Space Partitioning and Fuzzy Modeling.	9 hrs
4	Genetic Algorithms: Fundamentals of Genetic Algorithms. Encoding, Fitness function, Reproduction, Genetic modeling: Cross over, Inversion & Deletion, Mutation Operator, Bit wise Operators, Convergence of Genetic Algorithm	9 hrs
5	Swarm Intelligence: Introduction to swarm intelligence and key principles (e.g. self organization, stigmergy), neural and artificial examples, Computational and embedded SI, Foraging, trail lying, Open space, multi source foraging experiments: biological data, microscopic experiments. Recent trends in soft computing	9 hrs

Suggested Books (Minimum – 3):

Sr . N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	Introduction to Artificial Neural Systems	Jacek M. Zurada	Jaico Publishing House	1994	
2	Neural Network, Fuzzy Logic and	S. Rajshekar, G.A.	PHI Learning Pvt. Ltd	2003	

	Genetic Algorithm,	Vijaylaxmi Pai			
3	Fuzzy sets & fuzzy logic	George J Klir, B. Yuan	PHI	1995	1 edition
4	Swarm Intelligence: From Natural to Artificial Systems	E. Bonabeau, M. Dorigo, and G. Theraulaz	Oxford University Press,	1999	

Name of Department: Computer Science & Engineering

Subject Code: CSEL552

Course Title: Visualization Techniques

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credits	Evaluation Scheme							
Th	T	Pr	Total		Theory				Practical			Total
.	u	.	I		TA	CA	ES	Exam Mode	Int.	Ext.	Total	
3	-	-	3	3	20	30	50	Offline	-	-	-	100

Course Objectives

1. Learn foundation of data visualization
2. Learn design pitfall and overcome techniques
3. Learn tools for data visualization

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5):

1. Demonstrate fundamentals of visualization techniques
2. Apply proper visualization techniques satisfying various constraints like color, data richness, attribution etc.
3. Identify proper software tool and apply

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction to information visualization. Discussion of the theoretical foundations of data visualization (Tufte, Wurman, Mayer, Ware, Yau, and Fry), Information visualization types and purpose, Introduction to visual displays to: depict a relationship among data points, compare a set of values, track rises and falls over time, see parts of a whole, and analyze text.	7 hrs
2	Design principles: Avoiding major design pitfalls that can impede communication and comprehension of visual displays like chart junk, data ink ratio, data richness, scales, color, and attribution. A framework for producing visualizations, Identifying your audience, understanding the data visualization task, gathering the right data, and selecting the appropriate display.	7 hrs
3	Tools for static data visualization: Statistical visualizations (histograms, scatterplots) and times series data. Understanding your data - Working with various data formats and types. Creating the data you need. Refining your visualizations in Adobe Illustrator.	7 hrs
4	Tools for dynamic displays: Introduction to web-based visual displays for broad and deep visualizations. Introduction to the D3 JavaScript framework. Introduction to ManyEyes and Bubble charts, Maps: When to use maps as visualization. Introduction to building Choropleth maps.	7 hrs
5	Trees and network visualizations: Use cases for treemap visualizations. Displaying behaviors through network graphs.	9 hrs
6	Big Data Visualizations and Other Displays: Where some tools fail with Big Data visualizations. Using visualizations to explore and present Big Data. Visualizing text.	8 hrs

Suggested Books (Minimum – 3):

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition

1	Getting Started with D3	Dewar, M.	O'Reilly Media.	2012	1 edition
2	Data Points. Indianapolis	Yau, N.	O'Reilly	2013	
3	Visualize This: The FlowingData Guide to Design, Visualization, and Statistics. Indianapolis	Yau, N.	O'Reilly	2011	
4	Show me the numbers: Designing tables and graphs to enlighten	Few, S.	Analytics Press.	2012	
5	Information dashboard design: The effective visual communication of data. Sebastopol	Few, S.	O'Reilly	2006	
6	Visual thinking for design. Burlington	Ware, C & Kaufman, M.	Morgan Kaufmann Publishers.	2008	

Name of Department: Computer Science & Engineering
Subject Code: CSEL553
Course Title: Network Security & Cryptography
Teaching Mode: Offline
Exam Mode: Offline

Teaching Scheme				Credits	Evaluation Scheme							
					Theory				Practical			Total
Th.	Tu	Pr.	Total		TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total	

3	-	-	3	3	20	30	50	Offline	-	-	-	100
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Course Objective:

1. Develop an understanding of information assurance as practiced in computer operating systems, distributed systems, networks and representative applications.
2. Gain familiarity with prevalent network and distributed system attacks, defenses against them, and forensics to investigate the aftermath.
3. Develop a basic understanding of cryptography, how it has evolved, and some key encryption techniques used today.
4. Develop an understanding of security policies (such as authentication, integrity and confidentiality), as well as protocols to implement such policies in the form of message exchanges.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5)

1:

Upon successful completion of the course, students shall be able to-

1. Identify common network security vulnerabilities/attacks
2. Demonstrate detailed knowledge of the role of encryption to protect data.
3. Analyze security issues arising from the use of certain types of technologies.
4. Identify the appropriate procedures required to secure networks.
5. Identify the appropriate procedures required for system security testing and procedures of Backup and recovery.

Details of Course:

S. No.	Contents	Contact Hours
1	Overview: Services, Mechanisms and attacks, OSI security architecture, Model for network security. Classical Encryption Techniques: Symmetric	9 Hrs

	cipher model, Substitution techniques, Transposition techniques, Rotor machine, Steganography, Problems. Block Ciphers and DES (Data Encryption Standards): Simplified DES, Block cipher principles, DES, Strength of DES, Block cipher design principles, Block cipher modes of operation, Problems.	
2	Public Key Cryptography and RSA: Principles of public key cryptosystems, RSA algorithm, Problems. Other Public Key Crypto Systems and Key Management: Key management, Diffie-Hellman key exchange, Elliptic curve arithmetic, Elliptic curve cryptography, Problems.	9 Hrs
3	Message Authentication and Hash Functions: Authentication requirements, Authentication functions, Message authentication codes, Hash functions, Security of Hash functions and MAC's, Problems. Digital Signature and Authentication Protocol: Digital signature, Authentication protocols, Digital signature standard.	9 Hrs
4	Authentication Applications: Kerberos, X.509 authentication service, Kerberos encryption technique, Problems. Electronic Mail Security: Pretty good privacy, S/MIME, Data compression using ZIP, Radix-64 conversion, PGP random number generator. IP Security: Overview, IP security architecture, Authentication header, ESP (encapsulating security payload), Security associations, Key management, Problems.)	9 Hrs
5	Firewalls: Firewall design principles; trusted systems, Problems. Wireless Security Issues: The Unique Security Environment of Wireless, Notable Security Failures With WiFi and GSM, Authentication, Authorization and Accounting, IEEE 802.11 (WiFi) Solutions; Initial and Revised Virtual Private Networks. Recent trends in network security.	9 Hrs

Suggested Books (Minimum – 3):

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
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1	Cryptography and Network Security	William Stallings	Pearson Education (Asia) Pte. Ltd./ Prentice Hall of India,	2003	3 rd edition
2	Cryptography and Network Security	Atul Kahate	Tata McGraw-Hill,	2003	
3	Network Security: Private Communication in a Public World,	C. Kaufman, R. Perlman, and M. Speciner,	Education (Asia) Pte. Ltd.,	2002	2 nd edition
4	Fundamentals of Network Security	Eric Maiwald	McGraw-Hill,	2003	
5	Cryptography Demystified	John Hershey	McGraw-Hill,	2002	

Name of Department: Computer Science & Engineering

Subject Code: CSEL555

Course Title: Mobile & Pervasive Computing

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credits	Evaluation Scheme							
					Theory				Practical			Total
Th.	Tu	Pr.	Total		TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total	
3	-	-	3	3	20	30	50	Offline	-	-	-	100

Course objectives:

1. Objective of this course is to learn fundamentals of mobile & pervasive computing
2. The objective of the course is to introduce participants to the technologies, services and business models associated with Mobile and Pervasive Computing

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and	7	Open ended

	Tutorials		experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcomes

1. This course is about **learning to design successful mobile and pervasive computing applications and services.**
2. Learn to **evaluate critical design tradeoffs** associated with different mobile technologies, architectures, interfaces and business models
3. Learn impact of the **usability, security, privacy and commercial viability** of mobile and pervasive computing services and applications.

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction to mobile and pervasive computing, An overview of mobile and pervasive computing. Wireless technologies overview- History of cellular systems, Wireless technologies and mobile systems, Wireless networking essentials. Mobile computing environments-Mobile computing infrastructure, Characteristics of mobile computing environments, Challenges of mobile computing	9 hrs
2	Pervasive computing environments-Infrastructure of pervasive computing, Characteristics of pervasive computing environments, Vision and challenges of pervasive computing Context-aware computing and location-based services-Context awareness, Adaptation techniques, Location-based services in mobile environments.	9 hrs
3	Wireless sensors and sensor networks- Wireless sensor technologies, Sensor networks, Distributed coordination and aggregation, Sensor network applications. Peer-to-peer computing -The essentials of P2P, Structured and unstructured P2P, P2P file sharing, P2P media streaming, P2P computing systems and applications.	9 hrs
4	Wearable computing- Introduction of a wearable computer, Characteristics of wearable computing, Wearable	9 hrs

	computing projects.	
5	RFID- Introduction of RFID, The relationships between RFID technologies and pervasive computing, Data management issues and middleware. Advanced Topics- Autonomic computing, Utility computing, Pervasive computing applications and case study.	9 hrs

Suggested Books (Minimum – 3):

S r. N o.	Title	Author Name	Publish er	Year of Publi catio n	Edition
1	Fundamentals of Mobile and Pervasive Computing.	Golden Richard	McGraw-Hill Professional Publishing	December 2004.	
2	Pervasive Computing	Uwe Hansmann, Lothar Merk, Martin S. Nicklous, T. Stober. (Edt.)	Springer-Verlag Telos	May 2003	
3	Pervasive Computing: A New Class of Computing Devices	Jochen Burkhardt, Horst Henn, Stefan Hepper, Klaus Rindtorff and Thomas Schaeck.	Addison-Wesley Pub Co	January, 2002	

Name of Department: Computer Science & Engineering
Subject Code: CSEL554
Course Title: Data Mining and Warehousing
Teaching Mode: Offline
Exam Mode: Offline

Teaching Scheme				Credits	Evaluation Scheme							
Th.	Tu.	Pr.	Total		Theory				Practical			Total
					TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total	
3	-	-	3	3	20	30	50	Offline	-	-	-	100

Course Objective:

1. To understand and implement classical models and algorithms in data warehousing and data mining
2. To analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
3. To compare and contrast different conceptions of data mining
4. To characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5)

1:

Upon successful completion of the course, students shall be able to-

1. Evaluate the different models used for OLAP and data pre-processing.
2. Design and implement systems for data Mining & propose data mining solutions.
3. Exercise the data mining tools during Projects to build reliable products, and to address the current demand of the industry.

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System	9 hrs

	with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.	
2	Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining Data Cube Computation and Data Generalization: Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.	9 hrs
3	Mining Frequent Patterns, Associations and Correlations: Mining Methods, Mining Various Kinds of Association Rules, Correlation Analysis, Constraint Based Association Mining, Classification and Prediction: Basic Concepts, Decision Tree Induction, Bayesian Classification, Rule Based Classification by Backpropagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Ensemble Methods, Prediction.	9 hrs
4	Cluster Analysis Introduction :Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis.	9 hrs
5	Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Spatial Databases, Multimedia Databases, Time Series and Sequence Data, Text Databases, World Wide Web, Applications and Trends in Data Mining.	9 hrs

Suggested Books (Minimum – 3):

S r. N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	Data Mining – Concepts and Techniques	Jiawei Han & Micheline Kamber	Morgan Kaufman Publisher, Elsevier	2006	2nd Edition,
2	Introduction to Data Mining	Pang-Ning Tan, Michael Steinbach and Vipin Kumar	Pearson education	May 2005	1 edition
3	Data Mining Techniques	Arun K Pujari,	Universities Press	2001	2nd edition,
4	Data Warehousing Fundamentals	Paul Punniyan	John Wiley Pub	May 2010	2nd Edition
5	Data Warehousing in the Real World	Sam Aanhory & Dennis Murray	Pearson Education Asia	1997	1 edition
6	Insight into Data Mining	K.P.Soman, S.Diwakar, V.Ajay	PHI,	2008	

Name of Department : Computer Science & Engineering

Subject Code : CSEL556

Course Title : Pattern Recognition

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credits			Evaluation Scheme						
					Theory				Practical			Total	
Th.	Tu	Pr.	Total		TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

1. To study statistical pattern recognition, Parametric Approaches
2. To study Parametric Discriminate Functions
3. To study Nonparametric Classification, Feature Extraction

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5

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Upon successful completion of the course, students shall be able to-

1. Design systems and algorithms for pattern recognition ,with focus on sequences of patterns that are analyzed .
2. Analyze classification problems probabilistically and estimate classifier performance,
3. Understand and analyze methods for automatic training of classification systems,
4. Apply Maximum-likelihood parameter estimation in relatively complex probabilistic models, such as Bayesian parameter estimation,
5. Understand the principles of Bayesian parameter estimation and apply them in relatively simple probabilistic models.
6. Cluster and classify the system using non parametric techniques like KNN and clustering.

Details of Course:

S. No.	Contents	Contact Hours
1	INTRODUCTION Machine Perception, An Example, Pattern Recognition Systems, The Design Cycle, Learning and Adaption. Recognition with strings, Grammatical methods, Rule based Methods.	7 hrs
2	BAYESIAN DECISION THEORY Introduction, Bayesian Decision Theory-Continuous Features, Minimum-Error-Rate Classification, Classifiers, Discriminant Functions, and Decision Surfaces, The Normal Density, Discriminant Functions for the Normal Density, Error Probabilities and Integrals, Error Bounds for Normal Densities, Bayes	9 hrs

	Decision Theory-Discrete Features, Missing and Noisy Features, Bayesian Belief Networks, Compound Bayesian Decision Theory and Context.	
3	MAXIMUM-LIKELIHOOD AND BAYESIAN PARAMETER ESTIMATION Introduction, Maximum-Likelihood Estimation, Bayesian Estimation, Bayesian Parameter Estimation: Gaussian Case, Bayesian Parameter Estimation: General Theory, Sufficient Statistics, Problems of Dimensionality, Component Analysis and Discriminants, Expectation-Maximization (EM), Hidden Markov Models.	8 hrs
4	NONPARAMETRIC TECHNIQUES Introduction, Density Estimation, Parzen Windows, K_n – Nearest-Neighbors Estimation, the Nearest-Neighbor Rule, Metrics and Nearest-Neighbor Classification, Fuzzy Classification, Reduced Coulomb Energy Networks, Approximations by Series Expansions.	7 hrs
5	UNSUPERVISED LEARNING AND CLUSTERING Introduction, Mixture Densities and Identifiability, Maximum-Likelihood Estimates, Application to Normal Mixtures, Unsupervised Bayesian Learning, Data Description and Clustering, Criterion Functions for Clustering, Iterative Optimization, Hierarchical Clustering, The Problem of Validity, On-line Clustering, Graph-Theoretic Methods, Component Analysis, Low-Dimensional Representations and Multidimensional Scaling (MDS).	7 hrs
6	Validation and testing methods, Advanced topic and applications of pattern recognition.	7 hrs

Suggested Books (Minimum – 3):

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Pattern Classification and Scene Analysis	R. O. Duda, P. E. Hart	Wiley	2001	2 nd edition

2	Pattern Classification,	PHI	Earl Gose	2000	
3	syntactic methods in pattern recognition	K. C. Fu	academic Press,	1980	

Name of Department: Computer Science & Engineering

Subject Code: CSEL558

Course Title: Human Computer Interaction

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credits	Evaluation Scheme						
					Theory				Practical		
Th.	Tu	Pr.	Total		TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total
3	-	-	3	3	20	30	50	Offline	-	-	-

Course Objective:

1. This course introduces students the concept of Human-Computer Interaction.
2. This Course also aims to think constructively and analytically about how to design and evaluate interactive technologies

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5)

U:

Upon successful completion of the course, students shall be able to-

1. Implement fundamental concepts in HCI;
2. Carry out a range of different types of user study and usability study;

3. Explain how interface design is ultimately dependent on human perception and cognition.
4. Identify different methods and approaches in HCI.

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design, A brief history of Screen design, The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.	9 hrs
2	Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds, understanding business junctions.	9 hrs
3	Screen Designing:- Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow –Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics – Technological consideration in interface design.	9 hrs
4	Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls. Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.	9 hrs
5	Software tools – Specification methods, interface – Building Tools. Interaction Devices – Keyboard and function keys – pointing devices – speech recognition digitization and generation – image and video displays – drivers, Interface Design and Programming, Web Usability Recent trends in human computer interaction.	9 hrs

Suggested Books (Minimum – 3):

S r. N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	The essential	Wilbert O Galitz,	Wiley Dreamte	2002	Second Edition

	guide to user interface design,	Wiley DreamTe ch	ch		
2	Designin g the user interface.	Ben Shneider mann ,	Pearson Educatio n Asia		5 th Edition
3	Human – Computer Interactio n	Alan Dix, Janet Fincay, Gre Goryd, Abowd, Russell Bealg,	Pearson Educatio n	2003	3 rd Edition
4	Interactio n Design Prece	Rogers, Sharps. Wiley Dreamte ch,	Wiley Dreamte ch	2011	3rd Edition
5	User Interface Design	Soren Lauesen	Pearson Educatio n.	2005	

Name of Department: Computer Science & Engineering

Subject Code: CSEL559

Course Title: Natural Language Processing

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credits			Evaluation Scheme						
					Theory				Practical			Total	
Th.	Tu	Pr.	Total		TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

1. Develop familiarity with lexical, syntactic, semantic and pragmatic aspects of NLP.
2. Develop an understanding of NLP Models and Algorithms.
3. Develop background in statistical and machine learning approaches to NLP

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit

4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5)

1:

Upon successful completion of the course, students shall be able to-

1. Know the main methods used in the field of natural language processing
2. Are familiar with the main research areas in the field
3. Are able to implement a system which processes a natural language

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction: NLP tasks in syntax, semantics, and pragmatics. Applications such as information extraction, question answering, and machine translation. The problem of ambiguity. The role of machine learning. Brief history of the field.	9 hrs
2	N-gram Language Models: The role of language models. Simple N-gram models. Estimating parameters and smoothing. Evaluating language models. Part Of Speech Tagging and Sequence Labeling: Lexical syntax. Hidden Markov Models. Maximum Entropy Models. Conditional Random Fields.	9 hrs
3	Syntactic parsing: Grammar formalisms and tree banks. Efficient parsing for context-free grammars (CFGs). Statistical parsing and probabilistic CFGs (PCFGs). Lexicalized PCFGs.	9 hrs
4	Semantic Analysis: Lexical semantics and word-sense disambiguation. Compositional semantics. Semantic Role Labeling and Semantic Parsing.	9 hrs
5	Information Extraction (IE): Named entity recognition and relation extraction. IE using sequence labeling. Machine Translation (MT), Basic issues in MT. Statistical translation, word alignment, phrase-based translation, and synchronous grammars.	9 hrs

Suggested Books (Minimum – 3):

S	Title	Author	Publish	Year	Editio
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r. N o.		Name	er	of Publi catio n	n
1	Speech And Language Processi ng, An Introducti on To Natural Language Processi ng, Computa tional Linguistic s, And Speech Recogniti on,	Daniel Jurafsky And James H. Martin	Prentice Hall, Englewo od Cliffs,	1999	Secon d Edition
2	Text Analysis With Lingpipe	Bob Carpent er	LingPipe Publishin g	2011	
3	Introducti on To Natural Language Processi ng,	Steven Bird, Ewan Klein And Edward Loper	O'Reilly;	2009	1 edition
4	Pattern Recogniti on And Machine Learning,	Chris Bishop	Springer	2007	
5	The Lingpipe Java Library Suite - Informati on Extractio n And Data Mining Tools.	Bob Carpent er.			
6	An Introducti on To Language Processi ng With Perl And Prolog		Springer	2006	1st ed.

Name of Department: Computer Science & Engineering
Subject Code: CSEL561
Course Title: Reconfigurable Computing
Teaching Mode: Offline
Exam Mode: Offline

Teaching Scheme				Credits			Evaluation Scheme						
					Theory				Practical			Total	
Th.	Tu	Pr.	Total		TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

1. This course introduces basics of Reconfigurable computing concepts.
2. This course provides knowledge about various architectures used in reconfigurable computing.
3. This course gives understanding about mapping of applications described in a HDL to reconfigurable hardware.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5

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Upon successful completion of the course, students shall be able to-

1. Understand basics of Reconfigurable computing concepts.
2. Understand various architectures used in reconfigurable computing.
3. Identify & understand mapping of applications described in a HDL to reconfigurable hardware

Details of Course:

S. No.	Contents	Contact Hours
1	Computing requirements, Area, Technology scaling, Instructions, Custom Computing Machine, Overview, Comparison of	10 hrs

	Computing Machines. Interconnects, Requirements, Delays in VLSI Structures; Partitioning and Placement, Routing; Computing Elements, LUT's, LUT Mapping, ALU and CLB's, Retiming.	
2	Fine-grained & Coarse-grained structures, Multicontext, Comparison of different architectures viz. PDSPs, RALU, VLIW, Vector Processors, Multicontext, Comparison of different architectures viz. PDSPs, RALU, VLIW, Vector Processors Memories, Arrays for fast computations, CPLDs, FPGAs.	7 hrs
3	Partial Reconfigurable Devices, TSFPGA, Matrix, Best suitable approach for RD, Case study. Control Logic, Binding Time and Programming Styles, Overheads, Data Density, Data BW, Function density, Function diversity, Interconnect methods, Best suitable methods for RD; Contexts, Context switching.	7 hrs
4	Area calculations for PE, Efficiency, ISP, Hot Reconfiguration, Case study. Architectures for existing multi FPGA systems, Compilation Techniques for mapping applications described in a HDL to reconfigurable hardware, Architectures for existing multi FPGA systems, Study of existing reconfigurable computing systems to identify existing system limitations and to highlight opportunities for research.	7 hrs
5	Software challenges in System on chip, Testability challenges, Case studies. Modelling, Temporal portioning algorithms, Online temporal placement, Device space management, Direct communication, Third party communication, Bus based communication, Circuit switching, Network on chip, Dynamic network on chip, Partial reconfigurable design.	7 hrs
6	Case study on Xilinx Spartran III, Cyclone Series and Vertex series.	7 hrs

Suggested Books (Minimum – 3):

Sr . N o.	Title	Author Name	Publisher	Yea r of Pub lica tion	Edit ion
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1	Reconfigurable Architectures for General Purpose Computing	Andre Dehon,	Massachusetts Institute of Technology, Department of Electrical Engineering and Computer Science	1996	
2	Introduction to Reconfigurable Computing	Christophe Bobda,	Springer	2007	
3	Reconfigurable Computing	Maya Gokhale, Paul Ghaham	Springer;		2005 edition

Name of Department: Computer Science & Engineering
Subject Code: CSEL560
Course Title: Cloud Computing & Virtualization
Teaching Mode: Offline
Exam Mode: Offline

Teaching Scheme				Credits	Evaluation Scheme							
Th.	Tu.	Pr.	Total		Theory				Practical			Total
					TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total	
3	-	-	3	3	20	30	50	Offline	-	-	-	100

Course Objective:

1. To introduce the modern trends in computer architecture
2. This course gives an introduction to cloud computing and its techniques, issues, ecosystem with security
3. To understand the concept of virtualization and its applications.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz	10	Mini modeling, Minor Project

	,Poster, etc)		
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Course Outcome (Preferably – 3, Maximum – 5)

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Upon successful completion of the course, students shall be able to-

1. Articulate the main concepts, key technologies, strengths, and limitations of cloud computing.
2. Identify the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
3. Attempt to generate new ideas and innovations in cloud computing and virtualization.

Details of Course:

S. No.	Contents	Contact Hours
1	Defining Cloud Computing, Understanding Cloud Architecture, Virtualization, Types of Virtualization, Service Models, Applications by type.	9 hrs
2	Understanding Abstraction & Virtualization Technologies, Load Balancing & Virtualization, Understanding Hypervisors.	9 hrs
3	Defining Baseline and metrics, Baseline measurements, System metrics, Load testing, Resource ceilings, Servers and instance types, Network Capacity, Scaling.	9 hrs
4	Google Web Services, Amazon Web Services, Microsoft Cloud services.	9 hrs
5	Securing the Cloud, Securing Data, Establishing Identity and Presence. Advanced Topic : Cloud Applications	9 hrs

Suggested Books (Minimum – 3):

S. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Cloud Computing : Bible	Barrie Sosinsky	Wiley-India Pvt. Ltd.,	2011	
2	Mastering Cloud Computing	Rajkumar Buyya, Christian Vecchiola, S.	McGraw Hill Education (India) Pvt. Ltd	2013	

		Thamarai Selvi			
3	Cloud Computing	Michael Miller	Pearson Education	2009	
4	Cloud Computing, Implementation, Management, and Security	John W. Rittinghouse and James F. Ransome	CRC Press	2010	
5	Cloud Computing : Automating the Virtualized Data Center	Venkata Josyula, Malcolm Orr, Greg Page	CISCO, Pearson Education	2012	
6	Cloud Application Architectures	George Reese	O'Reilly	2009	

Elective IV

Name of Department: Computer Science & Engineering

Subject Code: CSEL566

Course Title: Advanced Digital Image Processing

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credit s			Evaluation Scheme						
					Theory				Practical			Total	
Th .	T u	Pr .	Total		TA E	CA E	ES E	Exam Mode	Int .	Ext .	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

1. This course introduces the fundamental principles and algorithms of digital image processing systems.
2. The course will cover many subjects including image sampling and quantization; spatial and frequency domain image enhancement techniques; digital signal processing theories used

for digital image processing, such as one dimensional and two dimensional convolution, and two dimensional Fourier transformation; color models and basic color image processing.

3. Have a comprehensive background of image processing

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5)

):

Upon successful completion of the course, students shall be able to-

1. Process images using techniques of smoothing, sharpening, histogram processing, and filtering,
2. Explain sampling and quantization processes in obtaining digital images from continuously sensed data,
3. Enhance digital images using filtering techniques in the spatial domain, frequency domain.
4. Restore images in the presence of only noise through filtering techniques,

Details of Course:

S. No.	Contents	Contact Hours
1	Image Enhancement in the Spatial Domain: Spatial and Frequency methods, Basic Gray Level Transformations, Histogram Equalization, Histogram Processing, Local Enhancement, Image Subtraction, Image Averaging, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters.	9 hrs
2	Transforms: Introduction to the Fourier Transformation, Discrete Fourier Transformation, Fast Fourier Transformation, Fourier Properties, 2D FT, inverse Fourier transform, Wavelet transform and multi	9 hrs

	resolution processing Image Enhancement in the frequency Domain: Filtering in the Frequency Domain, Correspondence between Filtering in the Spatial and Frequency Domain, Smoothing Frequency-Domain Filters, Sharpening Frequency-Domain Filters, Homomorphic Filtering, Implementation.	
3	Image Compression: Image compression models, lossy & lossless compression, image compression standards. Lossy Compression: Transform coding – Wavelet coding Morphological Image Processing: Preliminaries, Dilation and Erosion, Opening and Closing, hit-or-miss Transformation, Some Basic Morphological Algorithms, Extension to Gray-Scale Images.	9 hrs
4	Image Segmentation: Point Detection, Line Detection, Edge Detection, Gradient Operator, Edge Linking and Boundary Detection, Thresholding, Region-oriented Segmentation.	9 hrs
5	Representation: Chain Codes, Polygonal Approximations, Signatures, Boundary Segments, Skeleton of a Region. Description: Boundary Descriptors, Shape Numbers, Fourier Descriptors, Regional Descriptors, Simple Descriptors, Topological Descriptors. Recent trends in medical imaging.	9 hrs

Suggested Books (Minimum – 3):

S r. N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	Digital Image Processing	Rafael C. Gonzales and Richard E. Woods,	Prentice Hall	2002	2nd edition
2	Fundamentals of Digital Image Processing	A K Jain	Prentice Hall.	1989	4 th Edition
3	Digital Image Processing,	W K Pratt	John Wiley and Sons	2001	3rd Edition

4	Digital Image Processing	Chanda, Mazumdar	Prentice Hall, India.		2nd edition
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Name of Department: Computer Science & Engineering

Subject Code: CSEL568

Course Title: Computer Simulation & Modeling

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credit s			Evaluation Scheme						
					Theory				Practical			Total	
Th .	T u	Pr .	Total		TA E	CA E	ES E	Exam Mode	Int .	Ext .	Total		
3	-	-	3	3	20	30	50	Offlin e	-	-	-	100	

Course Objective:

1. Understand the pros and cons of different simulation model.
2. Understand the concept of Finite automata in simulation.
3. Understand simulation model for queuing system.
4. Understand mathematical techniques used to verify the simulation.
5. Understand the verification and analysis of simulation.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5)

1:

Upon successful completion of the course, students shall be able to-

1. Able to understand the pros and cons of different simulation model.
2. Able to use Finite automata in simulation

3. Able to use simulation model for queuing system.
4. Able to understand mathematical techniques to verify the simulation.
5. Able to verify the simulation model and analyze the simulation results

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction to modelling and simulation, System analysis, classification of systems. System theory basics, its relation to simulation. Model classification: conceptual, abstract, and simulation models. Heterogeneous models. Methodology of model building.	9 hrs
2	Simulation systems and languages, means for model and experiment description, Principles of simulation system design, Parallel process modelling, Using Petri nets and finite automata in simulation.	9 hrs
3	Models of queuing systems, Discrete simulation models, Model time, simulation experiment control, Continuous systems modelling. Overview of numerical methods used for continuous simulation, System Dymola/Modelica, Combined simulation, The role of simulation in digital systems design.	9 hrs
4	Special model classes, models of heterogeneous systems. Cellular automata and simulation. Checking model validity, verification of models. Analysis of simulation results.	9 hrs
5	Simulation results visualization, Model optimization, Generating, transformation and testing of pseudorandom numbers. Stochastic models, Monte Carlo method, Overview of commonly used simulation systems. Advanced Topic Case Studies: Simulation of manufacturing systems, Simulation of computer systems, Simulation of super market, Simulation of pert network.	9 hrs

Suggested Books (Minimum – 3):

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
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1	System Simulation	Geffery Gordon	Prentice Hall of India	1995	Second Edition
2	Theory of Modeling and Simulation	Bernard Zeigler, Herbert Praehofer, Tag Gon Kim	Academic Press	2000	Second Edition
3	System Simulation with Digital Computer	Narsing Deo	PHI	1978	
4	System Analysis and Modeling	Donald W. Boddy	Academic Press Harcourt India		
5	Simulation with Arena	W David Kelton, Randall Sadowski, Deborah Sadowski	McGRAW-HILL	1997	
6	Simulating Computer Systems: Techniques and Tools. Cambridge	M. H. MacDougall	MA: MIT Press	1987	

Name of Department : Computer Science & Engineering

Subject Code : CSEL567

Course Title : Ubiquitous Computing

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credits	Evaluation Scheme							
					Theory				Practical			Total
Th.	Tu	Pr.	Total		TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total	
3	-	-	3	3	20	30	50	Offline	-	-	-	100

Course Objective:

1. Provide a unified overview on the broad field of Ubiquitous Computing (UC/UbiComp)
2. Concepts and features of ubiquitous computing
3. Ubiquitous Technologies (networks, context-aware, smartness/intelligence, platform, systems, etc.) Trends and Challenges of ubiquitous computing and emerging ubiquitous society

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5)**U:**

Upon successful completion of the course, students shall be able to-

1. Understand the basic concepts & Vision of ubiquitous computing.
2. Identify the architecture of ubiquitous computing .
3. Learn the ubiquitous environments, programming and context awareness .
4. Apply the concepts of ubiquitous computing for designing & developing access control applications.

Details of Course:

S. No.	Contents	Contact Hours
1	The Ubiquitous Computing Vision- Introduction to Ubiquitous Computing, Ubiquitous Computing Visionaries, Introducing the Mouse and Early Ubiquitous Computing, MIT, Ethics, Privacy, Responsibility.	9 hrs
2	Architecture- Autonomic Computing, Distributed Computing, Cloud Computing, Peer to Peer, Mobility, Mobile Computation and Agents, Smart Places, Wearable Computing, Service-Oriented, Sensors and Actuators, HCI Principles for Ubiquitous Computing.	9 hrs
3	Ubiquitous Environments, Programming Ubiquitous Systems, Theory – Location, Spatial Databases, Topological Reasoning, Mobile Computation, Data Structures and MetaData, Security and Privacy, Ambient Calculus, Relational Models, Specifications, UML, OMG, Ontology's.	9 hrs
4	Context Awareness- GPS, Location and Tracking, Ontologies, Reasoning, Wearable	6 hrs

	Computing, Privacy-Problems of Authentication, Confidentiality, Total Information Awareness, Credentials.	
5	Access Control Applications- The Internet of Things, Smart Homes, Smart Workplaces, Social Computing, Religious Computing, Health and Medical Computing, Science, Surveillance, Monitoring, Navigation, GPS.	6 hrs
6	Recent trends in Ubiquitous Computing	6 hrs

Name of Department : Computer Science & Engineering

Subject Code : CSEL569

Course Title : Voice Over IP

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credits			Evaluation Scheme						
					Theory				Practical			Total	
Th.	Tu	Pr.	Total		TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

1. To understand IP Protocol Suite.
2. To understand H.323 and H.245 Standards and SIP.
3. To study Quality of Service (QoS) and VOIP.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5)**U:**

Upon successful completion of the course, students shall be able to-

1. Upon successful completion of the course, students will be able to
2. Understand and use concept of IP Protocol Suite.

- To study and use concepts of H.323 and H.245 Standards and SIP Simulation in networks.
- To study and apply concepts of Quality of Service & VOIP in Communication systems
- To use advanced techniques & Research in VOIP.

Details of Course:

S. No.	Contents	Contact Hours
1	Overview of IP Protocol Suite: The Internet Protocol, The Transmission Control Protocol (TCP), The User Datagram Protocol (UDP), The Real-time Transport Protocol (RTP), IP multicast, IP version 6 (IP v6), Interworking IPv4 and IPv6, The VoIP Market, VoIP Challenges.	8 hrs
2	H.323 and H.245 Standards: The H.323 Architecture, Call Signaling-Call Scenarios, H.245 Control Signaling Conference calls- The Decomposed Gateway.	8 hrs
3	The Session Initiation Protocol (SIP): SIP architecture- Overview of SIP Messaging Syntax- Examples of SIP Message sequences- Redirect Servers- Proxy Servers. The Session Description Protocol (SDP)- Usage of SDP With SIP.	8 hrs
4	Quality of Service (QoS): Need for QoS- End-to-end QoS, Overview of QoS solutions- The Resource reservation Protocol (RSVP)- Diffserv- The Diffserv Architecture- Multi-protocol Label Switching (MPLS)- The MPLS Architecture- MPLS Traffic Engineering- Label Distribution Protocols and Constraint-Based Routing.	8 hrs
5	VoIP and SS7: The SS7 Protocol Suite- The Message Transfer Part (MTP), ISDN User Part (ISUP) and Signaling Connection Control Part (SCCP), SS7 Network Architecture- Signaling Points(SPs)-Single Transfer Point (STP), - Service Control Point(SCP)- Message Signal Units (MSUs)- SS7 Addressing, ISUP, Performance Requirements for SS7, Sigtran- Sigtran Architecture- SCTP- M3UA Operation- M2UA Operation- M2PA Operation- Interworking SS7 and VoIP Architectures- Interworking Soft switch and SS7- Interworking H.323 and SS7.	8 hrs
6	Advance/Recent trends and technologies	5 hrs

Suggested Books (Minimum – 3):

S. r. N. o.	Title	Author Name	Publisher	Year of Publication	Edition
1	Carrier Grade Voice over IP	Daniel Collins	McGraw-Hill	2002	2nd ed
2	Understanding Voice over IP Technology	Nicholas Wittenberg, Cengage	Cengage Learning	2009	1st Ed
3	Voice Over WLANS – The Complete Guide	Michael, F. Finneva n	Elsevier	2008	
4	Digital Communications	John G. Proakis	Mc. Graw Hill Publication	2007	5 th Edition
5	Digital and Analog Communication Systems	K. Sam Shanmugam	Wiley Publications	2006	
6	Digital Communications	Symon Haykin	Wiley Publications	2014	

Elective

Name of Department : Computer Science & Engineering

Subject Code : CSEL571

Course Title : Research Methodology

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credit s			Evaluation Scheme					
					Theory				Practical			Total
Th .	T u	Pr .	Total		TA E	CA E	ES E	Exam Mode	Int .	Ext .	Total	
3	-		3	3	20	30	50	Offline	-	-	-	100

Course Objective:

- To gain insights into how scientific research is conducted.

- To help in critical review of literature and assessing the research trends, quality and extension potential of research and equip students to undertake research.
- To learn and understand the basic statistics involved in data presentation.
- To identify the influencing factor or determinants of research parameters.
- To test the significance, validity and reliability of the research results.
- To help in documentation of research results.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5):

Upon successful completion of the course, students shall be able to-

- Ability to critically evaluate current research and propose possible alternate directions for further work
- Ability to develop hypothesis and methodology for research
- Ability to comprehend and deal with complex research issues in order to communicate their scientific results clearly for peer review.

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction: Definition and objectives of Research – Types of research, Various Steps in Research process, Mathematical tools for analysis, Developing a research question-Choice of a problem Literature review, Surveying, synthesizing, critical analysis, reading materials, reviewing, rethinking, critical evaluation, interpretation, Research Purposes, Ethics in research – APA Ethics code.	8
2	Quantitative Methods for problem solving: Statistical Modeling and Analysis, Time Series Analysis Probability Distributions, Fundamentals of Statistical Analysis and Inference, Multivariate methods,	8

	Concepts of Correlation and Regression, Fundamentals of Time Series Analysis and Spectral Analysis, Error Analysis, Applications of Spectral Analysis.	
3	Tabular and graphical description of data: Tables and graphs of frequency data of one variable, Tables and graphs that show the relationship between two variables , Relation between frequency distributions and other graphs, preparing data for analysis.	8
4	Soft Computing: Computer and its role in research, Use of statistical software SPSS, GRETL etc in research. Introduction to evolutionary algorithms - Fundamentals of Genetic algorithms, Simulated Annealing, Neural Network based optimization, Optimization of fuzzy systems.	8
5	Research Reports: Structure and Components of Research Report, Types of Report, Layout of Research Report, Mechanism of writing a research report, referencing in academic writing.	8

Suggested Books (Minimum – 3):

Sr . N o.	Title	Author Name	Publisher	Year of Publication	E d i t i o n
1	Research Methods , Thomson Learning	Donald H. McBurney,	ISBN: 81-315-0047-0,2006	-	5th Edition,

Name of Department: Computer Science & Engineering

Subject Code: CSEL574

Course Title: Mobile Operating System

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credit s			Evaluation Scheme						
					Theory				Practical			Total	
Th .	T u	Pr .	Total		TA E	CA E	ES E	Exam Mode	Int .	Ext .	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objectives

Objective of this course is to:

1. Understand device and I/O management functions in operating systems as part of a uniform device abstraction.
2. Have an understanding of disk organisation and file system structure.
3. Be able to give the rationale for virtual memory abstractions in operating systems.
4. Understand the main principles and techniques used to implement processes and threads as well as the different algorithms for process scheduling.
5. Understand the main mechanisms used for inter-process communication.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5)

!:

Upon successful completion of the course, students shall be able to-

1. Having successfully completed this course, students should be able to:
2. Understand basics of Operating Systems
3. Know Scheduling , management and synchronization of processes
4. Identify mechanism to handle processes, memory, I/O devices, files and develop an appropriate algorithm for it
5. Understand how Android applications work, their life cycle, manifest, Intents, and using external resources

Details of Course:

S. No.	Contents	Contact Hours
1	Types of OS, Basic h/w support necessary for modern operating systems, services provided by OS, system programs and system calls, system design and implementation. Introduction to android An open platform for mobile development.	8 hrs
2	Process : Scheduling , management and synchronization	10 hrs

	Process concept, process control block, Types of scheduler, context switch, threads, multithreading model, goals of scheduling and different scheduling algorithms, Concurrency conditions, Critical section problem, software and hardware solution.	
3	Memory Management & File Systems Contiguous allocation, Relocation, Paging, Segmentation, Segmentation with paging, demand paging, Virtual Memory Concepts, page faults and instruction restart, page replacement algorithms, Thrashing, Garbage Collection. File concept File types, Access methods, Disk space management and space allocation strategies, directory structures.	9 hrs
4	Introduction to android: An open platform for mobile development, android applications, and android SDK features, developing for android, developing for mobile devices, android development tools.	6 hrs
5	Maps, Geocoding and Location based services setting up the emulator with test providers, Selecting the location provider, finding your location, using proximity alerts, using the geocoder, creating map based activities and mapping earthquakes example Advance Android development paranoid android, using AIDL to support IPC for services, using internet services, building rich user interfaces.	10 hrs

Suggested Books (Minimum – 3):

S r. N o.	Title	Author Name	Publish er	Year of Publi catio n	Editio n
1	Operatin g System concepts –	Silberch atz & Galvin,	Addison Wesley		6 th Edition .
2	Professio nal Android Applicati on Develop ment	Reto Meier,	John Wiley and Sons,	2010	

3	Android Application Development Programming with the Google SDK,	Rick Rogers, John Lombardo, Zigurd Mednieks, G. Blake Meike,	O'Reilly,	2009	
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Name of Department: Computer Science & Engineering

Subject Code: CSEL572

Course Title: Object Oriented Software Design

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credits	Evaluation Scheme							
Th.	Tu.	Pr.	Total		Theory				Practical			Total
					TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total	
3	-	-	3	3	20	30	50	Offline	-	-	-	100

Course Objective:

1. Understand the key drivers of successful OO design
2. Understand design principles and OO concepts
3. Be able to create OO designs using UML.
4. Understand the OO Guidelines and how they are used to support effective implementation of object-oriented applications
5. Be able to use Design Patterns, and to choose and adapt appropriate patterns in different scenarios.
6. Learn various techniques of testing and inspection.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5):

Upon successful completion of the course, students shall be able to-

1. Be able to use an object-oriented method for analysis and design
2. Be able to analyze information systems in real-world settings and to conduct methods such as interviews and observations
3. Design system using UML for notation
4. Use design patterns and model interaction and behavior.
5. Test and inspect software systems.

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction: Software Engineering, object orientation and reusable technology.	9 hrs
2	Developing requirements: Domain analysis, types of requirements. Modeling with classes: UML, essentials of UML class diagrams, associations and multiplicity, generalization, instance diagrams.	9 hrs
3	Design patterns: Abstraction-occurrence pattern, general hierarchical pattern, play-role pattern, singleton pattern, observer pattern, delegation pattern, adaptor pattern, facade pattern, immutable pattern, read-only interface pattern and proxy pattern. Focusing on users and their tasks: User-centered design, characteristics of users, developing use case models of systems, the basics of user interface design, usability principles, evaluating user interfaces.	9 hrs
4	Modeling interactions and behavior: Interaction diagrams, state diagrams, activity diagrams. Designing and testing software : The process of design, principles leading to good design, techniques for making good design decisions, software architecture, writing a good design document.	9 hrs
5	Testing and inspecting: Basic definitions of defect, error and failure, effective and efficient testing, defects in ordinary and numerical algorithms, defects in timing and coordination, defects in handling stress and unusual situations, documentation defects, writing formal test cases and test plans, strategies for testing large software, inspections, quality assurance in general. Managing the software process: Project management, software	9 hrs

	process model, cost estimation, building software engineering teams, project scheduling and tracking, contents of a project plan.	
6	Case studies: 1. Warehouse management system. 2. Automated teller machine (ATM) system. 3. The design of a 'What-You-See-Is-What-You-Get' (or 'WYSIWYG') document editor called Lexi.	9 hrs

Suggested Books (Minimum – 3):

S r. N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	Object-Oriented Software Engineering Practical software development using UML and Java	Timothy Lethbridge, Robert Langaniere,	Mcgraw-Hill	2004	Second Edition
2	Software Engineering A Practitioner's Approach	Roger S. Pressman,	Tata McGraw Hill.		5 th edition
3	The Unified Modeling Language User Guide	Grady Booch, James Rumbaugh, Ivar Jacobson	Addison-Wesley	2005	2 nd Edition
4	Case Studies in Object Oriented Analysis and Design	Edwards Yourdon, Carl Argila,	Prentice Hall.	1996	
5	The Unified Modeling Language User Guide	Booch, Rumbaugh & Jacobson	Addison-Wesley	1998	

6	Object Oriented Software Engineering: Using UML, Patterns and Java	Bernd Bruegge, Allen H. Dutoit	Pearson Education	2009	3 rd edition
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Name of Department: Computer Science & Engineering

Subject Code: CSEL570

Course Title: Bioinformatics

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credit s			Evaluation Scheme						
					Theory				Practical			Total	
Th .	T u	Pr .	Total		TA E	CA E	ES E	Exam Mode	Int .	Ext .	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

1. Understand the theoretical basis behind bioinformatics
2. Students will be trained in the basic theory and application of programs used for database searching, protein and DNA sequence analysis

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5):

U

Upon successful completion of the course, students shall be able to-

- 1) To query biological data, interpret and model biological information
- 2) To predict output of alignment method
- 3) To identify various approaches and tools related to bioinformatics problem

Details of Course:

S.	Contents	Contact
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No.		Hours
1	Introduction: Definitions, Sequencing, Biological sequence/structure, Genome Projects, Pattern recognition and prediction, Folding problem, Sequence Analysis, Homology and Analogy, conversion process in prokaryotes and eukaryotes Over-view of protein structure Protein Information Resources Biological databases, Primary sequence databases, Protein Sequence databases, Secondary databases, Protein pattern databases, and Structure classification databases.	9 Hrs
2	Genome Information Resources DNA sequence databases, specialized genomic resources DNA Sequence analysis Importance of DNA analysis, Gene structure and DNA sequences, Features of DNA sequence analysis, EST (Expressed Sequence Tag) searches, Gene hunting, Profile of a cell, EST analysis, Effects of EST data on DNA databases.	9 Hrs
3	Pair wise alignment techniques Database searching, Alphabets and complexity, Algorithm and programs, Comparing two sequences, sub-sequences, Identity and similarity, The Dotplot, Local and global similarity, working with BLAST and FASTA.	9 Hrs
4	Multiple sequence alignment Definition and Goal, The consensus, computational complexity, Manual methods, Simultaneous methods, Progressive methods, Databases of Multiple alignments and searching Working with DNA microarray, Gene Clustering.	9 Hrs
5	Drug Discovery Technologies, Drug Designing Approaches, Important Parameter In Drug Discovery, And Case Study of Various Tools.	9 Hrs

Suggested Books (Minimum – 3):

Sr . No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Introduction to Bioinformatics	by T K Attwood & D J Parry	Smith Addison Wesley Longman	1999	

2	Bioinformatics Methods And Applications: Genomics Proteomics And Drug Discovery	S. C. Rastogi, Parag Rastogi, Namita Mendiratta	PHI Learning Pvt. Ltd	2008	3 rd Edition
3	Bioinformatics- A Beginner's Guide	Jean-Michel Claverie, Cerdric Notredame	WILEY dreamleach India Pvt. Ltd	2003	
4	Bioinformatics	David Mount	Cold Spring Harbor Laboratory Press	2004	2nd edition
5	Introduction to Bioinformatics	M. Lesk	OXFORD publishers (Indian Edition	2013	Fourth Edition

Name of Department: Computer Science & Engineering

Subject Code: CSEL576

Course Title: Optimization Techniques

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credit s			Evaluation Scheme					
					Theory				Practical			Total
Th .	T u	Pr .	Total		TA E	CA E	ES E	Exam Mode	Int .	Ext .	Total	
3	-	-	3	3	20	30	50	Offlin e	-	-	-	100

Course Objective:

Understand about the fundamental optimization methods from traditional approaches to operations research.

1. Understand design issues in optimization technique
2. Recognize and formulate problems that arise in engineering in terms of optimization problems
3. Understand Particle Swarm Optimization and its application.
4. Learn about evolutionary and hyper/metaheuristics.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5)

U:

Upon successful completion of the course, students shall be able to-

1. Able to use the fundamental optimization methods from traditional approaches to operations research.
2. Able to identify the design issues at the time of selection of optimization technique.
3. Able to recognize and formulate problems that arise in engineering in terms of optimization problems
4. Able to use Particle Swarm Optimization.
5. Able to apply evolutionary and hyper/metaheuristics for planning and scheduling.

Details of Course:

S. No.	Contents	Contact Hours
1	Optimization: Linear and Nonlinear, Local and Global, Constrained and Unconstrained, Single Objective and Multi Objective, Classical optimization techniques. Randomized Search Algorithms: Black box optimization, Local search, Metropolis algorithm, Simulated annealing, Tabu search, Evolutionary algorithm.	9 Hrs
2	Bio-inspired Artificial Intelligence: Evolutionary Systems, Cellular Systems, Neural Systems, Developmental Systems, Immune Systems, Behavioral Systems, Collective Systems.	9 Hrs
3	Design Issues: Basic design issues: Representation, Fitness assignment, Selection, Variation, etc., Advanced design issues: Multiobjective optimization, Constraint handling, Implementation tools. Genetic Algorithm: Population, Mutation, Crossover, Fitness function, Single objective and Multi objective Gas, Binary coded GA, Real coded GA, Application of GA to various problems.	9 Hrs

4	Swarm Intelligence (SI): Particle Swarm Optimization (PSO): Biological background, Model of swarming, Algorithm, Properties of PSO, Discrete versions, Formulation of problem, Application of PSO to various problems, Bacterial Foraging Optimization (BFO): Basics, Formulation of problem, and Application of BFO to various problems. Ant Colony Optimization (ACO): Biological background, Ant algorithm, Ant system, Max-min ant system, NP-Hard problem, Data network routing problem, Application of ACO to various problems.	6 Hrs
5	Metaheuristics and hyperheuristics, Metaheuristics hybridization. Metaheuristics for planning and scheduling. Parallel optimization techniques, computationally-expensive optimization.	6 Hrs
6	Search Engine Optimization: Techniques and Tools.	6 Hrs

Suggested Books (Minimum – 3):

Sr . N o.	Title	Author Name	Publi sher	Year of Publi catio n	Edit ion
1	Bio-inspired Artificial Intelligence: Theories, Methods, and Technologies:	Claudio Mattiussi and Dario Floreano,	PHI	2008	-
2	Ant Colony Optimization	Thomas Stutzle and Marco Dorigo	PHI	2004	-
3	Genetic Algorithm:	David E. Goldberg	Pears on Educ ation India	2006	-
4	Optimization techniques for solving complex problems	E. Alba & C. Blum. Ed. John	Wiley & Sons	2009	-

Name of Department : Computer Science & Engineering

Subject Code : CSEL577

Course Title : Wireless Sensor Networks

Teaching Mode: Offline

Exam Mode: Offline

Applicable to Programmes - Semester :

M.Tech Computer Science Engineering 3rd Sem

Teaching Scheme				Credit s			Evaluation Scheme						
					Theory				Practical			Total	
Th .	T u	Pr .	Total		TA E	CA E	ES E	Exam Mode	Int .	Ext .	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

1. To Study Adhoc Network, Design issues and Routing Protocols
2. To study sensor deployment, Communication and information Processing
3. To study localization

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5)

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Upon successful completion of the course, students shall be able to-

1. Understand the concept of Adhoc Network , Design issues and Routing Protocols
2. To study and apply the concept of sensor deployment, Communication and information Processing.
3. To study and apply the concept of localization in target tracking.

Details of Course:

S. No.	Contents	Contact Hours
1	Ad hoc Networks: Introduction. Routing protocols (proactive and reactive methods, backbone and position based, and power efficient routing). Sensor Networks: Introduction and applications.	8 Hrs
2	Design issues and architecture. Routing protocols: data centric, hierarchical, location based, energy efficient routing etc.	8 Hrs
3	Sensor deployment, Scheduling and coverage issues, self configuration and topology control.	8 hrs

4	Querying, data collection and processing, Collaborative information processing and group connectivity.	8 Hrs
5	Target tracking, localization, and identity management. Future research Challenges.	8 Hrs
6	Advance/Recent trends and technologies	5 Hrs

Suggested Books (Minimum – 3):

S r. N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	Handbook of Algorithms for Wireless Networking and Mobile Computing	Azzedine Boukerche,	Chapman & Hall/ CRC	2006	-
2	Handbook of Sensor Networks: Compact Wireless and Wired sensing systems	Mohammad Ilyas and Imad Mahgoub	CRC Press	2005	-
3	Wireless Sensor Network Designs	Anna Hac	John Wiley & Sons Ltd.	2013	-
4	Wireless Sensor Networks : Architecture and Protocols	Jr., Edgar H. Callaway	Auerbach	2003	-
5	Wireless Sensor Networks	C.S. Raghavendra, Krishna M. Sivalingam and Taieb Znati	Springer	2005	-

Name of Department : Computer Science & Engineering

Subject Code : CSEL562

Course Title : Ethical Hacking & Digital Forensics

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credit s			Evaluation Scheme						
					Theory				Practical			Total	
Th .	T u	Pr .	Total		TA E	CA E	ES E	Exam Mode	Int .	Ext .	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

1. Understand key terms and concepts in cyber law, intellectual property and cyber crimes, trademarks and domain theft.
2. Incorporate approaches to secure networks, firewalls, intrusion detection systems, and intrusion prevention systems.
3. Understand principles of web security.
4. Incorporate approaches for incident analysis and response.
5. Incorporate approaches for risk management and best practices.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5**!:**

Upon successful completion of the course, students shall be able to-

1. Secure both clean and corrupted systems, protecting personal data, securing simple computer networks, and safe Internet usage.
2. Determine computer technologies, digital evidence collection, and evidentiary reporting in forensic acquisition.
3. Examine secure software construction practices.

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction to Ethical Hacking, Ethics, and Legality: Ethical Hacking Terminology, Different Types of Hacking Technologies, Different Phases Involved in Ethical Hacking and Stages of Ethical Hacking: Passive and Active Reconnaissance, Scanning, Gaining Access, Maintaining Access, Covering Tracks, Hacktivism, Types of Hacker Classes, Skills Required to Become an Ethical Hacker, Vulnerability Research, Ways to Conduct Ethical Hacking, Creating a Security Evaluation Plan ,Types of Ethical Hacks, Testing Types, Ethical Hacking Report Footprinting and	9 Hrs

	Social Engineering Footprinting, Information Gathering Methodology, Competitive Intelligence, DNS Enumeration Whois and ARIN Lookups, Types of DNS Records, Traceroute, E-Mail Tracking ,Web Spiders , Social Engineering, Common Types Of Attacks, Insider Attacks, Identity Theft, Phishing Attacks, Online Scams, URL Obfuscation, Social-Engineering Countermeasures.	
2	Scanning and Enumeration Scanning, types of Scanning , CEH Scanning Methodology ,Ping Sweep Techniques, Nmap Command Switches, SYN, Stealth, XMAS, NULL, IDLE, and FIN Scans, TCP Communication Flag Types, War-Dialing Techniques, Banner Grabbing and OS Fingerprinting Techniques, Proxy Servers, Anonymizers, HTTP Tunneling Techniques, IP Spoofing Techniques, Enumeration, Null Sessions, SNMP Enumeration, Windows 2000 DNS Zone Transfer, Steps Involved in Performing Enumeration System Hacking Understanding Password-Cracking Techniques, Understanding the LanManager Hash Cracking Windows 2000 Passwords, Redirecting the SMB Logon to the Attacker SMB Redirection, SMB Relay MITM Attacks and Countermeasures NetBIOS DoS Attacks, Password-Cracking Countermeasures, Understanding Different Types of Passwords Passive Online Attacks, Active Online Attacks, Offline Attacks Nonelectronic Attacks, Understanding Keyloggers and Other Spyware Technologies Understand Escalating Privileges, Executing Applications, Buffer Overflows, Understanding Rootkits Planting Rootkits on Windows 2000 and XP Machines, Rootkit Embedded TCP/IP Stack Rootkit Countermeasures, Understanding How to Hide Files, NTFS File Streaming NTFS Stream Countermeasures, Understanding Steganography Technologies, Understanding How to Cover Your Tracks and Erase Evidence, Disabling Auditing, Clearing the Event Log.	9 Hrs
3	Trojans, Backdoors, Viruses, and Worms Trojans and Backdoors, Overt and Covert Channels, Types of Trojans,	9 Hrs

	Reverse-Connecting Trojans, Netcat Trojan, Indications of a Trojan Attack, Wrapping, Trojan Construction Kit and Trojan Makers, Countermeasure Techniques in Preventing Trojans, Trojan-Evading Techniques, System File Verification Subobjective to Trojan Countermeasures Viruses and Worms, Difference between a Virus and a Worm, Types of Viruses, Understand Antivirus Evasion Techniques, Understand Virus Detection Methods Sniffers Protocols Susceptible to Sniffing, Active and Passive Sniffing, ARP Poisoning, Ethereal Capture and Display Filters, MAC Flooding, DNS Spoofing Techniques, Sniffing Countermeasures Denial of Service and Session Hijacking Denial of Service, Types of DoS Attacks, DDoS Attacks, BOTs/BOTNETs, "Smurf" Attack, "SYN" Flooding, DoS/DDoS Countermeasures, Session Hijacking, Spoofing vs. Hijacking, Types of Session Hijacking, Sequence Prediction, Steps in Performing Session Hijacking, Prevention of Session Hijacking.	
4	Hacking Web Servers, Web Application Vulnerabilities, and Web-Based Password Cracking Techniques Hacking Web Servers, Types of Web Server Vulnerabilities, Attacks against Web Servers, IIS Unicode Exploits, Patch Management Techniques, Web Server Hardening Methods Web Application Vulnerabilities, Objectives of Web Application Hacking, Anatomy of an Attack, Web Application Threats, Google Hacking, Web Application Countermeasures Web-Based Password Cracking Techniques, Authentication Types, Password Cracker, Password Attacks: Classification, Password-Cracking Countermeasures SQL Injection and Buffer Overflows SQL Injection, Steps to Conduct SQL Injection, SQL Server Vulnerabilities, SQL Injection Countermeasures Buffer Overflows, Types of Buffer Overflows and Methods of Detection, Stack-Based Buffer Overflows, Buffer Overflow Mutation Techniques.	9 Hrs
5	Linux Hacking Linux Basics, Compile a Linux Kernel, GCC Compilation Commands, Install Linux Kernel Modules, Linux Hardening Methods Penetration	9 Hrs

Testing Methodologies Security Assessments, Penetration Testing Methodologies, Penetration Testing Steps, Pen-Test Legal Framework, Automated Penetration Testing Tools, Pen-Test Deliverables	
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Suggested Books (Minimum – 3):

S r. N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	CEH official Certified Ethical Hacking Review Guide	Kimberly Graves	Wiley India Edition	-	1 st Edition
2	Certified Ethical Hacker	Michael Gregg	Pearson Education	2013	-
3	Certified Ethical Hacker	Matt Walker	TMH	2011	-
4	Computer Security, concepts, issues and implementation	Alfred Basta Wolf Halton, Cengage Learning	Cengage Learning India	2008	1 st Edition
5	Hacking Exposed Web 2.0	Rich Annings, Himanshu Dwivedi, Zane Lackey	Tata Mcgraw hill	-	-
6	Ethical Hacking & Network Defense	Michael T. Simpson,	Cengage Learning	2010	Edition 2
7	Hacking Exposed Windows	Joel Scambray, cissp, Stuart Mcclure, Cissp	Tata Mcgraw hill		Third Edition
8	Hacking Exposed Window server 2003	Joel Scambray Stuart Mcclure	Tata Mcgraw hill	-	-

Name of Department : Computer Science & Engineering
Subject Code : CSEL575
Course Title : Artificial Intelligence

Teaching Mode: Offline
Exam Mode: Offline

Teaching Scheme				Credit s			Evaluation Scheme						
					Theory				Practical			Total	
Th .	T u .	Pr .	Total		TA E	CA E	ES E	Exam Mode	Int .	Ext .	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

1. To have an appreciation for and understanding of both the achievements of AI and the theory underlying those achievements.
2. To have an appreciation for the engineering issues underlying the design of AI systems.
3. To have a basic proficiency in a traditional AI language including an ability to write simple to intermediate programs and an ability to understand code written in that language.
4. To have an understanding of the basic issues of knowledge representation and blind and heuristic search, as well as an understanding of other topics such as minimax, resolution, etc. that play an important role in AI programs.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5):

Upon successful completion of the course, students shall be able to-

1. Students will be able to understand issues, concerns and problems in computationally solving problems.
2. Develop mathematical formulation for building logic of programs.
3. Understand problem solving techniques to include spatial, temporal qualitative and common sense reasoning.

Details of Course:

S. No.	Contents	Contact Hours
1	Overview of history and goals of AI: Tentative definitions. Turing's test, knowledge Vs. Symbolic Level, Relations with other disciplines from Philosophy, to Linguistic to	9 Hrs

	Engineering, Review of AI successes and failures. State Spaces, Production System and Search: State Space representation of problems, Problem solving search, Constraints, Definition and examples of Production Systems, Heuristic search techniques, two person games.	
2	Knowledge representation Issues: Procedural Knowledge Representation vs. Declarative Knowledge + reasoning, Facts, General Assertions, Meta knowledge, The Frame Problem. Using First-Order logic for Knowledge Representation: Propositional Logic, Semantics and Deduction, first Order Logic: Semantic and Deduction. Unification. Resolution-based theorem proving. Using theorem proving to answer questions about the truth of sentences or to identify individuals that satisfy complex constraints, Logic Programming.	9 Hrs
3	Weak Slot-and-Filler Structures: Semantic Nets and Frames, Scripts for representing prototypical combination of events and actions. Rule-Based Systems: Pattern-matching algorithms. The problem of Control in Rule based Systems. The Rote Algorithm. Statistical Reasoning: Use of Certainty factors in Rule Based Systems. Associating probabilities to assertions in first-order logic, Bayesian Networks, Fuzzy logic.	9 Hrs
4	Learning: Learning to classify concepts using features of their instances, learning a concept (Introduction) from examples. Explanation-Based Learning. Version Spaces, Neural Nets with back propagation. Introduction to Expert Systems: Definition why build an expert system, application areas of expert system and how are expert systems used. Characteristics of Expert Systems, Structure of expert system, characteristics and phases and people involved in building an expert systems.	9 Hrs
5	Inference Techniques: Types of reasoning deductive, inductive, abductive, analogical, common-sense and non-monotonic, types of inference forward and backward chaining, search techniques, depth-first search, breadth-first search and best-first search. Introduction to rule based expert system. Rough set	9 Hrs

	Theory. Recent trends in AI & ES.	
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Suggested Books (Minimum – 3):

S r. N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	Principles of Artificial Intelligence and Expert Systems Development	Rolston, D.W.	McGraw Hill	1988	
2	Handbook of Expert Systems in Manufacturing	Maus, R. and Keyes, J.	McGraw Hill	1991	
3	A comprehensive guide to artificial intelligence and expert systems	Robert Levine	McGraw-Hill	1986	-
4	Artificial Intelligence	Elain Rich	PSI	1991	-

Elective VII

Name of Department : Computer Science & Engineering

Subject Code : CSEL588

Course Title : Data Science

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credit s			Evaluation Scheme						
					Theory				Practical			Total	
Th .	T u	Pr .	Total		TA E	CA E	ES E	Exam Mode	Int .	Ext .	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

1. To explain the relative strengths and weaknesses of the scalable data analytics platforms in use today, including databases, MapReduce-based platforms, NoSQL solutions.
2. Given a specification of a large-scale analytics problem, design an application to solve it.
3. Apply a selection of machine learning algorithms and suggest scalable implementations of them.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5)

1:

Upon successful completion of the course, students shall be able to-

- To implement models relevant to data science, including data cleaning and integration, data-intensive distributed computing, data mining algorithms (e.g., association rules, clustering), and data visualization.
- To Design, implement, and evaluate the core algorithms underlying an end-to-end data science workflow, including the experimental design, data collection, mining, analysis, and presentation of information derived from large datasets.
- Apply "best practices" in data science, including facility with modern tools (e.g., Python, Hadoop, NoSQL databases).

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction Examples, data science articulated, history and context, technology landscape, Data modeling: relations, key-value, trees, graphs, images, text.	7 Hrs
2	Statistics for Management Introduction, Grouping and Displaying Data to Convey Meaning: Tables and Graphs, Probability Distributions, Sampling and Sampling Distributions,	7 Hrs

	Estimation.	
3	Data Manipulation at Scale Databases and the relational algebra, Parallel databases, parallel query processing, in-database analytics, MapReduce, Hadoop, MR vs. RDBMS, Languages over MapReduce, workflow, Pig, elastic MapReduce, relationship to databases, algorithms, extensions, languages, Key-value stores and NoSQL; tradeoffs of SQL and NoSQL.	7 Hrs
4	Analytics Topics in statistical modeling: basic concepts, experiment design, pitfalls, Topics in machine learning: supervised learning (rules, trees, forests, nearest neighbor, regression), optimization (gradient descent and variants), unsupervised learning. Graph analytics: recursive queries, graph mining, social networks (+ MR algorithms)	7 Hrs
5	R Programming Overview of R, R data types and objects, reading and writing data, Control structures, functions, scoping rules, dates and times, Loop functions, debugging tools, Simulation, code profiling.	7 Hrs
6	Communicating Results & Special Topics Visualization, data products, visual data analytics, Provenance, privacy, ethics, governance, Case studies in analytics: social networking, bioinformatics, text processing, Graph Analytics: structure, traversals, analytics, PageRank, community detection, recursive queries, semantic web	10 Hrs

Suggested Books (Minimum – 3):

Sr . N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	Statistics for Management	Levin and Rubin	Pearson India	2008	7 th Edition
2	Data Mining: Concepts and Techniques	Han, Kamber, and Pei	Morgan Kaufmann Series	2011	3rd edition
3	Introduction to Data	Tan, Steinbach,	Pearson	2006	

	Mining	and Kumar			
4	Mining of Massive Datasets	Rajaraman, Leskovec, and Ullman	Cambridge University Press	2012	2 nd Edition
5	Data-Intensive Text Processing with MapReduce	Lin and Dyer	Morgan & Claypool Publishers	2010	
6	The Visual Display of Quantitative Information	Tufte	Graphics Press USA	2001	2 nd Edition
7	Visualize This: The FlowingData Guide to Design, Visualization, and Statistics	Yau	Wiley	2011	

Name of Department : Computer Science & Engineering

Subject Code : CSEL573

Course Title : Machine Learning

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credits			Evaluation Scheme						
					Theory				Practical			Total	
Th.	Tu	Pr.	Total		TAE	CAE	ESE	Exam Mode	Int.	Ext.	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

1. To study principles, advantages, limitations and possible applications of machine learning.
2. To study models for supervised, unsupervised, and reinforcement machine learning.
3. To study appropriate machine learning technique to classification, pattern recognition, optimization and decision problems.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit

4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5)

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Upon successful completion of the course, students shall be able to-

1. Understand the principles, advantages, limitations and possible applications of machine learning.
2. Understand a number of models for supervised, unsupervised, and reinforcement machine learning
3. Identify and apply the appropriate machine learning technique to classification, pattern recognition, optimization and decision problems.

Details of Course:

S. No.	Contents	Contact Hours
1	INTRODUCTION Machine Learning: Machine Learning Foundations, Overview, Applications, Types of Machine Learning, Basic Concepts in Machine Learning, Examples of Machine Learning, Applications, Linear Models for Regression, Linear Basis Function Models, The Bias- Variance Decomposition, Bayesian Linear Regression, Bayesian Model Comparison.	9 Hrs
2	SUPERVISED LEARNING Linear Models for Classification, Discriminant Functions, Probabilistic Generative Models, Probabilistic Discriminative Models, Bayesian Logistic Regression, Decision Trees Classification Trees, Regression Trees, Pruning, Neural Networks, Feed-Forward Network Functions, Error Back-Propagation, Regularization, Mixture Density and Bayesian Neural Networks, Kernel Methods, Dual Representations, Radial Basis Function Networks, Ensemble methods, Bagging, Boosting.	9 Hrs
3	UNSUPERVISED LEARNING Clustering: K-means, EM - Mixtures of Gaussians, The EM Algorithm in General, Model Selection for Latent Variable Models, High-Dimensional Spaces, The Curse of Dimensionality, Dimensionality Reduction, Factor Analysis, Principal Component Analysis, Probabilistic PCA,	9 Hrs

	Independent Components Analysis.	
4	PROBABILISTIC GRAPHICAL MODELS Directed Graphical Models, Bayesian Networks, Exploiting Independence Properties, From Distributions to Graphs, Examples, Markov Random Fields, Inference in Graphical Models, Learning –Naive Bayes Classifiers, Markov Models, Hidden Markov Models, Inference – Learning, Generalization, Undirected graphical models, Markov Random Fields, Conditional Independence Properties, Parameterization of MRFs, Examples, Learning, Conditional Random Fields (CRFs), Structural SVMs.	9 Hrs
5	COMBINING MULTIPLE LEARNERS, MACHINE LEARNING EXPERIMENTS Rationale: Generating Diverse Learners, Model Combination Schemes, Voting, Error, Correcting Output Codes, Bagging, Boosting, Mixture of Experts Revisited, Stacked Generalization, Fine-Tuning an Ensemble, Factors, Response, and Strategy of Experimentation, Response Surface Design, Randomization, Replication, and Blocking, Guidelines for Machine Learning Experiments	9 Hrs

Suggested Books (Minimum – 3):

Sr . N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	Pattern Recognition and Machine Learning	Christopher Bishop	Springer	2006	
2	Machine Learning: A Probabilistic Perspective	Kevin P. Murphy	MIT Press	2012	
3	Introduction to Machine Learning	Ethem Alpaydin	Prentice Hall of India	2005	
4	Machine	Tom	McGraw-	1997	

	Learning	Mitchell	Hill		
5	The Elements of Statistical Learning	Hastie, Tibshirani, Friedman	Springer	2008	2 nd
6	Machine Learning –An Algorithmic Perspective	Stephen Marsland	CRC Press	2009	
7	Pattern Recognition and Machine Learning. Berlin	Bishop, C	Springer	2006	

Name of Department : Computer Science & Engineering

Subject Code : CSEL557

Course Title : Computer Vision

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credit s			Evaluation Scheme						
					Theory				Practical			Total	
Th .	T u .	Pr .	Total		TA E	CA E	ES E	Exam Mode	Int .	Ext .	Total		
3	-	-	3	3	20	30	50	Offline	-	-	-	100	

Course Objective:

1. To introduce the student to computer vision algorithms, methods and concepts which will enable the student to implement computer vision systems with emphasis on applications and problem solving.
2. To exercises students with typical hardware as well as software development tools.
3. To implement computer vision algorithms.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5):

Upon successful completion of the course, students shall be able to-

1. To perform Image processing
2. To apply Low-level vision techniques such as filtering and edge detection.
3. To apply Mid-level vision techniques such as segmentation and clustering, shape reconstruction from stereo.
4. To apply High-level vision techniques such as object and scene recognition, face detection

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction: purpose, state of the art, history. Paradigms for image analysis, Case study: Face Recognition.	9 Hrs
2	Image Formation and Processing: Image Geometry, Radiometry and Digitization, optics, sensing, filtering, derivatives, and edges. Binary Image Analysis and Segmentation: Properties, Digital Geometry, Segmentation.	9 Hrs
3	Image Processing for Feature: Edge detection, corner detection, Line and curve detection, SIFT operator, Image-based modeling and rendering, Mosaics, snakes, pixel grouping methods, Shape.	9 Hrs
4	Classification and Motion Analysis: machine learning methods for feature classification, image summaries and end-to-end image classification, Motion detection and optical flow, Structure from motion.	9 Hrs
5	Object Detection and Recognition: sliding windows, detection of articulated objects, Model-based methods, Appearance-based methods, Invariants.	9 Hrs

Suggested Books (Minimum – 3):

S. r. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Computer Vision - A Modern Approach, Pearson	D. A. Forsyth and J. Ponce	Pearson	2012	2 nd
2	Computer Vision: A Modern Approach	D. A. Forsyth and J. Ponce	Prentice Hall	2003	
3	Distinctive image features from	D. G. Lowe	Kluwer Academic	2004	

	scale-invariant keypoints		Publisher		
4	Speeded-up robust features. Computer Vision and Image Understanding	H. Bay, A. Ess, T. Tuytelaars, and L. Van Gool,	Computer Vision and Image Understanding	2008	
5	Histograms of oriented gradients for human detection	N. Dalal and B. Triggs	IEEE	2005	
6	SLIC superpixels compared to state-of-the-art superpixel methods	A. Shaji, K. Smith, A. Lucchi, P. Fua, and S. Susstrunk	IEEE	2012	
7	Video Google: a text retrieval approach to object matching in videos	Sivic and Zisserman: J. Sivic and A. Zisserman	ICCV '03 Proceedings of the Ninth IEEE International Conference on Computer Vision	2003	
8	Robust real-time face detection	Viola and Jones: P. Viola and M. J. Jones	International Journal of Computer Vision	2004	
9	Automated flower classification over a large number of classes.	Nilsback and Zisserman: M. E. Nilsback and A. Zisserman		2008	
10	On feature combination for multiclass object classification.	Gehler and Nowozin: P. Gehler and S. Nowozin	ETH	2011	

11	Neural network-based face detection	H. Rowley, S. Baluja, and T. Kanade	IEEE	1998	
12	Object detection using discriminatively trained part-based models.	P. Felzenszwalb, R. Girshick, D. McAllester, and D. Ramanan	IEEE	2010	

Name of Department : Computer Science & Engineering

Subject Code : CSEL580

Course Title : Parallel Programming

Teaching Mode: Offline

Exam Mode: Offline

Teaching Scheme				Credits	Evaluation Scheme							
					Theory				Practical			Total
Th	Tu	Pr	Total		TA	CA	ES	Exam Mode	Int	Ext	Total	
3	-	-	3	3	20	30	50	Offline	-	-	-	100

Course Objective:

1. Grasp a thorough understanding on the advances of technologies, system architecture and communication architecture that propelled the growth of parallel and distributed computing systems
2. Given a parallel algorithm, analyze its time complexity and performance as a function and optimize the performance of the algorithm.
3. Given a parallel algorithm, implement it using MPI, OpenMP, pthreads, or a combination of MPI and OpenMP.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome (Preferably – 3, Maximum – 5):

Upon successful completion of the course, students shall be able to-

1. Understand Parallel processing and Parallel computer architectures
2. Understand the evolution of high performance computing (HPC)
3. Understand Message passing programming with MPI and Multi-core programming with Open MP
4. Analyze Performance of High Performance Computing

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction Motivating Parallelism, Scope of Parallel Computing, Parallel Programming Platforms: Implicit Parallelism-/trends in Microprocessor Architectures, Limitations of Memory System Performance, Physical Organization of Parallel Platforms, Communication costs in parallel machines.	9 Hrs
2	Principles of Parallel Algorithm Design Decomposition Techniques, Tasks & Interactions, Dependency graphs, granularity, concurrency, Processes and mapping, Processes versus processors, Mapping techniques for load balancing, Parallel Algorithm Models : The data-parallel model, The task graph model, The work pool model, The master-slave model, The pipeline or producer-consumer model, Hybrid models.	9 Hrs
3	Analytical Modeling of Parallel Programs Sources of overhead in parallel programs, Performance metrics for parallel systems, The effect of granularity on performance, scalability of parallel systems, Minimum execution time and minimum cost-optimal execution time, Asymptotic analysis of parallel programs,	9 Hrs
4	Programming Using the Message-Passing Paradigm Principles of Message-Passing	9 Hrs

	programming, Send and Received operations, MPI: The Message Passing Interface.	
5	Programming Shared Address Space Platforms Thread mechanism, Synchronization Primitives in Pthreads, OpenMP: a Standard for Directive Based Parallel Programming.	9 Hrs

Suggested Books (Minimum – 3):

S r. N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	Introduction to Parallel Computing	Ananth Grama, George Karypis, Vipin Kumar and Anshul Gupta	Pearson		2 nd Edition
2	Using open MP	Barbara Chapman, Gabriele Jost	MIT Press	2007	
3	An Introduction to Parallel Algorithms	Joseph Jaja, Addison-Wesley Professional	Addison Wesley	1992	
4	Parallel Programming in C with MPI and openMP	Michael J Quinn	McGraw Hill	2003	
5	Parallel Programming	Barry Wilkinson, Michael Allen	Pearson	2006	2 nd Edition



G H RAISONI COLLEGE OF ENGINEERING

(An Autonomous Institute affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)

Accredited by NAAC with 'A+' Grade

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M.Tech in Integrated Power System

Vision and Mission of Institute:

Vision

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges.

Mission

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake-holders. Our strength is directed to create competent professionals. Our endeavour is to provide all possible support to promote research and development activities.

Vision and Mission of Department

Vision

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards in electrical engineering with capabilities of accepting new challenges.

Mission

- To educate next generation of Engineers with strong knowledge base of electrical engineering
- To Produce technical manpower capable of addressing industry problems
- To pursue scholarly research in broad areas of electrical engineering

Program Educational Objectives

Graduates shall able to

PEO1 :Practice electrical engineering in Power System, drives & control.

PEO2 :Contribute to technical and economic development of society

PEO3: Pursue higher education and work for research and development of society

Program outcome

Student shall able to

PO1: Apply knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.

PO 2: Identify, formulate, research literature and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.

PO 3: Design solutions for complex engineering problems and design system components or processes that meet specified needs with appropriate consideration for

public health and safety, cultural, societal and environmental considerations

PO 4: Conduct investigations of complex problems using research-based knowledge and research methods including design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.

PO 5: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations

PO 6: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO 7: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.

PO 8: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO 09: Function effectively as an individual, and as a member or leader in diverse teams and in multi disciplinary settings

PO 10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations and give and receive clear instructions.

PO 11: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

PO 12: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific outcomes

Graduates shall

PSO1:Demonstrate industrial practices learned through internship and solve the live-problems of industries.

PSO2:Utilize skills in transforming ideas into hardware project and to protect intellectual property rights.

PSO3:Propose innovative solutions in the area of Power Systems and Electric Drives.

DEPARTMENT OF ELECTRICAL ENGINEERING
SCHEME OF M.TECH (INTEGRATED POWER SYSTEMS)

Semester	Hours	Credits	Marks
I	21	18	600
II	21	18	600
III	08	08	150
IV	16	16	300
Total	66	60	1650

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme					Total	Duration of Paper (hrs)
							Theory			Practical			
		Th .	T u	Pr .	Total		(TAE) (20)	(CAE) (30)	ESE (50)	Int .	Ext.		
SEM-I													
IPSL642	Advanced Power Electronics	3	-	-	3	3	20	30	50	-	-	100	3
IPSP642	Power Electronics Application Lab	-	-	2	2	1	-	-	-	25	25	50	2
IPSL643	Switchgear and Protection	3	-	-	3	3	20	30	50	-	-	100	3
IPSP643	Switchgear and Protection Lab	-	-	2	2	1	-	-	-	25	-	25	2
IPSLXX	Elective-I	3	-	-	3	3	20	30	50	-	-	100	3
IPSLXX	Elective-II	3	-	-	3	3	20	30	50	-	-	100	3
IPSLXX	Elective-III	3	-	-	3	3	20	30	50	-	-	100	3
MBA 602	Advanced Communication Skill		-	2	2	1	-	-	-	25	-	25	-
	Total	15	0	6	21	18	100	150	250	75	25	600	19

Elective-I - IPSL644 Power system Modeling / IPSL645Electrical Drives / IPSL646Renewable and Distributed Energy Systems

Elective-II - IPSL647HVDC Transmission system / IPSL648Digital Signal Processing/ IPSL649Distribution Automation

Elective III-IPSL650Advanced Control Theory/ IPSL651PLC & SCADA/ IPSL652Digital Control System

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme					Total	Duration of Paper (hrs)
							Theory		Practical				
		Th .	T u	Pr .	Total		(TAE) (20)	(CAE) (30)	ES E (50)	Int .	Ext .		
SEM-II													
IPSL653	Processor Applications to Power Systems	3	-	-	3	3	20	30	50	-	-	100	3
IPSP653	Processor Applications to Power Systems Lab	-	-	2	2	1	-	-	-	25	25	50	2
IPSL654	Power System Dynamics and control	3	-	-	3	3	20	30	50	-	-	100	3
IPSP654	Power system design Lab	-	-	2	2	1	-	-	-	25	-	25	2
IPSLX X	Elective-IV	3	-	-	3	3	20	30	50	-	-	100	3
IPSLX X	Elective-V	3	-	-	3	3	20	30	50	-	-	100	3
IPSLX X	Elective-VI	3	-	-	3	3	20	30	50	-	-	100	3
IDA 403	Research Methodology	-	-	2	2	1	-	-	-	25	-	25	-
	Total	15	0	8	21	18	100	150	250	75	25	600	19

Elective-IV – IPSL655FACTS / IPSL656Advanced Electrical Drives and their control /

IPSL657Sub-Station Engineering

Elective-V - IPSL658 Smart Grid Technologies and Applications/ IPSL659Electric and Hybrid Vehicle /

IPSL660Restructured Power systems

Elective VI- IPSL661Power quality / IPSL662Wind and Solar system/ IPSL663Artificial Intelligence

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme					Total
							Theory			Practical		
		Th.	Tu	Pr.	Total		(TAE) (20)	(CAE) (30)	ESE (50)	Int.	Ext.	
SEM-III												
IPSP664	Industry/ Research Project (phase-I)	-	-	8	8	8	-	-	-	150	-	150
	Total	-	-	8	8	8				150	-	150

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme					
							Theory			Practical		Total
		Th.	Tu	Pr.	Total		(TAE) (20)	(CAE) (30)	ESE (50)	Int.	Ext.	
SEM-IV												
IPSP665	Industry/ Research Project (Phase-II)	-	-	16	16	16	-	-	-	150	150	300
	Total	-	-	16	16	16	-	-	-	150	150	300

SEMSTER-I

Subject Code: IPSL642

Course Title: ADVANCED POWER ELECTRONICS

Course Objectives:

1. This Subject deals with the modern power semiconductor Switches and their application.
2. To introduce converter and inverter performance with various loads.
3. To introduce design of switch mode converter and resonant converter.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lecturers /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcomes:-

Shall able to

- 1) Analyse and design an AC/AC Cyclo-converter circuit topologies.
- 2) Apply the switched mode techniques to inverters.
- 3) Have acquired a good understanding of basic switched-mode DC/DC topologies, operation, performance and modelling.
- 4) Have acquired a basic understanding of resonant converter and its method of loss reduction.
- 5) Identify controller for various applications.

S. No.	Contents	Contact Hours
1	Unit 1: Over view of power semiconductor device structure, characteristics, rating and protection (Thyristor , BJT , MOSFET , IGBT, Integrated Gate- Commutated Thyristor (IGCT), MOS controlled Thyristor etc.) GTO, comparison of controlled switches.	(08 Hrs)
2	Unit 2: Inverters, type (Hard/soft switch inverter), Voltage source invertercurrent source inverter) multilevelOperation with different types of loads, Performance parameters Harmonic elimination, control of output, voltage using different switching techniques. Discontinuous mode of operation.	(10Hrs)
3	Unit 3: DC to DC switch mode converters , Basic concepts , analysis of switch on and Off transients types ,	(10 Hrs)

	DC to DC converters comparison , soft switching , close loop control .	
4	Unit 4: Resonant converters , comparison of PWM and resonant converters , classification , Basic resonant circuit concepts , Analysis and design of SRC (series), PRC (parallel) , SPRC(series -parallel) resonant converters, DC-DC as well as AC-DC resonant converter, Power conditioners and uninterruptible power supplies, Recent industrial power electronic applications.	(12 Hrs)
5	Unit 5: controller design with applications and simulation. Advanced topic on the subject.	(08 Hrs)

Subject Code :IPSL643

Course Title :SWITCHGEAR AND PROTECTION:

Course Objectives:

1. This course aims to upgrade the knowledge of operatically and control of power system.
2. To introduce protection of generator, transformer, transmission and distribution Lines.
3. To Study Switch gear against different faculty and abnormal conditions.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcomes:-

Shall able to

- 1) Understand basic concept of of protection of various power system components like generators, transformer, transmission lines etc.
- 2) Understand operation and control of various switchgears.
- 3) Demonstrate philosophy of numerical relaying.
- 4) Develop Instrumentation transformer.
- 5) Apply knowledge of relaying to various applications.

Details of Course:

S. No.	Contents	Contact Hours
1	Unit 1: Switchgear installation and criteria for selection. Circuit breaker ratings, principles of a-c circuit breaking. RRRV and recovery voltage and their control. Current chopping. Switching of capacitive currents. Kilometric faults. Resistance switching. D-C current interruption. Salient features and characteristics of different arc interrupting media - air, oil, air-blast, SF ₆ , and vacuum. The electric arc and circuit -breaker. Establishing an arc, discharge characteristic of arc, long arc, short arc, energy transfer between electric field and the arc column, energy transfer out of the column. Theories of arc interruption - restriking voltage and energy balance theories and their applications.	(08 Hrs)
2	Unit 2 : EHV Line Protection: Protection of EHV lines against short circuit and over voltages. Distance and carrier aided schemes. Stability of protection on power swing. Out of step blocking and tripping schemes. (With emphasis on implementation using static relays)	(08 Hrs)
3	Unit 3 : Transformer Protection: Various fault occurring on transformer & complete protection against these fault. Machine Protection: Protection of Alternators and large motors. Bus Protection: Schemes for complete protection on EHV bus bars.	(08 Hrs)
4	Unit 4: Instrument transformer for relaying: performance of conventional CT/VT as well as capacitive voltage transformers. Principle of operation of magneto optic CT/ VT, special cases like ferroresonance.	(08 Hrs)
5	Unit 5: Philosophy of Numerical relaying: Anti-aliasing Filters, sampling, Measurements principles using Fourier and other algorithms and its application for implementation of various numerical relays. Introduction to advanced industrial protection. Advanced topic on the subject: Microcontroller based relays	(08 Hrs)

Subject Code: IPSL644 (Elective –I)**Course Title: POWER SYSTEM MODELING:****Course Objectives:**

1. Techniques to represent all major Components of a power system are introduced.

2. To introduce load modeling of different types of load.
3. To introduce modeling of synchronous machines and doubly fed induction generator.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcomes:-

Shall able to

- 1) Develop mathematical model for synchronous Machine.
- 2) Understand three phase transformation into two phase using Parks equations.
- 3) Understand the characteristics of power system components and also the importance of dynamic behavior of all passive components under steady state operation

Details of Course:

S. No.	Contents	Contact Hours
1	Unit 1 : Synchronous Machines: Basic Models, Electric equations, Mechanical equations, per unit system and Normalization, Parks transformation, Flux linkages equations Voltage & current equations, Formulation of state-space equations.	(12 Hrs)
2	Unit 2: Equivalent circuit sub transient and transient inductances and time constants. Classical model of Synchronous Machines. Steady state equations and phasor diagram, Determination of Machines parameters from manufactures data. Linear model of single Machines infinite bus system.	(10 Hrs)
3	Unit 3: Load modeling for different types of loads. Transformer on nominal ratios. Tap representation three –phase models of transformer.	(06Hrs)
4	Unit 4: Modeling of excitation, IEEE systems type 1,2,3,4. Essentials elements of automatic feed back control system, concepts of voltage drop compensation and modeling of Prime mover controllers. Simulation by using recent software.	(06 Hrs)
5	Unit 5 : Modeling of Induction generator– Doubly fed.(DFIG)	(06 Hrs)

Subject Code : IPSL645 (Elective-I)

Course Title : ELECTRICAL DRIVES

Course objective:-To understand the basic concept of DC Drives. To understand the various control techniques involved with DC Drives.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcomes:-

Shall able to

- 1) Design and Analyze different control techniques of DC Drive
- 2) Formulate and solve numerical by understanding converter and commutation specifications.
- 3) Understand the concept of Controlled rectifier, Phase controlled converter and DC to DC Converter.

Details of Course:

S. No.	Contents	Contact Hours
1	Unit-1 : Controlled Bridge Rectifier (1- Φ) and (3- Φ) with DC Motor load separately excited DC motors with rectified single phase supply- single phase semi converter and single phase full converter for continuous and discontinuous modes of operation – power and power factor. Three phase semi converter and three phase full converter for continuous and discontinuous modes of operation – power and power factor – Addition of free-wheeling diode – Three phase double converter	10 Hrs
2	Unit-2 : Three phase naturally commutated bridge circuit as a rectifier or as an Inverter Three phase controlled bridge rectifier with passive load impedance, resistive load and ideal supply – Highly inductive load and ideal supply for load side and supply side quantities, shunt capacitor compensation, three phase	6Hrs

	controlled bridge rectifier inverter.	
3	Unit-3: Phase Controlled DC Motor Drives: Three phase controlled converter, control circuit, control modeling of three phase converter –Steady state analysis of three phase converter control DC motor drive – Two quadrant, Three phase converter controlled DC motor drive – DC motor and load, converter.	6Hrs
4	Unit-4: Current and Speed controlled DC Motor drives :Current and Speed controllers - current and speed feedback — Design of controllers – Current and Speed controllers – Motor equations – Filter in the speed feedback loop speed controller – current reference generator – current controller and flow chart for simulation – Harmonics and associated problems – sixth harmonics torque.	6 Hrs
5	Unit-5: Chopper controlled DC motor drives & Closed loop operation of DC motor Drives: Principle of operation of the chopper – Four quadrant chopper circuit – Chopper for inversion – Chopper with other power devices – model of the chopper –input to the chopper – Steady state analysis of chopper controlled DC motor drives – rating of the devices – Pulsating torque. Speed controlled drive system – current control loop – pulse width modulated current controller – hysteresis current controller – modeling of current controller – design of current.	12 Hrs

Subject Code: IPSL646 (Elective –I)

Course Title: RENEWABLE & DISTRIBUTED ENERGY SYSTEM:

Course Objectives:

1. To study wind energy conversion systems.
2. To study the distributed generation standards.
3. To Study the wind system with grid stability

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit

4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course outcomes:

Shall able to

- 1) Understand integrated operation of wind power generation with grid system.
- 2) Demonstrate distributed generation technical and economical impacts.
- 3) Implement the uses of various types of wind generators.

Details of Course:

S. No.	Contents	Contact Hours
1	Unit –1 :Dispersed photovoltaic, solar, wind, fuel cell and conventional dispersed generation technologies, economic factors and technical impact on utility distribution systems, interfacing and optimal location of dispersed generation.	08 Hrs
2	Unit –2 :Principles of wind energy extraction, electromechanical energy conversion, characteristics of wind turbines, Photovoltaic and Thermo-solar power generation profiles, Aerodynamics of wind turbines, aerodynamic power controls, pitch, stall, active stall, rotor power characteristics CP- λ , Power curves	08 Hrs
3	Unit –3 :Wind energy conversion systems, Induction generator , Synchronous generator with full scale power electronic block, variable speed operations, doubly fed induction generation. Wind interconnection requirements, low-voltage ride through (LVRT).	08 Hrs
4	Unit –4 : ramp rate limitations, and supply of ancillary services for frequency and voltage control, current practices and industry trends wind interconnection impact on steady-state and dynamic performance of the power system including modeling issue.	08 Hrs
5	Unit –5 :Distributed Generation Standards, DG potential, Definitions and terminologies; current status and future trends, Technical and economical impacts, Definitions and terminologies; current status and future trends, Technical and economical impacts DG Technologies, DG from renewable energy sources, DG from non-renewable energy sources .	08 Hrs

Subject Code : IPSL 647 (Elective-II)

Course Title :HVDC TRANSMISSION SYSTEMS

Course Objectives:

1. This deals with power transmission system with converter and inverter dc transmission.
2. To introduce digital simulation of various converter topologies.
3. To introduce multiterminal HVDC System.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcomes:-

Shall able to

1. Understand the DC transmission concept with EHVAC systems.
2. Demonstrate the HVDC Transmission control strategy.
3. Explain the multiterminal HVDC system operations

Details of Course:

S. No.	Contents	Contact Hours
1	Unit 1: Development of HVDC technology, comparison between HVAC and HVDC. Application of HVDC transmission. Type of DC transmission. Selection of converter configuration. Rectifier and inverter operation. Analysis of rectifier with two –valve conduction.	(05 Hrs)
2	Unit 2: Analysis of rectifier with two –three valve conduction, Analysis of inverter with two valve conduction. Analysis of inverter with two-three valve conduction.	(09 Hrs)
3	Unit 3: Digital simulation of converters .Generalized equation for simulation of courses. Derivation of converter equation with two valve conduction, three valve conduction, four valve conduction	(08 Hrs)
4	Unit 4: Control of HVDC converters and systems: Requirements from control systems of HVDC converters, rectifier compounding Inverter compounding, converter control characteristics. Converter firing schemes individual phase control (IPC), Equidistant pulse control (EPC) Draw backs of	(08 Hrs)

	individual phase control. Draw backs of EPC.	
5	Unit 5: Higher Level controls, power controllers, Characteristics & non-characteristics harmonics. Different methods to overcome problems of non-characteristics Harmonics. Fault development and protection. Interaction between AC - DC power systems. Over voltage on AC -DC side, Multiterminal HV -DC systems. Control of MTDC systems, Modeling of HVDC systems. Per unit system representation for power flow solution. Representation for stability studies. Introduction to HVDC light. Advanced topic on the subject	(10 Hrs)

Subject Code: IPSL 648 (Elective-II)

Course Title: DIGITAL SIGNAL PROCESSING

Course Objectives:

1. To study the concept of frequency in continuous and discrete time frame.
2. To study the Z transform applications.
3. Linear filter and prediction model of filters.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcomes:-

Shall able to

- 1) Apply the theoretical & practical aspects of modern signal processing in digital environment.
- 2) Apply appropriate techniques for application areas in electrical engineering.
- 3) Apply the knowledge of Z transform for HR system & optimum filters for the system.

Details of Course:

S. No.	Contents	Contact Hours
1	Unit 1: Classification of signals, concept of frequency in continuous-time and discrete-Time signals A/D and D/A conversion i.e. sampling and	6 Hrs

	quantization, Classification of discrete time systems, introduction HR and FIR systems.	
2	Unit 2.: Analysis of discrete-time linear time invariant systems, techniques for the Analysis of linear systems, convolution sum, properties of convolution and the Interconnection of LTI systems, stability of LTI systems, difference equation to Describe the LTI system, impulse response of LTI system.	6 Hrs
3	Unit 3 .: Z-transform, ROC, properties of Z-transformation, rational Z-transformation, one sided Z-transformation, solution of difference equation, basic network structure for HR system: direct form, cascade form, parallel form, basic network structure for FIR systems, DFT and its properties, fast Fourier transforms (FFT), decimation- In-time algorithm, decimation-in-frequency algorithm, design of HR filter by the bilinear transformation, design of FIR filter using window, property of the FIR filters.	8 Hrs
4	Unit 4 : Linear prediction and optimum linear filters-forward and backward linear Prediction, levinson Durbin algorithm, schur algorithm, AR & ARMA model, Wiener filter –FIR, HR, non causal (speech recognition applications).	8 Hrs
5	Unit 5. : Effects of finite register length in digital signal processing, effect of truncation or rounding, finite register length effects in realization of HR digital signal filters: statistical analysis of quantization in fixed point realization of HR digital signals, statistical analysis of quantization in floating point realization of HR digital filter, finite register length effects in realization of FIR digital filter, statistical analysis of quantization in fixed point realization of FIR digital filters, statistical Analysis of quantization in floating point point realization of FIR digital filter.	12 Hrs

Subject Code : IPSL649 (Elective –II)

Course Title: DISTRIBUTED AUTOMATION

Course objective:-

- 1) To understand the basic concept of distribution systems.

- 2) To understand the planning of substation related to size and locations.
- 3) To understand SCADA and remote metering and load control strategy.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcomes:-

Shall able to

1. Implement the load forecasting strategy .
2. Understand the size and location of sub stations.
3. Implement the SCADA system and remote metering.

Details of Course:

S. No	Contents	Contact Hours
1	Unit 1: Introduction to distribution systems. Nature of loads and load forecasting .Layout of substations and feeders. Design considerations. Power quality issues.	8 Hrs
2	Unit 2: Distribution system load flow.	6 Hrs
3	Unit 3: Optimum siting and sizing of substations, optimum capacitor placement.	6 Hrs
4	Unit –4 : Distribution system planning Short term planning, Long term planning, Dynamic planning,. Sub-transmission networks configurations, Substation bus schemes, Distribution substations ratings, Service areas calculations, Substation application curves	10 Hrs
5	Unit 5: Automation, configuration of distribution system. Distribution system monitoring and control : SCADA, Remote metering and load control strategies, Optimum feeder switching for loss minimization and load control. Distribution system restoration. Distribution system protection and switchgear.	10 Hrs

Subject Code: IPSL650(Elective-III)

Course Title: ADVANCED CONTROL THEORY:

Course Objectives:

1. The Subject deals with advanced concepts required for handling control related problem.
2. To introduce optimal control and fuzzy Control Strategy.
3. To Introduce Stability of discrete time systems, Non Linear system.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lecturers /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcome

Shall able to:

- 1) Apply the knowledge of advanced state variable analysis technique.
- 2) Analyze stability of systems using Lyapunov method.
- 3) Understand optimal control theory and fuzzy logic applications.

Details of Course:

S. No.	Contents	Contact Hours
1	Unit1: Review of state variable analysis, controllability and Observability. Discretization of continuous time state equations. Solution of state difference equation, controllability and Observability tests for Digital Control Systems.	(10 Hrs)
2	Unit 2: Stability of discrete time Systems. Stability improvement by state feedback ,pole placement design and observers.	(10 Hrs)
3	Unit 3: Lyapunov stability Analysis. Basic concepts, Lyapunov's first and second methods Stability definitions, Stability theorems, Lyapunov functions for linear and non-linear systems.	(10 Hrs)
4	Unit 4: Optimal Control, parameters optimization techniques, Lagrange parameter techniques, Calculus of variation, unconstrained and constrained minimization of functional. Two point boundary value problems.	(10 Hrs)
5	Unit 5 : Introduction to Fuzzy control: Fuzzy sets and linguistic variables, The fuzzy control scheme, Fuzzification and de fuzzification methods, Examples, Comparison between conventional and fuzzy	(10 Hrs)

	control. Introduction to adaptive control and variable structure control. Advanced topic on the subject: Co-ordination and integrated control of different systems in industry.	
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Suggested Books (Minimum – 3):

Sr. No.	Title	Author Name	Publisher	Edition
1	"Modern Control System Theory"	M. Gopal	Wiley Eastern Ltd., New Delhi	Third
2	Digital Control And State Variable Methods	M. Gopal	Tata Mcgraw – Hill	3rd Ed
3	Control Systems Engineering	I. J. Nagrath, M. Gopal	New Age International	2nd Ed
4	Digital Control Systems	Benjamin C. Kuo	Oxford University Press	Revised
5	Fuzzy Logic: With Engineering Applications	Timothy J. Ross	Wiley India Pvt Ltd	2nd Ed,

Subject Code: IPSL651 (Elective-III)

Course Title: PLC and SCADA

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lecturers /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

S. No.	Contents	Contact Hours
1	Unit1:introduction to PLC - Programmable Logic Controller ,SCADA - Supervisory Control and Data Acquisition,HMI - Human Machine Interface, DCS - Distributed Control System	(8Hrs)
2	Unit 2: Digital Electronics Basics PLC Fundamentals,PLC Hardware & Architecture, Source & sink Concepts, Wiring Different field Devices to PLC	(10 Hrs)

	introduction to PLC Programming software,Creating new application, addressing, Programming Languages,Basic Programming Instructions, Advance Instructions, Upload / Download / Monitoring,Forcing of I/Os,Fault finding / troubleshooting & documentation, Communication with SCADA software	
3	Unit 3: Getting started with HMI,Creating applications, creating tags,Downloading / uploading programs,Communication with PLC Fault diagnostics / troubleshooting	(10 Hrs)
4	Unit 4: Introduction to SCADA Software,Creating new SCADA project ,Creating & editing elementary graphic display,Attaching controls to graphic objects,Real time & historical trends,Using alarms &events,Application of scripts, Communication with PLC,Communication with excel,Fault finding / troubleshooting	(10 Hrs)
5	Unit 5 AC motors, operations & Limitations, Motor Starters : DOL, Star-Delta, Auto Transformer, Motor control circuits, interlocking circuits,Introduction to AC drives & applications, Criteria for drives selection, Designing of drive control panel,Communication with PLC, SCADA Software,Fault finding / troubleshooting	(10 Hrs)

Suggested Books (Minimum – 3):

Sr. No.	Title	Author Name	Edition
1	"Programmable Logic Controllers and Industrial Automation: An Introduction	Madhuchhanda Mitra and Samarjit Sem gupta	2nd Edition"
2	Programmable Logic Controller (Plc) Tutorial, Siemens Simatic S7-200"	Stephen P Tubbs	1 st Edition
3	"Fundamentals of Automation and Industrial Control Systems Using Plc"	Ayman Aly El-Naggar	2nd Ed

Subject Code: IPSL652 (Elective-III)
Course Title: Digital Control System
Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lecturers /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcomes: Students who successfully complete the course will be able to:

1. Analyze and model hybrid systems composed of continuous-time and discrete-time subsystems
2. Study discrete-time closed-loop systems by using the z-transform
3. Design discrete-time controllers for hybrid systems
4. Understand implementation issues for computer-based control systems
5. Apply knowledge in various applications

S. No.	Contents	Contact Hours
1	Unit1:Introduction to digital control systems,Discrete time systems and the z-transform	(8Hrs)
2	Unit 2: Sampling and Reconstruction	(10 Hrs)
3	Unit 3: State variables in discrete time systems,Closed-loop discrete time systems	(10 Hrs)
4	Unit 4:Sampled-data transformation of analog controllers	(10 Hrs)
5	Unit 5 :Digital controller design	(10 Hrs)

Suggested Books (Minimum – 3):

Sr. No	Title	Author Name	Edition
1	Digital Control System Analysis and Design	by C. L. Phillips, H. T. Nagle:	4th Edition, ISBN: 0-13-293831-6

SEMSTER-II

Subject Code : IPSL653

Course Title: PROCESSOR APPLICATIONS TO POWER SYSTEMS

Course Objectives: -

- 1) To solve the problems in modern power systems with modern tools .
- 2) To Study processor application .

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcomes:-

Shall able to

1. Implement the hard ware set up by using DSP and FPGA
2. Understand interfacing of DSP with various applications.
3. Apply the logic to control modern power system.

Details of Course:

S. No.	Contents	Contact Hours
1	Unit 1:Review of Advance Microprocessor & Microcontroller, FPGA Controller	(06 Hrs)
2	Unit 2: Fundamentals of DSP:2812	(08Hrs)
3	Unit 3: Operation and control of 28335, (piccolo)	(10 Hrs)
4	Unit 4: Application of DSP and FPGA to power System	(09 Hrs)
5	Unit 5: Interfacing ADC& DAC, LCD display, stepper motor with 8051. Application of DSP to drives. Advanced topic on the subject	(07 Hrs)

Subject Code : IPSL654

Course Title : POWER SYSTEM DYNAMICS AND CONTROL

1. This subject deals with stability of the power system.
2. To study transient of SMIB multi machine System.
3. To introduce the effect AVR & PSS on stability.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment

3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcomes:-

Shall able to

1. Analyze the power system under different stability conditions
2. Simulate the power system on computer for transient stability analysis.
3. Understand the role of automatic voltage regulator & other system for improving stability.

Details of Course:

S. No.	Contents	Contact Hours
1	Unit 1: Small Signal Stability Analysis.	(10 Hrs)
2	Unit 2: Transient stability : - a) Consideration of rotor angle, b) Consideration of time.	(10 Hrs)
3	Unit 3: Review of classical method, dynamic and transient stability investigations and simulation of single machine infinite bus and multi machine system.	(10Hrs)
4	Unit 4: Effects of grounding on stability, effects of various disturbance, parameters and controls on stability, prevention of stability, pull out.	(10 Hrs)
5	Unit 5: Role of automatic voltage regulator (AVR) on improving stability. Effect of excitation control and turbine Governing. Augmentation of stability of conventional methods. Recent software for power system analysis. Power system stabilizers (PSS): Introduction, Basic concepts, Choice of control signals, Torsional interaction with PSS. AI application to power system stability studies. Advanced topic on the subject	(08 Hrs)

Subject Code : IPSL655 (Elective-IV)

Course Title :Flexible AC Transmission System(FACTS)

Course Objectives:

1. This Subject deals with SSR and its control Strategy.
2. To Introduce concept of voltage Stability and reactive power Control Strategy
3. To Introduce voltage source converter based devices for active power, reactive power and voltage control

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcomes:

Shall able to

- 1) Analyse and design voltage source converter topologies.
- 2) Apply the VSC for active power, reactive power and voltage control of the power system.
- 3) Understand SSR problems and their remedies

Details of Course:

S. No.	Contents	Contact Hours
1	Unit 1 : SSR, Determination of SSR Methods of analysis SSR, (a) Eigen value analysis (b) Frequency domain analysis. Analysis of SSR with fixed series compensation and HVDC converter control. Counter measures for SSR. (a) System planning considerations. (i) Series Vs shunt compensation (ii) Static blocking filter (iii) By pass damping filter (b) Damping scheme (i) N.G. Hingorani Damping scheme (ii) Dynamic stabilizers.	(10 Hrs)
2	Unit 2: Voltage stability, Basic concepts, Active/Reactive power flow transmission using elementary models, Difficulties with reactive power transmission. classification, methods of analysis, voltage collapse. Factors affecting Voltage stability (i) Transient voltage stability (ii) Long-term voltage instability and its prevention, continuation power flow.	(08 hrs)
3	Unit 3: Comparison of rotor angle stability & voltage stability. (P-V) curves (nose curves) Methods of analysis (i) Dynamic and Static analysis. Modeling requirements for voltage stability. Recent case studies.	(12 Hrs)
4	Unit 4: Static VAR compensator (SVC), Types of SVC characteristics of ideal and realistic SVC their operation, Composite characteristics, modeling of SVC, Six pulse TCR, Application of	(10 Hrs)

	SVC, Flexible AC Transmission Systems (FACTS)	
5	Unit 5: Basic concepts, Voltage source converters, Current source converter comparison of STATCOM and SVC. Static Voltage and phase angle regulators: TCVR and TCPAR combine compensator UPFC (Unified Power Flow), IPFC (Interline power flow controller), Active Filters (Series and Shunt types only). Advanced topic on the subject.	(10 Hrs)

Subject Code: IPSL656 (Elective-IV)

Course Title: ADVANCED ELECTRIC DRIVES AND THEIR CONTROL

Course Objectives: - This Subject deals with modern drives controls techniques such as vector/scalar control for VVVF & DTC for industrial applications.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course outcomes:

Shall able to

1. Able to implement various control methods of drives.
2. Understand to apply VSC based control strategy.
3. Formulate & solve by understanding scalar & vector control.

Details of Course:

S. No.	Contents	Contact Hours
1	Unit 1: Dynamics of Electrical Drives classification of electric drives – Basic elements of an electric drive. Dynamic condition of electric System. Stability consideration of electric drives.	(07 Hrs)
2	Unit 2: Analysis of electric machinery. Reference frames, Theory of symmetrical IM and synchronous machines.	(09 Hrs)
3	Unit 3: Motor Control : Induction motor control systems AC regulation and static switches. Control of effective rotor resistance, Recovery of slip energy. Variable	(10 Hrs)

	frequency control of AC motor, harmonic analysis in VFD, Cycloconverter control of slip frequency, Forced commutated inverter drive, analysis.	
4	Unit 4: Synchronous servomotor drives with sinusoidal waveform, with trapezoidal waveforms, Load commutated inverter drives, Control of AC /DC machines, Digital control of drives, Application of microprocessor / computers to Electric AC / DC Drives.	(12 Hrs)
5	Unit- 5: State variable approach ,Scalar control method / Vector control method , comparison , Space vectors , stator space current ., stator voltage space vector ,stator flux linkages space vector , transformation of space vector coordinates from one reference frame to another . Introduction to DTC, Switched reluctance motor control, PMSM Motor, Study of recent drives controllers.Advanced topic on the subject: Effects of harmonics on motors.	(12 Hrs)

Subject Code: IPSL657 (Elective-IV)

Course Title: SUB-STATION ENGINEERING

Course Objectives: This subject deals with technical aspects related to planning, operation & maintenance of high voltage substations suitable for the modern era. Thus, it will cater to the needs of utilities as well as large industrial houses.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course outcomes:

Shall able to

1. Design aspect of sub stations for efficient working strategy.
2. Understand the various substation components.
3. Demonstrate operation, maintenance of substation.

Details of Course:

S. No.	Contents	Contact Hours
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1	Unit 1: Development of Indian Power Sector and grid Management, Development in Distribution Power Sector, Sub-station:Types of substation(Indoor & outdoor), Layout, Busbarsectionalization, Power transformers, Design of Earthing, Gas Insulated substation (GIS).	(08 Hrs)
2	Unit 2 : Overhead Insulators, CT/PT's, Station Batteries and charging equipment, Parameters of Overhead Lines and under-ground cables, Fault finding, Computer applications for Sub-station engineering	(08 hrs)
3	Unit 3 : Voltage control: Protection against over-voltages, bus-bars protection	(08 hrs)
4	Unit 4 : Operation, Maintenance & safety aspects of substation, including metering aspects.	(08 hrs)
5	Unit 5 : Indian electricity grid code, Case studies with 100 % stand-bye, Case studies with Participation for Co-generation and energy-sale, Case studies with emergency-supply arrangements: Short duration / Long duration Advanced topic on the subject.	(08 hrs)

Subject Code: IPSL658 (Elective-V)

Course Title: Smart Grid Technologies & Applications

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcomes:

Shall able to

- 1.Understand the concept of smart grid, their comparison over conventional grid & international policies
- 2.To implement smart metering & vehicle to grid applications.
- 3.Analyse Smart Substation & PMU's (Phasor Measurement Unit)
- 4.To practice power quality issues & audit.

5.To integrate grid with ICT(Information & Communication Technologies)

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction to Smart Grid: Evolution of Electric Grid, Concept of Smart Grid, Definitions, Need of Smart Grid, Functions of Smart Grid, Opportunities & Barriers of Smart Grid, Difference between conventional & smart grid, Concept of Resilient & Self-Healing Grid, Present development & International policies in Smart Grid. Case study of Smart Grid . CDM opportunities in Smart Grid	(06 Hrs)
2	Introduction to Smart Meters, Real Time Pricing, Smart Appliances, Automatic Meter Reading(AMR), Outage Management System(OMS), Plug in Hybrid Electric Vehicles(PHEV), Vehicle to Grid, Smart Sensors, Home & Building Automation, Phase Shifting Transformers	(08Hrs)
3	Smart Substations, Substation Automation, Feeder Automation. Geographic Information System(GIS), Intelligent Electronic Devices(IED) & their application for monitoring & protection, Smart storage like Battery, SMES, Pumped Hydro, Compressed Air Energy Storage, Wide Area Measurement System(WAMS), Phase Measurement Unit(PMU).	(08Hrs)
4	Power Quality Management in Smart Grid: Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit	(10 Hrs)
5	Information and Communication Technology for Smart Grid: Advanced Metering Infrastructure (AMI), Home Area Network (HAN), Neighborhood Area Network (NAN), Wide Area Network (WAN).	(08Hrs)

Subject Code: IPSL659 (Elective-V)

Course Title: ELECTRIC AND HYBRID VEHICLES-

Course Objectives:-Electrical Vehicles need strong sources, efficient power-drives & excellent co-ordination within the vehicle. This course introduces modern subsystems for efficient operation of vehicles.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk	6	Simulation of applications through
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	Board)		Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcomes:

Shall able to

- 1) Learn pollution problems due to petrol or diesel driven vehicles.
- 2) Suggest the remedial measures by developing skills to use sensors, motors, batteries, fuel cells, ultra-capacitors.
- 3) Design hybrid system for electric vehicles in cost effective way.
- 4) Understand various aspects of Road Conditions.
- 5) Application of Novel technologies in EV.

Details of Course:

S. No.	Contents	Contact Hours
1	Unit 1: Electric vehicles (EV) development, past, present and future, comparison with IC engine driven vehicles.	(06 Hrs)
2	Unit 2: Batteries, fuel cells, ultracapacitors. Power converters in EV. Different types of motors used in EV and their torque-speed characteristics, motor control techniques,	(08Hrs)
3	Unit 3: High performance and efficiency-optimized control, sensorless control. EV modeling, Their Characteristics	(08Hrs)
4	Unit 4: Slip phenomena. Road condition estimation, driving force observer. EV motion control, optimum slip ratio control, movement control, lateral motion stabilization	(10 Hrs)
5	Unit 5 : Fuel cell Vehicles, Hybrid Electric Vehicles (HEV), series, parallel and series-parallel (split) systems, Recent industrial power electronic applications. Advanced topic on the subject	(08Hrs)

Subject Code: IPSL660 (Elective –V)

Course Title: RESTRUCTURED POWER SYSTEMS

Course objectives:

1. To study the deregulation of power system.
2. To study the transmission open access and pricing of power.

3. To study the different market models.

Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course outcomes:

Shall able to

1. Understand the transmission open access operation and pricing of power transactions.
2. Understand the various market models and congestion management
3. Demonstrate operational planning activities .

Details of Course:

S. No.	Contents	Contact Hours
1	Unit –1: Deregulation, Reconfiguring Power systems, unbundling of electric utilities, Background to deregulation and the current situation around the world, benefits from a competitive electricity market after effects of deregulation	12 Hrs
2	Unit –2: Role of the independent system operator, Operational planning activities of ISO: ISO in Pool markets, ISO,EMS, in Bilateral markets, Operational planning activities of a GENCO: Genco in Pool and Bilateral markets, market participation issues, competitive bidding	08 Hrs
3	Unit –3: Power wheeling, Transmission open access, pricing of power transactions, security management in deregulated environment, and congestion management in deregulation	06 Hrs
4	Unit –4: General description of some ancillary services, ancillary services management in various countries, reactive power management in some deregulated electricity markets	06 Hrs

5	Unit –5: Different practices in power market operations: different market models, different types of bilateral transactions, centralized & decentralized dispatch philosophies, regulatory framework, open access issues.	08 Hrs
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Subject Code: IPSL661 (Elective-VI)

Course Title: POWER QUALITY

Course Objectives:

1. To acquire the knowledge of various power quality issues.
2. To study the standard norms for power qualities.
3. To study the various methods for control and measurements.

.Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course outcomes:

Shall able to

1. Understand the power quality issues.
2. Control and measure the power quality issues.
3. Understand the various standards related to power quality.

Details of Course:

S. No.	Contents	Contact Hours
1	Unit -1: Electric power quality phenomena- IEC and IEEE definitions - power quality disturbances-voltage fluctuations-transients-unbalance-waveform distortion-power frequency variations	10 Hrs
2	Unit -2 : Voltage variations, Voltage sags and short interruptions flicker-longer duration variations sources range and impact on sensitive circuits-standards solutions and mitigations equipment and techniques.	8 Hrs
3	Unit –3: Transients – origin and classifications – capacitor switching transient – lightning-load switching – impact on users – protection – mitigation.	6Hrs
4	Unit -4: Harmonics – sources – definitions & standards – impacts -	8 Hrs

	calculation and simulation, Harmonic power flow - mitigation and control techniques – filtering – passive and active	
5	Unit -5 : Power Quality conditioners – shunt and series compensators-DSTATCOM-Dynamic voltage restorer-unified power quality conditioners-case studies	08 Hrs

Subject Code : IPSL662 (Elective-VI)

Course Title : WIND AND SOLAR SYSTEMS

.Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course outcomes:

Shall able to

1. Maintain constant speed wind power plants.
2. Maintain variable speed wind power plants.
3. Maintain concentrated solar power (CSP) and solar photovoltaic (PV) wind powerplants,
4. Check the grid compatibility of the power from wind and solar power plants.
5. Resolve the grid integration issues of wind and solar power plants

Details of Course:

S. No.	Contents	Contact Hours
1	Unit – I. Constant Speed Wind Power Plants	10 Hrs
2	Unit -2 : Variable Speed Wind Power Plants	8 Hrs
3	Unit –3: Solar Power Plant Performance	6Hrs
4	Unit-4 : Wind and Solar Power Quality	8 Hrs
5	Unit-5 : Grid Connection of Wind and Solar Power Plants	6Hrs

Subject Code : IPSL663 (Elective-VI)
Course Title :ARTIFICIAL INTELLIGENCE
Modes of Delivery of Courses:

1	Conventional Teaching(Chalk Board)	6	Simulation of applications through Programming
2	Assignments and Tutorials	7	Open ended experiment
3	Seminars	8	Special guest lectures /Industry Visit
4	Audio visual aids	9	NPTEL Lecture
5	Activity based learning(Quiz ,Poster, etc)	10	Mini modeling, Minor Project

Course Outcomes: Upon completion of the course students shall be able to:

1. Understand basic concepts and techniques of artificial neural network.
2. Understand a range of machine learning algorithms along with their strengths and weaknesses.
3. Develop skills of using recent machine learning software for solving practical problems.
4. Apply machine learning algorithms to solve real time problems of moderate complexity.
5. Gain experience of doing independent study and research through case studies

S. No.	Contents	Contact Hours
1	Unit – I. Introduction to Artificial Intelligence, Understanding the Brain, Neural Networks as a Paradigm for Parallel Processing, The Perceptron, Training a Perceptron, Learning Boolean Functions ,Multilayer Perceptron, Backpropagation Algorithm	10 Hrs
2	Unit -2 :Introduction, What Is Machine Learning? , Examples of Machine Learning Applications, Learning Associations, Supervised&Unsupervised Learning, Reinforcement Learning, Classification, Regression	8 Hrs
3	Unit –3: R - Basic Syntax, Data Types, Variables, Operators, Decision Making, Loops, Functions, Strings, Vectors, Lists, Matrices, Arrays, Factors, Data Frames, Packages-chart & graphslar Power Plant Performance	6Hrs
4	Unit-4 :Introduction to Bayesian Function, Mean, Median & Mode, LinearRegression, MultipleRegression, Logistic Regression, Normal Distribution, BinomialDistribution,	8 Hrs

	PoissonRegression, Analysis of Covariance, Time Series Analysis, Nonlinear Least Square, DecisionTree, RandomForest, SurvivalAnalysis, Chi Square Tests	
5	Unit-5 :GrilIntroduction to clustering, k-Means Clustering, Hierarchical clustering, Introduction to Chat Bot, creation of Chat Bot.	6Hrs

SEMSTER-III

Subject Code: IPSP664

Course Title: Industry/ Research Project (phase-I)

SEMSTER-IV

Subject Code: IPSL665

Course Title: Industry/ Research Project (phase-II)



G. H. RAISONI COLLEGE OF ENGINEERING, NAGPUR
(An Autonomous Institute & Affiliated to R.T.M. Nagpur University)
Dual Accreditations NAAC "A+" (3.51) Grade & NBA (Tier-I)



Department of Electronics Engineering

PG- Course Book Programme: Master of Technology in VLSI

Vision of the Institute

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges.

Mission of the Institute

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake-holders. Our strength is directed to create competent professionals. Our endeavor is to provide all possible support to promote research and development activities.

Vision of the Department

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards in electronics & telecommunication engineering with capabilities of accepting new challenges.

Mission of the Department

Mission of the Department is

- To create competent professionals who are trained in the design, implementation of engineering & telecommunication systems
- To contribute towards the advancement of engineering, science and technology
- To impart quality and value based education to raise satisfaction of all stake holders
- To promote research & development activities in the field of electronics & telecommunication engineering and allied areas

Program Educational Objective (PEO)

Graduate shall be able to

1. Apply technical skills to analyze and solve complex microelectronics circuits and systems through the acquired in-depth knowledge.
2. Adopt rapid changes in technology and provide optimal solutions by appropriate selection of tools and techniques.
3. Satisfy Stakeholders by acquiring professional & intellectual integrity and able to undertake research & **Program Outcomes (PO)**

Graduates shall be able to:

1. Acquire in-depth knowledge of various analog, digital and mixed signal to analyze, synthesize and integrate the existing and new technologies of VLSI.
2. Analyze complex microelectronics circuits and systems; apply independent judgment for synthesizing information to make intellectual and/or creative advances for conducting research in a wider theoretical, practical and policy context.
3. Think laterally and originally to solve various problems in VLSI and related areas or applications after considering public health and safety, cultural, societal and environmental factors.
4. Have command to extract, analyze and interpret the information on unfamiliar problems through literature review and by applying research methodology techniques and tools.
5. Select and apply modern engineering tools, techniques and skills to create modeling and simulation necessary for complex problems in engineering with an understanding of the limitations.
6. Graduate shall have an understanding of group dynamics and have capacity for self management and decision making to achieve common goals in the relevant discipline or interdisciplinary environments.
7. Communicate confidently and effectively with engineering community and society at large through technical report writing, design documentation, project reports, presentations and to give and receive clear instructions.
8. Engage in life-long learning independently by recognizing the need with a high level of enthusiasm to improve knowledge and competence.
9. Acquire professional and intellectual integrity by practicing professional code of conduct, ethics of research and scholarship by understanding impact of research outcome for sustainable development of society.
10. Observe and examine critically the outcomes of one's actions and make corrective measures subsequently, and learn from mistakes without depending on external feedback.

Program Specific Outcomes (PSOs)

PSO1: Utilize the knowledge for VSLI design related application

PSO2: Demonstrate Innovation and shall have capacity to protect IPR

PSO3: Demonstrate industrial practices learned through internship and solve the live problems of industries.

Programme: Master of Technology in VLSI Summary of Scheme

Seme ster	Ho urs	Cre dit s	Marks
S C I	23	20	600
H II	23	20	600
E M III	10	10	150
E IV	10	10	300
Total	66	60	1650

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						Mode of Exam
							Theory			Practical		Total	
		Th.	Tu.	Pr.	Total		(TAE) (20)	(CAE) (30)	ESE (50)	Int.	Ext.		
SEMESTER- I													
VL531	VLSI subsystem Design	3	1	-	4	4	20	30	50	-	-	100	Paper Pen
EL531	Embedded Systems & Controllers	4	-	-	4	4	20	30	50	-	-	100	Practical Application Based Online
XXXXXXX	Elective-I	3	-	-	3	3	20	30	50	-	-	100	Paper Pen/online
XXXXXXX	Elective-II	3	-	-	3	3	20	30	50	-	-	100	Paper pen/online
XXXXXXX	Elective-III	3	-	-	3	3	20	30	50	-	-	100	Paper Pen/online
VL567	Laboratory-I	-	-	4	4	2				50	25	75	Practical
MBXXXX	GP-1(Advanced Communication)	-	-	2	2	1	-	-	-	25	-	25	Practical
	Total	16	1	6	23	20						600	

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						Mode of Exam
		Th.	Tu.	Pr.	Total		Theory			Practical		Total	
							(TAE) (20)	(CAE) (30)	ESE (50)	Int.	Ext.		
SEMESTER- II													
VLSL537	Analog VLSI Design	3	1	-	4	4	20	30	50	-	-	100	Paper Pen
VLSL538	Modeling of Digital Systems	4	-	-	4	4	20	30	50	-	-	100	Paper Pen
ELXL535	Elective-IV	3	-	-	3	3	20	30	50			100	Paper Pen/onlin
XXXXXX	Elective-V	3	-	-	3	3	20	30	50	-	-	100	Paper Pen/onlin
XXXXXX	Elective-VI	3	-	-	3	3	20	30	50	-	-	100	Paper Pen/online
VLSP568	Laboratory-II	-	-	4	4	2				50	25	75	Practical
MBAXXX X	GP-II(Research & Methodology)	-	-	2	2	1	-	-	-	25	-	25	Practical
	Total	16	1	6	23	20						600	

Sub. Cod e	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						Mode of Exam
							Theor y			Practical		Total	
		Th.	Tu.	Pr.	Total		TAE (20)	CAE (30)	ES E (50)	Int.	Ext.		
SEMESTER- III													
VLSP569	Dissertation (Phase –I)	-	-	10	10	10	-	-	-	75	75	150	Practical
	Total	-	-	10	10	10				75	75	150	

Sub. Cod e	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						Mode of Exam	
		Th.	Tu.	Pr.	Total		Theory			Practical		Total		
							(TAE) (20)	(CAE) (30)	ES E (50)	Int.	Ext.			
SEMESTER- IV														
VLSP570	Dissertation (Phase –II)	-	-	10	10	10	-	-	-	150	150	300	Practical	
	Total	-	-	10	10	10				150	150	300		

Pool of Electives

Track	Embedded & IoT system	Signal Processing & Data Computing	AI ML	VLSI
Elective-I	Real-Time Operating Systems	Advanced Digital Signal Processing & applications	Image Processing and Computer Vision	Digital Systems Design with FPGA
Elective-II	Software Technology for Embedded Systems	Audio & Speech Signal Processing	Probability and Statistics	ASIC & CAD IC Design
Elective-III	Reconfigurable Computing & High Speed Devices	DSP System Design And Implementation	Machine Learning & its Engineering Applications	Verilog HDL
Elective-IV	Advanced Embedded Algorithms	Linear Algebra & Numerical Methods	Pattern Recognition Techniques	Advanced Micro-processes And Nanotechnology
Elective-V	Real Time Signal Processing and Embedded Systems.	Optimization Technique	Advanced Machine Learning & Deep Learning	Low Power VLSI Design
Elective-VI	Cloud Computing and Applications	Human Machine Interface	Big Data Analytics and Business Intelligence	VLSI Design & Test Flow with Fault Tolerance

SEMESTER-I
VLSI573 - VLSI SUBSYSTEM DESIGN

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	W	Total Hours		TA	CA	ES	Cont. Evaluation	
3	1	-	4	4	20	30	50	--	100

Mode of Examination: Offline (Paper pen)

Course Objectives

- 1.To equip with an ability to apply knowledge of microelectronics devices & circuits.
- 2.An ability to design and conduct experiment related to VLSI
- 3.A knowledge and understanding of founding and fabrication processes

Course Outcomes

- 1.Understand the MOSFET basics & their fabrication & layout design rule.
- 2.Analyze performance issue & inherent trade off involves in system design.
- 3.Identify the interaction between process parameter, device structure, circuit performance & system design.
- 4.To Design VLSI Based system.

CO Mapping with PO and PSO:

CO	Programme Outcomes										Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PS1	PS2	PS3
CO1	2	2	2	1	2			2	1	1	2	1	1
CO2	3	3	3	1	3			2	1	1	3	1	2
CO3	3	3	3	2	3			2	2	1	3	2	2
CO4	3	3	3	2	3			2	2	1	3	2	3

Contents

UNIT I

Material Model : Electrical Properties, Junction Diode. MOS transistor Operation Modes Threshold Voltage: Metal and Poly-silicon Trapped Charge Implants Strong Inversion: Charge Modeling Constant V_t model.

NMOS/PMOS transistors. I/V characteristics, Sign Conventions parasitic Bipolar Transistors CMOS Latch-up Analysis (D.C. and transient),

UNIT II

Device capacitance and Charge Storage in MOS NMOS/CMOS circuit analysis, Small signal amplifier model Miller Effect. Layout / Fabrication, Diffusion / Implants / Wires, NMOS / CMOS Processes SCMO Design Rules – special derivation self-aligned processes Resistor / Capacitor Layout, Logic Level Design, Cube Decomposition, Realization of Duals for CMOS Euler path layout, Topological Considerations. Don't Cares and Redundancy, layout Parasitic Reduction

UNIT III

MOS Logic Families: Propagation Delay for CMOS/NMOS/PMOS, Layout capacitance / resistance. Estimation; Gain effects; MOS Performance Estimation, Buffers/Capacitive Loading, Power Dissipation: Transient Optimization, Sidewall/2-d and 3-d effects: Cross-talk Fringing, Ball-park numbers for process Estimation Scaling CMOS Design Optimization: High- Speed Logic Strategies.

UNIT IV

Interconnection. Distributed R/C cross/talk, Noise, Clocking Strategies, Sub-System Design and Partitioning Dynamic Logic, Dynamic Circuits, Stored Charge and timing. Domino Logic, Switched Capacitor and Charge Flow circuits, pass-Transistor logic (CPL). Advance topics on VLSI Design

BOOKS:

- 1.Weste, "Principles of CMOS VLSI Design (2nd edition)"
- 2.Douglas A. Pucknell and kamran Eshraghian, "Basic VLSI Systems and Circuits, Prentice Hall of India Pvt. Ltd. 1993.
- 3.Wayne Wolf, "Modern VLSI Design, 2nd Edition". Prentice Hall 1998.

VLSI574 EMBEDDED SYSTEMS & CONTROLLERS

Teaching Scheme				Evaluation Scheme				
				Credits	Theory			Total Marks
					T A E	C A E	S	
31	-	4	4	20	30	50	--	100

Mode of Examination: Offline (Paper pen)

Course Objectives

- 1.The main objective of the subject lies in the understanding of microcontroller based systems and their effective implementation in application.
- 2.To introduce devices and other microcontrollers used for embedded systems.
- 3.Explain programming concepts and embedded programming in C and C++.

Course Outcomes

- 1.To apply knowledge of RTOS based design
- 2.To solve problems and introduce device and buses for embedded networking
- 3.To Explain Real time operating system for inter & intra task communication models

CO Mapping with PO and PSO:

CO	Programme Outcomes										Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 1	PO 2	PO 3
CO 1	2	1	3	1	3			1	2		2	2	3
CO 2	2	2	3	1	3			1	2		2	3	3
CO 3	3	2	3	2	3	1	1	2	2		2	3	3

Mode of Examination: Online

Contents

UNIT I

Microcontrollers: Microprocessors and Micro-controllers, 8051 controller, Block Diagram & Architecture.

UNIT II

8051 Instruction Set, Addressing modes & programming. 8051 Timers, Serial I/O, Interrupts programming,

UNIT III

Memory Interfacing. Programming, Real time interfacing with LED, LED display, LCD display

UNIT IV

RISC Controller: PIC Micro-controllers – overview; features, PIC 16c6x/7x – architecture, file selection register, Memory organization, Addressing modes, Instruction set, Programming.

UNIT V

ARM Micro-controllers – overview; features, ARM 7 – architecture, Thumb, Register Model, Addressing modes, Advance topics on embedded system

BOOKS:

- 1.Steve Heath, “Embedded System Design” Butterworth Helnmann.
- 2.Kenneth J. Ayala “The 8051 Micro-controller– Architecture, Programming & Applications”, Second Edition, Penram International & Thomson Asia.
- 3.John B. Peatman, “Design with PIC Micro-controllers”, Low Price Edition, Pearson Education

SEMESTER-II

VLSI575 ANALOG VLSI DESIGN

Teaching Scheme				Evaluation Scheme				
				Credits	Theory			Total Marks
					T A E	C A E	S	
31	-	4	4	20	30	50	--	100

Mode of Examination: Offline (Paper pen)

Course Objectives

1. Ability to apply knowledge of VLSI circuits.
2. Ability to solve problems related to analog domain.

3. Ability to use design tools for analog domain.
4. Design of efficient analog circuits.

Course Outcomes

1. Understand to design VLSI chip layouts to account for process corners and fabrication process variations.
2. Perform design chip layouts for the advanced deep submicron processes.
3. Apply to characterize digital circuits for crosstalk noise in the layouts

CO Mapping with PO and PSO:

C O	Programme Outcomes										Programme Specific Outcomes		
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P S O 1	P S O 2	P S O 3
C O 1	2	2	3	2	3			2	3	1	2	2	2
C O 2	2	2	3	2	3			2	3	1	2	2	2
C O 3	2	1	2	1	2			1	1		1	1	2

Course Contents

Unit I

Device modeling and simulation Modeling, MOS Models Diode model, Bipolar modes BSIM Spice models, Circuit simulations using Spice. Basic Building Blocks: Switches. Current sources and sinks. Current mirrors. Voltage and current references.

Unit II

Amplifiers: MOS Inverting amplifier, Cascade amplifiers. Feedback amplifiers
Differential amplifiers. Frequency response, noise performance in Diff amplifiers, Output amplifiers.

Unit III

CMOS Two stage OPAMP Design, Cascade OPAMPs, Simulation and Measurement of OPAMPs, Comparators.
Analog signal processing, CMOS Digital to analog converters, Scaling and serial, cyclic.

Unit IV

Analog to digital converters Serial, SAR, Parallel, Pipelined, sigma-delta converters,

Unit V

Mixed signal Layout issues. Continuous time filters, Switched capacitor filters, Modulator and multipliers, PLL. Advance topics on Analog VLSI

BOOKS :

- 1.R.L. Geiger, P.E. Allen, "VLSI Design techniques for Analog and digital Circuits", McGraw Hill
- 2.J. Baker, D.E. Boyce. "CMOS Circuit Design, Layout and simulation", IEEE press.

VLSI 576 MODELING OF DIGITAL SYSTEMS

Teaching Scheme				Credits	Evaluation Scheme			
					Theory			Practical
T h	T u	P r	Total Hours		T A E	C A E	E S E	Co nt. Eva lu atio n
4	-	-	4	4	20	30	50	--

Mode of Examination: Offline (Paper pen)

Course Objectives

1. To understand the language based Digital System Modeling.
2. Understanding the design flow to VHDL language.
3. It is expected that students should able to model digital systems and implement using CPLD and FPGA devices with less hardware consumption.

Course Outcomes

CO1.To understand digital systems modeling using VHDL. CO2. Perform synthesizable System programming with use of VHDL models along with test benches.
CO3. Design digital systems that are reconfigurable for testing and test it on FPGA

CO Mapping with PO and PSO:

C O	Programme Outcomes										Programme Specific Outcomes		
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P S O 1	P S O 2	P S O 3
C O 1	2	2	2	1	3			1	1		3	2	1
C O 2	2	2	3	2	3		1	1	3		3	3	1
C O 3	2	1	3	2	3	1	1	2	3		3	3	2

Mode of Examination: Offline (Paper pen)

Course Contents

UNIT I

Programming Technologies – ROMs & EPROMs PLA . PAL gate Arrays Programmable gate arrays and applications, Anti-fuse FPGA, Synthesis methods for FPGA.Hardware Description Language. Design entities, architecture Bodies, Block Statements, processes data types. Operators Classes of Objects, Attributes, Functions and Procedures, Packages Control Statements.

UNIT II

Behaviour modeling.- Process Statement, Assertion Statement, Sequential wait Statement, Formatted ASCII I/O Operations Structural Modeling ; parts Library wiring of Primitives. Wiring of Iterative networks. Modeling a test bench.

UNIT III

Chip Level Modeling : Chip level modeling structures modeling delay, process model graphs, Functionally partitioned models, Timing Assertion, Setup & Hold time for clocked devices, Design rule checks System Modeling Modeling system interconnection, general model for signal interconnection, Multiplexing of signals. Multiple valued logic.

UNIT IV

Processor model. RAM model. UART model, Parallel I/O Ports, Interrupt controller Simulation with the physical model, simulation,

writing test bench, converting real and interconnection, Multiplexing of signals. Multiple valued logic.

UNIT V

Processor model. RAM model. UART model, Parallel I/O Ports, Interrupt controller. Simulation with the physical model, simulation, writing test bench, converting real and integer to time. Dumping results into text file, reading vectors from text file, test bench example. Advance topics on Digital System Modelling

BOOKS:

1. Navabi Z, "VHDL Analysis and Modeling of Digital Systems". Prentice Hall, 1993
- 2.J. Bhasker "VHDL Primer", Pearson Education, 2000
- 3.Armstrong & Grey. "VHDL Design. Representation and Synthesis", PHPTR, 2000
- 4.James R. Armstrong, "Chip Level Modeling with VHDL", Prentice hall, 1989

VLSI567 OPTIMIZATION TECHNIQUES

Teaching Scheme				Credits	Evaluation Scheme				Total Marks
					Theory			Practical	
					TA E	CA E	ES E	Cont. Evaluation	
Th	Tu	Pr	Total Hours		20	30	50		100

Mode of Examination: offline (Paper pen)

Course Objectives

- 1.To introduce concepts on about random variables and random process
- 2.To build capability to statistically characterize and model physical systems
- 3.To build capability to solve problems related to random variables and random processes

Course Outcome

1. To understanding about random variables and random process.
2. Able to statistically characterize and mode physical systems.
3. Able to solve problems related to random variables and random processes.

CO Mapping with PO and PSO:

CO	Programme Outcomes	Programme Specific Outcomes
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	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P S O 1	P S O 2
CO1	2		3	2	2			1	1		1	1
CO2	2		3	3	2			1	1		2	1
CO3	2		3	2	1			2	1		1	1

P. Peyton Z Peebles Jr., Probability, Random Variables, and Random Signal principles, McGraw Hill, 4th Edition 2002
 2. Athanasios Papoulis, Probability, Random Variables and Stochastic Processes, McGraw Hill, 4th Edition 2002

VLXL558 - ASIC AND CAD IC DESIGN

Content

Unit-I:

Introduction to probability: Sample space, outcomes and events. Axioms and properties of probability. Random variables: Conditions for function to be random variable. Discrete and continuous random variable. Distribution function. Density function. Binomial, Poisson, Uniform,

Unit-II:

Exponential, Gaussian, Rayleigh density functions. Conditional distribution and density functions. The central limit theorem. Reliability. Operations on random variables: Expectation. Weak and strong law of large numbers. Conditional expectation. Expectation of function of random variable. Moments about origin and central moments. Variance, skew and kurtosis.

Unit-III:

Chebyshev's and Markov inequalities. Characteristic function. Moment generating function. Chernoff's inequality and bounds. Transformation of discrete and continuous random variables. Multiple Random Variables: Vector of random variables. Joint distribution. Marginal distribution. Conditional distribution and density: Point and interval conditioning. Statistical independence. Distribution and density of sum and product of random variables. Gaussian Random variables: Bivariate, Multivariate Gaussian. Joint characteristic, density function. Linear transformation of Gaussian random variables. Complex Gaussian random variables.

Unit-IV:

Random Processes: Definition and characteristic of random processes. Strict-sense and wide-sense random processes. WSS through LTI systems. Power spectral density of WSS processes. Characterization of correlation function. Matched filter. Wiener filter. Wiener-Khinchin theorem. Ergodic process. Introduction to Poisson process, Renewal and Wiener and Markov process. theorem. Ergodic process. Introduction to Poisson process, Renewal and Wiener and Markov process.

Books:

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50		100

Mode of Examination: Offline (Paper pen)

Course Objectives

- 1.To prepare the student to be an entry level industrial standard cell ASIC or FPGA designer.
- 2.To give the student an understanding of issues and tools related to ASIC/FPGA design.
- 3.Prepare the student for implementation, including timing, performance and power optimization, verification and manufacturing test.

Course Outcomes

1. To able to design and synthesize a complex digital functional block
2. Perform optimization for complex digital functional block.
3. To understand of design issues and implement design application based on ASIC design and technology.

CO Mapping with PO and PSO:

CO	Programme Outcomes										Programme Specific Outcomes		
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P S O 1	P S O 2	P S O 3
CO1	2	2	2	1	3			1	1		3	2	1
CO2	2	2	3	2	3		1	1	3		3	3	1
CO3	2	1	3	2	3	1	1	2	3		3	3	2

Contents

Unit I:

Types of ASICs. ASIC design flow. Programmable ASICs. Antifuse, SRAM, EPROM, EEPROM based ASICs. Programmable ASIC logic cells and I/O cells. Programmable interconnects.

Unit II:

An overview of advanced FPGAs and programmable SOC's : Architecture and

configuration of Spartan II and Virtex II FPGAs . Apex and Cyclone FPGAs. Virtex II PRO kits and Nios kits. OMAP. ASIC physical design issues. system partitioning, interconnect delay models and measurement of delay.

Unit III:

ASIC floor planning, placement and routing. Design issues in SOC. Design methodologies. Processes and flows. Embedded software development for SOC. Techniques for SOC testing. Configurable SOC. Hardware/software code design.

Unit IV:

High performance algorithms for ASICS/ SOCS. SOC case studies- DAA and computation of FFT and DCT. High performance filters using delta-sigma modulators. Case Studies: Digital camera, Bluetooth radio/modem, SDRAM and USB controllers.

Text Books:

- 1.ASIC Design in the Silicon Sandbox: A Complete Guide to Building Mixed-Signal Integrated Circuits by by Keith Barr.
- 2.Application-Specific Integrated Circuits by Michael John Sebastian Smith Addison-Wesley
- 3.Physical Design Essentials: An ASIC Design Implementation Perspective by Khosrow Golshan Springer,

Reference Books:

- 1.Regular Fabrics in Deep Sub-Micron Integrated-Circuit Design by Fan Mo, Robert K. Brayton Springer,
- 2.Bio-inspired Computing Machines By Daniel Mange, Marco Tomassini PPUR presses polytechnique

VLXL574- VLSI DESIGN AND TEST FLOW WITH FAULT TOLERANCES

Teaching Scheme				Credits	Evaluation Scheme			
					Theory			Total Marks
Th	Tu	P	Total Hours		TA	CA	EE	
3	-	-	3	3	20	30	50	100

Mode of Examination: offline (Paper pen)

Course Objectives:

1. Understanding of VLSI design flow and details

2.To train students about characterization and properties of VLSI design.

Course Outcomes:

1. To develop the knowledge of VLSI and digital integrated circuits.
2. Students can design and analyze different logic style based digital circuits.
3. Draw and design the CMOS compatible layouts of the above circuits.

CO Mapping with PO and PSO:

CO	Programme Outcomes										Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	1	1	1	2			1	1	1	3	1	1
CO2	2	1	2	1	2			1	2	1	3	1	1
CO3	2	1	2	1	3			1	2	2	3	3	2

Contents:

Unit-I :

Introduction to VLSI Design: Introduction to VLSI Design, Levels of abstraction and the complexity of design, Challenges of VLSI design: power, timing, area, noise, testability, reliability and yield CAD tools: simulation, layout, synthesis, test VLSI fabrication principles, Layout design, Design rules, Stick diagrams MOS modeling, MOS device models, Short-channel effects and velocity saturation, Scaling of MOS circuits.

Unit-II

CMOS inverter: The CMOS inverter, VTC, Switching behavior, Noise margins and power dissipation Static dynamic CMOS combinational logic gate, Transistor sizing in static CMOS, logical effort , Pass-transistor logic, sizing issues , Domino logic gates , estimating load capacitance , Simple delay models (RC) for CMOS gates.

Unit-III

Power consumption Latches and clocking: Power consumption Latches and clocking, Flip-flops, Set-up and hold tests, Static and dynamic latch and flip-flop, Clock design Datapath units, Adders, Shifters, Multipliers Control logic strategies, PLAs , Multi-level logic, Synthesis and place-and-route .

Unit-IV

CAD MOS memories: CAD MOS memories, Register, SRAM, DRAM Global interconnect modeling, Capacitance, resistance and inductance of interconnect Signal and

power-supply integrity issues, Electro migration, RC interconnect modeling Driving large capacitive load, reducing RC delays

Unit-V

Layout design : Layout design, Standard-cell layout, Chip layout and floor planning, Array layout Implementation issues, Design for testability, Packaging technology, I/O issues: ESD protection, boundary scan, inductance, synchronization.

Text Books:

- 1.J. M. Rabaey, A. Chandrakasan and B. Nikolic, Digital Integrated Circuits: A Design Perspective, Perason , 2003
- 2.Sung-Mo Kang, Yusuf Leblebici, CMOS Digital Integrated Circuits, TMH , 2003

Reference Books:

- 1.Kamran Eshraghian and Neil Weste, Principles of CMOS VLSI Design: A Systems Perspective, Pearson/Addition Wesley
- 2.J. P. Uyemura, Introduction to VLSI Circuits and Systems, Wiley

VLXL559 RECONFIGURABLE COMPUTING & HIGH SPEED DEVICES

Teaching Scheme				Credits	Evaluation Scheme			
					Theory			Total Marks
Th	Tu	Pu	Total Hours		TA	CA	EE	
3	-	-	3	3	20	30	50	100

Mode of Examination: offline (Paper pen)

Course Objectives:

- 1.To understand the concepts of architecture reconfigurability, programmable logic devices and optimization of the Reconfigurable computer architecture to the task algorithm and data structure.
- 2.To obtain an understanding of a variety of signaling schemes and system-level trade-offs in high-speed links.
- 3.To obtain the ability to design and simulate both analog and digital circuits for high-speed links using Cadence and MATLAB tools.

Course Outcomes

- 1.Able to understand the state-of-the-art in reconfigurable computing both from a hardware and software perspective.

- 2.Able to understand both how to architect reconfigurable systems and how to apply them to solving challenging computational problems.
- 3.Understand the properties and fundamental limitations of high speed electronic systems in terms of the underlying physical principles.
4. Quantitatively model and analyse high speed electronic systems and interconnects in both the digital and analogue domain

CO Mapping with PO and PSO:

CO	Programme Outcomes										Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	1	2	2	1	2			1			2		
CO2	1	2	3	2	3			2	1		3	2	1
CO3	1	1	2	2	3			1	2		3		
CO4	1	1	3	2	3			2	2		3	2	1

Contents:

UNIT I -

Class overview: Class organization, topics overview, software. Machine learning Problems, data, and tools; Visualization; Linear regression; SSE; gradient descent; closed form; normal equations; features. Overfitting and complexity; training, validation, test and validation data

UNIT II - Classification

Classification problems; decision boundaries; nearest neighbor methods, Probability and classification, Bayes optimal decisions, Naive Bayes and Gaussian class- conditional distribution, linear classifiers, ayes' Rule and Naive Bayes Model, Logistic regression, online gradient descent, Decision tree.

UNIT III - Ensemble methods: Bagging, random forests, boosting. A more detailed discussion on Decision Tree and Boosting. Unsupervised learning: clustering, k-means, hierarchical agglomeration, Latent space methods, PCA.

UNIT IV –Optimization and Application Development Structural risk minimization; margin methods and support vector machines (SVM),Support vector machines and large-margin classifiers, Markov models; autoregressive models.

Books:

- 1.Ethem Alpaydin, Introduction to Machine Learning, Second Edition

2. Stephen Marsland, Machine Learning: An Algorithmic Perspective.
3. Christopher M. Bishop, Pattern Recognition and Machine Learning.
4. Tom Mitchell, Machine Learning, 1997

Text Books:

1. Reconfigurable Computing: The theory and Practice of FPGA-Based Computation Scott Hauck, André DeHon Reconfigurable Computing
2. Cardoso, Joao, Hübner, Michael (Eds.) Dynamic Reconfigurable Network-on-Chip Design: Innovations for Computational Processing
3. High-Speed Electronics and Optoelectronics: Devices and Circuits Sheila Prasad, Hermann Schumacher, Anand Gopinath
4. GaAs High-Speed Devices: Physics, Technology, and Circuit Applications By C. Y. Chang

VLXL562 -VERILOG HDL AND LOW POWER VLSI DESIGN

Teaching Scheme				Credits	Evaluation Scheme			
					Theory			Total Marks
Th	Tu	P	Total Hours		TA	CA	EE	
3	-	-	3	3	20	30	50	100

Mode of Examination: offline (Paper pen)

Course Objectives

1. To understand the language based Digital System Modeling.
2. Understanding the design flow to Verilog language.
3. To design low power circuit using various technologies

Course Outcomes

1. To understand digital systems modeling using Verilog.
2. will be able to design synchronous and asynchronous sequential circuits.
3. will be able to use programmable logic devices for designing of circuits
4. Upon completion of this course, students will be able to analyze and design low- power VLSI circuits using different circuit technologies and design levels

CO Mapping with PO and PSO:

CO	Programme Outcomes	Programme
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											e Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	2	3	2	3			2	1		3	1	3
CO2	2	1	2	1	2						3		1
CO3	2	1	2	1	3				1		3	1	2
CO4	3	3	3	2	3			2	2	1	3	2	2

Contents:

Unit I:

Explain the structure and fundamental components of digital systems. The Verilog Hardware Description Language (HDL) Introduction to Verilog HDLs Verilog system design

Unit II:

Describe the fundamental architecture of digital functional units such as data converters, message generators, ALUs, and memory. Module testing, Behavior modeling, Tasks and functions, Verilog structure, syntax and semantics.

Unit-III :

Digital circuit techniques for low power at technology level: Analysis of components of power dissipation in digital circuit techniques for low power at technology level, Techniques for low power design at logic design level (analysis of various logic design styles for their power consumption).

Unit IV:

Low power design techniques: Low power design techniques at architecture and system levels, Power consumption of dedicated hardware vs. software implementations of systems.

VLXL563 ADVANCED EMBEDDED ALGORITHMS

Teaching Scheme				Credits	Evaluation Scheme			
					Theory			Total Marks
Th	Tu	P	Total Hours		TA	CA	EE	
3	-	-	3	3	20	30	50	100

Mode of Examination: Online

Course Objectives:

1. To study concepts of microcontrollers and processors.
2. To study interfacing of microcontroller with peripheral devices.

3.To understand the usage of Gateways, cloud service and design of IOT based embedded systems.

Course Outcomes:

At the end of the course the student shall be able to:

- 1: Understand Microprocessor and develop real time applications.
- 2: Develop programming for applications.
- 3: Interface I/O devices and peripherals with microprocessors.
- 4: Understand different IoT platform for embedded applications.

CO Mapping with PO and PSO:

C O	Programme Outcomes										Programme Specific Outcomes		
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P S 1	P S 2	P S 3
C O 1	1	1	2	1	2			1	1		2	1	2
C O 2	1	1	3	1	3			1			2		3
C O 3	1	1	3	1	3			1			2		3
C O 4	2	3	3	2	3			2	2		3	2	3

Course Content:

Unit I:

Introduction of Microcontroller and architecture: Microcontrollers, Microprocessors and Micro-controllers, Types of Micro-controllers, External memory, Processor Architecture – Harvard v/s Von Neumann; CISC v/s RISC, Micro-controller, Memory types, Software development tools like assembler, cross- compiler, emulator, and simulator, 8051 controller, Block Diagram & Architecture.

Unit II:

Programming: 8051 Instruction Set, Addressing modes & programming. 8051 Timers, Serial I/O, Embedded C programming.

Unit III:

Device and peripheral Interfacing: Memory Interfacing. Programming, Real time interfacing with LED, LED display, LCD display.

Unit IV:

Advanced Controller and programming: Introduction to Raspberry PI and Intel Galileo Board. Platform Installation, Python Programming, OOP's and Modules in Python Programming, WiFi & Ethernet Setup, GPIO Programming

Unit V:

Sensors Interfacing:

Perform sensors interfacing (like PIR, pressure, dry electrode, TMP35, gas sensor, Ultrasonic sensor, Accelerometer, LDR. 7-segment, LCD, GLCD and wifi ESP8266 interfacing.

Unit VI:

Cloud Programming:

Introduction of Think's speak, Ubidot Cloud server and library. server programming to send & receive data. Design and perform different IoT Application:

Text Books:

1. Muhammad Ali Mazidi, The 8051 Micro-controller & Embedded System using assembly & C Pearson Education second edition 2008
2. Kenneth J. Ayala, The 8051 Micro-controller– Architecture, Programming & Applications, Penram International & Thomson Asia, Second edition 1996
3. Maneesh Rao, Internet of Things with Raspberry Pi 3, Packt Publisher, Second edition 2018
4. Peter Waher, Mastering Internet of Things: Design and create your own IoT applications using Raspberry Pi 3, Packt Publisher, First edition 2018

Reference Book:

1. John C. Shovic, Raspberry Pi IoT Projects: Prototyping
2. Experiments for Makers, Apress Publisher, First edition 2018
3. Ajay V. Deshmukh Micro-controllers - Theory and Applications, Tata McGraw Hill

VLXL566 ADVANCED MICRO PROCESSES AND NANOTECHNOLOGY

Teaching Scheme				Credits	Evaluation Scheme			
					Theory			Pra ctic al
T h	T u	P r	To tal		T A	C A	E S	Cont. Eval
								Mar ks

.	.	.	H ou rs		E	E	E	uation	
3	-	-	3	3	2 0	3 0	5 0		10 0

Mode of Examination: offline (Paper pen)

Course Objectives:

- 1.To train students on advances in nanotechnology, synthesis of nanoparticles, carbon fullerenes and nanotubes, micro and mesoporous materials,
- 2.To train students about characterization and properties of nano-materials.

Course Outcomes:

- 1.Study of emerging technology in field of Nanotechnology.
- 2.Study of Chemical potential as a function of surface Curvature.
- 3.To know the process of Nano-particles synthesis.
- 4.To study the properties of Nano-materials.

CO Mapping with PO and PSO:

C O	Programme Outcomes										Programme Specific Outcomes		
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P S O 1	P S O 2	P S O 3
C O 1	2	1	1	2	3			1			2	2	2
C O 2	1	1	1	2	3			1			2		
C O 3	2	1	2	3	3			1	1		2		1
C O 4	2	1	2	3	3			2	2		3	2	2

Contents:

Unit-I :

Introduction to Nanotechnology: Introduction, Emergence of Nanotechnology, Bottom-Up and Top- Down Approaches, Challenges in Nanotechnology Surface Energy.

Unit-II

Physical chemistry for solid surface:Chemical Potential as a Function of Surface Curvature, Electrostatic Stabilization, Surface charge density, Electric potential at the proximity of solid surface, Van der Waals attraction potential, Interactions between two particles: DLVO theory, Steric Stabilization, Solvent and polymer, Interactions between polymer layers, Mixed steric and electric interactions.

Unit-III

Synthesis of Nanoparticles: Nano-particles Synthesis of metallic nanoparticles, Influences of reduction, reagents, Influences by other factors, Influences of polymer stabilizer, Synthesis of semiconductor nanoparticles, Synthesis of oxide nanoparticles, Introduction to sol-gel processing, Forced hydrolysis.

Unit-IV

Oxide-polymer structures

Characterization and Properties of Nanomaterial: Introduction, Structural Characterization, X-ray diffraction (XRD), Small angle X- ray scattering (SAXS), scanning electron microscopy (SEM), Transmission electron microscopy (TEM), Scanning probe microscopy (SPM), Gas adsorption Application in Nano fluids, Applications in Polymer, and Applications in separation technology.

Text Books:

- 1.Nanostructures and Nanomaterials (synthesis properties and applications, Guozhong Cap, Ying Wang, World Scientific, 2nd Edition, USA 2011.
- 2.Nanotechnology (strategies, industry trends and applications, Jurgen Schulte, Willey, 1st Edition, England 2005.

Reference Books:

- 1.Carbon Nanotubes (Basic concept and physical property, S.Reich, C.Thomsen, J.Maultzsch, Wiley-VCH, 1st Edition, 2004, Weinheim.
- 2.Polymer Rheology theory and practice, Yuri G. Yanovsky, Chapman and Hall, 1st Edition 1993.
- 3.Nanostructured Materials, Gerhard Wilde, Elsevier, 1st Edition, Netherland, 2009.

VLXL551 Real-Time Operating Systems

Teaching Scheme				Cr ed its	Evaluation Scheme			
					Theory			Total Marks
					TA E	C A E	E S E	
T h .	T u .	P r.	Total Hour s				Cont. Evalu ation	

3	-	-	3	3	20	30	50		100
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Mode of Examination: Offline (Paper pen)

Course Objectives

1. Ability to apply knowledge of RTOS based design.
2. To solve problems and introduce device and buses for embedded networking.
3. Explain Real time operating system for inter & intra task communication models

Course Outcomes

1. Describe the general architecture of computers.
2. Describe, contrast and compare differing structures for operating systems
3. Understand and analyses theory and implementation of: processes, resource control, physical and virtual memory, scheduling, I/O and files
4. Distinguish a real-time system from other systems

CO Mapping with PO and PSO:

C O	Programme Outcomes										Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO 1	1	1		1	2			1					2
CO 2	1	1		2	3			1					2
CO 3	1	2	2	2	3			2	1		1	1	3
CO 4	2	2	3	2	3			2	2		1	2	3

Contents

Unit I :

Review Of Operating Systems: Basic Principles - Operating System structures – System Calls – Files – Processes – Design and Implementation of processes– Communication between processes– Introduction to Distributed operating system– Distributed scheduling.

Unit II:

Overview Of RTOS:RTOS Task and Task state - Process Synchronization- Message queues – Mail boxes – pipes Critical section – Semaphores – Classical synchronization problem – Deadlocks

Unit III:

Real Time Models And Languages Event Based – Process Based and Graph based Models – Real Time Languages – RTOS Tasks – RT scheduling - Interrupt processing – Synchronization–Control Blocks– Memory Requirements.

Unit IV:

Real Time Kernel

Principles – Design issues – Polled Loop Systems – RTOS Porting to a Target – Comparison and study of various RTOS like QNX – VX works – PSOS ,RTOS for Image Processing – Embedded RTOS for voice over IP – RTOS for fault Tolerant Applications – RTOS for Control Systems.

Text Books:

- 1.Jane W.S. Liu: Real-Time Systems, Prentice Hall.
- 2.Peter Galvin and Abraham Silberschatz: Operating Systems Principle.

Reference Books:

- 1.Raj kamal : Embedded Systems Architecture programming and Design, Tata McGraw-Hill Publishing Company Limited
- 2.Alan C. Shaw : Real – Time Systems and software; John Wiley & Sons Inc, 2001
- 3.M. Singhal & N.G. Shivaratri : Advanced Concept in Operating Systems Distributed Database & Multiprocessor
- 4.Operating System. Tata McGraw-Hill Publishing Company Limited.

VLXL555: SOFTWARE TECHNOLOGY FOR EMBEDDED SYSTEMS

Teaching Scheme				Credits	Evaluation Scheme				Total Marks
					Theory			Practical	
T h.	T u.	P r.	Total Hou rs		T A E	C A E	E S E	Cont. Evalu ation	
3	-	-	3	3	20	30	50		100

Mode of Examination: Online

Course Objectives

- 1.The main objective of the subject lies in the understanding of embedded programming in application.
- 2.Explain programming concepts and embedded programming in C and C++.

Course Outcomes

- 1) To apply knowledge of programming based design
- 2) To perform complex programming for applicative purpose.

CO Mapping with PO and PSO:

C O	Programme Outcomes										Programme Specific Outcomes		
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P S 1	P S 2	P S 3
C O 1	2	2	2	1	3						2		3
C O 2	2	2	3	1	3			1	1		2	1	3

COURSE:

UNITI:

Software Technology:- Software Architectures, Software development Tools, Software Development Process Life Cycle and its Model, Software Analysis, Design and Maintenance.

UNITII:

Introduction To Data Representation:- Data representation ,Two's complement, Fixed point and Floating Point Number Formats ,Manipulating Bits in -Memory, I/O Ports, Low level programming in C ,Primitive data types , Arrays, Functions ,Recursive Functions, Pointers, Structures & Unions ,Dynamic Memory Allocation ,File handling ,Linked lists, Queues, Stacks

UNITIII:

Mixing C and Assembly:- C and assembly, Programming in assembly ,Register Usage Conventions ,Typical use of Addressing Options, Instruction Sequencing , Procedure Call and Return , Parameter passing ,Retrieving Parameters , Everything in pass by value ,Temporary variables , Input/Output Programming:- I/O Instructions, Synchronization, Transfer Rate & Latency, Polled Waiting Loops, Interrupt – Driven I/O, Writing ISR in Assembly and C, Non Maskable and Software Interrupts

UNITIV:

Memory Management:- Direct Memory Access, Local and Global Scope, Automatic and Static Allocation, Distinguishing Static from Automatic Object Creation, Initialization and Destruction, Dynamic Allocation Unified Modeling Language:- UML basics, Object state behavior - UML state charts - Role of scenarios in the definition of behavior - Timing diagrams - Sequence diagrams - Event hierarchies - types and strategies of operations - Architectural design in UML concurrency design - threads in UML.

REFERENCE BOOKS

1. Daniel W. Lewis, "Fundamentals of embedded software where C and assembly meet", Pearson Education.
2. Bruce Powel Douglas, "Real time UML, second edition: Developing efficient objects for embedded systems (The Addison Wesley Object technology series)", 2nd edition 1999, Addison Wesley
3. Hassan Gomma, "Designing concurrent, distributed, and real time applications with UML", Pearson Education, 2000
4. C.M. Krishna, Kang G. Shin, "Real Time Systems", McGraw - Hill International Editions, 1997
5. By Albert M. K. Cheng, "Real-time systems: scheduling, analysis, and verification" wiley

VLXL560 DSP SYSTEM DESIGN AND IMPLEMENTATION

Teaching Scheme				Credits	Evaluation Scheme			
					Theory			Total Marks
T h	T u	P r.	Total Hours		TA E	C A E	E S E	
3	-	-	3	3	20	30	50	100

Mode of Examination: offline (Paper pen)

Course Objectives

1. To impart Digital Signal Processor basics
2. Third generation DSP Architecture and programming skills
3. Advanced DSP architectures and some applications.

Course Outcomes

1. Acquired knowledge about Fundamentals of DSP Processors.
2. Design complex programming for DSP Architecture.
3. Experiment different optimized algorithm

4. Perform different types application with use of DSP.

CO Mapping with PO and PSO:

C O	Programme Outcomes										Programme Specific Outcomes		
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P S O 1	P S O 2	P S O 3
C O 1	1	1	1	1	3						2		1
C O 2	1	1	1	1	3			1			2		2
C O 3	2	1	2	1	3			1	2		2	2	3
C O 4	2	2	3	2	3			2	2		2	2	3

Contents

Unit I

An overview of DSP concepts-Linear system theory, DFT, FFT, realization of digital filters. Typical DSP algorithms, DSP applications.

Unit II

Data flow graph representation of DSP algorithm. Loop bound and iteration bound Retiming and its applications.

Unit III

Algorithms for fast convolution. Algorithmic strength reduction in filters and transforms. DCT and inverse DCT. Parallel FIR filters. Pipelining of FIR filters. Parallel processing. Pipelining and parallel processing for low power.

Unit IV

Pipeline interleaving in digital filters. Pipelining and parallel processing for IIR filters. Low power IIR filter design using pipelining and parallel processing, Pipelined adaptive digital filters. Round off noise and its computation. Retiming and pipelining. Foster ability to understand architecture of different types of DSP processor 8 bit and 16 bit. Foster ability to design and implementation of different applications using DSP on FPGA

Text Books:

1. Oppenheim and Schaffer, "Discrete time signal processing", Prentice Hall.

2. J. G. Proakis, D. G. Manolakis, "Digital Signal Processing principals", Prentice Hall

Reference Books:

1. Rabinar and Gold, "Theory and Applications of Digital Signal Processing", Prentice Hall

2. Rabinar and Schaffer, "Digital Processing of Speech Signals", Prentice Hall

3. Orfanadis S., "Introduction to Digital Signal Processing", Prentice Hall, 1989

4. S. Salivahanan, A Vallavraj, C. Gnanapriya, "Digital Signal Processing", 2nd Edition, McGraw Hill

VLXL556 AUDIO & SPEECH SIGNAL PROCESSING

Teaching Scheme				Credits	Evaluation Scheme			
					Theory			Practical
T h	T u	P r	Total Hours		TA E	CA E	ES E	Cont. Evaluation
3	-	-	3	3	20	30	50	100

Mode of Examination :- OFFLINE (Paper Pen)

Course Objectives:

1. To study machine speech communication.
2. To study speech synthesis.
3. To represent and reason about knowledge in various new and advanced programming languages and to plan course of actions.
4. To perform evaluation of speech quality

Course Outcome:

The student shall able to

1. Apply machine speech communication approach for given application
2. Extract and recognize important features from complex data
3. To identify challenges to allow humans to communicate with machines and develop speech recognition system using a speech recognition software

CO Mapping with PO and PSO:

CO	Programme Outcomes										Programme Specific Outcomes		
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P S O 1	P S O 2	P S O 3
CO1	1	1	2	1	3			2	1		3	1	1
CO2	1	1	2	3	3			2	3		3	3	1
CO3	1	3	3	3	3			3	3	2	3	3	1

Course Contents:

UNIT I:

Introduction Audio communications aspects; Frequency Analysis, Audio chain, digital representations of Audio; intensity level of sound, Audio production: anatomy and physiology, universal Audio production model.

Speech signal analysis (Time domain methods; Frequency domain methods; Pitch estimation spectrogram analysis; Cepstrum analysis). Linear prediction coding: (Least squares autocorrelation and covariance methods; Line spectral frequencies).

UNIT II:

Psychoacoustics and auditory perception (Hearing; critical bands; phenomena of masking; Mel scale; perceptually important features of speech; prosodic features). Speech signal coding: (Speech coder attributes; Coding rates; PCM; ADPCM; CELP; Harmonic coding of speech; Coding standards).

UNIT III:

Evaluation of speech quality (Dependencies of quality; Objective and subjective quality evaluation measures; Objective evaluation of subjective quality). Speech synthesis: (Limited and unrestricted text to speech synthesis; Articulatory synthesis; Concatenative synthesis; Incorporation of prosody).

UNIT IV:

Automatic Audio & Speech recognition: (Pattern recognition approach; Dynamic time warping; Feature extraction; HMM; Language models, Verification vs. recognition, recognition techniques; features that distinguish speakers).

VLXL572 HUMAN MACHINE INTERFACE

Teaching Scheme				Credits	Evaluation Scheme				Total Marks
					Theory			Practical	
					TA	CA	EE	Cont. Evaluation	
Th	T	P	Total Hrs						
3	-	-	3	3	20	30	50		100

Mode of Examination: online

Course objectives

- 1.To introduce the basic concepts of brain computer interface.
- 2.To study the various signal acquisition methods.

3.To study the signal processing methods used in BCI.

Course outcome

- 1.Demonstrate the basics concept in the field of brain sensing for human-computer interaction research.
- 2.Make use of the various tools used in brain sensing.
- 3.Illustrate the steps required to use real-time brain sensing data as input to an interactive system.
- 4.Make use of the required features and classify the signal for applications.

CO Mapping with PO and PSO:

CO	Programme Outcomes										Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PSO 1	PSO 2	PSO 3
CO1	2	1	3	2	3			1	1		2	1	1
CO2	1	1	1	2	3			1	2		2	1	1
CO3	1	1	1	2	3			3	2		2	3	
CO4	2	1	3	3	3			3	3		2	3	1

Contents

UNIT 1

Fundamentals of BCI, Structure of BCI system, Classification of BCI: Invasive, Non-invasive and Partially invasive BCI Brain signal acquisition, Signal Preprocessing, Artifacts removal.

UNIT 2

Sensorimotor activity, Neuronal activity in motor cortex and related areas, Electric and magnetic fields produced by the brain, signals reflecting brain metabolic activity, Mu rhythm, Movement Related Potentials, Slow Cortical Potentials, P300 Event related potential, Visual Evoked Potential, Activity of Neural Cells, Multiple Neuro-mechanisms.

UNIT 3

Methods of Feature Extraction

Time/Space Methods: Fourier Transform, Wavelets, AR, MA, ARMA models, Bandpass filtering, Template matching, Kalman filter, PCA, Laplacian filter – Linear and Non-Linear Features. Linear Discriminant Analysis.

UNIT 4

BCI Applications, Ethics of BCI, Selected research papers

Suggested Books

1.Jonathan Wolpaw,Elizabeth Winter Wolpaw,'Brain Computer Interfaces: Principles and practice", Edition 1, Oxford University Press, USA, January 2012.

2.R. Spehlmann, "EEG Primer", Elsevier Biomedical Press, 1981.

3.Bernhard Graimann, Brendan Allison, Gert Pfurtscheller, "Brain-Computer Interfaces: Revolutionizing Human-Computer Interaction", Springer, 2010

VLXL569- ADVANCED MACHINE LEARNING & DEEP LEARNING

Teaching Scheme				Cr edits	Evaluation Scheme			
					Theory			Total Marks
T h .	T u .	P r .	To tal H ou rs		T A E	C A E	E S E	
3	-	-	3	3	20	30	50	100

Mode of Examination: online

Course Objectives

- 1.To understand machine learning and Deep learning technology.
- 2.An ability to design and investigate application based on AI & deep learning.

Course Outcomes

- 1.Develop an appreciation for what is involved in learning models from data.
- 2.Implement and evaluate a wide variety of learning algorithms.
- 3.Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

CO Mapping with PO and PSO:

C O	Programme Outcomes										Programme Specific Outcomes		
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P S 1	P S 2	P S 3
C O 1	1	1	2		3			2			1		3
C O 2	2	2	3	2	3			3			1		3

C O 3	2	2	3	2	3			3	1		1	1	3
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Contents

UNIT-I:

Penalized and generalized linear models: Logistic regression, L1 and L2 penalization, elastic net, SCAD penalty, application to high dimensional low sample size problems. Intro to neural networks: Artificial neuron, single hidden layer, multiple hidden layer, back propagation, momentum, loss functions, relation with support vector machines and penalized logistic regression.

UNIT-II:

Convolution neural networks: Convolutional layers, pooling layers, drop out, VGGnet, inception modules, residual networks, deconv nets, applications to object recognition. Why deep learning works: Role of depth, closeness of local minima to global minimal, predominance of saddle points and ridges vs. local minima.

UNIT-III:

Recurrent neural networks and LSTMs: lateral connections, LSTM units, gated recurrent networks, applications to NLP. Probabilistic Graphical Models: Factor graphs and belief networks,

UNIT-IV:

Deep belief networks (Adaboost, LeNet) and Boltzmann machines, sampling methods including Gibbs sampling, contrastive divergence, generative adversarial networks. Introducing Tensor flow, KERAS: overview, installation, platform, Algorithm and related application.

Text/References

1. Deep Learning by Goodfellow, Bengio and Courville.
- 2.Probabilistic Graphical Models: Principles and Techniques by Koller and Friedman.

VLXL554 DIGITAL SYSTEMS DESIGN WITH FPGA

Teaching Scheme				Cr edits	Evaluation Scheme			
					Theory			Total Marks
T h .	T u .	P r .	Total Hour s		T A E	C A E	E S E	
3	-	-	3	3	20	30	50	100

Mode of Examination: OFFLINE

Course Objectives

1. To understand the language based Digital System Modeling.
2. Understanding the design flow to VHDL language.
3. It is expected that students should be able to model digital systems and implement using CPLD and FPGA devices with less hardware consumption.

Course Outcomes

1. To understand digital systems modeling using VHDL.
2. Write correct synthesizable System VHDL models along with test benches.
3. Design digital systems that are reconfigurable for testing and test it on FPGA.

CO Mapping with PO and PSO:

C O	Programme Outcomes										Programme Specific Outcomes		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PS 1	PS 2	PS 3
CO 1	2	1	2	1	3			2	1		3	2	1
CO 2	2	2	3	2	3		1	2	3		3	3	1
CO 3	2	3	3	2	3	1	1	3	3		3	3	2

Contents

UNIT I

Programming Technologies – ROMs & EPROMs PLA . PAL gate Arrays Programmable gate arrays and applications, Antifuse FPGA, Synthesis methods for FPGA. Hardware Description Language. Design entities, architecture Bodies, Block Statements, processes data types. Operators. Classes of Objects, Attributes, Functions and Procedures, Packages Control Statements.

UNIT II

Behavior modeling.- Process Statement, Assertion Statement, Sequential wait Statement, Formatted ASCII I/O Operations Structural Modeling ; parts Library wiring of

Primitives. Wiring of Iterative networks. Modeling a test bench.

UNIT III

Chip Level Modeling : Chip level modeling structures modeling delay, process model graphs, Functionally partitioned models, Timing Assertion, Setup & Hold time for clocked devices, Design rule checks System Modeling : Modeling system interconnection, general model for signal interconnection, Multiplexing of signals. Multiple valued logic.

UNIT IV

Processor model. RAM model. UART model, Parallel I/O Ports, Interrupt controller Simulation with the physical model, simulation, writing test bench, converting real and interconnection, Multiplexing of signals. Multiple valued logic. Processor model. RAM model. UART model, Parallel I/O Ports, Interrupt controller. Simulation with the physical model, simulation, writing test bench, converting real and integer to time. Dumping results into text file, reading vectors from text file, test bench example. Advance topics on Digital System design

Books:

1. Navabi Z, "VHDL Analysis and Modeling of Digital Systems". Prentice Hall, 1993
2. J. Bhasker "VHDL Primer", Pearson Education, 2000
3. Armstrong & Grey. "VHDL Design. Representation and Synthesis", PHPTR, 2000
4. James R. Armstrong, "Chip Level Modeling with VHDL", Prentice hall, 1989

VLXL570 -LOW POWER VLSI DESIGN

Teaching Scheme				Credits	Evaluation Scheme			
					Theory			Total Marks
Th	Tu	P	Total Hours		TA E	CA E	ES E	
3	-	-	3	3	20	30	50	100

Mode of Examination: offline (Paper pen)

Course Objectives

1. To understand the concept of VLSI circuit of low power operation
2. To design various circuits for optimize power
3. To understand case study of low power design

Course Outcomes

1. Recognize advance issue and classify the mechanism of power dissipation in VLSI System and specific deep submicron Technology.
2. Model Power dissipation, use optimization techniques for technology level, Circuit level, and System level designs.

Mapping with PO and PSO:

C O	Programme Outcomes										Programme Specific Outcomes		
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P S O 1	P S O 2	P S O 3
C O 1	1	2	2	1	3			1			3	1	2
C O 2	1	2	2	1	3			1	3		3	3	3

Contents

Unit I: Low Power CMOS VLSI Design

Introduction, Sources of power dissipation, designing for low power, Simulation, Low Power CMOS VLSI Design, Power Dissipation in CMOS, Short Circuit & Dynamic power dissipation, Load Capacitances Low power VLSI Design Limits, Architecture and Systems Advanced Techniques, Special Techniques. Power dissipation in MOSFET devices.

Unit II: Power Estimation

Power Analysis- Probabilistic Power Analysis, Signal Probability Calculation, Probabilistic technique, Statistical technique, Glitches, Estimation of Power. Power Estimation at circuit level & higher level.

Unit III: Low Power Static RAM Architecture

Low Power Static RAM Architectures, MOS static RAM memory cell, reducing voltage swing on bit lines, reducing power in write driver circuits and sense amplifier circuit, Methods for achieving low core voltages from a single Supply.

Unit IV: Energy Recovery Technique and software Design for low power Energy Recovery Circuit design, Designs with partially reversible logic, Supply clock generation, Sources of Software power dissipation,

Software power estimation, software power optimization. Related applications.

Text Books:

1. Kaushik Roy, Sharat Prasad, "Low Power CMOS-VLSI Circuit Design", 2000

Reference Books:

1. Gary Yeap "Practical Low Power Digital VLSI Design", 1997.

VLXL565 - PATTERN RECOGNITION

Teaching Scheme				Credits	Evaluation Scheme			
					Theory			Practical
T h .	T u .	P r.	Total Hours		TA E	CA E	ES E	Cont. Evaluation
3	-	-	3	3	20	30	50	100

Mode of Examination: offline (Paper pen)

Course Objectives

1. Understand basic concepts in pattern recognition
2. Gain knowledge about state-of-the-art algorithms used in pattern recognition research.
3. Apply pattern recognition techniques in practical problems.

Course Outcomes

At the end of this course, students will be able to:

1. Explain and compare a variety of pattern classification, structural pattern recognition, and pattern classifier combination techniques.
2. Apply performance evaluation methods for pattern recognition, and critique comparisons of techniques made in the research literature.
3. Apply pattern recognition techniques to real-world problems such as document analysis and recognition.

Mapping with PO and PSO:

CO	Programme Outcomes										Programme Specific Outcomes		
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 10	P S O 1	P S O 2	P S O 3
CO1	1	1	2	1	3						1		2
CO2	1	1	2	1	3			1	1		1	1	2
CO3	2	2	3	2	3			1	1		1	1	3

Contents:

UNIT-I:

Introduction to Pattern Recognition Tree Classifiers, Decision Trees, Random Forests, Bayesian Decision Theory, Linear Discriminants
Discriminative Classifiers: the Decision Boundary, Separability, Perceptron, Support Vector Machines.

UNIT-II:

Parametric Techniques: Bayesian Decision Theory, Maximum Likelihood Estimation, Bayesian Parameter Estimation, Sufficient Statistics
Non-Parametric Techniques: Kernel Density Estimators, Parzen Window, Nearest Neighbor Methods.

UNIT-III:

Unsupervised Methods: Component Analysis and Dimension Reduction, the Curse of Dimensionality, Principal Component Analysis, Fisher Linear Discriminant, Locally Linear Embedding, Clustering.

UNIT-IV:

Classifier Ensembles: Bagging, Boosting AdaBoost, Graphical Models, Dynamic Bayesian Networks and related application

References:

1. Devi V.S.; Murty, M.N. (2011) Pattern Recognition: An Introduction, Universities Press, Hyderabad.
2. R. O. Duda, P. E. Hart and D. G. Stork, Pattern Classification, Wiley, 2000.

VLXL564 - LINEAR ALGEBRA & NUMERICAL METHODS

Teaching Scheme				Credits	Evaluation Scheme			
					Theory			Total Marks
Th	Tu	Pr	Total Hours		TA	CA	EE	
3	-	-	3	3	20	30	50	100

Mode of Examination: offline (Paper pen)

Course Objectives

After completing this course, the students should be able to:

1. Understand basic concepts in linear algebra and related concepts

2. Apply different numerical method to solve different mathematical model.

Course Outcomes

At the end of this course, students will be able to:

1. Comprehend the use of various forms of complex numbers to solve numerical problem
2. Apply knowledge of basic terms and concepts of numerical method for mathematical application

Mapping with PO and PSO:

CO	Programme Outcomes										Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	3	2	2	1	2						2		2
CO2	3	3	2	3	2				1		2	2	2

Contents:**Unit I**

Definitions of matrices, sub-matrices, square matrices, lower and upper triangular matrices, diagonal matrices, identity matrices, symmetric matrices, skew-symmetric matrices. Matrix Operations: Matrix transpose, addition, multiplication. Linear Systems: Definition, homogeneous systems, elementary row operations, echelon form of a matrix, row echelon form, reduced row echelon form.

Unit II

Vector Algebra: Linear combination, Linear independence, vector space, vector subspaces, dimension and basis of a vector space, null space, determinant, inverse and rank of matrices. Eigen analysis of Matrices: Eigen values and eigenvectors, characteristic equation, matrix diagonalization, quadratic forms. Introduction to a Software Package – MATLAB.

Unit III

Numerical errors, absolute and relative errors, stability and convergence of numerical algorithms. Computation of Zeros: Bisection method, false position method, Newton method, secant method and fixed-point method. Interpolation: Lagrangian polynomials, Newton's divided difference method, least square approximation. Prepared by Ben M. Chen 4 Course Outlines (cont.) Numerical Integration: Newton-Cotes Method, trapezoidal rule, Simpson's 1/3 rule and Simpson's 3/8 rule.

Unit IV

Numerical Solutions to Ordinary Differential Equations: Taylor series method, Euler method, Runge-Kutta method. Numerical Solutions to Partial Differential Equations: Classification of 2nd order quasilinear PDE, numerical solutions.

References Book

1. Linear Algebra & Numerical Methods. Ben M. Chen.
2. Numerical Linear Algebra by Sundarapandian

VLXL552: ADVANCED DIGITAL SIGNAL PROCESSING AND APPLICATION

Teaching Scheme				Cr edits	Evaluation Scheme			
					Theory			Total Marks
T h .	T u .	P r .	To tal H ou rs		T A E	C A E	E S E	
3	-	-	3	3	20	30	50	100

Mode of Examination: offline (Paper pen)

Course Objectives

- 1.To introduce the student to advanced digital processing techniques
- 2.To study multirate signal processing fundamentals
- 3.To study parametric methods for power spectrum estimation
- 4.To study adaptive filtering techniques and to study the applications of adaptive filtering
- 5.To study the analysis of speech signals.
- 6.To introduce the students to wavelet transforms & advanced dsp processor's

Course Outcomes

1. Design optimum filtering algorithms & apply them to various signals
2. Modeling of spectrum analysis using non-parametric as well as parametric approaches
3. Introduce spectrum estimation for non-parametric methods Power Spectral Density, Auto Correlation Function and transfer function

Mapping with PO and PSO:

C O	Programme Outcomes										Programme Specific Outcomes		
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	P O 7	P O 8	P O 9	P O 1	P S	P S	P S

										0			
											0	0	0
											1	2	3
C O 1	1	1	1	1	3				2	2	2	2	2
C O 2	2	1	1	1	3				2	2	2	2	2
C O 3	1	2	2	2	3				2	3	2	3	3

Contents

UNIT I

Overview of digital signal processing, Multirate Signal Processing: Introduction, Sampling and signal Reconstruction, sampling rate conversion,

UNIT II

Decimation by an integer factor, interpolation by an integer factor, sampling rate conversion by rational factor, Direct form Realization of FIR systems, linear phase and Polyphase FIR structures.

UNIT III

Multirate FIR Filter Design: Design of FIR filters for sampling rate conversion, Multistage implementation of sampling rate conversion, Applications of Interpolation and decimation in signal processing operations, sub-band processing, Decimated filter banks, Power Spectral Estimation: Estimation of spectra from finite duration observations of a signal, periodogram, use of DFT in power spectral estimation, .

UNIT IV

Adaptive Filters, Introduction, Examples of Adaptive Filtering, Adaptive Equalization, Adaptive Noise Cancelling, Echo Cancellation, Application of DSP in voice processing, Biomedical Engineering, Radar, Introduction to Wavelets.

BOOKS:

- 1.Oppenheim and Schaffer, "Discrete time signal processing", Prentice Hall
- 2.J. G.Proakis, D. G.Manolakis, "Digital Signal Processing principals", Prentice Hall
- 3.Rabinar and Gold, "Theory and Applications of Digital Signal Processing", Prentice Hall
- 4.Rabinar and Schaffer, "Digital Processing of Speech Signals", Prentice Hall
- 5.Orfanadis S., "Introduction to Digital Signal Processing", Prentice Hall, 1989

VLXL567: REAL TIME SIGNAL PROCESSING AND EMBEDDED SYSTEMS

Teaching Scheme				Credits	Evaluation Scheme			
					Theory			Total Marks
Th	Tu	Pr	Total Hours		TA	CA	EE	
3	-	-	3	3	20	30	50	100

Mode of Examination: offline (Paper pen)

Course Objectives

1. Analyze digital signal processing systems with use of embedded application
2. To study Signal processing based embedded system

Course Outcomes

Upon completion of this course students will be able to

- 1.To Apply knowledge of DSP for applications development
2. Experiment DSP programming methods for small systems and related issues.

Mapping with PO and PSO:

CO	Programme Outcomes										Programme Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PSO1	PSO2	PSO3
CO1	2	1	2	1	3			1	2		2	1	1
CO2	2	1	2	2	3			2	2		2	2	2

Contents:

UNIT I -

OVERVIEW OF DSP

Digital signal processing basics – processing model
s for dsp – common filters – adaptive digital systems – non-linear systems.

UNIT II -

DSP APPLICATIONS-I

Spectral analysis and modulation – RLS estimation, pseudo-inverse. Kalman filter – data compression methods, Huffman algorithm, LZW coding, Vocoder, LPC, MP3 coding.

UNIT III -

DSP APPLICATIONS – II

Error correcting codes and channel coding, hamming Distance and error correction, CRC, Reed Solomon codes, convolution codes, Viterbi decoding, interleaving – practical issues in using DSP.

UNIT IV -

DSP PROGRAMMING

Overview of DSP algorithms – DSP architectures – optimizing DSP software – RTOS for DSP, testing and debugging DSP systems– embedded DSP software design using multicore SoC architectures.

BOOKS:

- 1.Burns and Wellings Real-Time Systems and Programming Languages (Third Edition), Addison Wesley Longmain 2001
- 2.White, E. Making Embedded Systems, O'Reilly Media 2012
- 3.Noergaard, T Embedded Systems Architecture, Elsevier 2004.
4. Dag Stranneby, William Walker, "Digital Signal Processors and applications", Elsevier, 2003.
- 5.Robert Oshana, "DSP Software Development Techniques for embedded real time applications", Elsevier, 2006.
6. S. Salivahanan, A Vallavraj, C. Gnanapriya, " Digital Signal Processing", 2nd Edition, McGraw Hill.



G H RAISONI COLLEGE OF ENGINEERING

(An Autonomous Institute affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)

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Department of Electronics & Telecommunication Engineering Programme: Master of Technology in Communication Engineering

Vision of Institute:

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges.

Mission of Institute:

Our efforts will be dedicated to impart quality and value based education to raise satisfaction level of all stake-holders. Our strength will be directed to create competent professionals. Our Endeavour will be to provide all possible support to promote research and development activities.

Vision of the Department:

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards in electronics & telecommunication engineering with /capabilities of accepting new challenges.

Mission of the Department

- 1) To create competent professionals who are trained in the design, implementation of engineering & telecommunication systems .
- 2) To contribute towards the advancement of engineering, science and technology.
- 3) To impart quality and value based education to raise satisfaction of all stake holders.
- 4) To promote research & development activities in the field of electronics & telecommunication engineering and allied areas

Programme Educational Objectives:

Programme: Master of Technology in Communication Engineering

The Programme Educational Objectives of the PG programme of Communication Engineering are designed to produce competent manpower ready to contribute effectively to the advancement of communication engineering and allied areas to accommodate the needs of the profession.

The programme shall:

1. Prepare students for academic excellence by quality education methods.
2. Inculcate the attitude of accepting technological advancements for contributions in the employed organization and Impart advanced knowledge to foster doctoral research.
3. Develop students to exhibit professional and ethical behavior in employed organization with understanding of the social and human context.

Programme Outcomes

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

Programme: Master of Technology in Communication Engineering

SCHEME

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						Mode of Exam
							Theory			Practical		Total	
		Th	Tu	Pr	Total		TAE	CAE	ESE	Int.	Ext.		
SEMESTER-I													
xxxxxxx	Elective-I	3	-	-	3	3	20	30	50			100	Paper Pen
COML552	Advanced Digital Communication	3	-	-	3	3	20	30	50			100	Paper Pen
COMLXXX	Spread Spectrum Communication and Jamming.	3	-	-	3	3	20	30	50			100	Paper Pen
Xxxxxxxx	Elective-II	3	-	-	3	3	20	30	50			100	Paper Pen
Xxxxxxxx	Elective-III	3	-	-	3	3	20	30	50			100	Paper Pen
COMP554	Laboratory-I	-	-	4	4	2	-	-	-	25	50	75	Practical Based
MBA601	Advanced Communication Skill	-	-	2	2	1	-	-	-	25	-	25	Paper Pen
	Total	15	-	8	23	18						600	

Pool of Courses for Elective-I ,Elective-II& Elective-III:

Sr. No.	Code	Course Name
1	COML571	Information Theory
2	COML572	Microwave Devices & Circuits
3	COML573	Advanced Fiber Optical Communication
4	COML574	CDMA Systems
5	COML575	Embedded System Design
6	COML576	Low Power VLSI Design
7	COML577	DIP and Wavelet Signal Processing
8	COML578	Human and Machine Speech Communication
9	COML587	Information Hiding and Data Encryption
10	COML590	Wireless Sensor Networks
11	COML551	DSP Processor and Architecture

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						Mode of Exam	
		Th.	Tu	Pr.	Total		Theory			Practical		Total		
							TAE (20)	CAE (30)	ESE (50)	Int.	Ext.			
SEMESTER-II														
COML555	Analysis of Transmission Line	3	-	-	3	3	20	30	50			100	Paper Pen	
Xxxxxxxx	Elective–IV	3	-	-	3	3	20	30	50			100	Paper Pen	
COML594	Systems spectral analysis of signals	3	-	-	3	3	20	30	50			100	Paper Pen	
Xxxxxxxx	Elective-V	3	-	-	3	3	20	30	50			100	Paper Pen	
Xxxxxxxx	Elective–VI	3	-	-	3	3	20	30	50			100	Paper Pen	
COMP558	Laboratory-II	-	-	4	4	2	-	-	-	25	50	75	Practical Based	
IDA401	Research Methodology	-	-	2	2	1	-	-	-	25	-	25		
	Total	15	-	8	23	18						625		

POOL OF COURSES FORELECTIVE-IV ,ELECTIVE-V&ELECTIVE VI :

Sr. No.	Code	Course Name
1	COML579	Estimation and Detection Theory
2	COML580	Microwave Propagation and Systems
3	COML581	Adaptive Signal Processing
4	COML582	Wireless Communication and Broadband Technology
5	COML583	Processors and Embedded Controller
6		Radio Spectrum Engineering and Management
7	COML585	Soft Computing
8	COML586	Multi-rate Signal Processing and Filter Banks
9	COML591	FPGA Based Embedded Communication Systems
10	COML592	Guided Wave Optical Components and Devices
11	COML593	Advanced Satellite Communication
12	COML594	Systems Spectral Analysis of Signals
13	COML556	Mobile Communication

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						Mode of Exam
							Theory			Practical		Total	
		Th.	Tu	Pr.	Total		TAE (20)	CAE (30)	ESE (50)	Int.	Ext.		
SEM-III													
COMP559	Industry Project / Research Dissertation (Phase –I)	-	-	8	8	8	-	-	-	150	-	150	Practical Based
	Total	-	-	8	8	8				150	-	150	

Sub. Code	Name of the Course	Teaching Scheme				Credits	Evaluation Scheme						Mode of Exam
		Th.	Tu	Pr.	Total		Theory			Practical		Total	
							(TAE) (20)	(CAE) (30)	ESE (50)	Int.	Ext.		
SEM-IV													
COMP560	Industry Project / Research Dissertation (Phase –II)	-	-	16	16	16	-	-	-	150	150	300	Practical Based
	Total	-	-	16	16	16				150	150	300	

SEMSTER-I**COML552****ADVANCED****DIGITAL****COMMUNICATION (Offline)**

Teaching Scheme				Credi ts	Evaluation Scheme				
					Theory			Practic al	Tota l Mar ks
T h	T u	P r	Tota l Hou rs		TA E	CA E	ES E		
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen**Course Objectives:**

1. Understand basic components of advance digital communication systems.
2. Design optimum receivers for base band modulation techniques.
3. Analyze the Signal detection in discrete time for digital modulation techniques.
4. Design digital & optical communication systems under given power, spectral and error performance Constrain.

Course Outcomes

Student shall be able to

1. Understand the basic of base band data transmission system.
2. Understand basis of Coherent detection in independent noise.
3. Learn the design methodology for Optical Fiber Link Design.

Content:

UNIT I:**(08****Hrs.)**

BASEBAND DATA TRANSMISSION: Nyquist criterion for zero ISI, Correlative level coding. Data detection, Optimum design of transmit and receive filters. Equalization. Linear, adaptive, fractionally spaced and decision feedback equalizers.

UNIT II:**(12****Hrs.)****CONSTANT ENVELOPE MODULATION:**

Advantages of Constant Envelope Modulation; Binary Frequency Shift Keying- Coherent and Non-coherent Detection of BFSK; Minimum Shift Keying-; Gaussian Minimum Shift Keying; M-ary Phase Shift Keying; M-ary Quadrature Amplitude Modulation; M-ary Frequency Shift Keying.

UNIT III:**(10 Hrs.)**

Generation of sub-carriers using the IFFT: Guard Time and Cyclic Extension; Windowing; OFDM signal processing; Peak Power Problem: PAP reduction schemes-Clipping, Filtering, Coding and Scrambling.

UNIT IV:**(08 Hrs.)**

Different synchronization techniques (Early-Late Gate, MMSE, ML and spectral line methods).

UNIT V:**(10****Hrs.)****Communication over Fading Channels:**

Characteristics of fading channels, Rayleigh and Rician channels, receiver performance-average SNR, outage probability, amount of fading and average bit/symbol error rate.

Text Books:

1. J. G. Proakis, Digital Communication (4/e), McGraw- Hill, Fourth Ed., 2001
2. S. Lin & D. J. Costello, Error Control Coding, Pearson Second Ed., 2005
3. G. Keiser, Optical Fiber Communication, McGraw Hill International, Third Ed, 2000

Reference Books:

1. S. Haykin, Communication Systems, Wiley, Fourth Ed, 2001.
2. S. Haykins, Digital Communication, Mc Graw Hill, Int Edition
3. R. E. Zimer & R. L. Peterson, Introduction to Digital Communication, PHI, 2001
4. D.F Mynbacv and L. Scheiner, Fiber optic communication technology, Pearson Education
5. J. Dassm, S. K. Mullick & PK Chatterjee, Principal of Digital Communication, Wiley Eastern Ltd.

COMLXXX Spread Spectrum Communication and Jamming.

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA	CA	ESE	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen**Course Objectives:**

1. Perform analysis on the performance of spread spectrum modulation formats.
2. Analyze the performance of spread spectrum signals in the presence of

multiple access interference (CDMA context).

3. Analyze the performance of spreading code acquisition and tracking circuits.

Course Outcomes:

Student shall be able to

1. Perform analysis on the performance of spread spectrum modulation formats.
2. Describe the differences and benefits of different types of spreading codes.
3. Describe the differences between standard narrowband communication systems and spread spectrum systems.
4. Analyze the performance of spread spectrum systems in the presence of interference.
5. Describe techniques for reducing the impact of interference on spread spectrum signals.

Analyze the performance of spreading code acquisition and tracking circuits.

Course Content:

Unit I:

Types of Spread Spectrum Systems:

Different Spreading Techniques will be addressed, Generation Mechanism of sequences and Waveforms, Code Properties and comparative studies.

Unit II:

Systems under Jamming: Performance Analysis
Concept of code generator polynomial and characteristic equation, Interference Rejection Techniques.

Unit III:

Code Acquisition and Tracking Mechanism, Concept of Fading Channels and Diversity

Unit IV:

CDMA Technology and Interference Handling Mechanisms, MUD and Performance Analysis of CDMA Networks, WCDMA; Low Probability of Intercept Methods.

Text Books:

1. Introduction to Spread Spectrum Communications : Roger L. Peterson, R. E. Ziener, David E. Borth , Pearson Education
2. Wireless Communication –Principles & Practice –T.S.Rappaport, Pearson Edu.,2002

Reference Book:

1. Cellular Mobile Systems Engineering-S. Faruque, Artech House, 1996

ELECTIVE I , II & III

COML551 DSP PROCESSOR & ARCHITECTURE (Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objectives:

1. To introduce concepts of digital signal processing techniques.
2. To know the implementation of DSP & FFT algorithms by programming the DSP TMS320C54XXPROCESSOR
3. To learn about interfacing of serial & parallel communication peripherals.

Course Outcomes:

Student shall be able to

1. Knowledge & concepts of digital signal processing techniques, implementation of DSP & FFT algorithms.
2. Capability for programming the DSP TMS320C54XX PROCESSOR.
3. Interface serial & parallel communication devices like CODEC to the processor.

Contents:

Unit-I : (CO2)

(6hrs)

Architecture of TMS 320C54X processors. Addressing modes. Assembly instructions. Pipelining. Interrupts. Clock generator. Timer. Serial ports. Parallel ports. Host-port interface (HPI).

Unit-II (CO2)

(6hrs)

Comparison with TMS320C55X processor architecture and instruction set.CPU data paths and control, Addressing modes, Instruction set, Pipeline operation.

Unit-III (CO3)

(6hrs)

Interfacing with serial I/O. A/D, D/A converters. Parallel interfacing. Interfacing with RAM, EEPROMs, and FPGAs. Wait state generation. DSP tools: Assembler. Debugger. C Compiler. Linker and loader.

Unit-IV (CO1)

(6hrs)

DSP Applications: Digital Filter Adaptive filters. FIR adaptive LMS algorithm. Convergence of adaptive algorithms. Fast algorithms. Noise canceller, echo canceller and equalizer.

Text Books:

1. B. Venkataramani & M. Bhaskar, Digital Signal Processor, Architecture, Programming and Applications, McGraw-Hill, 2003.
2. S. Lin & D. J. Costello, S. Srinivasan & Avtar Singh, Digital Signal Processing, Implementations using DSP, Microprocessors with Examples from TMS320C54X, Brooks/Cole, 2004

Reference Books:

1. N. Kehtarnavaz & M. Kerama, DSP System Design using the TMS320C6000, Prentice Hall
2. M. Kuo & B. H. Lee, Real-Time Digital, Signal Processing, Implementations, Applications and Experiments with the TMS320C55X

COML553 ERROR CONTROL CODING(Offline)

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen**Course Objectives:**

1. To provide an introduction to traditional and modern coding theory.
2. To introduce the fundamentals of error control coding techniques and their applications

Course Outcomes:

At the end of the course, the students shall be able to

1. Understand the need for error correcting codes in data communication and storage systems.
2. Use the mathematical tools for designing error correcting codes, including finite fields.
3. Know the operating principles of block codes, cyclic codes and Convolutional codes

Course Contents:**UNIT I:**

Review of modern algebra. Galois fields. Linear block codes; encoding and decoding. Cyclic codes, Non-binary codes.

UNIT II:

Convolution codes, Generator sequences, Structural properties, ML decoding, Viterbi decoding, Sequential decoding.

UNIT III:

Modulation codes, Trellis coded modulation, Lattice type Trellis codes, geometrically uniform trellis codes, Decoding of modulation codes.

UNIT IV:

Turbo codes, Turbo decoder, Inter-leaver Turbo decoder, MAP and log MAP decoders, Iterative turbo decoding, Optimum decoding of turbo codes.

UNIT V:

Space-time codes, MIMO systems, Space-time block codes (STBC) – decoding of STBC.

Text Books:

1. S. Lin & D. J. Costello, Error Control Coding (2/e), Pearson, 2005.
2. B. Vucetic & J. Yuan, Turbo codes, Kluwer, 2000

Reference Books:

1. C. B. Schlegel & L. C. Perez, Trellis and Turbo Coding Wiley, 2004.
2. B. Vucetic & J. yuan, Space-Time Coding, Wiley, 2003.
3. R. Johannaesson & K. S. Zigangirov, Fundamentals of Convolutional Coding, Universities Press, 2001.

COML571 INFORMATION THEORY

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	Pr	Total Hours		Theory			Practical	Total Marks
					TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen**Course Objectives**

1. To provide a foundation in information theory – the theory that provides quantitative measures of
2. Information
3. To analyze and characterize the fundamental limits of communication systems.
4. To introduce information theory, the fundamentals of error control coding techniques and their applications

Course Outcomes:

At the end of the course, the students shall be able to

1. Understand the need for error correcting codes in data communication and storage systems.
2. Use the mathematical tools for designing error correcting codes, including finite fields.
3. Know the operating principles of block codes, cyclic codes and Convolutional codes

Course Contents:

UNIT I:

Introduction, Shannon's Noiseless Coding Theorem, Practical Aspects and Signal Recovery, Shannon Fano Theorem. Markov sources; Shannon's noisy coding theorem and converse for discrete channels; Calculation of channel capacity and bounds for discrete channels; Application to continuous channels.

UNIT II:

Waveform Coding: PCM Channel Noise & Error Probability. Speech at Low Bit Rates Prediction & Adaptive Filters. Base Band Shaping for data Transmission. PAM signals & their Power Spectra. Nyquist Criterion, ISI & Eye Pattern Equalization. Base Band & Band Pass, Sampling Theorems, Reconstruction from samples, Practical aspects of sampling & signal recovery TDM.

UNIT III:

Coherent and Non Coherent Detection. Error probability & Bandwidth Efficiency. Bit error analysis using Orthogonal Signaling. Waveform Coding Techniques PCM Channel noise and error probability DPCM and DM Coding speech at low bitrates Prediction and adaptive filters. Base band shaping for data transmission, PAM signals and their power spectra, Eye pattern Equalization.

UNIT I:

Block Codes, Decoding, Viterbi Decoding Algorithm. Digital Modulation Techniques Binary and M-ary modulation techniques, Coherent and non-coherent detection, Bit Vs symbol error probability and bandwidth efficiency.

UNIT IV:

Bit error analysis, using orthogonal Signaling. Error Control Coding Rationale for coding Linear block codes, cyclic codes and convolution codes Viterbi decoding algorithm and trellis codes. Techniques of coding and decoding; Huffman codes and uniquely detectable codes;

UNIT V:

Cyclic codes, convolution arithmetic codes.

Text Books :

1. M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987.
2. Introduction to the theory of Error correcting codes: Vera Press, 1992
3. Information Theory and Reliable Communication: Robert G. Gallanger McGraw Hill, 1992

4. Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, 1983.

Reference Books :

1. N. Abramson, Information and Coding, McGraw Hill, 1963.
2. Principles of Communication Systems By Taub and Shilling, Tata Mc-Graw Hill
3. Digital and Analog communication By Couch, Pearson
4. Communication Systems Engineering, By John G. Proakis Masoud Salehi, Pearson
5. R.B. Ash, Information Theory, Prentice Hall, 1970.

COML 572 MICROWAVE DEVICES AND CIRCUITS

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objective:

1. To understand and study of circuit theory, network analysis, impedance matching technique related to microwave devices
2. To study various microwave passive devices.

Course Outcome:

Students shall able to

1. Understand the working of various passive microwave component and MIC lumped elements
2. Understand the working of various MIC switches and phase shifters
3. Analyze the microwave circuits by applying transmission matrix and scattering matrix
4. Design impedance matching circuits

Course Contents:

UNIT I:

Review of Basic Transmission Line Theory: - waves on ideal transmission line, resistive and capacitive termination lossy transmission line and their termination.

UNIT II:

Circuits theory for waveguide systems: one port circuits, Fosters reactance theorem, Even and odd properties of Z_{in} , N port circuits, two port junctions Transmission (ABCD) matrix, Scattering parameters, generalize matrix for power waves, Signal flow graph,

UNIT III:

Impedance Matching Techniques: Smith chart, Matching networks using lumped elements, Single- and double-stub matching, Quarter wave Transformer

UNIT IV:

Passive devices: Excitation of wave guide, waveguide coupling by Aperture, power dividers, Transmission line resonant circuits, microwave cavity, equivalent circuits for cavities, Dielectric resonator

Planar Transmission Lines - Stripline, microstrip line, Suspended strip line and coplanar line; Parallel coupled lines in Stripline and Microstrip - Lumped elements in MIC, Discontinuities and resonators in Microstrip, Analysis and design of Stripline/microstrip components- Directional couplers, Power divider, Hybrid ring. Switches and Phase Shifters Basic series and shunt switches in microstrip; SPST and SPDT switches, Switched line, branch line coupled and loaded line phase shifters in microstrip, Applications in phased arrays.

Text books:

1. Foundation for microwave engineering , Rodert Collin Wiley
2. Stripline-like Transmission Line for Microwave Integrated Circuits, 1989. B. Bhat & S.K. Koul New Age Intl. (P) Ltd.

Reference books:

1. Radio Frequency and Microwave Communication Circuits – Analysis and Design, 2001. D. K. Misra, John Wiley & Sons,
2. Radio Frequency and Microwave Electronics 2001 M.M. Radmanesh, Pearson Education Asia,

COML573 ADVANCED OPTICAL FIBER COMMUNICATION

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	Pr	Total Hours		Theory			Practical	Total Marks
					TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objectives

1. To study advanced optical communication and fiber characteristics.
2. To study the basic building blocks of an Optical Fiber system.

3. To understand the way of developing coherent light wave and multichannel systems.

Course Outcomes:

Student shall be able to

1. Understand the characteristics of various fiber optic components.
2. Use the knowledge of building blocks of an optical fiber system.
3. Understand the design of coherent light wave and multichannel system.

Course Contents:

UNIT I: [6Hrs]

Introduction To Optical Communication And Fiber Characteristics: Evolution of Light wave systems, System components, Optical fibers - Step Index & Graded index – Mode theory, Fiber modes – Dispersion in fibers, Limitations due to dispersion - Dispersion shifted and dispersion flattened fibers - Fiber Losses - Non-linear effects

UNIT II: [6Hrs]

Optical Transmitters: Basic concepts - LED's structures - Spectral Distribution - Semiconductor lasers - Structures – Threshold conditions - SLM and STM operation - Transmitter design.

UNIT III: [5Hrs]

Optical Detectors And Amplifiers: Basic Concepts - PIN and APD diodes structures, Photo detector Noise, Receiver design. Amplifiers: Basic concepts - Semiconductor optical amplifiers; Raman - and Brillouin amplifiers - Erbium-doped fiber amplifiers, pumping requirements, cascaded in-line amplifiers.

UNIT IV: [4Hrs]

Coherent Lightwave Systems: Homodyne and heterodyne detectors - Modulation formats - Demodulation schemes - BER in synchronous receivers - Sensitivity degradation – Post - and pre compensation techniques - Optical solitons – Soliton based communication system.

UNIT V: [6Hrs]

Multichannel Systems: WDM systems, Multiple access networks - WDM Components - Hetero wavelength linear crosstalk and homo wavelength Linear Crosstalk – TDM, Channel multiplexing and demultiplexing - Code-division multiplexing.

TEXT BOOKS:

1. Optical Fiber Communication – John M. Senior – Pearson Education – Second Edition. 2007
2. Optical Fiber Communication – Gerd Keiser – Mc Graw Hill – Third Edition 2000

3. G.P. Agrawal, "Fiber Optic Communication Systems", 3rd Edition, John Wiley & Sons, New York, 2002
4. Franz & Jain, "Optical Communication, System and Components", Narosa Publications, New Delhi
5. Djafar K. Mynbaev Lowell and Scheiner, "Fiber Optic Communication Technology", Pearson Education Asia, 2001.

COML574 CDMA SYSTEMS

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course objective

1. To study concept of CDMA system.
2. To study different CDMA techniques.
3. To understand the design of Multicarrier

Course Outcomes

At the end of the course, the student shall be able to

1. Understand and apply basic concepts of CDMA system.
2. Apply and Analyze different CDMA Techniques.
3. Design CDMA based system.

Course Contents:

UNIT I: Basic Concepts of CDMA: Spread spectrum communication techniques (DS-CDMA, FH-CDMA), Synchronization in CDMA system, Detection and False alarm probabilities, Early-Late gate measurement statistics, Information capacity of Spread Spectrum Systems.

UNIT II: IS-95 CDMA Techniques: Spreading Codes , Power control, Handover techniques, Physical and logical channels and processing (Forward and reverse links)

UNIT III: WCDMA / CDMA 2000: Introduction to IMT 2000, CDMA 2000 - Physical layer characteristics, modulation & demodulation process, Handoff and power control in 3G systems.

UNIT IV: Multicarrier CDMA Systems: Multicarrier CDMA, System design , Performance parameters – BER lower bound ,Multiuser detection, UTRA, FDD and TDD systems.

UNIT V: Optical CDMA: Prime Codes and it's properties, Generalized and Extended Prime Codes, Experimental demonstration of Optical CDMA, Synchronization of Optical CDMA networks, Multiwavelength Optical CDMA networks.

Text & Books:

1. John G.Proakis, "Digital Communications", McGraw Hill International Ltd, 4th ed., Singapore, 2000.
2. Andrew J. Viterbi, "CDMA: Principles of Spread Spectrum Communication", Addison-Wesley, 1sted. , 1995.

Reference Books

1. Kaveth Pahlavan. K. Prashanth Krishnamuorthy, "Principles of Wireless Networks", Prentice Hall of India, 2006.
2. Vijay Kumar Garg, "IS -95 CDMA and CDMA 2000: Cellular/PCS Systems Implementation", Pearson Education, 2st ed. , 2003.
3. Richard Van Nee, Ramjee Prasad, " OFDM for Wireless Multimedia Communication" , Artech House Boston ,London, 2000.
4. Andreas F. Molisch, "Wireless Communication", Wiley India, 2006.
5. Raymond Steele, Chin-Chun Lee, Peter Gould, "GSM CDMA One and 3G Systems", Wiley India, 2004.

COML575 EMBEDDED SYSTEM DESIGN

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	Pr	Total Hours		Theory			Practical	Total Marks
					TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objectives

1. Develop an understanding of the technologies behind the embedded computing systems
2. Understand technology capabilities and limitations of the hardware, software components
3. Methods to evaluate design tradeoffs between different technology choices.

Course Outcomes

Student shall be able to

1. Understand the basic of embedded system hardware organization
2. Understand basis of real time operating system
3. Learn the design methodology & hardware & software interface

- Study the designing concept of software for embedded system, basics of exemplary RTOS

Course Contents:

UNIT I: Introduction to Embedded Systems:

Definition of Embedded System, Embedded Systems Vs General Computing Systems, History of Embedded Systems, Classification, Major Application Areas, Purpose of Embedded Systems, Characteristics and Quality Attributes of Embedded Systems.

COML576 LOW POWER VLSI DESIGN

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objectives:

- To understand different sources of power dissipation in CMOS.
- To focus on synthesis of different level low power transforms.
- To gain knowledge on low power static RAM architecture & the source of power dissipation in SRAM
- To understand the various energy recovery techniques used in low power design

Course Outcomes:

Students shall be able to:

- Analyze different source of power dissipation and the factors involved in.
- Identify and analyze the different techniques involved in low power SRAM Design.
- Understand various energy recovery techniques.

Course Contents:

UNIT I:

Introduction, Sources of power dissipation, designing for low power, Simulation, Low Power CMOS VLSI Design

UNIT II:

SPICE circuit simulators, gate level logic simulation, capacitive power estimation, static state power, gate level capacitance estimation, architecture level analysis

UNIT III:

Low Power Static RAM Architectures, MOS static RAM memory cell, reducing voltage swing on bit lines, reducing power in write driver circuits and sense amplifier circuit, Methods for achieving low core voltages from a single Supply.

UNIT IV:

Energy Recovery Circuit design, Designs with partially reversible logic, Supply clock generation, Sources of Software power dissipation, Software power estimation, software power optimization.

UNIT V:

Power consumption in circuits. Flip Flops & Latches design, high capacitance nodes, low power digital cells library, Gate reorganization, signal gating, logic encoding, state machine encoding, pre-computation logic, Power & performance management, switching activity reduction, parallel architecture with voltage reduction, flow graph transformation, Algorithmic level analysis & optimization, Architectural level estimation & synthesis.

Text books:

- Kaushik Roy, Sharat Prasad, "Low-Power CMOS VLSI Circuit Design" Wiley, 2000
- Gary K. Yeap, "Practical Low Power Digital VLSI Design", KAP, 2002

References:

- Rabaey, Pedram, "Low power design methodologies" Kluwer Academic, 1997

COML 577DIP & WAVELET SIGNAL PROCESSING

Teaching Scheme				Credits	Evaluation Scheme				
Th	Tu	Pr	Total Hours		Theory			Practical	Total Marks
					TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objective:

- To study Image Representation & Processing
- To study Transformations
- To study DIP Technique for Image Enhancement, Segmentation
- Recent Trends & Application of DIP

Course Outcome:

The student shall able to-

- Apply theoretical and practical approach of modern Image processing
- Apply appropriate technique for application areas with particular stress on pattern

recognition/detection, Classification on image data

3. Apply the techniques, skills, and modern engineering tools such as MATLAB

Course Contents:

UNIT I:

Digital Image Representation-Relationship between pixels Image Enhancements in spatial domain and Frequency domain. Image Restoration techniques. Color Image processing.

UNIT II:

Morphological operations in Binary and Gray Images. Image segmentation: Point, Line and Edge segmentation. Edge linking and Boundary detection. Segmentation using thresholding, Region based segmentation-segmentation by morphological watersheds.

UNIT III:

Digital Image Representation-Relationship between pixels-Image transformations: 2D-DFT, DCT, DST, Hadamard, Walsh, Hotelling transformation, 2D-Wavelet transformation, Wavelet packets.

UNIT IV:

Limitations of standard Fourier analysis, Windowed Fourier transform. Continuous wavelet transforms. Time-frequency resolution, Wavelet bases. Balian-Low theorem, Multiresolution analysis. (MRA), Construction of wavelets from MRA. Fast wavelet algorithm. Wavelet methods for image processing.

UNIT V:

Burt-Adelson and Mallat's pyramidal decomposition schemes. 2D-dyadic wavelet transforms.

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, Digital Image processing, Pearson edition, Inc2/e, 2002.
2. Anil K. Jain, Fundamentals of Digital Image Processing, PHI, 1995
3. E. Hernandez & G. Weiss, A First Course on Wavelets, CRC Press, 1996.2. L. Prasad & S. S. Iyengar, Wavelet Analysis with Applications to Image Processing, CRC Press, 1997.

Reference Books:

1. J.C. Russ, The Image Processing Handbook, (5/e), CRC, 2006
2. R. C. Gonzalez & R.E. Woods; Digital Image Processing with MATLAB, Prentice Hall, 2003
3. A. Teolis, Computational Signal Processing with Wavelets, Birkhauser, 1998

4. R.M. Rao & A.S. Bopardikar, Wavelet Transforms, Addison Wesley, 1998.
5. J.C. Goswami & A.K. Chan, Fundamentals of Wavelets, John Wiley, 1999.

COML 578

HUMAN & MACHINE SPEECH COMMUNICATION

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objectives:

1. To study machine speech communication.
2. To study speech synthesis.
3. To represent and reason about knowledge in various new and advanced programming languages and to plan course of actions.
4. To perform evaluation of speech quality

Course Outcome:

The student shall be able to

1. Apply machine speech communication approach for given application
2. Extract and recognize important features from complex data
3. To identify challenges to allow *humans* to *communicate* with *machines* and develop speech recognition system using a speech recognition software

Course Contents:

UNIT I:

Introduction (Human-machine speech communications aspects; speech chain, digital representations of speech; intensity level of sound). Speech production: (anatomy and physiology of speech organs; articulatory phonetics; acoustic phonetics; phonetics transcription; universal speech production model.)

UNIT II:

Speech signal analysis (Time domain methods; Frequency domain methods; Pitch estimation spectrogram analysis; Cepstrum analysis). Linear prediction coding: (Least squares autocorrelation

and covariance methods; Line spectral frequencies).

UNIT III:

Psychoacoustics and auditory perception (Hearing; critical bands; phenomena of masking; Mel scale; perceptually important features of speech; prosodic features). Speech signal coding: (Speech coder attributes; Coding rates; PCM; ADPCM; CELP; Harmonic coding of speech; Coding standards).

UNIT IV:

Evaluation of speech quality (Dependencies of quality; Objective and subjective quality evaluation measures; Objective evaluation of subjective quality). Speech synthesis: (Limited and unrestricted text to speech synthesis; Articulatory synthesis; Concatenative synthesis; Incorporation of prosody).

UNIT V:

Automatic Speech recognition: (Pattern recognition approach; Dynamic time warping; Feature extraction; HMM; Language models). Speaker recognition: (Verification vs. recognition, recognition techniques; features that distinguish speakers).

COMP 554LABORATORY I

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Int	Ext.	
-	-	4	4	2	-			25	50	75

Mode of Exam :- Practical Base

Course Objective:

1. To understand the advanced tools & Techniques to apply knowledge.
2. To give the depth knowledge of all subject.
3. To design the mini project based on the course they have studied in this semester.

At least twelve experiments are to be performed related to the subjects taught in 1st semester.

Course Outcomes:

Students shall be able to

1. Apply knowledge of advanced tools & Technique while designing the System
2. Demonstrate the tools and design the mini /minor project.

SEMSTER-II

COML555 ANALYSIS OF TRANSMISSION LINE

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objectives:

1. To study various Parameters and Static and dynamic analysis methods of planar transmission line
2. To learn designing methods of microwave filters, amplifier and oscillator.

Course Outcomes:

Students will able to

1. Understand the various analysis methods, static and dynamic properties of planar transmission line
2. Able to design microwave integrate circuits filters.
3. Able to design microwave amplifiers, oscillators according to given specification

Course Contents:

UNIT I:Planar transmission lines:

Characteristics, properties, design parameters and applications for microstrip line, coplanar waveguide, coplanar strips, striplines and slot line.

Basic Passive Components -Lumped elements in MIC, 3 dB hybrid design. Directional Coupler, Hybrid ring and Power dividers Discontinuities and resonators in microstrip

Design of mixers.MIC filters. Kuroda transformation, K inverter, J inverter. Resonator filters.

UNIT II:

Microwave amplifier design. Power gain equations. Maximum gain design. Low noise Design. High power design. Stability considerations.

UNIT III:

Microwave oscillator design. One – port and two – port negative resistance oscillators. Oscillator design using large – signal measurements.

Text books:

1. I.J. Bhal & P. Bhartia,Microwave Solid state Circuit Design,Wiley,2003

2. S. Y. Liao, Microwave Amplifier and Oscillator Design, Pearson Education, 2003
3. T. Itoh, Numerical Techniques for Microwave and Millimeter Wave Passive Structures, John Wiley & Sons, 1989
4. C. Nguyen, Analysis Methods for RF, Microwave and Planar Transmission Line Structures, Wiley, 2000

Reference Books:

1. G. Gonzalez, Microwave Transistors and Amplifiers, Prentice-Hall, Englewood Cliffs, 1984
2. Annapurna Das., Microwave Engineering, Tata McGraw Hill, 2000
3. Soohoo, Microwave Electronics, Addison Wesley
4. C. Nguyen, Analysis Methods for RF, Microwave, and Millimeter-Wave Planar Transmission Line Structures Wiley Interscience, 2000

COML 557 SIGNAL PROCESSING AND SMART ANTENNAS

Teaching Scheme				Credits	Evaluation Scheme				Total Marks
					Theory			Practical	
Th	Tu	P	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objectives:

1. To understand the processing and computation on signals
2. To understand of wireless and mobile system concepts.
3. To study intelligent antennas

Course Outcomes:

Students shall be able to

1. Evaluated a system requirement for the implementation and design appropriate Smart Antenna.
2. Understand from very basic concepts to quite advanced topics in mobile communication and will be able to do research in this area.

Course Contents:

UNIT I:

Introduction: Antenna Gain, Phased Array Antenna, Power Pattern, Beam Steering, Degree of Freedom, Optimal Antenna, Adaptive Antenna, Smart Antenna Equalization and Synchronization:

- Adaptive Equalization: LMS, RLS & Blind adjustment, Timing recovery and carrier recovery.

UNIT II:

Smart Antennas systems : Generalized array signal processing, multiple Beam forming concepts: DOB, TRB & SSBF, Switched beam antennas, spatial diversity, and fully adaptive antennas for enhanced coverage

UNIT III:

Broadband Processing: Tapped-Delay Line Structure, Partitioned Realization, Derivative Constrained Processor, Correlation Constrained Processor

UNIT IV:

SDMA concepts and Smart antennas implementation issues: RF and LNA, IQ Modulator, Mixers, DSP s & Micro-controllers in wireless communication, ASICs and FPGAs.

Text Books:

1. T. S. Rappaport, Wireless Communication: Principles & Practices, Prentice Hall, Second, 2002
2. Liberty & T. S. Rappaport, Smart Antennas for Wireless Communication: IS-95 and Third Generation CDMS applications, Prentice Hall, 1999
3. B. Pattan, Robust Modulation Methods and Smart Antenna in Wireless Communication, Prentice Hall, 2000

ELECTIVE: IV, V AND VI

COML555 MOBILE COMMUNICATION

Teaching Scheme				Credits	Evaluation Scheme				Total Marks
					Theory			Practical	
Th	Tu	P	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objective :

1. To Study the concepts of Generation of mobile communication system
2. To study the different wireless technologies and languages.

Course Outcomes:

At the end of course student shall be able to

1. Apply knowledge in the generation and development of cellular system
2. Design the systems using different markup languages.

Course Contents:

UNIT I:

The Cellular concept, System design, Capacity improvement in cellular systems, Co channel interference reduction, intelligent cell concept and applications.

UNIT II:

Principle of Cellular Communication. Overview 1G, 2G, 2.5G and 3G and 4G technologies. GSM Architecture and Mobility management hand off management Mobile Devices –PDA and mobile OS, Palm OS, Win CE and Symbian.

UNIT III:

Markup Languages, An Introduction to XML, Fundamentals of WML., Writing and Formatting Text, Navigating between Cards and Decks, Displaying Images, Tables, Using Variables, Acquiring User Input.

UNIT IV:

An Introduction to WML Script, WML Script Control Structures Radio propagation and propagation path-loss model Free-space attenuation Multipath channel characteristics Signal fading statistics Path-loss models Sectoring using directional antenna, Multiple access techniques ,FDMA,TDMA,CDMA SDMA Long Term Evolution Technologies (LTE)MIMO channels, Space Time. Codes, LTE Advanced Other Wireless systems IEEE 802.11 WLAN (Wi-Fi) WiMAX

Text Books:

- 1.Yi Bing Lin,Wireless and Mobile Networks Architecture,John Wiley
2. Wrox,The Beginning WML and WML Script Wrox Publication
- 3.Tomasz Imielinski et.al,Mobile Computing Kluwer Academic Press,1996

Reference Books:

- 1.Uwe Hansmann,Pervasive Computing Handbook. The Mobile World,IEEE publication,2002

COML 579 DETECTION AND ESTIMATION THEORY

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	P	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objective:

1. To understand the basic principal of detection Theory
2. To understand the concept of filtering techniques.

3. To understand the estimation of data from different techniques.

Course Outcomes:

Students shall be able to

1. Apply the principle of detection theory.
2. Use filtrating technique for designing digital communication techniques

Course Contents:

UNIT I:

Random Processes: Discrete Linear Models, Markov Sequences and Processes, Point Processes, and Gaussian Processes.

UNIT II:

Detection Theory: Basic Detection Problem, Maximum A posteriori Decision Rule, Minimum Probability of Error Classifier, Bayes Decision Rule, Multiple-Class Problem (Bayes)-minimum probability error with and without equal a priori probabilities, Neyman -Pearson Classifier, General calculation of Probability of Error, General Gaussian Problem, Composite Hypotheses.

UNIT III:

Linear Minimum Mean-Square Error Filtering: Linear Minimum Mean Squared Error Estimators, Nonlinear Minimum Mean Squared Error Estimators. Innovations, Digital Wiener Filters with Stored Data, Real -time Digital Wiener Filters, Kalman Filters.

UNIT IV:

Statistics: Measurements, Nonparametric Estimators of Probability Distribution and Density Functions, Point Estimators of Parameters, Measures of the Quality of stimators, Introduction to Interval Estimates, Distribution of Estimators, Tests of Hypotheses, Simple Linear egression, Multiple Linear Regression.

UNIT V:

Estimating the Parameters of Random Processes from Data: Tests for Stationarity and Ergodicity, Model-free Estimation, Model-based Estimation of Autocorrelation Functions, Power Special Density Functions.

Text Books:

1. K. Sam Shanmugan & A.M. Breipoh,Random Signals: Detection, Estimation and Data Analysis Wiley India Pvt. Ltd,2011

2. Lonnie C. Ludeman, Random Processes: Filtering, Estimation and Detection, Wiley India Pvt. Ltd., 2010

Reference Books:

1. Steven. M. Kay, Fundamentals of Statistical Signal Processing: Volume I Estimation Theory, Prentice Hall 1998
2. Steven. M. Kay, Fundamentals of Statistical Signal Processing: Volume I Detection Theory, Prentice Hall 1998
3. Srinath, Rajasekaran, Viswanathan, Introduction to Statistical Signal Processing with Applications, PHI 2003
4. Louis L. Scharf, Statistical Signal Processing: Detection, Estimation and Time Series Analysis, Addison Wesley, 1991
5. Harry L. Van Trees, Detection, Estimation and Modulation Theory: Part -I, John Wiley & Sons, 2001
6. Mischa Schwartz, Leonard Shaw, Signal Processing: Discrete Spectral Analysis – Detection & Estimation Mc Graw Hill, 1975

COML580 MICROWAVE PROPAGATION AND SYSTEMS

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objective:

1. To understand the electrical characteristics of waveguides and transmission lines through electromagnetic field analysis.
2. To study different measurement techniques.

Course Outcomes:

Students shall be able to

1. Able to analyze radiation patterns of antenna
2. Able to determine electrical characteristics of waveguides through electromagnetic field analysis
3. Able to determine electrical characteristics of planar transmission lines through electromagnetic field analysis

Content:

UNIT I:

Basics of Electromagnetic Theory

: Propagation of electromagnetic waves through material including propagation constant, wave number, attenuation constant dielectric constant and loss tangent. Types of transmission lines, phase velocity, group delay, dispersion. Brief overview of Maxwell's equations, boundary conditions and skin depth.

UNIT II:

Analysis of Transmission Lines: Classification of Wave solutions Field analysis of transmission line, Planar Transmission lines, Micro strip lines, Coplanar lines. Microwave propagation in ferrite, field analysis in Microwave resonators.

UNIT III:

Antenna : Polarization, Radiation Pattern, Performance Antenna Parameters (Radiated Power, Directivity, Gain, Efficiency, Radiation Resistance and Input impedance) Aperture antennas -Horn and dish reflector antennas. Microstrip antennas Rectangular, circular Microstrip patch antennas.

UNIT IV:

Terrestrial Propagation: Basic propagation modes, free space, ground reflection and diffraction Ground wave propagation. Sky wave propagation Atmospheric effects on radio wave propagation Space (terrestrial) wave propagation models in mobile radio systems. Statistical models. Basic diversity and Fading Principles of propagation in rectangular and circular waveguides. Phase velocity and group delay in waveguides, cut off frequencies. Evanescent modes, waveguide modes. Applications of waveguides.

UNIT V:

Microwave measurements: Measurement of: Impedance, Power, Attenuation, Noise / Mismatch corrections / Accuracy and Uncertainty / Vector Network Analyzer (VNA) Basics / Cables and Connectors / Calibration Methods / Calibration in Coaxial line / Calibration on-wafer / Extended VNA practical session – calibration; measurement; verification.

Text Books:

1. Rodert Collin, Foundation for microwave engineering, Wiley
2. D. M. Pozar, Microwave Engineering, John Wiley, 1998
3. D. K. Misra, Radio Frequency and Microwave Communication Circuits Analysis and Design, John Wiley, 2004

Reference Books:

1. G. Gonzalez, Microwave Transistor Amplifiers Analysis and Design, Prentice Hall, 1997
2. S.K. Koul and B. Bhat, Microwave and Millimeter Wave Phase Shifters, Vol. II Semiconductor And Delay Line Phase Shifters Artech House, 1991
3. A.M. Pavio and U.L. Rhode, Microwave Circuit Design using Linear and Nonlinear Techniques, G.D. Vendelin, 1990

**COML 581
PROCESSING****ADAPTIVE SIGNAL**

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen**Course Objectives:**

1. To learn different algorithms used for adaptive signal processing
2. To study the performance evaluation of systems
3. To make students understand synthesis of filters

Course Outcomes:

Student shall be able to

1. design of adaptive filter
2. Modeling systems like multipath communication channels.
3. Apply the skills in designing of kalman filters.

Course Contents:**UNIT I:**

Adaptive systems: Definitions, Characteristics & Applications, Adaptive Linear Combiner, Input signal and weight vectors, Desired Response Performance Function, Gradient & Mean Square Error, Performance function, Gradient & Minimum Mean Square Error, Introduction to Filtering, Smoothing & Prediction, Linear optimum filtering, Orthogonality, Wiener, Hop equation, Performance surface.

UNIT II:

Searching performance surface-stability and rate of convergence - learning curve gradient search - Newton's method - method of steepest descent - comparison - gradient estimation - performance

penalty - variance - excess MSE and time constants - maladjustments

UNIT III:

LMS algorithm convergence of weight vector, LMS / Newton algorithm, Properties, Sequential Regression algorithm, Adaptive Recursive Filters, Random, Search Algorithms, Lattice Structure Adaptive filters with orthogonal signals, Method of Steepest Descent, Comparison of Learning Curves.

UNIT IV:

Applications-adaptive modeling and system identification-adaptive modeling for multi path communication channel, geophysical exploration, FIR digital filter synthesis, inverse adaptive modeling, equalization, and deconvolution-adaptive equalization of telephone channels-adapting poles and zeros for IIR digital filter synthesis

UNIT V:

Kalman filtering: Introduction - Recursive Mean Square Estimation Random variables, Statement of Kalman filtering problem – Filtering -Initial conditions - Variants of Kalman filtering – Extend Kalman Filtering.

Text Books:

1. Bernard Widrow, Samuel D. Stearns, Adaptive Signal Processing, PE, 2005
2. Simon Haykin, Adaptive Filter Theory, PE Asia, Fourth 2002
3. Bernard Widrow and Samuel D. Stearns, Adaptive Signal Processing, Pearson Education, 2005
4. John R. Treichler, C. Richard Johnson, Michael G. Larimore, Theory and Design of Adaptive Filters, Prentice-Hall, 2002
5. S. Thomas Alexander, Adaptive Signal Processing Theory and Application, Springer-Verlag

Reference Book:

1. Sophocles .J. Orfamadis, Optimum signal processing: An introduction, McGraw-Hill, Second, 1988

COML582: WIRELESS COMMUNICATION & BROADBAND TECHNOLOGY

Teaching Scheme	Credi ts	Evaluation Scheme		
		Theory	Practic	Tota

								al	I Mar ks
T h	T u	P r	Tota l Hou rs		TA E	CA E	ES E	Cont. Evaluati on	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objective :

1. To understand the different broadband technology
2. To understand the concept of Wireless Application protocol
3. To understand the advanced wireless communication technology

Course Outcomes:

At the end of course student shall be able to

1. Explain the different broadband technology
2. Apply knowledge of various wireless protocols.

Course Contents:

UNIT I:

The Wireless Application Protocol application environment, wireless application protocol client software, hardware and websites, wireless application protocol gateways, WAP architecture ,WAP transaction model

UNIT :II

Cellular mobile communication beyond 3G GSM, WCDMA- Network planning, MC-CDMA IS-95, GPRS, UMTS, WLAN, Bluetooth, beyond 4G.

UNIT III:

Broad Band Wireless: Fixed Wireless, Direct Broadcast Satellite (DBS), Multi channel multi point distribution services (MMDS), Local multi point Distribution services (LMDS), and Wideband integrated Digital Interactive Services (WIDIS), Mobile Wireless 3G– IMT 2000.

Text Books:

1. S.G. Glisic, Adaptive CDMA, Wiley, 2003
2. A. F. Molisch, Wireless Communications, Wiley, 2005

Reference Books:

1. K. Fazel & S. Kaiser, Multi-carrier and Spread Spectrum Systems, Wiley, 2003
2. S. G. Glisic, Advanced Wireless Communications, 4G Technologies, Wiley, 2004.
3. W. C. Y. Lee, Mobile Communication Engineering. McGraw- Hill, Second, 1998

COML583 PROCESSOR & EMBEDDED CONTROLLER

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objectives:

1. Develop an understanding of the technologies behind the embedded controller systems.
2. Understand technology capabilities and limitations for RISC controllers.
3. Methods to evaluate design tradeoffs between different technology choices.
4. Understand the RTOS Based Embedded Controller.

Course Outcome:

Student shall be able to

1. Understand the basic of Processor & embedded controllers.
2. Understand basis of RISC controller (ARM920T)
3. Design software interface for Embedded Controller
4. Study the designing concept of RTOS and Interfacing using embedded controllers.

UNIT I:

Introduction to ARM920T Processor:

RISC/ARM Design Philosophy, Core, Processor Functional Block Diagram, Data Types, Processor modes, Registers, General Purpose Registers, Program Status Register, CP15 Coprocessor, Memory and memory mapped I/O, Pipeline, Exceptions, Interrupts and Vector table, Architecture revisions, ARM Processor Families.

UNIT II:

Embedded Controller: Embedded Micro controller Cores, Embedded Memories, SRAM, DRAM Controller, and Embedded System Design Aspects.

UNIT III:

Interfacing using Embedded Controller:

Interfacing between analog and digital sections, signal conditioning, interfacing with external systems, User interfacing for Software aspects of Embedded Systems:

UNIT IV:

RTOS Based Embedded Controller: Real time programming languages & operating systems for Embedded Systems, Embedded programming in

C/C++, Scheduler, Multitasking, Threading concepts and implementation.

UNIT V:

Case studies with embedded controller: Serial Communication Interface: UART, SCI applications, Modern Serial Interface Standards, Modems, SPI, I2C, Programmable interface with A/D & D/A interface; Digital voltmeter, control-Robot system; PWM motor speed controller

Text Books:

1. Steve Furber, ARM System-on-Chip Architecture Pearson Education, Second
2. Muhammad Ali Mazidi, Janice Gillispie, The 8051 Microcontroller and Embedded Systems using Assembly and C, Prentice Hall, Second

Reference Books:

1. J. W. Valvo, Embedded Micro computer system Brooks/Cole
2. K. J. Ayala, The 8051 Microcontroller, Pernam Intl.
3. Jack Ganssle, The art of designing Embedded Systems
4. Daniel W. Lewis, Fundamentals of Embedded Software
5. Raj Kamal, Microcontroller - Architecture Programming Interfacing and System Design Pearson Education, First.

COML584 VLSI SIGNAL PROCESSING

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	P	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objective:

1. To study about Digital Filter
2. To study About VLSI Signal processing
3. To study systolic array design methodology
4. To study Convolution Algorithms

Course Outcomes:

Student shall be able to

1. Design Digital filter to increase the performance of system.
2. Evaluate the performance of system by systolic array design methodology.
3. Reduce the arithmetic complexity of circuit using fast convolution Algorithm.

Course Contents:

UNIT I:

Introduction, pipelining of FIR Digital filters parallel processing, Pipelining and parallel processing for low power.

UNIT II:

Re-timing: Introduction, Definition and properties, solving system of inequalities, retiming techniques.

UNIT III:

Unfolding: Introduction An algorithms for unfolding, Properties of unfolding, Critical path, unfolding and retiming, Application of unfolding. Folding: Introduction Folding Transformation, Register Minimization Techniques, Register minimization in folded Architectures Folding if Multi-rate systems

Introduction, Systolic Array Design Methodology, FIR systolic Arrays, Selection of scheduling vector, Matrix Multiplication and 2D systolic array Design, Systolic design for space representations containing Delays.

Introduction, Cook, Toom algorithm, Winograd algorithm, iterated convolution, Cyclic Convolution, Design of Fast Convolution Algorithm by Inspection. Advance topics on VLSI Signal Processing and Algorithm

Text Books:

1. Keshab K. Parhi, VLSI Digital Signal Processing Systems, Wiley-Inter Sciences, 1999
2. Mohammed Ismail, Terri, Fiez, Analog VLSI signal and information processing, McGraw Hill, 994

Reference Books:

1. Kung. S.Y., H.J. White house T. Kailath, VLSI and Modern signal processing, Prentice hall, 1985
2. Jose E. France, Yannis Tsividis, Design of Analog Digital VLSI circuits for telecommunications and signal processing, prentice Hall, 1994

COML585

SOFT COMPUTING

Teaching Scheme				Credits	Evaluation Scheme				Total Marks
					Theory			Practical	
Th	Tu	P	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objectives:

- 1.To study artificial intelligence, neural network and its applications.
- 2.To study the fuzzy logic controller and its design.
- 3.To study PSO algorithm, genetic algorithm & its applications.
- 4.To study LISP applications

Course Outcome:

The student shall able to

1. Apply artificial intelligence, neural network approach for given application
2. Apply appropriate technique of fuzzy logic controller and its design for given application
3. Apply the Genetic Algorithm, ACO, PSO optimization techniques in Hybrid Intelligent system design and modern engineering software tools such as MATLAB

Course Contents:

UNIT I:

AI and applications-Introduction to AI, Knowledge representation, LISP applications, Fuzzy -basic concept, uncertainty, randomness, fuzzy membership function, grade, fuzzy arithmetic ,fuzzy relations, various applications of closed loop and other, fuzzy system, design of FLC

UNIT II:

Neural Network Theory Neuronal Dynamics: Activations and signals, Neurons as functions, signal monotonicity

UNIT III:

Biological Activations and signals, Neuron Fields, Neuron Dynamical Systems, Common signal functions, Pulse-Coded Signal functions, Back propagation algorithm, Optimizations

UNIT IV:

Genetic Algorithms, PSO & its application, Ant colony optimization, Hybrid Intelligent system design.

Text Books:

- 1.Jose E. France, Yannis Tsividis,Design of Analog Digital VLSI circuits for telecommunications and signal processing,prentice Hall,1994
2. M. Amirthavalli,Fuzzy logic & Neural Network
3. Bart Kosko,Neural Networks and fuzzy systems A dynamical systems approach to machine Intelligence ,PHI

Reference Books:

- 1 R. R. Yager ,L. A. Zadeh, K. M. Shahane,An Introduction to Fuzzy logic applications in Intelligent systems

- 2.E. Rich, Knight,Artificial intelligence ,TATA MC Hill
3. J. M. Zurada,Introduction to Artificial neural system
4. David E Goldberg-Addison Wesley,Genetic Algorithms in search, Optimization & Machine Learning
5. Pieter Adriaans and Dolf Zantinge,Data Mining Pearson Education Asia

COML 586 MULTIRATE SIGNAL PROCESSING & FILTER BANDS

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objectives

1. To study modern signal processing
2. To know decimation and interpolation operations
3. To understand the techniques applied in Filter Banks and advanced filtering structures.

Course Outcomes:

Student shall be able to design and application

1. QMF banks.
2. perfect reconstruction filters
3. Cosine modulated filters banks.

Course Contents:

UNIT I:

Fundamentals of Multirate Theory, Sampling at subnyquist rate, Basic Formulations and schemes. Basic Multirate operations: Decimation and Interpolation.

UNIT II:

Digital Filter Banks- DFT Filter Bank- Identities-Polyphase representation, Maximally decimated filter banks: Polyphase representation - Errors in the QMF bank- Perfect reconstruction (PR), QMF Bank - Design of an alias free QMF Bank

UNIT III:

M-Channel Perfect Reconstruction Filter banks, Uniform band and non uniform filter bank, Tree structured filter bank, Errors created by filter bank system, Poly phase representation, Perfect reconstruction systems.

UNIT IV:

Perfect reconstruction (PR) filter banks, Paraunitary PR Filter Banks- Filter Bank Properties induced by paraunitarity- Two channel FIR paraunitary, QMF Bank- Linear phase PR Filter banks- Necessary conditions for Linear phase property- Quantization Effects: -Types of quantization effects in filter banks. - coefficient sensitivity effects, dynamic range and scaling.

UNIT V:

Cosine Modulated filter banks, Cosine Modulated pseudo QMF Bank- Alias cancellation- phase - Phase distortion- Closed form expression- Polyphase structure- PR Systems.

Text Books:

1. N.J. Fliege, Multirate digital signal processing, John Wiley, 1994
2. P.P. Vaidyanathan, Multirate systems and filter banks., Prentice Hall PTR, 1993

Reference Books:

1. Sanjit K. Mitra, Digital Signal Processing: A computer based approach, McGraw Hill, 1998
2. R.E. Crochiere. L. R, Multirate Digital Signal Processing, Inc., Prentice Hall, 1983
3. J.G. Proakis. D.G. Manolakis, Digital Signal Processing: Principles. Algorithms and Applications, Prentice Hall India, Third, 1999.

COMP 558 LABORATORY II

Teaching Scheme				Credits	Evaluation Scheme					
Th	Tu	Pr	Total Hours		Theory			Practical		Total Marks
					TA E	CA E	ES E	Int	Ext.	
-	-	4	4	2	-			25	50	75

Mode of Exam :- Practical Base

Course Objectives:

1. To understand the advanced tools & Techniques to apply knowledge.
2. To give the depth knowledge of all subject.
3. To design the mini project based on the course they have studied in this semester.

At least twelve experiments are to be performed related to the subjects taught in 2nd semester.

Course Outcomes:

Students shall be able to

1. Apply knowledge of advanced tools & Technique while designing the System
2. Demonstrate the tools and design the project.

COML 587 INFORMATION HIDING AND DATA ENCRYPTION

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objective :

1. To understand the concept of data encryption techniques
2. To understand the concepts of data hiding techniques .

Course Outcomes :

At the end of the course students shall be able to

1. Demonstrate and apply the knowledge of different encryption algorithm
2. Demonstrate and apply the knowledge of different Hiding algorithm

Course Contents:

UNIT I:

Introduction to Complexity theory, Elementary Number theory, Algebraic Structures-Groups, Rings and Finite Fields, Polynomials over Finite Fields (Fq).

UNIT II:

Classical Cryptography, Stream Ciphers, and Public Key Cryptography: based on Knapsack problem, AES. Digital Signature, zero knowledge Proofs.

UNIT III:

Information Hiding: Watermarking, Steganography. Objectives, difference, requirements, types (Fragile and robust). Parameters and metrics (BER, PSNR, WPSNR, Correlation coefficient, MSE, Bit per pixel). LSB, additive, spread spectrum methods. Applications: Authentication, annotation, tamper detection and Digital rights management.

UNIT IV:

Hiding text and image data, mathematical formulations, Adaptive steganography, Costa's approach, hiding in noisy channels, Information theoretic approach for capacity evaluation.

Hiding in 1D signals: Time and transform techniques-hiding in Audio, biomedical signals, HAS Adaptive techniques.

Hiding in 2D signals: Spatial and transform techniques-hiding in images, ROI images, HVS Adaptive techniques.

Hiding in video: Temporal and transform domain techniques, Bandwidth requirements.

Stag-analysis: Statistical Methods, HVS based methods, SVM method, and Detection theoretic approach.

Quality evaluation: Benchmarks, Stirmark, Certimark, Checkmark, standard graphs for evaluation.

Text Books:

- 1.Neal Koblitz,A Course in Number Theory and Cryptography ,Springer,Second
- 2.Stefan Katzenbeisser, Fabien A. P. Petitcolas, Information Hiding Techniques for te ganography and Digital Watermarking.,Artech House Publishers,2000
- 3 Neil F Johnson, Et al Kluwer Information hiding: steganography and watermarking attacks and Countermeasures Academic Publishers London

Reference Books:

- 1.Ingmar J Cox,eta al Digital Watermarking, Morgan Kaufman Series, Multimedia information and system

COML 588 MONOLITHIC MICROWAVE INTEGRATED CIRCUIT & TECHNOLOGY

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objective

1. To understand the advantages and limitations of MMIC Designs
2. To understand biasing networks for active circuits.
3. Design gain amplifiers MMICs using lumped and distributed matching.
4. Understand to Calculate the lifetime of MMIC chips in packaged and unpackaged assemblies.

Course Outcomes:

Students shall be able to

1. Apply concept of MMIC Design

2. Apply the concept of designing biasing network
3. Design MMIC chips in packaged and unpackaged assemblies.

Course Contents:

UNIT I:

Introduction to MMIC Design: Advantages and tradeoffs: cost, performance, reliability, size. Applications: Satellite communications, wireless LANs, microwave links, cellular networks. Choosing among device technologies: GaAs FET/pHEMT, GaAs HBT, GaN HEMT MMIC Design cycle : process selection, device characterization, circuit topology decision, design, taping-out, testing.

UNIT II:

Passive MMIC Elements: Lumped element modeling : resistors, capacitors, inductors, via holes. Transmission line modeling : micro strip, coplanar. Combiners and dividers: Wilkinson, Lange. Baluns, coupled lines, transformers, couplers. Design example: 50-to-50 ohm matching network.

UNIT III:

Two-port network basics: S-, Y-, Z-, and H- parameters. Gain definitions : Gmax, MSG, Unilateral gain. Conjugate matching. •Stability analysis : odd mode, even mode analysis.

UNIT IV:

Active Devices: De-embedding, Characterization, modeling. GaAs MESFET, HEMT, HBT, and GaN HEMT Emerging technologies : Si CMOS, SiGe BiCMOS Device parameters : f_t , f_{max} , g_m , R_{ON} , $COFF$, parasitics. Equivalent circuit—physical basis. Intrinsic equivalent circuit. Illustrative example: equivalent circuit extraction. Thermal resistance and lifetime estimation. Design example: choosing FET gate-pitch and bias for 10+ years lifetime.

UNIT V:

Buffer Amplifiers: Biasing network selection. Single stage design: lumped vs. distributed matching. Design example: 30 GHz power amplifier. Multi-stage design. Feedback amplifiers. Design example: 5 GHz, 1/2 – Watt power amplifier.

UNIT VI:

Layout steps: Microstrip layout rules, Coplanar layout rules. Process control and monitoring. Design rules and component values limitations.Reverse engineering.Yield and sensitivity analysis. Testing and Packaging ,Rapid testing: on-wafer, dc- screening. Package design. Package parasitics: cavity effects,

stabilization. Thermal management: epoxy, eutectic.

Text Books:

1. Vi ay K Varadan, Vinoy K J and Jose K A, RF MEMS and Their Applications ,Published by John Wiley & Sons Ltd, England, reprinted, April 2003.
2. J De Los Santos, RF MEMS Circuit Design, Artech House., 2002
3. Gabriel M Rebeiz, RF MEMS Theory, Design and Technology ,John Wiley & Sons Ltd, New Jersey, 2003

Reference Books:

1. Hector J DeLos Santos, RF MEMS Circuit Design for Wireless communications ,Artech House, 2002.
2. Frank Ghenassia, Transaction Level Modeling with SystemC: TLM Concepts and Applications for Embedded Systems, Springer, 2005
3. Luca Benini and Giovanni De Micheli, Networks on Chips: Technology and Tools, Morgan Kaufmann Publishers, 2006.

COML589 WDM OPTICAL NETWORKS

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	P	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objective:

1. To understand the concept of WDM optical network
2. To understand the concepts of different switching techniques used in Optical Network

Course Outcomes:

At the end of the course students shall be able to

1. Demonstrate the principle of optical network
2. Apply the knowledge of Optical switching in the network

Course Contents:

UNIT I:

Optical Networking-Introduction and Challenges: Advantages of optical network, telecom network overview and architecture, WDM optical networks, WDM network evolution, WDM network construction, broadcast and select optical WDM network, wavelength routed optical WDM network, Challenges of optical WDM network.

UNIT II:

Optical Networking Components/Building Blocks:

Optical transmitters, semiconductor laser diode, tunable and fixed laser, laser characteristics, photodetectors, tunable and fixed optical filters, channel equalizers, optical amplifiers and its characteristics, semiconductor laser amplifier, Raman amplifier, doped fiber amplifier, various switching elements, OADM, OXC, CLOS architecture, MEMS, wavelength converters.

UNIT III:

Single and Multi-hop Networks : Introduction to single and multi-hop networks, Characteristics of single and multi-hop networks, experimental single hop networks: LAMBDANET, STARNET, SONATA, Rainbow, experimental multi-hop networks: Shufflenet, De Bruijn Graph, Hypercube.

UNIT IV:

Optical switching: Optical packet switching basics, slotted and unslotted networks, header and packet format, contention resolution in OPS networks, self routing, examples on OPS node architecture, optical burst switching, signaling and routing protocols for OBS networks, contention resolution in OPS networks, multicasting, implementation and application. MEMS based switching, switching with SOAs.

UNIT V: [08Hrs.]

Optical Access Network : Introduction to access network, PON, EPON and WDM EPON: overview, principal of operation, architecture; dynamic wavelength allocation, STARGATE: overview, need, architecture, operation and application, gigabit Ethernet, radio over fiber network.

Text Books:

1. Rajiv Ramaswami and Kumar N. Sivarajan, Optical Networks : A Practical Perspective Harcourt Asia Pte Ltd., Second, 2006
2. Behrouz A. Forouzan, Data Communication by 4th Edition, Mc graw hill., Fourth
3. C. Siva Ram Moorthy and Mohan Gurusamy, WDM Optical Networks: Concept, Design and Algorithms, Prentice Hall of India, First, 2002

Reference Books:

1. P.E. Green, Jr Fiber Optic Networks, Prentice Hall, NJ, 1993
2. Biswanath Mukherjee, Optical WDM Networks Springer ,2006.

COML590 WIRELESS SENSOR NETWORKS

Teaching Scheme	Credits	Evaluation Scheme		
		Theory	Practical	Total

								Cont. Evaluati on	Mar ks
T h	T u	P r	Tota l Hou rs		TA E	CA E	ES E		
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objective:

1. To understand the fundamentals of wireless sensor Network
2. To understand the different routing protocol for WSN

Course Outcomes:

1. At the end of the course students shall be able to
2. Apply knowledge of wireless sensor network.
3. Apply knowledge of various routing protocols for WSN
4. Demonstrate and implement the sensor network

Course Contents:

UNIT I:

Challenges for wireless sensor networks, Comparison of sensor network with ad hoc network, Single node architecture – Hardware components, energy consumption of sensor nodes, Network architecture – Sensor network scenarios, types of sources and sinks, single hop versus multi-hop networks, multiple sinks and sources, design principles, Development of wireless sensor networks.

UNIT II:

Introduction, wireless channel and communication fundamentals – frequency allocation, modulation and demodulation, wave propagation effects and noise, channels models, spread spectrum communication, packet transmission and synchronization, quality of wireless channels and measures for improvement, physical layer and transceiver design consideration in wireless sensor networks, Energy usage profile, choice of modulation, Power Management

UNIT III:

MAC protocols – fundamentals of wireless MAC protocols, low duty cycle protocols and wakeup concepts, contention-based protocols, Schedule-based protocols - SMAC, BMAC, Traffic-adaptive medium access protocol (TRAMA), Link Layer protocols – fundamentals task and requirements, error, control, framing, link management.

UNIT IV:

Gossiping and agent-based uni-cast forwarding, Energy-efficient unicast, Broadcast and multicast, geographic routing, mobile nodes, Data-centric routing – SPIN, Directed Diffusion, Energy aware routing, Gradient-based routing – COUGAR, ACQUIRE, Hierarchical Routing – LEACH, PEGASIS, Location Based Routing – GAF, GEAR, Data aggregation – Various aggregation techniques.

Text Books:

1. Holger Karl & Andreas Willig, Protocols And Architectures for Wireless Sensor Networks, John Wiley,2005
2. Feng Zhao & Leonidas J. Guibas,Wireless Sensor Networks- An Information Processing Approach Elsevier ,2007

Reference Books:

1. Kazem Sohraby, Daniel Minoli, & Taieb Znati Wireless Sensor Networks- Technology, Protocols, And Applications. John Wiley ,2007
2. Anna Hac, Wireless Sensor Network Design, John Wiley ,2003

COML591 FPGA BASED EMBEDDED COMMUNICATION SYSTEMS

Teaching Scheme				Credits	Evaluation Scheme				Total Marks
					Theory			Practical	
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objectives

1. Develop an understanding of the technologies behind the FPGA & Communication systems
2. Understand technology capabilities and limitations for multi rate digital signal processing
3. Analyze the speech coding technique for FPGA based system design.
4. Methods to evaluate design tradeoffs for encoder and decoder.

Course Outcomes

Student shall be able to

1. Understand the basic of FPGA based communication system design.
2. Understand basis of digital filter & multitone modulation techniques.
3. Learn the design methodology for CORDIC architectures.

4. Study the designing concept of speech coding and Encoder and decoder technique.

Course Contents:

UNIT I:

FPGA based design : FPGA fundamentals, design and implementation, Logic Blocks, Routing Architecture, Design flow technology mapping for FPGAs.

UNIT II:

Introduction to ADSL Modem Discrete multi tone modulation and its realization using DFT.

Implementation and verification on FPGAs

UNIT III:

CORDIC (coordination Rotation Digital computer): CORDIC architectures, Computation of special functions using CORDIC. Vector and rotation mode of CORDIC. Digital down converters and demodulators Universal modulator and demodulator using CORDIC and Implementation and verification on FPGAs Block diagram of a software radio.

UNIT IV:

CIC filters. Residue number system and high speed filters using RNS. Implementation and Verification on FPGAs

UNIT V:

Speech coding- Speech coding using linear prediction. CELP coder. Block diagrams of encoders and decoders of G729. Implementation and verification on FPGAs

Text Books:

1. J. H. Reed, Software Radio, Pearson, 2002
2. U. Meyer – Baese, Digital Signal Processing with FPGAs, Springer, 2004.

Reference Books:

1. Tsui, Digital Techniques for Wideband receivers Artech House, 2001
2. S. K. Mitra, Digital Signal processing, McGrawHill, 1998.

COML 592: GUIDED WAVE OPTICAL COMPONENTS AND DEVICES

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	P	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course objective

1. To understand the concept of optical components and amplifiers
2. To understand the principle of optic fibers sensors
3. To understand the fiber optic Fabrication, Modeling, and Applications:

Course Outcomes:

Students shall be able to

1. Apply knowledge of designing the optic fiber amplifier
2. Designing optical fiber communication system using amplifier sensors etc.

Course Contents:

UNIT I:

Single-mode fiber designs, recent development of polymer optical fiber and its applications: Micro structured optical fibers: Photonic Band gap Bragg fibers: Radial effective index method for the analysis of micro structured fibers: Some important nonlinear effects in optical fibers

UNIT IV:

Fiber-optic parametric amplifiers for light wave systems; Erbium doped fiber amplifiers: Fiber-optic Raman amplifiers: Application of numerical analysis techniques for the optimization of wideband amplifier performances: Analog and digital transmission using high-power

UNIT IV:

Fiber amplifiers: Optical amplifiers for dynamic optical networks: Fused fiber couplers: Fabrication, Modeling, and Applications: Side-polished evanescently coupled optical fiber overlay devices: Fiber gratings : Enhancing photo sensitivity of optical fibers Solitons in fiber Bragg gratings: Advances in DWDM multiplexing/ demultiplexing Technologies : Dispersion tailored higher order mode fibers for in-line fiber photonic devices ,Principles of fiber optic sensors, Structural strain and temperature measurements using FBG sensors

Text Books:

1. Bishnu Pal, Guided Wave Optical Components and Devices- Ed. , Elsevier
2. Rajiv Ramaswami, Kumar N Sivarajan and Galen H. Sasaki, Optical Networks -A practical perspective, Third

Reference Books:

1. Martin Maier, Optical switching networks, First
2. Gred Keiser, Optical fibre communications, Fourth
3. Hearold Kolimbins, Fiber optics communications,

COML593 ADVANCED SATELLITE COMMUNICATION

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course objective:

1. To study basic concept of Satellite Communication system.
2. To study different multiple access techniques.
3. To study architecture and technologies of VSAT network.

Course outcome:

At the end of course, the student shall be able to

1. Understand basic concept of advanced satellite communication.
2. Used different multiple access technique.
3. Understand the design of VSAT system

UNIT I:

Introduction to Satellite Communication

Orbital mechanics look angle determination, orbital perturbation, launchers and launch vehicles, orbital effect in communication system performance, satellite subsystem, altitude and orbit control system, telemetry tracking command and monitoring, power system, communication subsystem, satellite antennas

UNIT II:

Satellite Link Design

Basic transmission, system noise temperature, G/T ratio, design of down links, satellite system using small earth station, uplink design, design of specified C/N, system design examples.

UNIT III:

Multiple Access Techniques

Introduction, FDMA, TDMA, onboard processing, DAMA, random access, packet radio systems and protocols, CDMA.

UNIT IV:

Propagation Effects

Quantifying attenuation and depolarization, propagation effects not associated with hydrometer-rain and ice effects, prediction of rain attenuation, and prediction of XPO-propagation impairment counter mechanism.

UNIT V:

VSAT systems

Overview, network architecture, access control protocols, basic techniques, VSAT earth station, calculation of link margins for VSAT star network, system design procedure, VSAT Technologies - Network Configurations - Multi access and Networking Network Error Control - Polling VSAT Networks.

Text Books:

1. Timothy Pratt, Charles W Bostian, Jeremy E Allnut
Satellite Communication, Wiley, 2007
2. Wilbur L. Pritchard, Hendri G. Suyderhood, Robert A. Nelson, Satellite Communication Systems Engineering, Prentice Hall, New Jersey., Second
3. Dennis Rudy, Satellite Communication, Regents/Prentice Hall, Fourth.

Reference Books:

1. Maini, Agrawal, "Satellite Communication", Wiley 2014
2. Bruce R. Elbert, The Satellite Communication Applications Hand Book, Artech House

COML 594 SPECTRAL ANALYSIS OF SIGNALS

Teaching Scheme				Credits	Evaluation Scheme				
					Theory			Practical	Total Marks
Th	Tu	Pr	Total Hours		TA E	CA E	ES E	Cont. Evaluation	
3	-	-	3	3	20	30	50	--	100

Mode of Exam :- Paper Pen

Course Objectives:

1. To Understand Power and Energy spectral density of signals
2. To understand Parametric and non-parametric methods of estimation of PSD
3. To understand Filter bank methods of spectral analysis.

Course Outcomes:

Students shall be able to

1. Apply concepts of Power and Energy spectral density of signals.
2. Calculate Parametric and non-parametric methods of estimation of PSD
3. Design Filter bank of spectral analysis.

Course Content:

UNIT I:

Power Spectral Density: Energy spectral density of deterministic signals, Power spectral density of random signals, Properties of PSD.

UNIT II:

PSD Estimation - Non-parametric methods: Estimation of PSD from finite data, Non-parametric methods: Periodogram properties, bias and variance analysis, Blackman-Tuckey method, Window design considerations, time-bandwidth product and resolution - variance trade-off in window design, Refined periodogram methods: Bartlett method, Welch method.

UNIT III:

Parametric method for rational spectra: - Covariance structure of ARMA process, AR signals, Yule-Walker method, Least square method, Levinson-Durbin Algorithm, MA signals, Modified Yule-Walker method, Two stage least square method, Burg method for AR parameter estimation. Parametric method for line spectra: Models of sinusoidal signals in noise, Non-linear least squares method, Higher order Yule-Walker method, MUSIC and Pisarenko methods, Min-norm method, ESPRIT method.

UNIT IV:

Filter bank methods: Filter bank interpolation of periodogram, Slepian base-band filters, refined filter bank method for higher resolution spectral analysis, Capon method, Introduction to higher order spectra.

Text Books:

1. R. L. Moses, Introduction to Spectral Analysis, Stochastic, Prentice Hall
2. Kay S M, Modern Spectral Estimation Theory & Applications, Prentice Hall
3. Marple, Introduction to Spectral Analysis, Prentice Hall

COMP 559 DISSERTATION (PHASE –I)

Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TA	CA	ESE	Int.	Ext.	
	-	8	8	8				150		150

Mode of Exam :- Practical Base

Course Objectives:

1. To understand the ideas regarding the research topic and research Objectives.
2. To marshal knowledge of content issues from their respective fields.

3. To articulate, summarize and present their dissertation feasibility.

Course Outcomes:

Students shall be able

1. To select and identify broad area of research
2. To do a proper literature review, analyze data and put forward the findings
3. To define the problem statement as outcome of literature review
4. To get conversant with relevant hardware and software tools to be used for carrying out dissertation work
5. To deliver and improve upon the seminar delivery skills.

COMP 560 DISSERTATIONS (PHASE –II)

COWI 300 DISSERTATIONS (PHASE II)										
Teaching Scheme				Credits	Evaluation Scheme					
					Theory			Practical		Total Marks
Th	Tu	Pr	Total Hours		TA	CA	EE	Int.	Ext.	
	-	16	16					150	150	300

Mode of Exam :- Practical Base

Course Objectives

1. To make independent, systematic progress on their individual dissertation work
2. To undertake the extensive research work and conduct the experimentation work for finding the solution of defined and problem in dissertation Phase-I course of III Semester.
3. To present the work accomplished for further suggestions and implementation.
4. To articulate, summarize, and present their dissertation studies

Course Outcomes:

At the end of the course students shall be able to

1. To interpret relevant scientific theories and literature of concerned identified topic and defined problem.
2. To plan the research work execution in phased manner and link the different phases of work for proper research work outcome.
3. To design, implement and simulate the system and experimental setup with techno managerial skills

4. Undertake an extensive and independent research work and perform experimentation, analyze and interpret data and records to put forward the conclusion in the form of outcome of research work carried out.
 5. To document the dissertation work carried out effectively and to present the dissertation work and finding thereof.
-



G H RAISONI COLLEGE OF ENGINEERING

(An Autonomous Institute affiliated to Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur)
Accredited by NAAC with 'A+' Grade

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COURSE-BOOK POST GRADUATE PROGRAMMES M.Tech (CAD/CAM)

VISION & MISSION OF DEPARTMENT

Institute

Vision

To achieve excellent standards of quality education by keeping pace with rapidly changing technologies and to create technical manpower of global standards with capabilities of accepting new challenges.

Mission

Our efforts are dedicated to impart quality and value based education to raise satisfaction level of all stake-holders. Our strength is directed to create competent professionals. Our endeavour is to provide all possible support to promote research and development activities.

The Vision and Mission of the Department are derived from Vision and Mission of Institute

Department

Vision

To be recognized internationally for quality education and research in mechanical engineering with excellence in the fields of design, manufacturing and thermal sciences.

Mission

- To impart quality and value based education to raise satisfaction level of all stake holders.
- To promote research and development activities in the field of mechanical engineering and allied areas.
- To create competent mechanical engineering professionals who are trained in the fields of design, manufacturing and thermal sciences

Programme Educational Objectives

The educational objectives of the mechanical engineering programme are designed to produce competent engineers who are ready to contribute effectively to the advancement of mechanical engineering causes and to accommodate the needs of the profession. The mechanical engineering department is dedicated to graduating mechanical engineers who:

1. Shall practice mechanical engineering in the general disciplines of design, thermal and manufacturing engineering in industry and establishments in government and private sectors.
2. Shall apply fundamental technical knowledge and skills to find workable solutions to technological challenges and problems in various areas of mechanical engineering.
3. Shall pursue advanced education, research and development, and creative efforts in mechanical engineering and allied areas of science and technology.

4. Shall practice mechanical engineering in a responsible, professional and ethical manner for the benefit of the industry and society.

Program Specific Outcomes

1. Demonstrate industrial practices learned through internship and solve the industrial problem using technical knowhow acquired.
2. Apply skill in multi disciplinary area of renewable energy, automotive, agricultural & heat transfer
3. Utilize skill in developing innovative prototype concepts enabling to protect intellectual property rights

Program Outcomes

The students will be able to learn:

- **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations
- **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
- **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

HIGHLIGHTS OF DEPARTMENT

- Outcome Based Education since 2010
- 03Professors
- 05 faculty members are Ph. D holders

- RPS, MODROBS, IEDC, IEI Grants worth Rs. 1.20 Crore
- 52 patents filed
- Six month Industry Internship for students at seventh semester level
- Audit courses in UG & PG scheme
- Department Industry Advisory Board
- Approved Research Center for Ph.D.
- 03 Ph.D. Supervisors
- Financial support from Institute for UG & PG projects
- Financial support for publications
- In journals and conferences.
- MoUs with industries & institutes
- Skill enhancement programmes
- Research paper publication mandatory for PG students
- Research Methodology workshops
- One month industry internship of PG students
- IIT / NIT Professors on BOS

FACULTY WITH PH.D. TEACHING TO CAD/CAM

Sr. No.	Name Of Faculty	Designation	Qualification	Experience (Years)
1.	Dr. S. B. Jaju	Professor	M. Tech (IE) Ph.D, M.B.A.	22
2.	Dr. V. N. Bhaiswar	Associate Professor	M. Tech. (MMD), Ph. D	26
3.	Dr. A. M. Khalatkar	Associate Professor	M. Tech. (MMD), Ph. D	18
4.	Dr. N. P. Awate	Assistant Professor	M. Tech. (MMD), Ph. D	12
5.	Dr. V. Francis	Assistant Professor	M.Tech (CAD/CAM), Ph.D	06

PROGRAMME CO-ORDINATOR

Programme	Coordinators	Mobile No.
M. Tech (CAD/CAM)	Dr. A.M.Khalatkar	8669181689/7755990803

PROGRAMME CURRICULUM

Parameters	M.Tech. (CAD/CAM)
Total Theory	10
Total Practical	04
Total Audit	02
Total Credits	60
Total Marks	1650
Total Elective courses	18

PG Scheme

- Total six electives
- Two electives in 1st and 2nd Semester.
- Each elective having three subject choice

One month Industry Internship Mandatory for admission in 4th Semester

Three audit courses

- Teaching Methodology
- Research Methodology and
- Advanced Communication Skill

STRUCTURE OF THE CURRICULUM M.Tech (CAD/CAM)

Subject Code	Name of the Course	Mode of Examination	Teaching Scheme				Credits	Evaluation Scheme					
			Th.	Tu	Pr.	Total		Theory			Practical		Total
								TAE (20)	CAE (30)	ESE (50)	Int.	Ext.	
SEM-I													
CADL439	Computer Graphics for CAD/CAM	Online	4	-	-	4	3	20	30	50	-	-	100
CADP439	Computer Graphics for CAD/CAM	Practical Based	-	-	2	2	1	-	-	-	25	25	50
CADL440	CNC & Robotics	Offline	3	1	-	4	3	20	30	50	-	-	100
CADP440	CNC & Robotics	Practical Based	-	-	2	2	1	-	-	-	25	-	25
CADL441 CADL442 CADL443	Elective-I	Offline	4	-	-	4	3	20	30	50	-	-	100
CADL444 CADL445 CADL446	Elective-II	Offline	4	-	-	4	3	20	30	50	-	-	100
CADL447 CADL448 CADL449	Elective- III	Offline	4	-	-	4	3	20	30	50	-	-	100
MBA602	Advanced Communication Skills	Viva-Voice	-	-	2	2	1	-	-	-	25	-	25
Total			19	01	06	26	18	-	-	-	-	-	600

Elective I:

CADL441 Computer Integrated Manufacturing
 CADL442 Project Management and Finance
 CADL443 Total Quality Systems and Engineering

Elective II:

CADL444 Data Structures & Algorithm
 CADL445 Artificial Intelligence and Expert systems
 CADL446 Product Data Management

Elective III:

CADL447 Optimization Techniques
 CADL448 Design of Experiments
 CADL449 Vibration Analysis and Condition Monitoring

Subject Code	Name of the Course	Mode of Examination	Teaching Scheme				Credits	Evaluation Scheme					
			Th.	Tu.	Pr.	Total		Theory			Practical		Total
								TAE (20)	CAE (30)	ESE (50)	Int.	Ext.	
SEM-II													
CADL547	Product Design and Development	Offline (Hackathon Based)	4	-	-	4	3	20	30	50	-	-	100
CADP547	Product Design and Development	Practical Based	-	-	2	2	1	-	-	-	25	25	50
CADL548	Finite Element Analysis	Offline	3	1	-	4	3	20	30	50	-	-	100
CADP548	Finite Element Analysis	Practical Based	-	-	2	2	1	-	-	-	25	-	25
CADL549 CADL550 CADL551	Elective- IV	Offline	4	-	-	4	3	20	30	50	-	-	100
CADL552 CADL553 CADL554	Elective- V	Offline	4	-	-	4	3	20	30	50	-	-	100
CADL555 CADL556 CADL557	Elective- VI	Offline	4	-	-	4	3	20	30	50	-	-	100
IDA403	Research Methodology	Viva-Voice	-	-	2	2	1	-	-	-	25	-	25
Total			19	01	06	26	18	-	-	-	-	-	600

Elective-IV:

CADL549 Modeling and Simulation
 CADL550 Computational Methods for Design
 CADL551 Computer Aided Tool Design

Elective-V:

CADL552 Plastics and Composites
 CADL553 Manufacturing System Integration and Management
 CADL554 Fracture Mechanics and Fatigue

Elective VI:

CADL555 Advanced Machine Design
 CADL556 Design of Piping System
 CADL557 Design of Material Handling System

Subject Code	Name of the Course	Mode of Examination	Teaching Scheme				Credits	Evaluation Scheme					
								Theory			Practical		Total
			Th .	T u	Pr .	Total		TAE (20)	CAE (30)	ESE (50)	Int. .	Ext .	
SEM-III													
CADP632	Industry project Dissertation/Research (Phase I)	Viva-Voice	-	-	8	8	8	-	-	-	150	-	150
Total			-	-	8	8	8	-	-	-	150	-	150

Subject Code	Name of the Course	Mode of Examination	Teaching Scheme				Credits	Evaluation Scheme					
								Theory			Practical		Total
			Th	T	Pr	Total		TAE (20)	CAE (30)	ESE (50)	Int.	Ext.	
SEM-IV													
CADP633	Industry project Dissertation/Research (Phase II)	Viva-Voice	-	-	10	10	16	-	-	-	150	150	300
Total			-	-	10	10	16	-	-	-	150	150	300

**G. H. Raison College of Engineering,
Nagpur-16
Full time PG course in CAD/CA**

**M (Autonomous)
Autonomy Syllabus
M. Tech. (CAD/CAM)**

FIRST SEMESTER

**CADL 439 - Computer Graphics for
CAD/CAM (4-0-0-4)**

Course Objectives:

1. To understand the role of computer graphics in CAD/CAM and contemporary terminology, progress issues and trends in computer graphics.
2. To understand the computer graphics techniques such as geometric transformations, geometric algorithms, 3D modeling, vector representation of geometric entities, 3D object models (surface, volume and implicit), visible surface algorithms.
3. To study the 2D and 3D orthographic and perspective projection which is wide variety of applications and examples due the interdisciplinary nature of computer graphics

Unit-I

Role of computer graphics in CAD/CAM, fundamentals of 2D graphics, menu design and Graphical User Interfaces (GUI), customization and parametric programming.

[7Hrs]

Unit-II

Vector representation of geometric entities, lines, circle, arc, conics, homogeneous

coordinate systems, geometric transformations, 2D and 3D, orthographic and perspective projection, hidden line removal algos.

[9 Hrs]

Unit-III

Planar and space curve design, analytical and synthetic approaches, parametric and implicit equations. surface of revolution, sweep surfaces, ruled and developable surfaces

[8Hrs]

Unit-IV

Modeling of bi parametric freeform surfaces, Coons, Bezier, B-spline, Rational B-Splines and NURBS surface patches, surface manipulation techniques, geometric modeling techniques, wireframe modeling. solid modeling, B-Rep, CSG and hybrid modelers, feature based parametric and variational modeling.

[8Hrs]

Unit-V

Introduction to product data standards and data structures, data-base integration for CIM.

[6

Hrs]

Advanced topics on the subject

Practicals:

These including some open ended practicals, shall be based on above syllabus.

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Demonstrate an understanding of contemporary graphics hardware
2. Create interactive graphics applications in C++ using one or more graphics application programming interfaces

3. Write program functions to implement graphics primitives
4. Write programs that demonstrate geometrical transformations

Books:

1. Faux, I.D. and Pratt, M.J., 'Computational Geometry for Design and Manufacture', John Wiley & Sons, NY, 1979
2. Mortenson, M.E., 'Geometric Modelling', John Wiley & Sons, NY, 1985.
3. Choi, B.K., 'Surface Modeling for CAD/CAM', John Wiley & Sons, NY, 1991
4. Martti Mantyla, 'An Introduction to Solid Modeling', Computer Science Press
5. Ibrahim Zeid, 'CAD/CAM', TMH
6. Rogers D F I and Adams J A, 'Mathematical Elements for Computer Graphics', McGraw-Hill, 1996
7. Multineux, 'CAD -Computational Concepts and Methods', Kogan Page Ltd, 1984
8. Ding Q. and Davies B. J. , 'Surface Engineering Geometry for Computer-Aided Design and Manufacture, Ellis Horwood, 1987
9. Hiroaki C., 'Solid Modelling with Design Base', Addison Wesley Publishing Co., 1998
10. Hoschek J., Dieter L., 'Fundamentals of Computer Aided Geometric Design', A K Peters, 1997

FIRST SEMESTER

CADL 440 - CNC & Robotics (3-1-0-4)

Course Objectives:

1. To understand constructional details and operations of CNC lathe and milling as well as part programming.
2. To learn about working of Wire EDM machine.
3. To enable learning about constructional and operational details of robotics as well as programming.

Unit-I

Concepts of NC, CNC, DNC, classification of CNC machines, machine configurations, types of control, CNC controllers characteristics, interpolators. cutting tool materials, carbide inserts classification; qualified semi qualified and preset tooling, tooling system for machining centre and turning centre, work holding devices, of CNC Machines.

[7Hrs]

Unit II

Programming CNC machines, part print analysis and process planning, advanced programming features, canned cycles, subroutines, macros, special cycles etc, APT part programming using CAD/CAM, parametric programming, manual part programming for CNC turning, milling and machining center.

[8Hrs]

Unit III

Wire EDM machines, computer assisted part programming techniques, conversational and graphics based software, solids based part programming. freeform surface machining, simulation and verification of CNC programs, adaptive CNC control techniques, integration of CNC machines for CIM, robotics - basic concepts, robot configurations , basic robot motions, types of drives, applications

[7Hrs]

Unit IV

Transformations and kinematics, vector operations, translational transformations and rotational transformations, properties of transformation matrices, homogeneous transformations and manipulator, forward solution, inverse solution. controls and end effectors, control system concepts , analysis, control of joints, adaptive and optimal control end effectors, classification, mechanical, magnetic, vacuum, adhesive, drive systems and gripper design.

[8Hrs]

Unit V

Robot programming, methods, languages, computer control and robot software – programming languages, sensory devices, non optical and optical position sensors, velocity and acceleration, range, proximity, touch, slip, force, torque, machine vision, image components, representation, hardware, picture coding, object recognition and categorization, integration of robots with CNC machines for CIM.

[8Hrs]

Advanced topics on the subject

Practicals:

These including some open ended practicals, shall be based on above syllabus.

Course Outcomes:

After successfully completing the course students will be able to:

1. Work with CNC lathe, milling, wire EDM machines and machining center.
2. Write programmes using manual part programming technique and APT for CNC lathe and milling machine.
3. Select appropriate robot for the given application.
4. Integrate the CNC machines with robot.

Books:

1. Krar, S., and Gill, A., 'CNC Technology and Programming', McGraw Hill publ Co, 1990.
2. Gibbs, D., 'An Introduction to CNC Machining', Casell, 1987.
3. Seames, W.S., 'Computer Numerical Control Concepts and Programming', Delmar Publishers, 1986.
4. Lynch, M., 'Computer Numerical Control for Machining', McGraw Hill, 1992.
5. Koren Y., 'Computer Control of Manufacturing Systems', McGraw, 1986

FIRST SEMESTER

Elective- I

CADL 441 - Computer Integrated Manufacturing (4-0-0-4)

Course Objectives:

1. To learn different types of manufacturing systems, in particular the manufacturing cell and the flexible manufacturing systems (FMS).
2. To learn the basics of computer assisted numerical control programming and programming languages.
3. To learn the concepts of computer integrated manufacturing and management system, automated flow lines and common CAD/CAM data base.
4. To learn using automated material handling, inspection and quality control systems in manufacturing.
5. To learn criteria required for implementing CAD/CAM systems and use associated software for design and manufacturing.

Unit I

Concept and scope of CIM, components of CIM, benefits, limitations, introduction to Group Technology, limitations of traditional manufacturing systems, characteristics and design of groups, benefits of GT and issues in GT, part families, classification and coding, production flow analysis, machine cell design, benefits.

[7Hrs]

Unit II

Introduction & components of FMS, application work stations, computer control and functions, planning, scheduling and control of FMS, scheduling, knowledge based scheduling, hierarchy of computer control, supervisory computer, manufacturing data systems, data flow, CAD/CAM considerations, planning FMS database.

[8Hrs]

Unit III

Automated material handling systems, AS/RS, general considerations, selection, evaluation and control, inspection and quality control, CAQC, CMM types, working, applications.

[7Hrs]

Unit IV

Process planning in the manufacturing cycle, Process planning and production planning, process planning and concurrent engineering, CAPP, variant process planning, generative approach, forward and backward planning, input format, logical design of a process planning, Implementation considerations, manufacturing system components.

[8Hrs]

Unit V

Overview of rapid product development, product developing cycle, definition of rapid product development, virtual prototypical and rapid manufacturing technologies, physical prototyping & rapid manufacturing technologies-synergic integration technologies, other rapid prototyping technologies such as three dimensional printing (3DP), solid based, liquid based and powder based 3DP systems.

[8Hrs]

Advanced topics on the subject

Course Outcomes:

On completion of the course, the student will be able to:

1. Design, develop, select and integrate process equipment for flexible manufacturing and computer integrated manufacturing systems.
2. Develop high technology manufacturing systems based on common data bases.
3. Develop process planning under diverse manufacturing situations.
4. Identify and develop control systems for implementing production plans.

Books:

1. Nanua Singh, 'Systems Approach to Computer Integrated Design and Manufacturing', John Wiley & Sons, 1996.

2. Groover M.P., 'Automation, Production Systems and Computer Integrated Manufacturing', Prentice-Hall of India Pvt. Ltd., New Delhi, 2002
3. Jha, N.K., 'Handbook of Flexible Manufacturing Systems', Academic Press Inc., 1991.
4. Burbidge, J.L., 'Group Technology in Engineering Industry', Mechanical Engineering pub. London, 1979.
5. Askin, R.G. and Vakharia, A.J., 'G.T Planning and Operation in The automated factory-HandBook: Technology and Management, Cleland, D.I. and Bidananda, B (Eds), TAB Books, NY, 1991.
6. Irani, S.A., 'Cellular Manufacturing Systems', Hand Book.
7. Kamrani, A.K, Parsaei, H.R and Liles, D.H. (Eds), 'Planning, Design and Analysis of Cellular Manufacturing Systems', Elsevier, 1995.
8. Gideon Halevi and Roland D. Weill, 'Principles of Process Planning - A Logical Approach', Chapman & Hall, 1995.

FIRST SEMESTER

Elective- I

CADL 442 - Project Management & Finance (4-0-0-4)

Course Objectives:

1. To obtain an understanding and ability to use basic business financial management concepts in the context of project execution.
2. To understand capital budgeting, cost of capital, capital structure and resource allocation.
3. To be able to analyse and periodically monitor financial performance of project.
4. To apply financial leveraging for short term and long term financial policies for business and relate capital investment decisions and financial policies to business valuations.

Unit-I

Project Management Concepts - Characteristics of a project need for project

management, roles of project managers, project planning: statement of work (SOW) and overall project goals, work breakdown structure (WBS), preparation of task-flow network, CPM-PERT, Gantt chart, schedule the completion of all work elements, planning project communication, quality planning.

[8Hrs]

Unit II

Cost Estimating and Budgeting - Preparing cost estimates, budgets and expenditures, effort and time estimation, developing cost summaries for tracking project expenditures, developing cost forecasts to proactively control future planned expenditures, resource allocation - identifying resource requirement, scheduling resources, analyze optimal labor utilization for cost effectiveness and schedule efficiency.

[8Hrs]

Unit III

Project Performance Measurement and Control - Concept of earned value performance measurement, use of Project Management Information Systems (PMIS) to monitor, evaluate, and control planned cost and schedule performance, conducting periodic project performance evaluation audits.

[8Hrs]

Unit IV

Project Evaluation and Termination - Analyzing project performances versus cost and schedule constraints, identify causes associated with project success and failure, ways in which a project can be terminated upon completion.

[8Hrs]

Unit V

Concept of Business Finance - Finance function & scope in organization, responsibilities of finance executive, goals & objectives of financial management, functional areas, long term sources of financing : shares, debentures, term loans, lease & hire purchase, retained earnings, public deposits, bonds (types, features &

utility), short term sources of financing: bank finance, commercial paper & trade credit & bills discounting internal: retained earnings, depreciation policies.

[8Hrs]

Advanced topics on the subject

Course Outcomes:

After successful completion of this course the students will be able to:

1. Develop understanding and ability to use basic business financial management concepts in the context of project execution.
2. Prepare capital budget, estimate cost of capital, develop capital structure and allocate resources.
3. Analyse and periodically monitor financial performance of project.
4. Understand short term and long term financial policies for business and relate capital investment decisions to project performance.

Books :

1. Meredith and Mantel, 'Project Management - A Managerial Approach' , John Wiley and Sons, Fifth Edition, 2003. Course Text.
2. J. Davidson Frame, 'The New Project Management', Jossey-Bass, 1994.
3. Harold Kerzner, 'Project Management', Van Nostrand Reinhold, 1979.
4. Milton D. Rosenau, 'Successful Project Management', Lifelong Learning, 1981.
5. Ravi Kishore, 'Financial Management', Taxmann's.
6. S. M. Inamdar, 'Financial Management', Everest Publishing house, 12th Edition 2004
7. Sharma & Gupta , 'Financial Management', Kalyani Publishers
8. P. Shah, 'Financial Accounting for Management', Published by Oxford

FIRST SEMESTER

Elective- I

CADL 443 -Total Quality System & Engineering (4-0-0-4)

Course Objectives:

1. To study the significance and meaning of quality in changing business environment.
2. To study acceptance sampling and different statistical quality control tools and techniques.
3. To understand TQM, quality cost concepts and application of different Japanese management approaches for improving productivity and quality.
4. To understand ISO 9000 and others quality systems for world competitiveness.

Unit I

Customer focus, principles of quality management, pioneers of quality, quality assurance, core concepts of TQM, quality costs, quality system, quality planning, benchmarking, re-engineering, business leadership, quality & productivity inter-relations

[8Hrs]

Unit II

Organization structure for managing quality, information systems and documentation, quality auditing, ISO 9000 - QS 9000, QMS, quality awards

[7Hrs]

Unit III

Cutting the cost of quality, single vendor concept, just in time, lean and agile manufacturing, quality function deployment, quality circles, Kaizen, Pokayoke, quality engineering, Taguchi methods

[8Hrs]

Unit IV

Methods and philosophy of statistical process control, process capability analysis, control charts for variables and attributes, special adaptations and varieties of control charts

and SPC techniques, organized problem solving, quality improvement tools

[7Hrs]

Unit V

Acceptance sampling, operating characteristic curve, AOQ, single, double and multiple sampling plans for attributes, sequential sampling, and six sigma manufacturing concepts

[7Hrs]

Advanced topics on the subject.

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Apply concepts of quality management to manufacturing operations and use various quality and productivity improvement techniques
2. Implement QFD, quality circles, Kaizen and similar concepts in maintaining and improving quality of manufacturing systems.
3. Use statistical techniques and acceptance sampling for controlling manufacturing processes and quality of products.

Books :

1. Mohamed Zairi, 'Total Quality Management for Engineers', Woodhead Publishing Limited 1991.
2. Harvid Noori and Russel, 'Production and Operations Management - Total Quality and Responsiveness', McGraw-Hill Inc, 1995.
3. N. Logothetis, 'Managing for Total Quality', Prentice Hall of India Pvt .Ltd, 1998
4. John Bank, 'The Essence of Total Quality Management', Prentice Hall of India Pvt. Ltd., 1995.
5. Douglas C. Montgomery, 'Introduction to Statistical Quality Control', 2nd Edition, John Wiley and Sons, 1991.

6. Grant E.L and Leavensworth, 'Statistical Quality Control', McGraw-Hill, 1984.

FIRST SEMESTER

Elective- II

CADL 444 - Data Structures & Algorithm (4-0-0-4)

Course Objectives:

1. To understand the different methods of organizing large amounts of data.
2. To learn the systematic ways of solving data based problems.
3. To learn to programming in C.
4. To implement the different data structures efficiently.
5. To solve specific problems using stack, queue, link list and graphs.

Unit I

Review of basic concepts of OOPs, objects, classes, polymorphism, inheritance, application in CAD/CAM codes. Introduction to data structures, abstract data types, array as an ADT, using one dimensional arrays, arrays as parameters, character string operations, multidimensional arrays.

[8Hrs]

Unit II

structures and classes, stack and its application, definition and examples, primitive operations, recursion, Fibonacci sequence, binary search, recursive chains, recursive definition of algebraic expressions, queues and lists, the queues representation insert operation, priority queue, array implementation of a priority queue.

[8Hrs]

Unit III

Linked lists, inserting and removing nodes from a list, linked implementation of stacks, linked implementation of queues, linked list as a data structure, non integer and non homogeneous lists, dynamic and array implementation of lists, simulation using linked lists simulation process, data structures, other list structures, circular lists, doubly linked lists , multiple linked lists.

[8Hrs]

Unit IV

Trees, binary trees operations, applications, representations of binary tree, internal and external nodes, implicit array representation of binary trees, choosing a binary tree representation, binary tree traversals, heterogeneous binary trees, sorting, efficiency considerations, o notation, efficiency of sorting, exchange sorts, bubble sort, quick sort, selection and tree sorting, straight selection sort, binary tree sorts, heap sort, insertion sorts, simple insertion, shell sort

[8Hrs]

Unit V

Searching, basic search techniques, algorithmic notation, sequential searching, reordering a list searching an ordered table, indexed sequential search, binary search, interpolation search, tree searching, inserting/deleting in a binary search tree

[8Hrs]

Advanced topics on the subject

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Understand the basics of data structures

2. Identify structures and their implementation for handling large amount of data.
3. Develop an appropriate data structure for analysis and applications to problem solving
4. Understand advanced techniques for sorting and searching data efficiently

Books:

1. Langsam Y., Augenstein M. J. & Tenenbaum A. M., 'Data Structures Using C and C++', Prentice Hall of India Pvt. Ltd.
2. Tremblay J. P. & Sorenson P. G., 'An Introduction to Data Structures with Applications', Tata McGraw Hill Pub. Co. Ltd.
3. Horowitz E. & Sahani S., 'Fundamentals of Computer Algorithms', Galgotia Publications Ltd

FIRST SEMESTER

Elective - II

CADL 445 - Artificial Intelligence and Expert Systems (4-0-0-4)

Course Objectives:

1. To study, analyze and simulate different AI techniques, different expert systems, etc.
2. To develop the concepts of AI in real life applications.
3. To study the use of artificial intelligence in machine through the natural language programming.
4. To study the architecture of expert systems and understand the knowledge rule based systems in AI.
5. To learn OOPs in expert system.

Unit I

Human and machine intelligence, artificial intelligence (AI), programming in AI environment, natural language processing (NLP), architecture of an expert system.

[7Hrs]

Unit II

knowledge base, inference engine forward and backward chaining, use of probability and fuzzy logic, selection of inference mechanism, semantic nets, structure and objects, ruled systems for semantic nets, certainty factors, automated learning.

[8Hrs]

Unit III

Introduction to rule based system, conflict resolution, advantages and drawbacks of rule based systems clausal form logic; rule base verification, refinement and validation creating knowledge base, knowledge engineer and domain expert, phases of knowledge engineering, tools for knowledge engineering

[9Hrs]

Unit IV

Neural network applications, artificial neural network models, NN applications in cellular manufacturing and other areas of mechanical engineering

[8Hrs]

Unit V

Fundamentals of OOP (Object Oriented Programming), creating structures and objects, object operations, invoking procedures, programming applications, object oriented expert systems.

[7Hrs]

Advanced topics on the subject

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Apply the basics of AI and expert system to analyze practical problems.

2. Select appropriate AI & expert systems and tools for solving real life problems and their analysis.
3. Understand advanced computing techniques that would help in further research and development.

Books:

1. Addis, T.R., 'Designing Knowledge Based System', Prentice Hall, 1985.
2. Rolston, D.W., 'Principles of Artificial Intelligence and Expert Systems Development', McGraw Hill, 1988.
3. Maus, R. and Keyes, J., 'Handbook of Expert Systems in Manufacturing', McGraw Hill, 1991
4. Robert Levine, 'A comprehensive guide to artificial intelligence and expert systems',
5. Elain Rich, 'Artificial Intelligence', PHI Publication
6. Sasikumar, Ramani, et al, 'Rule based expert systems'.
7. Graham Winstanley, 'Program Design for Knowledge Based Systems', Galgotia Publications.
8. Zurada, 'Artificial Neural Networks'

FIRST SEMESTER

Elective - II

CADL 446 - Product Data Management (4-0-0-4)

Course Objectives:

1. To introduce general idea of database management system.
2. To develop skills to design databases using data modeling and design techniques.
3. To develop skills to implement real life applications which involve database handling.
4. Enable exploring opportunities in designing, storage techniques and data handling and managing techniques

Unit I

Purpose of database systems, view of data, data models, database languages, database users, overall system structure design issues, mapping constraints, keys, entity-relationship diagram, weak entity sets, extended E-R features, design of an E-R database schema

[7Hrs]

Unit II

Structure of relational databases, the relational algebra, tuple relational calculus, the domain relational calculus, extended relational algebra operations, modifications of database, views, basic structure, set operations, aggregate functions, null values, nested sub queries, derived relations, views

[7Hrs]

Unit III

Modification of the database, joined relations, data-definition language, other relational languages, query by example, quell, data log, views domain constraints, referential integrity, assertions, triggers, functional dependencies views, pitfalls in relational-database design, decomposition, normalization using functional dependencies, views.

[8Hrs]

Unit IV

Enterprise Resource Planning: An overview, enterprise – an overview, benefits of ERP, ERP and related technologies, business process reengineering (BPR), implementation lifecycle, implementation methodology, project management and monitoring business modules in an ERP Package: finance, manufacturing, human resources, plant maintenance, materials management, quality management, sales and distribution.

[8Hrs]

Unit V

Fundamentals of PLM, enterprise solution with PLM, impact of manufacturing with PLM, standardized product data and materials data model, PLM service information model, PLM

for e-manufacturing, product design databases, CAD-CAM data management requirements, databases for shop floor control and factory information system, database requirements of computer integrated manufacturing, views.

[8Hrs]

Advanced topics on the subject

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Understand basics of data base management system
2. Identify data models and design techniques involved in the database design process
3. Develop applications for handling data in real life applications.
4. Understand advanced storage methods, indexing techniques, optimization techniques, transaction management processes in database handling.

Books:

1. Abraham Silber Schatz, Henry F. Korth, S. Sudarshan, 'Database System Concepts', McGraw Hill International Editions, Third Edition
2. P. Beynon-Davies, 'Expert Database Systems – A Gentle Introduction', McGraw Hill International; 1991
3. James Martin, 'Database Management Systems'
4. Fredrick H. Jones and Lloyd Martin, 'The AutoCAD Database Book – Accessing and Managing CAD Drawing Information', Galgotia Publications, Third Edition

FIRST SEMESTER

Elective- III

CADL 447 - Optimization Techniques (4-0-0-4)

Course Objectives:

1. To introduce methods of optimization including linear programming and simplex method.
2. To understand different one variable and unconstrained optimization techniques.
3. To learn different direct and indirect methods of optimization under constraints such as random search, sequential linear programming, penalty function method and the augmented Lagrange multiplier method.

Unit I

Basic Concepts: Introduction, optimization concepts, general problem statement, classification of optimization problems, optimization techniques linear programming: introduction, standard linear programming form, possible solutions, the Simplex method, revised Simplex method, duality in linear programming, sensitivity analysis

[8hrs]

Unit II

One Variable Optimization: Introduction, search methods, polynomial approximations, golden section method, other methods, comparison of the methods

[7Hrs]

Unit III

Unconstrained Optimization Techniques: Introduction, zero-order methods, first-order methods, second-order methods, convergence criteria

[8Hrs]

Unit IV

Constrained Optimization Techniques: Direct methods, introduction, random search, sequential linear programming, the method of feasible directions, generalized reduced gradient method, sequential quadratic programming, indirect methods: introduction, the exterior penalty function method, the interior penalty function method, the extended interior penalty function method, the augmented Lagrange multiplier method.

[8Hrs]

Unit V

Further Topics in Optimization: Structural optimization, multiobjective optimization, genetic algorithms.

[7Hrs]

Advanced topics on the subject

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Apply linear programming, simplex method and other tools of optimization.
2. Apply different one variable and unconstrained optimization techniques to engineering systems.
3. Use different direct and indirect methods of optimization under constraints.

Books :

1. S. S. Rao, 'Engineering Optimization', New Age International
2. E. J. Haug and J.S. Arora, 'Applied Optimal Design', Wiley, New York
3. K. Deb, 'Optimization for Engineering Design', Prentice Hall of India
4. G.V. Reklaites, A. Ravindran and K.M. Ragsdell, 'Optimization'
5. N.S. Kambo, 'Mathematical Programming Techniques', Affiliated East-West Press
6. E. L. Golts, 'Differential Equations and Calculus of Variations', Mir Publications.
7. G. N. Vanderplaats, 'Numerical Optimization Techniques for Engineering Design With Applications', McGraw-Hill, 1984

FIRST SEMESTER

CADL 448 - Design of Experiments (4-0-0-4)

Course Objectives:

1. To use statistical concepts in experimentation and data dependent modeling
2. To understand the important role of design of experiments in new product design, manufacturing process development, and process improvement.
3. To analyze the results from planned investigations to obtain conclusions.
4. To use factorial experiments for understanding system behaviour

Unit I

Introduction: Approaches to the study of the research problem and problem formulation, formulation of hypotheses, feasibility, preparation and presentation of proposal for a research investigation, basic principles of design of experiments, some typical applications of experimental design, guidelines for designing experiments, strategy of experimentation.

[8Hrs]

Unit II

Introduction to Statistical Analysis: Probability and probability distributions; binomial, Poisson, exponential and normal distributions and their applications, primary and secondary data, their collection and validation, methods of sampling, regression and correlation analysis, linear regression models, estimate of parameters in linear regression models.

[8Hrs]

Unit III

Analysis of Variance: Introduction, regression model diagnostics, hypothesis testing in multiple regression, confidence intervals in multiple regression, testing for lack of fit, tests of significance based on normal, t and chi-square distributions, the F-test, example of ANOVA process, degrees of freedom, error variance and pooling, error variance and application.

[8Hrs]

Unit IV

Simple Comparative Experiments: Randomized designs, complete block design, Latin square design, balanced incomplete block design, inferences about the differences in means, paired comparison designs, inferences about the variances of normal distributions, completely randomized and randomized block designs.

[8Hrs]

Unit V

Introduction to Factorial Design : Basic definition and principles, advantages of factorials, general factorial design, two level and three level factorial designs, response surface methodology, fitting response curves and surfaces, blocking in a factorial design.

[8Hrs]

Advanced topics on the subject

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Plan, design, and conduct experimental investigations efficiently and effectively.
2. Understand and interpret, using statistical tools, experimental data and characteristic behavior.
3. Choose an appropriate experimental design strategy and analysis to evaluate and optimize new product design or processes.

Books:

1. Douglas C Montgomery, 'Design and Analysis of Experiments', John Wiley & Sons, New York, 1996, 4th Edition
2. John P.W.M., 'Statistical Design and Analysis of Experiments', Macmillan, New York, 1971
3. Montgomery D.C., Runger G. C., 'Introduction to Linear Regression

Analysis', Wiley New York, 1992, 2nd Edition

4. Myers R.H., Montgomery D. C., 'Response Surface Methodology: Process And Product Optimisation Using Designed Experiments', Wiley, New York, 1995
5. Taguchi, 'Introduction to Quality Engineering', Asian Productivity Organisation, G. UNIPUB, White Plains, New York.
6. Taguchi, 'System of Experimental Design: Engineering Methods to Optimize Quality and Minimize Cost', G. UNIPUB, White Plains, New York
7. C. R Kothari, 'Research Methodology', Wishwa Prakashan
8. J.W. Bames, 'Statistical Analysis for Engineers & Scientists', McGraw Hill, N.York
9. Phillip J. Ross, 'Taguchi Techniques for Quality Engineering', McGraw Hill, Intl. II Edition, 1995.

FIRST SEMESTER

Elective III

CADL 449 - Vibration Analysis and Condition Monitoring (4-0-0-4)

Course Objectives:

1. To understand and appreciate the importance of vibrations in mechanical design of machine parts that operate in vibratory conditions
2. To be able to obtain linear vibratory models of dynamic systems with changing complexities (SDOF, MDOF)
3. To be able to make free and forced (harmonic, periodic, non-periodic) vibration analysis of single and multi degree of freedom linear systems
4. To be able to monitor the dynamic performance and condition of rotating machines and diagnose faults through signal processing

Unit I

Free body diagram, free & forced vibration, undamped and damped single degree of freedom systems subjected to harmonic and

other periodic excitations, impulse response, convolution integral and response to arbitrary excitation, vibration isolation and transmissibility, solution using Laplace transform, Runge-Kutta method, structure damping

[8Hrs]

Unit II

Energy method applied to multi degree freedom system, Lagrange's equation, generalized mass, formulation of mass, damping and stiffness matrix and its numerical solutions, vibration absorber, torsional vibration of two and three disc system, geared rotor system, influence coefficients and flexibility matrix of bending vibration of beam and multi-disc rotor, mode shapes and orthogonally principle

[8Hrs]

Unit III

Numerical techniques for single and multiple degrees of freedom (SDOF, MDOF) systems, matrix iteration method, Holzer's method for torsional vibration, Dunkley's method for critical speed determination of multi disc rotor, Rayleigh quotient sweeping matrix method for determination of all the natural frequencies and mode shapes, Raleigh-Ritz method, modal matrix and expansion theorem, free and forced response by modal analysis

[8Hrs]

Unit IV

Vibration of continuous system, axial vibration of rod, bending vibration of beam and torsional vibration of shaft, Hamilton's principle and derivation of equation of motion, Rayleigh quotient, modal co-ordinates and modal forces, free and forced response through modal analysis

[8Hrs]

Unit V

Machinery monitoring using vibration, transducers, spectrum analyzers, concept of signature & prediction of trouble by signature

monitoring, trend analysis and approach for diagnostics.

[8Hrs]

Advanced topics on the subject

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Analyze mathematical models of vibratory systems to determine its response and apply these to real life engineering systems
2. Use numerical techniques and Lagrange's equations for linear and nonlinear vibratory systems and determine vibratory responses of SDOF and MDOF systems to harmonic, periodic and non-periodic excitation
3. Monitor dynamic performance and condition of rotating machines and diagnose faults through signal processing

Books :

1. W. T. Thomson, 'Theory of Vibration', CBS Publishers, Delhi,
2. L. Meirovitch, 'Elements of Vibration Analysis'
3. J. S. Rao & K. Gupta, 'Mechanical Vibrations'
4. J. S. Rao, 'Advanced Theory of Vibration'
5. Victor Wowk, 'Machinery Vibration: Measurement and Analysis', Mc-Graw Hill Publication.
6. Kolacoat, "Vibration Based Condition Monitoring", Prentice Hall Publication.
7. J. S. Rao, 'Vibration Condition Monitoring of Machines'
8. Gandall & Mark, 'Random Vibrations'

FIRST SEMESTER

MBA 602 - Advanced Communication Skills (0-0-2-2)

Course Objectives:

1. To develop ability to communicate and express effectively and assertively
2. To enhance quality of learning and communication by using effective public speaking techniques.
3. To create awareness of advanced techniques of public speaking and one-to-one communication

Contents:

Instructions are imparted through class room teaching, case studies, demos, practical exercises and training at Language Laboratory to cover the following:

1. Speech process, message, speech style, & encoding.
2. Strategies for good conversation, fluency & self expression with good vocabulary.
3. Listening skills.
4. Good pronunciation, voice quality, accent, intonation, & body language.
5. Group discussion & strategies.
6. Presentation skills & its importance, need for planning, organizing and improving through rehearsals, preparing an effective power point presentation
7. Professional writing skills, business letters, Salas letter, resume & job application.
8. Note taking, summarizing, paraphrasing and referencing skills.
9. Oral drills through extempore and debate.
10. Interpretation of non verbal inputs such as graphs & charts.

Course Outcomes:

Upon successfully undergoing the course, students will be able to:

1. Express ideas and views in an effective and assertive manner in society and as a professional
2. Analyze, evaluate and summarize conversations, texts, charts, graphs and make presentations more effectively
3. Apply knowledge of phonetics to articulate speech

SECOND SEMESTER

CADL 547 - Product Design & Development (4-0-0-4)

Course Objectives:

1. To develop competence in using tools and methods for product design and development.
2. To create awareness of the role of multiple functions in creating a new product (e.g. marketing, finance, industrial design, engineering, production).
3. To develop ability to coordinate multiple, interdisciplinary tasks in order to achieve a common objective.
4. To be able to integrate specific knowledge from other fields of studies through practice.

Unit I

Design fundamentals, importance of product design, type of design product definition product specification, phases of production development: conceptual, embodiment and detailed design, product and technology development cycle, concept generation and evaluation methods.

[8Hrs]

Unit II

Material selection, importance of classification of material, performance characteristics, selection criteria, Ashby material selection chart, economics, cost versus performance, process selection – importance types of manufacturing processes and their classification, sources of information selection criteria material and process selection methods, expert systems.

[8Hrs]

Unit III

Benchmarking, DFM, DFA, DFX, fairly supplier involvement robust design, identification of customer needs, customer

requirements, QFD concurrent engineering, embodiment design, product architecture, configuration design, parametric design, role of models in design, mathematical modeling, reliability theory, design for reliability, reliability centered maintenance, robust design-failure mode effect analysis.

[9Hrs]

Unit IV

Methods of cost estimates, industrial engineering approach, parametric approach, introduction to assembly modeling, top-down & bottom-up approaches of AM, mating conditions representation schemes, generation of assembly sequence

[8 Hrs]

Unit V

Product development cycle and importance of prototyping, types of prototypes, principles and advantages, different types of generative manufacturing process viz stereo lithography, FDM, SLS etc, factors concerning to RP, consideration for adoptions, advantages, accuracy and economic consideration.

[7Hrs]

Advanced topics on the subject

Practicals:

These including some open ended practicals shall be based on above syllabus.

Course Outcomes:

After successfully completing the course students will able to:

1. Explore the boundaries of design methodologies and decision making for real product design.
2. Use skills and knowledge gained to create new products.
3. Incorporate and select right approaches and considerations for successfully developing new product designs.

Books:

1. Kevin Otto, Kristin Wood, 'Product Design', Pearson 2001
2. Dieter George E. 'Engineering Design', McGraw Hill Pub. Company , 2000
3. Ulirich Karl T. and Eppinger Steven D, 'Product Design and Development', McGraw Hill Pub Company, 1995.
4. Bralla, James G, 'Handbook of Product Design for Manufacturing', McGraw-Hill Pub. Company, 1986.
5. Martti Mantilya, 'An Introduction to Solid Modeling', Computer Science Press.
6. Chitale and Gupta, 'Product Design &Manufacturing', PHI publication, 3rd edition, 2005

SECOND SEMESTER

CADL 548 - Finite Element Analysis (3-1-0-4)

Course Objectives:

1. To enable understanding of fundamental ideas of the FEM
2. To learn the theory and characteristics of finite elements that represent engineering structures.
3. To know the behavior and usage of each type of elements covered in this course
4. Be able to prepare a suitable FE model for structural mechanical analysis problems
5. One can interpret and evaluate the quality of the results (know the physics of the problems)

Unit I

Objective of the course, basic steps in FEM formulation, general applicability of the method fundamental concept of FEM, scope of FEM in Engg, applications, principle of minimum potential energy, brief introduction to different numerical method, FEM and FDM, concept of virtual work, Raleigh – Ritz method

[8 Hrs]

Unit II

One dimensional finite element analysis, general form of total potential for 1-D, linear and quadratic shape function. finite element modeling and analysis using bar and beam element – stiffness matrix assembly, boundary conditions, load vector, applications to heat transfer in 1-D element.

[10 Hrs]

Unit III

Two dimensional finite element analysis, two dimensional problems using CST and LST – formulation of CST and LST elements, plane stress, plain strain and axisymmetric formulation, basic boundary value problem in 2 dimensions- triangular, quadrilateral, higher order element. Applications to heat transfer in 2-dimension.

[10 Hrs]

Unit IV

Applications in heat transfer & fluid mechanics, one dimensional heat transfer element, application to one-dimensional heat transfer problems, scalar variable problems in 2-dimensions, applications to heat transfer in 2-dimension, application to problems in fluid mechanics in 2-D.

[8 Hrs]

Unit V

Dynamic analysis using finite element method, introduction, free vibration problems, equations of motion, longitudinal vibration of bars, transverse vibration of beams, introduction to transient field problem, direct integration methods.

[8 Hrs]

Advanced topics on the subject

Practicals:

These including some open ended practicals, shall be based on above syllabus.

Course Outcomes:

After successfully completing the course:

1. Students will demonstrate an ability to derive element matrix equation by different methods by applying basic laws in mechanics and integration by parts
2. Students will demonstrate an ability to apply the steps required for FEM solution to variety of physical systems and obtain engineering design quantities
3. Identify the application and characteristics of FEA elements such as bars, beams, planar elements, and common 3-D elements.
4. Apply existing 3-D computer-aided design (CAD) skills to prepare models for finite element analysis.

Books:

1. T.R. Chandrupatla & A. D. Belegundu , 'Introduction to Finite Elements in Engineering', PHI Publication, 3rd Edition, 2002
2. S.P. Timoshenko, 'Theory of Elasticity', Tata McGraw Hills
3. R.D. Cook, 'Concept and Applications of Finite element Analysis', John Wiley & Sons
4. D.W. Griffiths, D.A. Nethercot, 'The Finite Element Method – A Basic Introduction for Engineers', Granada Publishing.
5. T.J.R. Hughes, 'The Finite Element Method: Linear Static and Dynamic Finite Element Analysis', Dover Publications, 2000.
6. R.W. Lewis, P. Nithiarasu and K.N. Seetharamu, 'Fundamentals of the Finite Element Method for Heat and Fluid Flow', Wiley, 2004.

SECOND SEMESTER

Elective IV

CADL 549 - Modeling & Simulation (4-0-0-4)

Course Objectives:

1. To understand simulation as a tool for providing solutions to various applications, characteristics of queuing systems and performance measures.
2. To understand the use of random numbers for simulating various real life situations and develop the mathematical models.
3. To enable learning about model building, verification and validation of simulation models of manufacturing systems, material handling system and introduce simulation languages and packages.

Unit I

Introduction to simulation as a tool, areas of application, system model, components of system, system environment, types of system model, steps in a simulation study, discrete event system simulation, event scheduling, time advance mechanism, list processing - basic properties and operations, dynamic allocation, linked lines.

[7Hrs]

Unit II

Characteristics of queuing systems, transient and steady-state behavior, long-run performance measures, infinite-population steady-state models, finite-population models

[7Hrs]

Unit III

Properties and generation of random numbers, testing of generated random numbers, random variate generation: Exponential, Uniform, Weibull, Triangular, Empirical, Discrete distributions, direct transformation for normal distribution, convolution method, acceptance-rejection technique

[8Hrs]

Unit IV

Data collection, identifying distributions, parameter estimation, goodness-of-fit tests, multivariate and time series input models,

model building, verification, validation process, verification of simulation models, calibration and validation of models: validation of assumptions, input-output transformations, validation of input-output using historical data and turning test, modeling manufacturing systems, material handling system, goals and performance measures, modeling down times and failures, trace-driven models, case studies of manufacturing and material handling systems.

[8Hrs]

Unit V

Statistical procedures for comparing real world observations and simulation output data, simulation languages, introduction to SIMLIB, SIMAN, SIMSCRIPT, SLAM-II, Promodel general description, action times, succession of events, choice of paths, simulation of mfg. shop, facilities & storages, gathering statistics, conditional transfers, program control statements, GPSS examples.

[8Hrs]

Advanced topics on the subject

Course Outcomes:

After successfully completing the course:

1. Students will be able to select appropriate simulation tool to develop the solution for the real life situations pertaining to manufacturing system, material handling systems.
2. Students shall be able to develop the mathematical models of the real life systems using random numbers and simulate the same to generate the solution.
3. The students shall be able to use statistical procedures for comparing real world observations and simulation output data.

Books :

1. J. Banks, 'Discrete-Event System Simulation', Prentice Hall (India)

2. S. Law , 'Simulation Modeling and Analysis', McGraw Hill Publishing Co.
3. N. Deo , 'Discrete Simulation using Digital Computers',
4. J. Gordon , 'System Simulation', Prentice Hall (India)
5. A.M.Law & W.D. Keltron, 'Simulation Modeling & Analysis', McGraw Hill International series.
6. Mikell P. Groover, 'Automation, Production Systems and Computer Integrated Manufacturing', PHI Learning Pvt. Ltd., 2010

SECOND SEMESTER

Elective IV

CADL 550 - Computational Methods for Design (4-0-0-4)

Course Objectives:

1. To understand different finite element methods, governing equations and boundary conditions and finite difference equations.
2. To use mathematical and computational techniques to solve fluid flow problems under different boundary conditions

Unit I

Introduction: Finite difference method, finite volume method, finite element method, governing equations and boundary conditions, Derivation of finite difference equations, Solution methods: Solution methods of elliptical equations – finite difference formulations, iterative solution methods, direct method with Gaussian elimination.

[8Hrs]

Unit II

Parabolic Equations: Explicit schemes and Von Neumann stability analysis, implicit schemes, alternating direction implicit schemes, approximate factorization, fractional step methods, direct method with tri-diagonal matrix algorithm. Hyperbolic equations: explicit schemes and Von Neumann stability analysis, implicit schemes,

multi step methods, nonlinear problems, second order one-dimensional wave equations.

[8Hrs]

Unit III

Burgers Equations: Explicit and implicit schemes, Runge-Kutta method. Formulations of incompressible viscous flows: Formulations of incompressible viscous flows by finite difference methods, pressure correction methods, vortex methods.

[7Hrs]

Unit IV

Treatment of Compressible Flows: Potential equation, Euler equations, Navier-stokes system of equations, flow field-dependent variation methods, boundary conditions, example problems.

[7Hrs]

Unit V:

Finite Volume Method: Finite volume method via finite difference method, formulations for two and three-dimensional problems. Standard variational methods - 1: Linear fluid flow problems, steady state problems, Standard variation methods – 2: Transient problems.

[8Hrs]

Advanced topics on the subject

Course Outcomes:

On completion of course, students shall be able to:

1. Formulate solutions to problems using different finite element methods, governing equations and boundary conditions and finite difference equations.
2. Apply mathematical and computational techniques to solve fluid flow problems under different boundary conditions

Books :

1. T. J.Chung, 'Computational Fluid Dynamics', Cambridge University press, 2002.
2. Frank Chorlton, 'Text Book of Fluid Dynamics', CBS Publishers & Distributors, 1985.
3. S. V. Patankar, 'Numerical Heat Transfer and Fluid Flow', McGraw-Hill
4. H. K. Versteeg & W. Malalasekera, 'An Introduction to Computational Fluid Dynamics', Longman Scientific & Technical.
5. John D. Anderson Jr, 'Computational Fluid Dynamics', McGraw Hill Book Company.

SECOND SEMESTER

Elective IV

CADL 551 - Computer Aided Tool Design (4-0-0-4)

Course Objectives:

1. To understand the need of using computers for designing cutting tools and dies.
2. To learn about different types of production presses, dies, jig and fixtures and designing inspection gauges
3. To understand basics of metal cutting and tool geometry and design single and multi point cutting tools such as drills, milling cutters, broaches etc.
4. To select appropriate cutting tools for NC, CNC machines
5. To learn different forging processes, dies, equipment and their selection and design

Unit-I

Three dimensional stress pattern, true stress and true strain, principal stresses, yield criteria, Vos Mises criterion, Tresca's criterion, Von Mises Yield for plane strain problems, Coloumb function and sticking

friction.

[8Hrs]

Unit-II

Press working, types of presses, types of dies, computer aided design of cutting dies like simple die, compound die, progressive die and combination die, forming dies like bending die, drawing die, flanging die, coining die, embossing die.

[8Hrs]

Unit-III

Jigs and fixtures, principles of location and clamping, unconventional clamping systems, design of various types of jigs for various parts, design of different types of fixtures, Taylor's principles of gauge design, and design of limit gauges.

[8Hrs]

Unit-VI

Forging in plane strain, forging of circular disc, effect of friction, forging equipment, defects in forged products, causes & remedies, design of forging dies.

[8Hrs]

Unit-V

Mechanics of metal cutting, design of single point tools, design of multipoint cutting tools like drills, reamers, broaches, taps and milling cutters, design of tools for joining processes, design of tools for NC, CNC machines.

[8Hrs]

Advanced topics on the subject

Course Outcomes:

On successful completion of the course, student shall be able to:

1. Use computers for designing different types of cutting tools, metal forming and forging dies, jigs and fixtures.
2. Design limit gauges for inspection.

3. Select single and multipoint metal cutting tools geometry for different machining applications for NC, CNC machines

Books:

1. C. Donaldson, G. LeCain, V. Goolld, and J. Ghosh, 'Tool Design', McGraw Education (India), New Delhi, 2012, Fourth Edition
2. F. Wilson (Chief Editor ASTME), 'Fundamentals of Tool design', Prentice Hall of India Pvt. Ltd., New Delhi, 1976
3. Pollock, 'Fundamentals of Tool Design' Prentice Hall; 2 Sub edition (February 1988)
4. Grant, 'Unconventional Clamping Systems'
5. Kempster, 'Fundamentals of Tool Design'

SECOND SEMESTER

Elective V

CADL 552 - Plastics and Composites (4-0-0-4)

Course Objectives:

1. To study basics about the different kinds of polymeric materials predominantly being used for various engineering applications.
2. To study different manufacturing techniques of polymeric materials and fabrication techniques of the polymeric materials.
3. To learn about basics of the different categories of the composite materials including powder metallurgy techniques.
4. To study the different manufacturing techniques of the composite materials.

Unit I

Introduction to nonmetallic materials, introduction to polymers, classification of polymers, overview of important polymer

processes - extrusion, injection moulding, blow molding, thermoforming, compression moulding, introduction to the functional process analysis of polymer extrusion.

[8Hrs]

Unit II

Polymer blending, master batches of polymers, properties of polymers important for basic polymer process analysis, characterization of polymers important for basic polymer process analysis.

[8Hrs]

Unit III

Joining of plastics, heated tool welding, ultrasonic welding, vibration welding, spin welding, hot gas welding, extrusion welding, laser welding, IR welding, resistive implant welding, induction welding, heat sealing, flash free welding, friction stir welding.

[8Hrs]

Unit IV

Fibres, matrix materials, interfaces, polymer matrix composites, metal matrix composites, ceramic matrix composites, whiskers, carbon fibre composites.

[8Hrs]

Unit V

Different composite processing methods, industrial sector wise engineering applications of composite materials, composite in aircraft industry, composite for structural application, composites as biomaterials, miscellaneous applications.

[8Hrs]

Advanced topics on the subject

Course Outcomes:

On successful completion of the course, student shall be able to:

1. Choose the right type of plastic materials and ceramics for engineering applications.
2. Select different plastic processes for designing and manufacturing needs of intended product.
3. Design and develop fiber based materials and plastic products and use processes for their shaping, joining and coating.
4. Understand various methods of composite manufacturing and their applications.

Books:

1. J. R. Fried, 'Polymer Science and Technology', Prentice Hall of India Pvt. Ltd., New Delhi, Eastern Economy Edition, 2000.
2. V. R. Gowarikar, M. V. Viswanathan & J. Sridhar, 'Polymer Science', Wiley Eastern Ltd., 1988.
3. P. Ghosh, 'Polymer Science and Technology', Tata McGraw-Hill Publishing Company, New Delhi, 2002.
4. R. Sinha, 'Outlines of Polymer Technology: Manufacture of Polymers', Prentice Hall of India Pvt. Ltd., New Delhi, 2000.
5. F.L. Matthews and R.D. Rawlings, 'Composite Materials: Engineering and Science', Chapman & Hall, London, 1994.
6. Bryan Harris, 'Engineering Composite Materials', IOM Communications Ltd., 1999.
7. S. C. Sharma, 'Composite Materials', Narosa, 2000.

SECOND SEMESTER

Elective V

CADL 553 - Manufacturing System Integration and Management (4-0-0-4)

Course Objectives:

1. To study application of computers and integration of operations in manufacturing systems.
2. To understand capacity planning and inventory management and understand materials requirement planning.
3. To understand ERP and MRP II as modern production control tools.
4. To understand and apply JIT, pull manufacturing and various techniques for waste reduction in manufacturing by taking open minded decisions based objectivity and rational analysis.
5. To study shop floor control techniques.

Unit I

Manufacturing planning and control, computer integrated production management systems, business plan, master production schedule, aggregate production planning, rough cut capacity planning, materials requirement planning (MRP), operations planning & strategies, capacity planning and utilization, dependent and independent demand, BOM, manufacturing and design data base, factory data collection systems.

[8Hrs]

Unit II

Functions of inventory management, inventory systems, inventory control models, advanced inventory models, purchasing, demand management, master production scheduling functions, MRP logic, planning factors, inputs-outputs of MRP, recourses planning, manufacturing resources planning (MRP II), framework of MRP II system, close the loop approach, benefits and prospects for MRP II, enterprise resource planning (ERP), supply chain inventory management.

[8Hrs]

Unit III

Production planning and scheduling under different circumstances, shop floor control functions, order release, order scheduling, loading, production leveling, sequencing

rules, order progress, final assembly scheduling, factory coordination, production activity control, optimized production technology, input output control, production reporting, supplier scheduling.

[8Hr]

Unit IV

Limitations of traditional manufacturing systems, responding to changing manufacturing environment, repetitive manufacture, group technology and flexible manufacturing systems, concurrent engineering, value added focus, small lot production, setup time reduction, push and pull production control systems, execution and control in pull environments, achieving pull production, sources of waste, JIT manufacturing principles and operating conditions, supply chain coordination.

[8Hr]

Unit V

Japanese contributions to world class manufacturing, lean manufacturing, Toyoto production systems, workers involvement, quality circles, continuous improvement techniques, visual management and 5-S, Kanban system, automation, error prevention, total productive maintenance, agile manufacturing, six sigma concept.

[8Hr]

Advanced topics on the subject

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Develop master production schedule and plan production activities on short and long term basis.
2. Use JIT, MRP, ERP, MRP-II systems and various productivity improvement concepts in manufacturing.
3. Design, develop and implement computer based inventory control

systems and reduce different wastes in production.

4. Plan, organize, schedule and implement shop floor manufacturing activities and control them

Books:

1. Jonsson P. & Mattson S. A., 'Manufacturing Planning and Control', Tata McGraw Hill Education Private Limited, 2011
2. Vollman T.E., Berry W.L., Whybark D.C. & Jacobs F.R., 'Manufacturing Planning and Control for Supply Chain Management', Tata McGraw Hill Education Private Limited, 2011
3. Adam E.E. & Ebert R.J., 'Production & Operations Management', Prentice Hall of India Private Limited, 5th Edition, 2005
4. Grover M. P., 'Automation, Production Systems & Computer Integrated Manufacturing', PHI Learning Private Ltd, 3rd Edition, 2010
5. Gopalkrishnan N., 'Simplified Lean Manufacture', PHI Learning Private Ltd, 2010
6. Bubidge J. L., 'Group Technology in Engineering Industry', Mechanical Engineering Pub, London , 1979.
7. Askin R. G. and Vakharia, A. J., 'G. T. Planning and Operation in the Automated Factory, Cleveland, D. I.
8. Irani, S. A., 'Cellular Manufacturing Systems Hand Book'
9. Kamrani. A. K., Pasaei, H. R. & Liles, D. H. (Editors), 'Planning Design and Analysis of Cellular Manufacturing Systems', Elsevier, 1995.
10. Nicholes Jonn M., 'Competitive Management' McGraw Hill International Editions.
11. Khalid Shaikh, 'Manufacturing Resource Planning', Tata McGraw Hill Co. Ltd.
12. James M. Moore, 'Plant Layout and Design', McMillan Company.

SECOND SEMESTER

Elective V

CADL 554 - Fracture Mechanics and Fatigue (4-0-0-4)

Course Objectives:

1. To understand failure mechanisms in materials and use the knowledge as a basis for predicting fracture and fatigue behavior
2. To understand the mechanical behavior of materials, analyze and assess the strength using knowledge of material properties, sensors and data acquisition techniques and identify the material properties required in different situations
3. To be able to predict fatigue life using S/N and fracture mechanics based computational methods.
4. To be able to identify the cause of failure of a material based on fracture surface observations.

Unit I

Transducers and Data Acquisition: Strain gage fundamentals, resistance wire and etched resistance foil gages, gage resistance and excitation voltage, gage material, strain gage arrangements, Mohr's circle strain analysis, strain gage bridge calibration, introduction to brittle coating, photostress coating, optical strain measuring techniques, introduction to thermocouple, thermistors, electrical resistance thermometers and resistance-temperature detectors for temperature measurement. signal conditioning, need for analog-to-digital (A-D) and digital-to-analog (D-A) converters, sampling frequency, aliasing error, frequency domain analysis, statistical decision making, experimental data verification.

[8Hr]

Unit II

Introduction to Failure Mechanisms: Elastic instability, plastic instability, yielding and plastic collapse, stationary creep, fracture and Mohr's failure criterion, resonance, linear-elastic fracture mechanics, modes of deformation, stress intensity factors, design

and failure analysis using stress intensity concepts, stresses, stress concentration, stresses at crack tip, stress intensity factor, and fracture criteria, nondestructive evaluation.

[8Hr]

Unit III

Fatigue Analysis and Design of Structural Component: An introduction to fatigue, stress vs. life (s-n) curves, life prediction using the Palmgren-Miner rule, strain vs. life (e-N) curves, low-cycle fatigue(LCF), high-cycle fatigue (HCF), analysis of fatigue data and design s-n curves in the finite life region, factor for reliability, structural component is subject to cyclic uniaxial and combined loading, stress and strain -based fatigue analysis and design, crack propagation under cyclic loading.

[8Hr]

Unit IV

Computational Fracture Mechanics: Overview of numerical methods, traditional methods in computational fracture mechanics, the energy domain integral mesh design, linear elastic convergence, study analysis of growing cracks.

[8Hr]

Unit V

Environmentally Assisted Cracking in Metals: Corrosion principles, environmental cracking overview, stress corrosion cracking, hydrogen embrittlement, corrosion fatigue.

[8Hr]

Advanced topics on the subject

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Apply fracture mechanics to predict material failure.
2. Identify and describe the basic fracture and fatigue mechanisms.

3. Predict fatigue life using S/N and fracture mechanics based computational methods.
4. Identify the cause of failure of a material based on fracture surface observations.

Books :

1. T.L. Anderson, 'Fracture Mechanics: Fundamental and Applications', 3rd Edition, 2005, CRC Press.
2. Z.P. Bazant, J. Planas, 'Fracture and Size Effect in Concrete and Other Quasibrittle Materials', 1998.
3. F. Bower, 'Applied Mechanics of Solids', CRC Press, 2009.
4. M. Meyers, K. Chawla, 'Mechanical Behavior of Materials', Cambridge, 2009.
5. D. Broek, 'Elementary Engineering Fracture Mechanics', Springer; 4th edition (June 30, 1982)
6. Ashok Saxena, 'Non-Linear Fracture Mechanics for Engineers', 2nd edition

SECOND SEMESTER

Elective VI

CADL 555- Advanced Machine Design (4-1-0-4)

Course Objectives:

1. To apply basic concepts and fundamentals of stress and strain for product design and analysis.
2. To be able to use differential equations of equilibrium and compatibility equations for stress analysis.
3. To learn various theories of failure & their significance in practical problem solving.
4. To apply strain energy concepts to find out the solution of statically indeterminate problems.
5. To understand and apply the concept of fluctuating load in component and system design.

Unit I

Elasticity and Stress Strain Relations: Elasticity, fundamentals of stress and strain, Hooke's law, Poisson's ratio, elastic constants, plane stress & plane strain, principal stresses, Mohr's circle, principal stresses from Mohr's circle.

[8Hrs]

Unit II

Differential Equations of Equilibrium: Differential equations of equilibrium in two-dimensional cartesian co-ordinates, boundary conditions, compatibility equations in Cartesian co-ordinates, stress function.

[8Hrs]

Unit III

Theories of Failure: maximum normal stress theory, maximum shear stress theory, maximum normal strain theory, distortion-energy theory, Mohr's theory, significance of theories of failure, use of factor of safety in design, selection of materials for engineering applications.

[8Hrs]

Unit IV

Energy Method: Elastic strain energy, Maxwell-Betti-Rayleigh reciprocal theorem, Castigliano's theorem, strain energy due to axial force, shear force, torsion, and bending moment.

[8Hrs]

Unit V

Design against Fluctuating Load: Stress concentration, fluctuating stresses, fatigue failure, endurance limit, s-n curve, notch sensitivity, reversed stresses-design for finite and infinite life, Soderberg and Goodman lines.

[8Hrs]

Advanced topics on the subject

Course Outcomes:

After successfully completing the course students will be able to:

1. Do stress analysis using differential equations of equilibrium and compatibility equations.
2. Apply various theories of failure to solve practical problems in machine designing.
3. Apply strain energy concepts to find out the solution of statically indeterminate problems.
4. Design machine components under fluctuating load conditions.

Books:

1. L S Srinath, 'Advanced Solid Mechanics', Tata McGraw-Hill
2. S P Timoshenko, J N Goodier, 'Theory of Elasticity', McGraw-Hill, Third Edition
3. M.F. Spotts & T.E. Shoup, 'Design of Machine Elements', Pearson Education
4. Joseph E. Shigley & Charles R. Mischke, 'Mechanical Engineering Design', McGraw Hill
5. George B. Dieter, 'Engineering Design', McGraw Hill
6. Robert L. Norton, 'Machine Design - An Integrated Approach', Pearson Education
7. Arthur H. Burr & John B. Chetham, 'Mechanical Analysis & Design', Prentice Hall India
8. Robert C. Juvinall & Kurt M. Marshe, 'Fundamentals of Machine Component Design'.

SECOND SEMESTER

Elective VI

CADL 556 - Design of Piping System (4-0-0-4)

Course Objectives:

1. To understand the physical phenomena which affect the design of piping systems for various industries

2. To be able to use standard software, codes, data and methods to design process equipment and piping layout and draw appropriate specifications for the selected components and systems.
3. To be able to provide adequate safety measures during fabrication / installation of piping systems and undertake inspection and testing.

Unit I

Introduction to piping engineering and role of piping engineer in various fields, industry functioning and plant overview, function of process equipment and their piping requirement, study and applications of plant design management system (PDMS) software.

[8Hrs]

Unit II

Fundamentals of fluid flow through pipes, basic process requirement of plant/project detailed study of various piping systems, procedure of designing piping system, material selection for various process services, piping elements, their joining methods, relevant standards / codes, their importance and applications, valves & nozzles.

[8Hrs]

Unit III

Use of vendor data in design, various documents required for plant design, basic information on welding, its testing and inspection preparation of piping material specification, valve specification and data sheets, nozzle orientation of process equipment, bill of material at various stages, isometric drawings and final MTO.

[8Hrs]

Unit IV

Piping layout, line pressure drop, piping analysis, stress analysis of curved pipelines, development of equipment layout, piping layout, industrial plot plan.

[8Hrs]

Unit V

Study and analysis of system using CAESAR II software, pipe supports & loop calculations, pipeline operation and maintenance-friction reduction, cleaning, coating, wear, leak detection, water hammer

Advanced topics on design and analysis of piping systems.

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Understand the physical phenomena which affect the design of piping systems for various industry sectors.
2. Use standard software, codes, data and methods to design and select process equipment and piping layout and draw appropriate specifications.
3. Ensure provision of adequate safety measures during fabrication / installation of piping systems and undertake inspection and testing.

Books:

1. Peter Smith, 'Fundamentals of Piping Design', Gulf Publishing House, 2006
2. M. W. Kellogg Company, 'Design of Pipeline Systems', Martino Fine Books, 2009
3. G. K. Sahu, 'Handbook of Piping Design', New Age International, 1998
4. Mohinder L. Nayyar, 'Piping Handbook', McGraw-Hill Education: New York, 2000, Seventh Edition
5. Rutger Botermans and Peter Smith,

SECOND SEMESTER

Elective VI

CADL 557 - Design of Material Handling System (3-1-0-4)

Course Objectives:

This subject provides students with:

1. A basic understanding of material handling equipment and facilities and the fundamental principles of material handling.
2. Ability to design and select material handling equipment, attachments, drives and systems and also understand their limitations.
3. An understanding of safety issues and regulations in material handling.

Unit I

Types of intraplant transporting facility, principal groups of material handling equipments, choice of material handling equipment, hoisting equipment, screw type, hydraulic and pneumatic conveyors, general characteristics of hoisting machines, surface and overhead equipments, general characteristics of surface and overhead equipments and their applications.

[8Hrs]

Unit-II

Flexible hoisting appliances like ropes and chains, welded load chains, roller chains, selection of chains hemp rope and steel wire rope, selection of ropes, fastening of chains and ropes, different types of load suspension appliances, fixed and movable pulleys, different types of pulley systems, multiple pulley systems, chain and rope sheaves and sprockets.

[8Hrs]

Unit III

Load handling attachments, standard forged hook, hook weights, hook bearings, cross piece and casing of hook, crane grab for Unit and piece loads, carrier beams and clamps, load platforms and side dump buckets, electric lifting magnets, grabbing attachments for loose materials, crane attachments for handling liquid materials.

[8Hrs]

Unit IV

Arresting gear, ratchet type arresting gear, roller ratchet, shoe brakes and its different types like electromagnetic, double shoe type, thruster operated, controller brakes, shoe brakes, thermal calculations of shoe brakes and life of linings, safety handles, load operated constant force and variable force brakes general theory of band brakes, its types and construction.

[8Hrs]

Unit-V

Different drives of hoisting gears like individual and common motor drive for several mechanisms, traveling gear, traveling mechanisms for moving trolleys and cranes on runway rails, mechanisms for trackless, rubber-tyred and crawler cranes, motor propelled trolley hoists and trolleys, rails and traveling wheels, slewing, jib and luffing gears, operation of hoisting gear during transient motion, selecting the motor rating and determining braking torque for hoisting mechanisms, drive efficiency calculations,

selecting the motor rating and determining braking torque for traveling mechanisms, slewing mechanisms, jib and luffing mechanisms.

[8Hrs]

Advanced topics on the subject

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Select appropriate equipment for material handling and understand the applications as well as limitations of the different equipment.
2. Apply appropriate techniques for improving existing material handling systems.
3. Recognize the importance of safety issues in material handling.

Books :

1. N. Rudenko, 'Materials Handling Equipment', Envee Publishers, New Delhi, 2nd Edition, 1969
2. M. P. Alexandrov, 'Materials Handling Equipment', Mir Publications, Moscow, 1st Edition, 1981
3. Ronald G.A. and Charles R.S., 'Modeling and Analysis of Manufacturing System', New York, Wiley, 1993
4. McCormik E.J. and Sanders M., 'Human Factors in Engineering and Design', New York, McGraw-Hill, 1992
5. Sims R.E., 'Material Handling Systems, In Handbook of Industrial Engineering', 2nd edn, New York: John Wiley & Sons, 1992
6. Francis R.L., McGinnis L. and White J.A., 'Facility Layout and Location: An analytical Approach', Englewood Cliffs, NJ, Prentice-Hall, 1992
7. Muther R. and Wheeler J.D., 'Simplified Systematic Layout Planning', Kansas City, MO, Management and Industrial Publication, 1994

8. Ridley J., 'Safety at Work', Butterworth Heinemann Ltd., 1994
9. Alberto Garcia-diaz, J. Macgregor Smith, 'Facilities Planning and Design', Prentice Hall, 2007
10. Edward Frazelle, 'World-class Warehousing and Material Handling', McGraw Hill, 2004
11. Matthew P. Stephens, Fred E. Meyers, 'Manufacturing Facilities Design and Material Handling', Prentice Hall, 2009

SECOND SEMESTER

IDA 403 - Research Methodology (0-0 -2-2)

Course Objectives:

1. To enable researchers to understand and appreciate the nature, complexities and challenges of research.
2. To equip them with knowledge and skills that will enable them to exercise choice between available techniques or methods of research.
3. To develop abilities to write technical reports, file patent applications and communicate findings in written and oral form.

Contents

As per Direction No.10 of 2011 and Direction No.29 of 2012 of RTMNU, the course work is compulsory. The course covers different aspects of research methodology and quantitative methods of computer application as needed for undertaking research investigations. It provides for skills needed to review published work in the relevant field, effective delivery of seminars, developing the attitude for continuous and lifelong learning. It helps in developing clarity of thought and expression, communication and presentation skills, analytical abilities, critical appreciation of the existing literature and apply experimental or design skills.

The following principal areas are covered:

1. Introduction to research
2. Methods of research

3. Literature review
4. Tools and techniques of data collection
5. Sampling & hypothesis testing
6. Statistical techniques - linear and multiple regression
7. Data dependent modeling and analysis
8. Optimization techniques-Genetic Algorithm
9. Presentation of research findings
10. Report writing
11. Soft computing-ANN, Fuzzy, PSO
12. How to write a technical paper?
13. Patent & innovation
14. Scientific networking & evaluation of research
15. Do's and don'ts in publishing
16. Case presentations & lab visits for R&D facilities
17. Quantitative methods of computer applications
18. Application of modeling & simulations software (AUTOCAD, MATLAB & Simulink, LABVIEW)

Course Outcomes:

Upon successful completion of the course, students will be able to:

1. Conduct a research activity independently or as a team member in a chosen narrow area of specialization.
2. Develop abilities to analyze complex engineering problem in scientific manner, find workable solutions, and communicate and present research findings in oral and written form.
3. Develop an attitude for continuous and lifelong learning.

THIRD SEMESTER

CADP 632 - Industry Project Dissertation (Phase-I) (0 -0 -8-8)

Course Objectives :

1. To develop the ability to analyze and use scientific approach in solving complex engineering problems.

2. To develop an attitude of continuous and lifelong learning
3. To develop oral and written communication and presentation skills, critical review of the existing literature.
4. To develop design skills and the ability to conduct planned experimentation.

Work expected:

The dissertation work is aimed at training the students to independently analyze and solve a complex engineering problem posed to them. The project may be a purely analytical piece of work, a completely experimental one or combination of both. The project may also be based on live industry problems and, in few cases, can also involve a sophisticated design work.

The project report is expected to show clarity of thought and expression, analytical skills, critical appreciation of the existing literature, experimental or design skills and develop the abilities for continuous and lifelong learning, leadership and team work and execution of assignments.

Each student shall select a problem in the field of specialization for dissertation work. The project topic shall be from the domain areas of simulation / fabrication / industrial problem solving / design. A student in consultation with his supervisor shall initiate action towards the end of second semester to identify research area and prepare synopsis after literature survey. Candidates are expected to commence project activities immediately after the completion of the second semester under the guidance of the Institute supervisor. There could be a co-supervisor if the project is interdisciplinary in nature. For an industry based project, the co-supervisor may be from the concerned industry.

Each student shall have to deliver a seminar on part of the dissertation work completed during the semester and shall include problem identification methodology, literature survey, scope of proposed work, research methodology to be adopted, status of fabrication (if any), plan of action etc.

Course Outcomes:

Upon successful completion of phase –I of dissertation, students shall be able to:

1. Analyze complex engineering problems, develop action plan and apply appropriate research methodologies to find workable solution.
2. Develop oral and written communication and presentation skills, critical review of the existing literature, experimental and design skills
3. Develop an attitude of continuous and lifelong learning

FOURTH SEMESTER

CADP 633 - Industry Project Dissertation (Phase-II) (0-0-10-10)

Course Objectives :

1. To develop the ability and skill sets to analyze and solve complex engineering problems, independently or as a team member, using modern tools and computational techniques.
2. To develop oral and written communication and presentation skills, critical review of the existing literature, experimental and design skills
3. To develop an attitude of continuous and lifelong learning

Work expected:

The student shall present his / her work before a board of experts and deliver a pre thesis submission seminar on the dissertation work completed by him / her under the guidance of the supervisor(s) during the third and the fourth semesters. The presentation shall include problem identification methodology, literature survey and gap analysis, research methodology adopted, fabrication (if any), experimentation details, observations, findings and outcome of the work, contribution to the field of knowledge etc.

The dissertation work should demonstrate that the student has developed to a satisfactory level the ability to independently analyze and solve a complex engineering problem posed to him / her as also developing abilities for continuous and lifelong learning, leadership and team work and execution of assignments. The project report is expected to show clarity of thought and expression, communication and

presentation skills, analytical abilities, critical appreciation of the existing literature, experimental or design skills.

The student shall be allowed to submit the dissertation only after passing in all of the prescribed courses of the program, within the prescribed period, and after satisfactory performance in pre submission seminar.

Course Outcomes:

Department of Management Studies

Scheme Summary

Semester	Hours	Credits	Marks
1	25	30	900
2	25	30	900
3	15	15	500
4	25	25	700
Total	90	100	3000

Proposed Scheme for Master of Business Administration

First Year - Semester – I

Sub Code	Name of Subject	Teaching Scheme			Total	Total Credit	Theory			Practical		Total Marks
		L	T	P			TAE	CAE	END	Internal	External	
MBL 211	Managerial Economics	3	-	-	3	3	20	30	50	-	-	100
MBL 212	Quantitative Technique	3	-	-	3	3	20	30	50	-	-	100
MBL 213	Legal Aspects of Business	3	-	-	3	3	20	30	50	-	-	100
MBL 214	Management Accounting	3	-	-	3	3	20	30	50	-	-	100
MBL 215	Marketing of Product & Services	2	-	-	2	2	10	15	25	-	-	50
MBL 216	Human Resource Management	3	-	-	3	3	20	30	50	-	-	100
MBL 217	Corporate Finance	3	-	-	3	3	20	30	50	-	-	100
MBL 218	Basic Computer Technique	2	-	-	2	2	10	15	25	-	-	50
Specialization I:												
	Elective 1	2	-	-	2	2	10	15	25	-	-	50
	Elective 2	2	-	-	2	2	10	15	25	-	-	50
Specialization II:												
	Elective 1	2	-	-	2	2	10	15	25	-	-	50
	Elective 2	2	-	-	2	2	10	15	25	-	-	50
	Total	30			30	30	180	270	450			900

First Year - Semester – II

Sub Code	Name of Subject	Teaching Scheme			Total	Credit	Theory			Practical		Total
		L	T	P			TAE	CAE	END	Internal	External	
MBL 311	Understanding Competition	3	-	-	3	3	20	30	50	-	-	100
MBL 312	Operations Management	3	-	-	3	3	20	30	50	-	-	100
MBL 313	Research Methodology	3	-	-	3	3	20	30	50	-	-	100
MBL 314	Organizational Behavior	2	-	-	2	2	10	15	25	-	-	50
MBL 315	Consumer Behavior & Retail Management	3	-	-	3	3	20	30	50	-	-	100
MBL 316	Performance Management and Compensation	3	-	-	3	3	20	30	50	-	-	100
MBL 317	International perspective in HR	2	-	-	2	2	10	15	25	-	-	50
MBL 318	Taxation	3	-	-	3	3	20	30	50	-	-	100
Specialization I:												
	Elective 3	2	-	-	2	2	10	15	25	-	-	50
	Elective4	2	-	-	2	2	10	15	25	-	-	50
Specialization II:		Elective 3										
	Elective 3	2	-	-	2	2	10	15	25	-	-	50
	Elective4	2	-	-	2	2	10	15	25	-	-	50
	Total	30			30	30	180	270	450			900

Second Year Semester – III

Sub Code	Name of Subject	Teaching Scheme			Total	Credit	Theory			Practical		Total
		L	T	P			TAE	CAE	END	Internal	External	
MBP 551	Industry Internship (every 30 days progress seminar)*	-	-	15	15	15	-	-	-	300	200	500
	Total			15	15	15				300	200	500

Second Year Semester – IV

Sub Code	Name of Subject	Teaching Scheme			Total	Credit	Theory			Practical		Total	Course taken from Institution
		L	T	P			TAE	CAE	END	Internal	External		
MBP 552	Major Industry Internship Project (every 30 days progress seminar)	-	-	25	25	25	-	-	-	500	200	700	No were
	Total			25	25	25				500	200	700	

Total Credit: 30+30+15+25 = 100

Total Marks: 900+900+500+700 = 3000

List of Electives:

S.No.	Name of Specialization	Sub Code	Electives
1	Specialization I: Entrepreneurship	MBLD 210	Elective 1: Exploring Business Opportunities
		MBLD 211	Elective 2: Social Entrepreneurship
		MBLD 310	Elective 3: Industrial Relation & Labor Law
		MBLD 311	Elective 4: Family Business Management
2	Specialization II: Creativity & Innovation	MBLE 210	Elective 1: Enterprise Resource Planning
		MBLE 211	Elective 2: Business Analytics and Intelligence
		MBLE 310	Elective 3: Consumer Psychology
		MBLE 311	Elective 4: Project Management
3	Specialization III: Marketing Management	MBLA 210	Elective I: Advertising and Business communication
		MBLA 211	Elective II: Brand management
		MBLA 310	Elective III: Retail management
		MBLA 311	Elective IV: Technology management
4	Specialization IV: Financial Management	MBLB 213	Elective 1: Indian Financial System and international Financial Management
		MBLB 214	Elective 2: Security Analysis and Investment Management
		MBLB 313	Elective 3: Corporate Taxation
		MBLB 314	Elective 4: Principles and Practices of Banking
5	Specialization V: Human Resource Management	MBLC 220	Elective 1: Conflict and Negotiation
		MBLC 221	Elective 2: Training and Development Practices and Human Resource Development
		MBLC 320	Elective 3: Industrial Relation & Labor Legislation
		MBLC 321	Elective 4: Advanced HR: Strategic HRM
6	Specialization VI: Operations Management	MBLG 237	Elective 1 Project Management
		MBLG 238	Elective 2 Total Quality Management
		MBLG 337	Elective 3 Supply Chain Management
		MBLG 338	Elective 4 Business Process Reengineering

Course Outcomes

1. The study of Principles of Business Management helps the students to develop the Business Acumen & understand the different functions of management such as Planning, Organizing, Co-ordinating, Controlling.
2. To Understand the Techniques in Marketing Management such as Marketing Plan, Market Analysis, Product Management, Marketing Strategies, Service Management etc.
3. The study of Human Resource Management helps the students to understand the Basics of Human Resource Management & the Framework of HRM.
4. Business Legislation helps to understand the various laws and regulations required in corporate world.
5. The study of Information Technology Management helps the students to develop the Acumen For Information Technology & makes them aware about the Techniques in I T Management.
6. Financial Accounting objective is to acquaint the student with the language of accounting and develop in them the ability to evaluate and use accounting data as an aid to decision making. The main purpose is to assist the students in developing skills in problem solving and decision making in the financial area.
7. The study of Quantitative Decision Making helps the students to Develop Quantitative Decision Making Skills & makes them aware about the Techniques applied in QDM.
8. The study of Financial Management helps the students to develop Financial Management Skills & makes them aware about the Techniques & Tools used in Financial Management.
9. The study of Organizational Behaviour & Development helps the students to develop resource managing skills & makes them aware about the group dynamics; also it makes them understand how to apply motivational techniques at work.
10. Managerial economics assists in solving the problems encountered in making economic decisions in business & management.
11. The study of Environment Management helps the students to create environmental awareness & makes them understand the impact of environmental degradation.
12. The study of Business Research helps the students to understand the Basics of Business research & makes them aware about the techniques of business modeling; also it makes aware about the techniques of data collection, processing and interpretation.
13. Integrated Marketing Communication let the student understand the importance of different elements of Marketing Communication Mix.
14. Brand Management helps to understand the concept of branding and its role in today's marketing world.

15. The study of Data Base Management System helps the students to Develop Acumen for Computer Systems& also makes them understand various Terms & Terminology in IT.
16. The study of International Financial Markets & Foreign Exchange Management helps the students to develop Acumen for International Business & also makes them understand about the various International Investment Options.
17. The study of International Business Management helps the students to develop an understanding of International Marketing& makes them aware about the various complexities in Export Import Documentations & Procedures.
18. Project Management help develop an awareness about project planning and management and apply professional attitudes and techniques to project at hand. To increase the students ability to function effectively in a project team.
19. The study of Total Quality Management helps the students to develop better Understanding about the changing trends & various needs of TQM & it also makes them aware about the various techniques in TQM.
20. The study of Banking Laws& Regulations helps the students to develop an understanding about the Banking Procedures & Policies& it also helps them to develop the acumen for Laws relating to Banking.
21. The study of financial services helps the students to develop an understanding about the Various Financial Products in Banking & it also helps them to develop& update the knowledge for Banking Services.
22. Entrepreneurship Development Programmehelps students to recognize a business opportunity that is fit for them. Demonstrates the understanding of how to launch the individual's entrepreneurial career.
23. Strategic Business Management entails specifying the organization's mission, vision and objectives. Developing policies and plans, often in terms of projects and programs, which are designed to achieve these objectives.
24. Business Ethics and Corporate Governance examines ethical principles and moral or ethical problems that arise in a business environment. It applies to all aspects of business conduct and is relevant to the conduct of individuals and entire organizations.
25. Enterprise Resource Planning facilitates information flow between all business functions inside the organization, and manages connections to outside stakeholders.
26. Changing lifestyles is prompting changes in the retail environment. Paucity of time & increase In disposable income have created a need for new type of retail formats. This could be understood well in Retail Management.
27. To understand different views of Logistics and Logistics Management and the historical development of the views regarding Logistics.
28. To know the importance of Technology Management in Marketing and using it strategically to organization's advantage.

29. Business Process Re-engineering is basically a dramatic change achieved from fundamental re-consideration of existing business plans and strategy to ensure the required improvements.

Programme Outcomes

- 1. Managerial Knowledge:** The student should have an ability to apply knowledge of Marketing, Finance, HRM, Strategic Management, Operations etc to solve live business problems.
- 2. Problem Analysis:** The student should have an ability to identify, formulate, study literature, and analyse broadly-defined managerial practices in reaching substantiated conclusions using analytical tools appropriate to management studies.
- 3. Design/ development of solutions:** The student should have an ability to design solutions for broadly-defined managerial practices to meet specified needs with appropriate consideration for public institutional and safety, cultural, societal, and environmental considerations.
- 4. Investigation:** The student should have an ability to conduct investigations of broadly-defined managerial practices; to provide valid conclusions.
- 5. Modern Tool Usage:** The student should have an ability to select and apply appropriate techniques, resources, and modern managerial practices.
- 6. The Manager and Society:** The student should have an ability to demonstrate understanding of the societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to management practices.
- 7. Environment and Sustainability:** The student should have an ability to understand the impact of business management solutions in societal and environmental context, and demonstrate knowledge of, and need for sustainable development.
- 8. Ethics:** The student should have an ability to understand and commit to professional ethics, responsibilities and norms of business management practices and code of conduct.
- 9. Individual and Team work:** The student should have an ability to function effectively as an individual, and as a member or leader in diverse management teams.
- 10. Communication:** The student should have an ability to communicate effectively on broadly-defined management practices with the management community and with society at large, by being able to comprehend and write effective managerial reports, make effective presentations, and give and receive clear instructions.

11. Project Management and Finance: The student should have an ability to demonstrate knowledge and understanding of management principles and apply the same to one's own work, as a member and leader in a team and to manage projects in multidisciplinary environments.

12. Life-long learning: The student should have an ability to recognize the need for, and to engage in life-long learning in management and allied domain with rapidly changing technology.

13. Research: The student should understand the need and develop ability to get involved in research & development activities.

Programme Education Objectives (PEO)

1. The Graduate should be able to solve complex business problems by applying knowledge of Management.
2. The Graduate should be able to manage their Business Unit profitably.
3. The Graduate should be committed to professional ethics and should be discharging duties in the interest of the society.

Mission of the Department

Our strength will be directed to create competent Managers.

Our endeavor will be to provide all possible support to promote Research and Development activities. Our efforts will be dedicated towards imparting quality and value based education to raise satisfaction level of all stake holders.

Vision of the Department

To achieve excellent standards of quality education by keeping pace with rapidly changing Business Environment. To develop Managers of global standards with capabilities of accepting new challenges.

Name of Department: Department of Management Studies
Subject Code: MBL 211 **Course Title :** Managerial Economics
Contact Hours: 30 **L:** 3 **T:**0 **P:**0
Examination Duration (Hrs.) : Theory
Relative Weight age:
TAE- 20 CAE-30 ESE-50 Total-100

Credits : 03 Semester : 1st
Subject Area : Economics

Course Objectives

1. To develop the understanding towards micro economics.
2. To understand the techniques in micro economic analysis.
3. To prepare students to understand macroeconomics.

Details of Course :

S. N o.	Contents	Co nt Hr s.
1	Nature and fundamental concepts and basis techniques of managerial economics - Analysis of Demand, Significance, estimation of demand; Elasticity of Demand, Techniques and Importance of Demand forecasting; Basic Mathematical Problems related to demand estimation and elasticity of demand. Production & Cost Analysis - Production & Production Function: Concept, Forms of production function, Law of variable Proportions, Returns to scale. Cost concept, Short term and long term cost output relationship, Cost curves, Economies of scale.	7
2	Objectives & Equilibrium of the Firm - Market Structures- Perfect Competition, Monopoly, Monopolistic Competition & Oligopoly - kinked demand curve and cartels, Mathematical Problems on profit maximization and Price & Output determination under various market structures	5
3	Market failure - Concept, Symptoms and Reasons, Concept of Asymmetric Information; Market intervention by Government-Rationale for Intervention National Income Accounting - Concept & measurement; Determination of Income & Employment; Concept of multiplier; Inflation and Deflation, types, causes and control of inflation	6
4	Macroeconomic policy - Monetary and fiscal-objectives and Instruments; Effectiveness of Monetary & Fiscal Policy with respect to Indian Economy. Business cycles - Concept, Causes & Impact, Measures to control Business cycles.	5

5	Interpretation of data - Techniques of Interpretation, Report writing, Layout of a project report, preparing research reports. Software Application in SPSS	7
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Course Outcome: The student should be able -

1. To exhibit the understanding the basic concepts of managerial economics.
2. To exhibit the understanding of concepts of Demand, Supply and Equilibrium and their determinants.
3. To exhibit the understanding and estimating production function.
4. To exhibit the understand different market structures of competition and execute output and pricing strategies.
5. To exhibit the understanding basic concepts of macroeconomics.
6. To make optimal business decisions by integrating the concepts of economics.

Suggested Books:

Sr . N o.	Title	Auth or Name	Publis her	Year of Publicat ion	Editio n
1	Managerial Economics	P. L. Mehta	Sultan Chand & Sons, New Delhi	2011	3 rd
2	Managerial Economics	Dwivedi	Tata McGraw-Hill Publishing Company Limited, New Delhi.	2008	5 th
3	Managerial Economics	Suma Damodaran	Oxford University Press, New Delhi	2006	4 th

Name of Department: Department Of Management Studies
Subject Code: MBL 212
Course Title: Quantitative Technique
Contact Hours: 30 **L:** 03 **T:** 0 **P:** 0

Examination Duration (Hrs.): Theory

Relative Weightage:

TAE- 20 CAE-30 ESE-50 Total-100

Credits: 03 Semester: 1

Subject Area: Managerial Decision Making

1. Do the study of Quantitative Decision Making helps the students to develop quantitative decision making skills.
2. Be aware about the Techniques applied in QDM.
3. Learn about various methods of decision making.
4. Understand forecasting business decision.
5. Incorporate awareness of complexity in problem solution by simplification process.
6. Follow quantitative techniques by choosing the best suitable method.

Suggested Books :

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Business Statistics	G. C. Beri	Tata McGraw-Hill Education Pvt. Ltd.	2009	IIIrd
2	Quantitative Techniques in Management	N. D. Vohra	Tata McGraw-Hill Education	2006	IIIrd
3	Quantitative Methods For Business	Anderson	(Thomson Learning Books)	2012	XII th
4	Statistical methods	S.P. Gupta	(S Chand)	2011	IV th

Details of Course:

S. N o.	Contents	Cont Hrs
1	Measures of Central Tendency –Arithmetic Mean, Median, Mode, Comparison of Mean, Median and Mode, Measures of Dispersion – Range, Quartile Deviation, Mean Deviation, Standard Deviation, Relative Dispersion, Coefficient of Variance, Regression and Correlation Analysis Regression: Method of Least Squares, Regression Coefficient, Standard Errors of Estimate. Correlation: Types, Graphical and Algebraic Method, Coefficient of Determination, Rank Correlation.	6Hrs.
2	Time Series Analysis and Forecasting – Components of Time Series, Trend, Seasonal Variation, Cyclic Variation and Irregular Variation, Forecasting. Matrices and Markov Chains – Matrices: Concepts, Laws, Addition, Multiplication using Matrices, Inverse of Matrix, Markov Chains and its application.	6Hrs.
3	Introduction to Operations Research – Definition, Characteristics, Model, Phases, Indian Companies using Operations Research Techniques, Future Scope of Operations Research Industry, Quantitative Approach to Decision Making. LPP - Graphical Method – Assumptions, Formulation and Solution by Graphical Method.	6Hrs.
4	LPP - Simplex Method –Formulation and Construction of Initial Basic Table by Simplex Method and its interpretation, Theoretical Concept of Duality and Sensitivity.	6Hrs.
5	LPP – Transportation –Formulation and Solution by North West Corner Rule (NWC), Least Cost Method (LCM) and Vogel's Approximation Method (VAM). Optimization by Modified Distribution Method (MODI). LPP – Assignment –Formulation and Solution.	6Hrs

Course Outcome : Student should be able to:

Name of Department: Department of Management Studies

Subject Code: MBL 213 Course Title:

Legal Aspects of Business

Contact Hours:30 L: 3 Hrs T: 0 P: 0

Examination Duration (Hrs.): Theory

Relative Weightage:

TAE- 20 CAE-30 ESE-50 Total-100

Credits:03

Semester: First Subject Area: Business Law

Course Objectives

- 1) To develop acumen towards various acts required in Business Activity.
- 2) To create basic knowledge of business law.
- 3) To study IP and other laws related to business world

Details of Course :

S. No.	Contents	Cont Hrs
1	Introduction to administration of law & legal system in India Introduction to Legal Aspects of Business in General, Companies Act (1956) – Definition & Characteristics of a Company, Company Distinguished from Partnership, Kinds of Companies, Provisions relating to Incorporation, Lifting the Corporate Veil	07
2	Memorandum of Association – Doctrine of Ultra-Vires, Articles of Association – Doctrine of Indoor Management & Constructive Notice, Concept of Prospectus. Role & Duties of Promoter - Shares and Debentures – Natures, Kinds, Transfer and Transmission, Directors – Powers, Position and Duties Winding Up of the Company – Types of Winding up- Winding up by Court, Voluntary winding up, Winding up under the supervision of Court and Conduct of winding up	08
3	The Income Tax Act, 1961- Introduction to Income tax act Definition of Assesse, Residential Status of Assesse; Definition of Deduction, Rebate, Relief & Exemption, Heads of Chargeable Income for salaried. Indian Contract Act (1872) – a) Definition (Sec.2) b) Essential elements of a valid contract c) Competency to enter into contract	07
4	Intellectual Property Act- Scope, Provisions & overview	04
5	Information Technology Act 2000 & Cyber Law- Scope, Provisions & overview, Right to Information Act 2005. Consumer Protection Act – Scope, Provisions & overview	04

Course Outcome :

- The student should be able -
1. To be able to analyze & implement various laws & regulations governing the corporate world.
 2. To be able to comprehend & execute the legitimate ways to solve a business problem.
 3. To understand various facets of Companies Act 1956, & to execute it in dealing with business issues.
 4. To understand the Income Tax concept & its application in corporate world
 5. To analyze the Intellectual Property act and its execution in real life situations.
 6. To study the Information Technology act & to look into various issues of implementing it in India.

Suggested Books :

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Business Law	M. C. Kuchhal	Vikas Publication House, New Delhi	2010	2 nd
2	Business Law	N. D. Kapoor	S. Chand & Co.	2005	5th

3	Company Law	Singh Avtar	Eastern Book Co. Lucknow	2001	11 th
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Name of Department: Department of Management Studies

Subject Code: MBL 214

Course Title:

Management Accounting

Contact Hours: 30 **L: 3 T: 0 P: 0**

Examination Duration (Hrs.): Theory

Relative Weight age:

TAE- 20 CAE-30 ESE-50 Total-100

Credits: 03

Semester: I

Subject Area: Finance

Course Objectives

1. To Develop Accounting Skills.
2. To Understand the Techniques in Accounting.
3. To Undergo Computer skills required in Accounting

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction –Meaning, Scope and Importance of Financial Accounting. Financial Accounting - Concepts and Conventions, Classification of Accounts, Rules and Principles governing Double Entry Book-keeping system. Accounting Books & Record Meaning, Preparation of Journal, Ledger & Trial balance.	6 hrs
2	Final Account of Joint Stock Companies –Final Accounts of Joint Stock Companies, Contents, and Preparation of Trading and Manufacturing, Profit and Loss Account, Balance sheet with Adjustment. Funds Flow Analysis and Cash Flow Analysis, Simple Problems on Preparation of Funds Flow Statement and Cash Flow Statement	6 hrs
3	Ratio Analysis – Classification of Various Ratios, Reading Balance Sheet and Other Financial Data to comment on the financial soundness of the firm. Management Accounting for Decision Making and Control, Cost Volume Profit Analysis, EVA and Performance Measurement.	6 hrs

4	Performance Evaluation Techniques – Introduction to Budgeting and Budgetary Control, Classification of Budget, Problems on Flexible and Cash Budgets, Responsibility Accounting. Cost Accounting – Objectives & Classification of Cost, Preparation of Statement of Cost, Quotations, , Marginal Costing, Operating / Service Costing,	6 hrs
5	Applications – Overview of Control in Banking and Non Banking Finance, Service Industry, Transnational Companies, Project management and PSE.	6 hrs

Course Outcomes: The student should be able -

1. to understand the principles of double entry book keeping.
2. to critically analyze the functionalities of accounting.
3. to analyze and interpret income statement and Balance sheet.
4. to apply appropriate financial analysis tool to make effective financial decisions.
5. to apply budgetary control.
6. to apply Cost Volume Profit analysis tools as a controlling technique.

Suggested Books:

Sr. No	Title	Author Name	Publisher	Year of Publication	Edition
1	Financial, Cost and Management Accounting	Dr.P.P eriasamy	Himalaya Publishing House	2008	III
2	Cost & management accounting	M N Arora	Himalaya Publishing House	2009	II
3	Management Accounting	R S N Pillai & V Bagavathi	S Chand & Co	2006	III

Name of Department : Department of Management Studies

Subject Code: MBL 215 Course Title : Marketing of Product & Services

Contact Hours: 30 L: 2 T: 0 P: 0

Examination Duration (Hrs.) :03 Theory

Relative Weightage:

TAE-10 CAE-15 ESE-25 Total-50

Credits :02

Semester : I st

Subject Area : Marketing Management

Course Objectives

1. To develop the acumen for marketing management.
2. To understand the Techniques in Marketing Management such as Marketing Plan, Market Analysis, Product Management, Strategies, Services, etc.
3. To understand the basic practices of marketing management.

Details of Course :

S. No.	Contents	Contact Hours
1	Concepts & Application : Core Concepts of Marketing, Company Orientation towards Market place, Functional areas of Marketing. Marketing Plan- Nature and Contents of Marketing Plan, Marketing Mix. Steps in Marketing Process, Scanning the Marketing Environment, Customer relationship Management (CRM), Marketing Research & Demand Forecasting.	6
2	Product & Pricing: Segmenting, Targeting, Positioning and Repositioning, Analyzing Buying Behavior, Analyzing Competition. Product Management – Meaning of Product, Product classification, Product Levels, Product Policies, Product Life Cycle, New Product Development, Branding & Packaging, Pricing Strategies– Pricing Objectives, Methods and Pricing Policies, Adopting Price, Initiating and Responding to Price Changes	6
3	Marketing Communication& Distribution: Understanding Communication Process, Managing Advertising; Sales promotion, Public Relations and Direct Marketing. Distribution Strategy – Channel Design and Management, Channel Dynamics and Market Logistics, Channels of Distribution, Types of Channels, Importance of Retailing and wholesaling.	6
4	New Trends in Marketing: E-Business, Database Marketing, Globalization, Consumerism, Legal issues and ethics.	6
5	Marketing Control: Evaluating Results of Marketing Strategy Implementation and Plans, Need and Importance of Marketing Control, Types of Controlling- Operating Control, Strategic Control, Marketing Audit.	6

Course Outcome : The Student should be able -

1. to understand the core concepts of Marketing Management.
2. to Segment, Target and Position a product or services in the given market.
3. to design Product, Pricing, Promotion and Distribution strategy for a company.
4. to acknowledge the importance of Relationship Marketing in present business scenario.
5. to design a Marketing plan for a company.
6. to apply the knowledge of Marketing to practical business situations by understanding the implications of Micro & Macro Marketing Environment.

Suggested Books :

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Marketing Management	Philip Kotler, Kevin Keller, Abraham Koshi & Mithleshwar Jha	Prentice Hall Inc (A South Asian Perspective)	2014	14 th
2	Marketing Management	V. S. Ramaswamy and S. Namakumari	McMillan	2010	4 th
3	Marketing Management	– Rajan Saxena	Tata McGraw-Hill	2011	4th

Name of Department: Department of Management studies

Subject Code: MBL 216 **Course Title :** Human Resource Management

Contact Hours: 30 **L: 3 T: 0 P: 0**

Examination Duration (Hrs.) : Theory

Relative Weightage:

TAE-20 CAE-30 ESE-50 Total-100

Credits : 03 Semester : I st

Subject Area : Human Resource Management

Course Objectives

1. To understand the Basics of HRM.
2. To understand the Framework of HRM.
3. To learn the functions of HRM.

Details of Course :

Sr. No	Contents	Con tHr s
1	Nature, Scope, Objectives, Importance and Functions of HRM, Human Resource as an Asset in Organization, Evolution of the Concept of HRM, Human Resource Management in India, Job Analysis & Design – Job Analysis – Meaning, Uses, Process and Methods of Collecting Data for Job Analysis, Competency Approach to Job Analysis, Job Description, Job Specifications & Role Analysis, Factors affecting Job Design, Techniques of Job Design, Cases and Exercises in understanding Job Analysis	6Hr s
2	– Human Resources Planning, Its Need & Process, Recruitment Policy, Factors Affecting Recruitment, Sources of Recruitment, Recruitment Practice in India, The Problem of The 'Sons of The Soil', Assessment of The Recruitment Programme selection Process, Methods of Selection – Interviews, Tests and Assessment of Effectiveness of selection tools, Induction Programme, Problems in Induction, Internal Mobility, Transfers, Employee Separations	6Hr s
3	Introduction, Objectives and Importance of Training, Organization Analysis, Task Analysis, Man Analysis, Lead Time Planning, Types and Techniques of Training and Development, Objectives & Classification of Training Methods/Techniques, Training by Supervisors, Need and Importance of Management Development, Evaluation of Training, Reasons of Training Failure, Improving Effectiveness of Training.	6Hr s
4	Employee Benefits: Meaning, Types of Benefits & Services, Principles of Fringes, Guidelines for Effective Benefit Programme. Incentive Payments, Incentive Plans, Individual Incentives, Group Base Incentive Plan, Organization wide Incentive Plans, Other Incentive schemes, HR Records Keeping– Process, Methods (Manual / Computerized), Types & Importance. HR Research – Areas of research, Methods of conducting Research	6Hr s
5	Employee Benefits: Meaning, Types of Benefits & Services, Principles of Fringes, Guidelines for Effective Benefit Programme. Incentive Payments, Incentive Plans, Individual Incentives, Group Base Incentive Plan, Organization wide Incentive Plans, Other Incentive schemes, HR Records Keeping– Process, Methods (Manual / Computerized), Types & Importance. HR Research – Areas of research, Methods of conducting Research	6Hr s

Course Outcome: The Student should be able -

1. To develop the acumen for Human Resource management.
2. To understand the Framework of HRM.

3. To learn the functions of HRM
4. To know the importance of absorption & retention of manpower In an organization
5. To measure performance appraisal , rewards& compensation for employee
6. To study the effectiveness of right person at right job at right time

Suggested Books:

S r. N o .	Title	Author Name	Publisher	Year of Publication	Edition
1	Personnel and Human Resource Management	P. Subba Rao	Himalaya Publishing House	2008	2 nd
2	Human Resource Management	K. Aswathappa	McGraw –Hills Companies	2006	5 th
3	Personnel Management and Industrial Relation	N. G. Nair Latha Nair	S. Chand	2004	1 st

Name of Department: Department Of
Management Studies Subject Code: MBL 217
Course Title: Corporate Finance
Contact Hours: 30 **L:** 03 **T:** 0 **P:** 0
Examination Duration (Hrs.): Theory
Relative Weight age:
TAE- 20 **CAE-** 30 **ESE-50** **Total-100**
Credits:03 **Semester:** I
Subject Area: FINANCE

100

Details of Course:

Course Objectives

1. To develop financial management skills.
2. To understand the techniques & tools used in financial management.
3. To create awareness about budgeting.

S. No.	Contents	Contact Hours
1	Introduction – Concept of Business Finance, Finance Function & Scope in Organization, Responsibilities of Finance Executive, Goals & Objectives of Financial Management, Functional areas. Concept of Time Value of Money, Compounding & Discounting, Future Value of Single Amount & Annuity, Present Value of Single Amount & Annuity, Practical application of Time Value Technique, Sources of financing – LONG TERM: Shares, Debentures, Term Loans, Lease & Hire Purchase, Retained Earnings, Public Deposits, Bonds (Types, features & utility) SHORT TERM: bank finance, commercial paper & trade credit & bills discounting INTERNAL: Retained earnings, Depreciation policies.	06 Hrs
2	Capital structure – Concept, Meaning, Principles & Importance, Introduction to Trading on Equity, Capital Gearing & Leveraging, Cost of Capital, Cost of Different Sources of Finance, Weighted Average Cost of Capital, Theories of Capital Structure, Concept of Optimal Capital Structure, Computation of Leverages, Cost of Capital and EBIT-EPS analysis. Capitalization – Concept, Theories, Over Capitalization – Concept, Symptoms, Causes, Consequences & Remedies, Under Capitalization-Concept, Causes, Consequences & Remedies.	06 Hrs
3	Dividend Policies – Concept, Determinants and Factors Affecting, Relevance and Irrelevance Concept, Dividend Valuation Models – Gordon, Walter and Modigliani-Miller Models, Stability of Dividends – Concept and Significance. Working capital – Concept, Significance & Types. Adequacy of Working Capital, Factors Affecting Working Capital Needs, Financing Approaches for Working Capital, Methods of Forecasting Working Capital Requirements.	06 Hrs
4	Capital Budgeting – Nature and Significance, Techniques of Capital Budgeting – Pay Back Method, Accounting Rate of Return, Net Present Value and Profitability Index. Financial Institutions- Need, Structure, Policies, Norms & Schemes, Financing Procedures, Changing Role of Project Appraisal, Overview of operations of NBFC's & Financial Institutions.	06 Hrs
5	Financing of Small Scale Industry – Meaning, Importance, Growth of SSIs, Special Financing Needs and Sources, Issues & Implications. Corporate Restructuring – Reasons & Drivers of Restructuring, Methods of Restructuring- Mergers, Takeovers, Acquisitions, Divesting, Spin-off, Split ups, Privatization, Buyback & Joint Ventures.	06 Hrs

Course Outcome : Student should be able to:

1. Study of financial management helps the students to develop financial management skills.
2. Creates awareness about budgeting.
3. Be aware about the techniques & tools used in financial management.
4. Understand various capital structures for effective financial resource management.
5. Enable in learning the role of financial manager to manage and create wealth.
6. Learn application of finance and its control.

Suggested Books:

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Financial Management	Ravi Kishore	Taxmann's	2013	2013
2	Financial Management	S. M. Inamdar,	Everest Publishing house	2004	XII th
3	Financial Management	Sharma & Gupta	R.M. Srivastav Kalyani Publishers.	1999	1 st

Name of Department: Department of Management Studies

Subject Code: MBL 218 **Course Title:** Basic

Course Objectives

1. To develop the acumen for information technology.
2. To Understand the techniques used in I T Management

Computer Technique

Contact Hours: 30 **L:** 2 **T:** 0 **P:** 0

Examination Duration (Hrs.): Theory

Relative Weightage:

TAE- 10 CAE-15 ESE-25 Total- 50

Credits: 02 **Semester:** 1st

semester **Subject Area:** Information Technology

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction to Computers –Working of Computer, Block Diagram, Hardware and Software, Programming and Flow Charts concepts, Operating systems (MSDOS, Windows, UNIX, Linux), and Networking concepts. Introduction to Word, Excel, PowerPoint, Internet and Web (Working with Google, Yahoo, Rediff, Amazon, e-bay etc.)	6
2	Multimedia –Introduction, Components of Multimedia: Graphics, Audio & Animation, Using Multimedia at Home, Business, Education and Entertainment, Applications in Games and Animation Industry. Basics, Text, Lists, Images, Links, Backgrounds, Tables, Frames, Forms, Meta-tags and Hexa-colors, Preparing simple web pages.	6
3	IT Consulting –Basic concepts of Business, Strategy and Operation with respect to IT, Business / Strategic Consulting: Reengineering, BPR, Operations Consulting: Domain knowledge concept, domain consulting, Cases Studies: McKinsey, AT Kearney etc. IT Enabled Services (ITES) – Processes, Outsourcing Function, Call Centers; BPO's: Captive BPO's (GE and Dell) and Third Party BPO's (Infosys BPO, Wipro BOP, Mphasis, Progeon, WNS, Daksh and EXL etc) KPO's: Processes and Domain Expertise.	6
4	Software Engineering: SDLC: Concepts and Life Cycle, Software Testing: fundamentals and terminology, Software Quality fundamentals, Software Project Management. Information Security – Importance, Malicious Programs: Virus, Trojans, Worm, Logic Bomb, Antivirus: Norton, CA-eTrust, Symantec, McAfee. Cryptography and Data Encryption, Firewall, Hacking, Cyber Law's Basics.	6
5	Trends in IT –Definitions, Conceptual Understandings and Applications of Data Mining, Data Warehousing, Knowledge Management, e-Commerce, e-Learning, e-Business and e-Governance	6

Course Outcome : The Student should be able –

- 1 To develop the acumen for information technology.
- 2 To Understand the techniques used in IT Management.
- 3 To learn basic knowledge of Internet related practices.
- 4 To identify and address issues associated with the internal operation of IT and offer solutions.
- 5 To integrate new and emerging technologies of Machine Learning into each of the foundational components of IT.
- 6 To apply knowledge gained in the program to the completion of a major capstone project.

Suggested Books :

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Database Management Design	J. C.S.V. Murthy	Himalaya publishing house	2007	3 rd
2	Computer application in Business	S. Sudalaimuthu S. Anthony Raj	Himalaya publishing house	2008	1 st
3	Information Technology for business	Dhiraj sharma	Himalaya publishing house	2007	1 st
4	Fundamental of Computers	P. K. Sinha	BPB publication	2004	6 th

Name of Department : Department of Management Studies**Subject Code: MBL 311 Course Title :****Understanding Competition****Contact Hours: 30 L: 3 T: 0 P: 0****Examination Duration (Hrs.) : Theory****Relative Weightage:****TAE-20 CAE-30 ESE-50 Total-100****Credits :03****Semester : 2nd****Subject Area : Strategic Management****Course Objectives:**

1. To identify the procedures for globalization & role of strategic management in global expansion.
2. To analyze the primary issues in an industry, to implement strategy & to establish strategic evaluation & control.
3. To analyze the main structural features of an industry and develop strategies that position the firm most favorably in relation to competition and influence industry structure to enhance industry attractiveness.
4. To appraise the resources and capabilities of the firm in terms of their ability to confer sustainable competitive advantage and formulate strategies that leverage a firm's core competencies.
5. To demonstrate the ability to think critically in relation to a particular problem, situation or strategic decision through real-world scenarios.
6. To Understand various levels of strategy & its impact on Marketing, Finance, HR, Operations, IT.

Details of Course :

S. No.	Contents	Cont Hrs.
1	Portfolio Approach & analysis - a) Portfolio analysis, advantages & disadvantages, b) BCG Matrix c) General Electric's Business Screen, d) Life cycle or Arthur D Little matrix, e) Balance scorecard. Global strategy - Reasons for globalization, Global expansion strategy, International Portfolio Analysis; Market entry strategy, International strategy & competitive advantage.	6
2	Strategic Implementation - 7 s framework- (separate variables in details), Strategic Business Unit (SBUs), Merits & Demerits of SBU; Leadership, Power & organisation culture. Strategic evaluation, Control & continuous Improvement - Establishing strategic evaluation & control; the quality imperative: continuous Improvement to build customer value, Fundamentals of Six sigma approach for continuous improvement.	6
3	Strategic management - Introduction to strategic management, Strategic decision making, Strategic management process; Difference between Policy, Strategy and Tactics. Strategic Intent - Vision, Mission & goals, Preparation of Vision & Mission Statement; Organisational objectives, Hierarchy of objectives & strategies, setting of Objectives. Internal & Resource analysis - SWOT analysis, Resource analysis- a) Organisation capabilities & competitive advantage b) Value chain analysis; Concept of synergy -Core competency, Competitive analysis - Interpreting the five forces model, Competitors analysis.	6
4	External analysis - Environment analysis a) Components of External environment b) Components of Internal environment c) Environmental scanning. Industry Analysis a) A Framework for industry analysis b) Michael Porter's Analysis c) Usefulness of industry analysis. Strategy Formulation (Case study) - Corporate level strategy: A) Growth-Concentration, Horizontal, Vertical, B) Diversification- Concentric, conglomerate. C) Expansion through Cooperation; Merger, Acquisitions, Joint ventures & strategic alliances D) Stability - Pause/proceed with caution, No change, Profit strategies. E) Retrenchment –Turnaround, Captive Company Strategy, Selling out Bankruptcy, Liquidation.	6
5	Business Level strategy & Functional level strategy - A) Business Level strategy-Competitive advantage, Low cost strategy, Differential strategy and Focus strategy, B) Functional level strategy - Operations strategy, Marketing strategy, Financial strategy, Human Resource strategy.	6

Course Outcome:

- The student should be able –
1. To identify the procedures for globalization & role of strategic management in global expansion.
 2. To analyze the primary issues in an industry, to implement strategy & to establish strategic evaluation & control.
 3. To analyze the main structural features of an industry and develop strategies that position the firm most favorably in relation to competition and influence industry structure to enhance industry attractiveness.
 4. To appraise the resources and capabilities of the firm in terms of their ability to confer sustainable competitive advantage and formulate strategies that leverage a firm's core competencies.
 5. To demonstrate the ability to think critically in relation to a particular problem, situation or strategic decision through real-world scenarios.

6. To Understand various levels of strategy & its impact on Marketing, Finance, HR, Operations, IT.

Suggested Books :

Sr. No.	Title	Author Name	Publisher	Yr of Pub	Edition
1	Strategic Management and Business Policy	Azhar Kazmi	Tata McGraw-Hill Education Pvt.Ltd., New Delhi	2011	3 rd
2	Strategic Management , Edition – Publication-	John A Pearce II, Richard B Robinson, Jr.	Tata McGraw- Hill Publishing Company Limited, New Delhi.		9 th
3	Crafting & Executing Strategy	A. Thompson Jr, A.J. Strickland ,	Tata McGraw-Hill Education Pvt.Ltd., New Delhi		14 th

Name of Department: Department of Management Studies

Subject Code: MBL 312

Course Title:

OPERATIONS MANAGEMENT

Contact Hours: 30 **L:** 3 **T:** 0 **P:** 0

Examination Duration (Hrs.): Theory

Relative Weight age:

TAE- 20 CAE-30 ESE-50 Total- 100

credits: 03

Semester:

2nd

Subject Area: Operations

Management

Course Objectives:

1. To develop an awareness of the need for project planning and management and apply professional attitudes and techniques.
2. To develop better understanding about the changing trends & various needs of TQM.
3. To understand and explain different views of Logistics and Supply Chain Management (SCM).

Details of Course:

S. No	Contents	Cont Hrs.
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1	Project Management Concepts - Characteristics of a project Need for project management, Roles of project managers. Project Planning: Statement of work (SOW) and overall project goals, Work breakdown structure (WBS), Preparation of Task-Flow network, CPM-PERT, Gantt chart, Schedule the completion of all work elements, Planning project communication.	6
2	Project Performance Measurement and Control - Concept of earned value performance measurement, Use of Project Management Information Systems (PMIS) to monitor, evaluate, and control planned cost and schedule performance, Conducting periodic project performance evaluation audits.	6
3	Introduction to Quality Concepts - Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation. Concept of Six Sigma.	6
4	TQM Principles - Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDCA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development. Quality Improvement Techniques - Pareto Diagrams, Cause-Effect Diagrams, Scatter Diagrams, Run Charts, Cause and Effect Diagrams	6
5	Logistic Management - Strategic Practices of logistic management, strategic management of supply chain for reduction in inventory, supply chain analysis. Lean Production - Project Scheduling, Waiting Line Analysis for service improvement, Introduction to Lean Production. Supply Chain Management - Supply Chain Management, Transportation and Transshipment Models. Mathematical Foundations of Supply Chain Solutions - Use of Stochastic Models and Combinatorial Optimization in: Supply Chain Planning, Supply Chain Facilities Layout, Capacity Planning, Inventory Optimization, Dynamic Routing and	6

	Scheduling, Understanding the "internals" of industry best practice solutions.	
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Course Outcome: The Student should be able -

1. To develop an awareness of the need for project planning and management and apply professional attitudes and techniques.
2. To deals with the basics of project management.
3. To develop better understanding about the changing trends & various needs of TQM.
4. To apply various techniques in TQM.
5. To understand and explain different views of Logistics and Supply Chain Management (SCM).
6. To apply the mathematical models to optimize operations in Logistics.

Suggested Books:

Sr. No	Title	Author Name	Publisher	Year of Publication	Edition
1	Project Management, A Managerial Approach	Meredith and Mantel, John Wiley and Sons	Course Text.	2003	5th
2	The New Project Management	J. Davidson Frame, Jossey-Bass	Oxford University Press, New Delhi	2011	5rd
3	Total Quality Management	Feigenbaum.A.V	McGraw-Hill, New Delhi	2011	6th
4	Supply Chain Management Strategy, Planning and Operation	Chopra, S, and P. Meindl	Pearson Education	2004	2nd

5	Logistics and Supply Chain Management,	Raghuram, G. and N. Rangaraj	Macmillan, New Delhi	2006	5th
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Name of Department: Department of Management Studies

Subject Code: MBL 313 **Course Title :**

Research Methodology

Contact Hours: 30 **L:** 3 **T:**0 **P:**0

Examination Duration (Hrs.) : Theory

Relative Weight age:

TAE- 20 CAE-30 ESE-50 Total-100

Credits : 03

Semester : 2nd

Subject Area : Research Methodology

Details of Course :

S · N o ·	Contents	C o n t Hr s.
1	Introduction: Meaning, Objectives and Types of research, Research Approach, Research Process, Relevance & scope of research in management. Research Design - Features of good Design, Types of Research Design, Basic principles of experimental Design, Use of advanced technology in Research Design, Role of Research analyst. Cases and Exercises in understanding Job Analysis.	6
2	Sampling Design - Steps in sample Design, Characteristics of a good sample Design, Probability & Non Probability sampling. Measurement & scaling techniques - Errors in measurement. Test of sound measurement, Scaling and scale construction technique	6
3	Methods of data collection - Primary data – questionnaire and interviews; Collection of secondary data; Use of computer and Information technology in data collection. Collection and Processing data - Field work, Survey Errors, Data coding; Editing and Tabulation.	6
4	Analysis of data - Analysis of Variance; Advanced Data Analysis Techniques- Factor Analysis, Cluster Analysis, Discriminate Analysis, Conjoint Analysis, Multi-Dimensional Scaling. Testing of hypothesis - Procedure for hypothesis testing; Use of statistical techniques for testing of hypothesis.	6

5	Interpretation of data - Techniques of Interpretation, Report writing, Layout of a project report, preparing research reports. Software Application in SPSS	6
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Course Outcome:

1 To give the Research & va

Applicable to Programs- Semester:

1. MBA2nd

2.To understand in conducting

3. To apply scaling techniques in the analysis of data.

4. To and various methods of data collection & its applic 100 research.

5. To understand various facets related to data analysis& to analyze why proper data analysis is required for proper research.

6. To gain an insight about the proper method of writing a research report.

Suggested Books :

Sr · N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	Business Research Methods	Zikmund :	Thomson Learning Books	2011	3 rd
2	Marketing Research	G C Beri	Tata McGraw-Hill Publishing Company Limited, New Delhi.	2011	3 rd

Course Objective ;

1. To understand the Basics of Business research.
2. To understand the techniques of business modeling.

3	Research Methods in Behavioural Science	Dwivedi	Macmillan)	2009	5 th
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Name of Department : Department of Management Studies

Subject Code: MBL 314 **Course Title :**

ORGANIZATION BEHAVIOR

Contact Hours: 30 **L:** 2 **T:** 0 **P:** 0

Examination Duration (Hrs.) : Theory

Relative Weightage:

TAE-10

CAE-15

ESE-25

Total-50

Credits : 02

Semester :

2nd

Subject Area : Human Resource Management

Course Objectives

1. To develop resource managing skills.
2. To understand the group dynamics.
3. To apply motivational techniques at work
4. To understand economic environment of business.

Details of Course :

S. N o.	Contents	Hr s.
1	Introduction –The globalization of work, Managing human rights in the workplace, Managing developments in information technologies, Managing organizational transitions, Managing new forms of Organization. Productivity and managerial performance, Value-added managers. Foundations of Individual Behavior - biographical characteristics, ability, and learning. Perception: Introduction, Halo effect, Stereotyping, pigeonholing and compartmentalization; Self-fulfilling prophecy; Perceptual mythology; other influences on perception.	8
2	Attitudes and values - Attitudes, Components of attitudes, Attitudes and behaviour, Attitudes and cognitive consistency, Job satisfaction as an attitude; development Values, Sources and types of values, Patterns and trends in values, Managing values and attitudes.	4
3	Motivation- Concepts, Theories of Maslow, Herzberg, McClelland, Porter & Lawler Model, Application of Motivation concept, Individual motivation and motivation in the organization, Cultural Differences in Motivation, Intrinsic and Extrinsic Motivation, Social Motivation, Motivation and Health, Role of motivation in human behavior.	6

4	Foundations of group behavior - The nature of groups, groups and teams, informal and formal purpose of teams, Teams and team building: selecting team members, team roles, stages in team development, team building, team identity, team loyalty, commitment to shared beliefs, multi-disciplinary teams, Team Dynamics: group norms, decision-making behavior, dysfunctional teams, Cohesiveness, Conflict - Substantive and emotional conflicts, Levels of conflict, Sources of conflict in organisations, Symptoms of conflict Causes of conflict, Strategies for the management of conflict.	8
5	Organizational Change - Nature, levels and dilemmas of change, Pressures for change, The Domino effect, Responses to change, Force field analysis, Change process, Resistance to change, Dynamics of change.	4

Course Outcome: The student should be able -

1. to engage human resource for the benefit of the organization.
2. to manage job attitude and values of the organization effectively.
3. to apply motivational techniques at work to increase the employee effectiveness and efficiency.
4. to differentiate between group and team and use them judiciously wherever required.
5. to manage conflict strategically for the benefit of the organization.
6. to handle the resistance to change by employee in an organization.

Suggested Books:

S r. N o .	Title	Author Name	Publisher	Year of Publication	Edition
1	Organis ational Behavi our	Stephan s Robbins	Pearson Education Asia	2012	14th
2	Organis ational Behavi our	Luthans fred	McGraw- Hill Publishing Company	2011	12 th

3	Organisational Behavior: Text and cases	Kavita Singh	Pearson Education South Asia	2010	1 st
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Name of Department: Department of Management Studies

Subject Code: MBL 315 **Course Title:** Consumer Behavior & Retail Management

Contact Hours: 30 **L:** 3 Hrs **T:** 0 **P:** 0

Examination Duration (Hrs.): Theory

Relative Weightage:

TAE- 20 CAE-30 ESE-50 Total-100

Credits :03

Semester :

2nd Subject Area : Marketing Management

Course Objectives

1. To understand the concept of retail formats in the market
2. To understand nature & scope of Sales
3. To know channel management, distribution planning & cost control.

Details of Course :

S. No.	Contents	Cont Hrs
1	Introduction to Retail Management - Retail & Retailing – definitions, Meaning of Retail Mix, Growth of Retail Industry, Factors responsible for changes in retailing, Challenges & Opportunities to Retail Industry. Store Retail Formats - Independent/ Stand alone outlet, Convenience Store, Supermarket, Discount Store, Off-price retailer, Department Store, Corporate chains, Consumer co-operatives, Shopping malls, Hypermarkets, Catalogue showroom, Franchising.	07
2	Non-store Retail Formats - Multi-Level marketing, e-tailing, Tele-shopping, Automatic Vending Machines, and Direct Mail Marketing. Retail Planning - Retail Planning Process, Retail Finance, Location Selection Decision, Layout Planning Studying Consumer Behavior & Other Related Issues in Retailing -Understanding Consumer Behavior, Cultural & Social Group influence on Consumer Purchase Behavior, Consumerism & Ethics in Retailing, Merchandising .	08
3	Nature and scope of sales management - Nature of personal selling, Role of the sales force, setting and formulating personal selling objectives, Sales forecasting methods. Designing sales force strategy and structure- Recruiting and selecting sales personnel, determining the kind of salespeople, determining size of the sales force; Training salespeople: Developing and conducting sales training programmes, Defining training objectives, deciding training content, selecting training method	07

4	Channel management and channel strategy- Determination of channel objectives, Determining coverage and support requirements, Distribution logistics.	04
5	Distribution planning, costs and control- Functions of intermediaries (wholesaler & retailers), Selection and motivation of intermediaries, Need, criterion and establishing objectives for intermediaries; Control issues- Major cost centres in distribution, Establishing standards for control, Controlling channel members and tools for control; Cases and recent articles and reports should be discussed in the class.	04

Course Outcome : Student should be able to:

1. To analyse the market.
2. Compare and contrast the market.
3. Sell any kind of goods or services in the market with an acumen to handle Sales team.
4. Analyse the market concerning distribution of goods and services and be able to solve it with the knowledge of Distribution planning and Channel Management.
5. Understand the Retail business in today's changing business environment.
6. Understand and identify itself as a Retail Entrepreneur.

Applicable to Programs–MBA

Semester : II

100

Suggested Books :

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Retail Management	Barry Berman/Joel R Evans	Pearson Education	2007	10th
2	Retailing Management	Swapna Pradhan	Mc.Graw Hill	2007	2nd
3	Retail Management	Icfai Centre for Management Research	Icfai Press	2003	3rd

Name of Department : MBA

Subject Code: MBL 316 **Course Title :-** Performance Management & compensation

Contact Hours: L: 3 T: 0 P: 0

Examination Duration (Hrs.): Theory

Relative Weightage:

TAE- 20 CAE-30 ESE-50

Total-100

Credits :03

Semester : II

Subject Area : Human Resource Management

Details of Course:

S. No.	Contents	Co nt Hrs
1	Unit-I – Job Evaluation / Grade Structure - a. Purpose and Methods of Job Evaluation, Ranking Systems, Job Classification / Grading method, Points System, Factor Comparison Method, Packaged Point Plans, Implementation; b. Job Analysis; Nature/Use, Methods, Job Identification Summary, Relationships, Responsibilities and Duties, Writing Job Specifications and Description– Compensation Planning - Concepts, Nature and objectives of Compensation, Wages, Wage Fixation, Wage differentials, legal Status of Wages (basics), Wage Plans – Rowan /Halsey.	7H R
2	Unit-II :Wages – Variable Compensation and Supplementary Compensation – Perks, Fringe Benefits, Pay for Performance – Incentives,Methods of PA, Graphic Rating Scales, BARS, Alternation Ranking, Forced Distribution Method, Critical Incident Method, MBO, Assessment Centers, Group Appraisal; 360 deg Feedback, Appraisal Interview; Performance Planning and Potential Appraisal – Trait Based, Behavior Based and Result Based, Pitfalls.	8Hr
3	Unit-III : Career Management - Career Development Plan - Employee's and Employer's Role, Career Anchors, Nature of Careers, Career Problems – Low ceiling Careers, Career Mapping, Career Counseling, Succession Planning	6Hr
4	Unit IV HR Scorecard / Balanced Scorecard – Introduction, Concept, Structure, Practical Application. Constructing and developing models of PMS, Competency Mapping, Career Plans, Employee Manual	6 Hr
5	Unit-V Ancillary Topics - Goal Setting, Promotions and Transfers; Separations-Retirement, VRS, Deputation, Death, Retrenchment, Pink Slips.	6Hr

Course Outcome: The student should be able -

1.To Develop Understanding for Human Value.

Course Objective

1. To Develop Understanding For Human Value.
2. To Understand various practices followed in HRM.
3. To know the compensation planning.
4. To learn the importance of different job components & its management.
5. To highlight importance of career management
6. To leverage Retrenchment policy to build equity in organization

Suggested Books :

Sr . N o.	Title	Auth or Name	Publis her	Year of Publica tion	Editio n
1	Compens ation Managem ent	Dr. Kancha n Bhatia	Himalay a Publishi ng House	2009	1 st
2	Human Resource Managem ent	S. S. Kankha	S. CHAND	2003	1 ST
3	Managing Human Resource s	Monap pa Publica tion	Macmilla n	2009	3 rd

Name of Department : __MBA

Subject Code: MBL 317 Course Title :

International perspective in HR

Contact Hours: L: 2 T: 0 P: 0

Examination Duration (Hrs.) : Theory

Relative Weightage:

TAE- 10 CAE-15 ESE-25 Total- 50

Credits :02 Semester : _II_

Subject Area : Human Resource Management

Course Objective:

- 1.To understand basic understanding about the five aspects of international perspective of HRM to the students.
2. To understand integration of general human resource management in an international perspective is essential to international business.
3. To broaden the concepts of HRM across the countries.

Details of Course:

S. No.	Contents	Contact Hours
1	Unit-I –Introduction –Defining International HRM, Difference between Domestic and International HRM,, The International Recruitment process-Recruitment Means: Internal-External, advantages and disadvantages, International selection, effectiveness analysis of selection process, special issues in IHRM, Understanding human behavior in global.	8HR.

2	Unit-II : Training and Development: Importance of training program for international perspective, components of effective Pre-departure training, developing staff-through international assignments,: Role Expatriate Training of Expatriate Training.	7Hr
3	Unit-III Compensation: Meaning of compensation, type of compensation, objective of international compensation, key components of an international compensation program, approaches to international compensations	6Hr
4	Unit IV: Performance Management: Introduction, performance management of international employees, Performance appraisal of international employees, multinational performance, HCN employees.	6 Hr
5	Unit-V: International HRM trends and future challenges, Role and responsibilities of HR manager in Global markets, International joint venture: role of corporate office, organizational structure in MNC, Managing people in international contest.	6Hr.

Course Outcome: The student should be able -

1. to understand cultural difference in India & Abroad with respect to HRM
2. To broaden the concepts of HRM across the countries.
3. To understand international compensation and its components
4. To leverage the various HR practices handled by global manager
5. To understand the importance of training program for international perspective
6. To understand the global HRM trends and future challenges.

Suggested Books :

Sr . N o.	Title	Auth or	Publis her	Year of Publica tion	Editio n
1	Internatio nal Human Resource Manage ment	Monir Tayeb,	Oxford Universit y Press.	2005	10 th
2	Internatio nal Human Resource Manage ment	Randall Schuler & Dennis Briscoe ,	Routledg e Global Human Resourc e Manage ment Series	2005	8 th

3	Strategic human Resource Management	S. SCHULER and SUSAN E JACKSON	Blackwell Publishin g,	2007	2 nd
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Name of Department: Department of Management Studies

Subject Code: MBL 318 **Course Title:** Taxation

Contact Hours: 30 **L: 3 T: 0 P: 0**

Examination Duration (Hrs.): Theory

Relative Weightage:

TAE- 20 CAE-30 ESE-50 Total- 100

Practical - Ext. - Int.- Total-

Credits :03 Semester : II

Subject Area : Finance

Course Objectives

1. To understand the concept of tax planning and different central excise laws applied in business
2. To understand the concept of service tax levied.

Details of Course:

S. No.	Contents	Contact Hours
1	Definition of Income & Assesse, Previous year, Assessment year, Gross total income, Total taxable income, Residential status, Agricultural income. Distinction between capital and revenue receipts; Income from Business & Profession (excluding professional income).	6 hrs
2	Income from capital gains and income from other sources relating to company assessee only. Income exempt from tax, Tax rebates, Deductions relating to company assessee only. Set off & Carry forward of losses, TDS, Self assessment tax, Filing of return	6 hrs
3	Tax Planning - Concept, Tax Planning with reference to setting up of new business, Financial management decisions & Employees remuneration. Special features of Indirect tax levies - All authorizing the levy and collection of duties of central excise, Customs and central sales tax., tax avoidance vs. tax Evasion.	6 hrs

4	Central Excise Laws - Basis of chargeability of duties of central excise-goods, Manufacture, Classification and valuation of excisable goods- specific issues and case studies; Assessment procedure, Exemption, Payment, Recovery and refunds of duties. Central sales tax - Scope of levy of Central Sales Tax; Inter-State sale, sale outside a State and sale in the course of import and export-basic principles; Registration of dealers and determination.	6 hrs
5	Provisions of law and procedures; VAT – concept, Applicability, Procedures involved and implications of the VAT. Customs Laws – Nature of customs duty, Types of customs duty, Classification for Customs and rate of duty, Valuation for customs duty, Provisions regarding baggage, Courier, Postal articles and stores	6 hrs

Course Outcome: The student should be able -

1. to identify the different Heads of Income.
2. to identify the nature of Incomes and their tax incidence.
3. to calculate income from salary, business and profession.
4. to calculate the tax liability of Partnership firm and Joint stock companies.
5. to file returns, apply appeals & revisions.
6. to understand the Indirect Taxes.

Suggested Books :

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Systematic Approach to Income Tax.	Ahuja, G. K. & Gupta, Ravi,	Bharat Law House	2008	II
2	Direct Taxes Law & Practice	Bhagwati Prasad	Wishwa Prakashan	2009	III
3	Indirect Taxes	Datey V. S.	Taxmann Publications, New Delhi	2006	I
4	Direct taxes law	Singhani V K Singhani Kapil Singhani Monica	Taxmann Publications, New Delhi	2007	III

Course Objectives

1. An understanding of various aspects involved in setting up the venture.
2. An understanding of the basic aspects of the market.
3. An understanding of aspects involved in managing processes and people.

Name of Department: Department of Management studies

Subject Code: MBLD 210 **Course Title:** Exploring Business Opportunities

Contact Hours: 30 **L:** 2 **T:** 0 **P:** 0

Examination Duration (Hrs.): Theory

Relative Weightage: -

TAE- 10 CAE-15 ESE-25 Total- 50

Credits: 02 **Semester:** Ist -SEM

Subject Area: Entrepreneurship Development

Details of Course:

Sr. No.	Contents	Contact Hours
1	Unit-I – Establishing your Venture Identification of Business opportunities, feasibility assessment, financing, selecting infrastructure, buying machinery,	6Hrs.

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Entrepreneurship in Action	Mary Coulter	PHI.	2012	14th
2	Entrepreneurship-New Venture	David . H. Holt,	PHI..	2011	12 th

	technology, recruitment, project implementation.	
2	Unit-II- Your Market Marketing for small businesses, sales promotion, export environment.	6Hrs.
3	Unit-III- Production planning and productivity Production planning and control, innovations, quality control.	6Hrs.
4	Unit-IV-Managing People & Processes Decision making, measuring and evaluating organizational performance, introducing change, HRM issues, motivating employees, work teams and leadership, conflict management.	6Hrs.
5	Unit-V- Managing IPR's Patent, Trade mark, Copyright; who may apply?; process, implication for entrepreneurs. Managing Growth and Other Challenges Growth, downturns, exiting the venture, managing personal life.	6Hrs

Course Outcome: The Student should be able -

1. An understanding of various aspects involved in setting up the venture.
2. An understanding of the basic aspects of the market.
3. An understanding of planning and control function no production.
4. An understanding of aspects involved in managing processes and people.
5. An understanding of aspects involved in IPR's.
6. An understanding of aspects involved in managing growth.

Suggested Books:

Name of Department: Department of Management studies

Subject Code: MBLD 211

Course Title:

Social Entrepreneurship.

Contact Hours: 30 L: 2 T: 0 P: 0

Examination Duration (Hrs.): Theory

Relative Weightage:

TAE-10 CAE-15 ESE-25 Total-50

Credits: 02

Semester: Ist -SEM

Subject Area: Entrepreneurship Development

Details of Course:

Sr. No.	Contents	Contact Hours
1	Unit-I – Introduction to Social Entrepreneurship: Features of Social entrepreneurship, Difference between social and Business entrepreneurship. Difference between social entrepreneurship and Activism, Relationship of social enterprises to other companies, government agencies and markets.	6Hrs.
2	Unit-II- Legal setup: legal setup for 'Not for Profit' organization and 'For Profit' social enterprise, Forms of Organization.	6Hrs.
3	Unit-III- Social innovation and entrepreneurship in India: Education, Agriculture, Healthcare, Renewable Energy, Manufacturing, and Skill Development.	6Hrs.
4	Unit-IV-Challenges: Financial constraints: Funding, Incubation and Micro Financing. Social challenges. Wealth Creation: Economic value, social innovation and sustainability.	6Hrs.
5	Unit-V- Social Entrepreneur - A Change Agent: What does social entrepreneur do? Sustainability: Is social entrepreneurship the way of business for tomorrow.	6Hrs

Course Outcome: The Student should be able -

1. An understanding of social entrepreneurship and its uniqueness.

2. An understanding of Legal setup for social entrepreneurship.
3. An understanding of social innovation and entrepreneurship in India.
4. An understanding of various social challenges.
5. An understanding of wealth creation through social entrepreneurship.
6. An understanding of role of social entrepreneur.

Suggested Book:

Name of Department: Department of Management studies

Subject Code: MBLD 310

Course Title: Industrial Relation And labor Law

Contact Hours: 30 L: 2 T: 0 P:0

Examination Duration (Hrs.) : 3

Relative Weight age:

TAE- 10 CAE- 15 ESE-25 Total-50

Credits :02

Semester : 2

Subject Area : Entrepreneurship

Course Objectives:

1. To understand the concept of grievances & disputes and

Course Objectives

An understanding of social entrepreneurship and its uniqueness.

An understanding of social innovation and entrepreneurship in India.

An understanding of role of social entrepreneur.

its impact on industry.

2. To understand role of ILO & various labor legislations.

3. To know welfare activities & social security measures in industry

Details of Course:

S. No.	Contents	Hrs.
1	Definition and concept of industrial relation, basic facts, scope, aspects & ideologies of Industrial relations, Approaches to Industrial relations. Industrial Democracy- (A) COLLECTIVE BARGAINING, definition, importance, types ,prerequisites of effective collective Bargaining & Collective Bargaining in India; (B) WORKERS PARTICIPATION: Concept & meaning, Aims & objective,	6

	Forms & levels of participation, conditions essential of working of the scheme	
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Sr . No.	Title	Author Name	publisher	Publisher	Year of Publication	Edition
1	Social Entrepreneurship (What Everyone Needs To Know),	David Bornstein and Susan Davis	Oxford University Press	PHI.	2012	14th
2	How to Change the World: Social Entrepreneurs and the Power of New Ideas	David Bornstein	Oxford University Press	PHI..	2011	12th

2	Grievances & Disputes - Nature & causes, settlement machinery, social obligations, Industrial Disputes, causes, remedial & prevention measures. Consequences of Industrial disputes on Industry & Society, Significance of Peace & Harmony to Industrial Productivity & progress Labour Welfare & Social Security Concept - Meaning & scope, Labour welfare & welfare officer in Indian Industry, his role, perceptive, limitations, role perception and role performance, New challenges & expectations, Training of welfare officers	6
3	Labour Legislations & ILO - Nature, Scope, character growth & development of labour legislation In India, Legislation & the constitution of India; Constitution, working & impact of ILO on Labour Legislations in India, ILO convention & recommendations	6
4	Normative Labour Legislations - Factories Act, 1948, Bombay shop & Establishment Act 1948, PULP Act 1971.Wage Legislation - Minimum wages Act, Payment Of wages Act 1936, Payment of Bonus Act 1965. Industrial Relations Legislations - Trade Union Act 1926, Industrial Employment standing order Act 1946, Bombay Industrial Relations Act, Industrial Dispute Act 1947.	6

5	Social Security Legislations - Workmen's compensation Act, Employees state Insurance Act 1948, Provident Fund Act 1952 and Payment of Gratuity Act 1972. Functions & Working Of Offices Attached To Labour Ministry - Directorate –General of Employment & Training; Labour Bureau; Welfare Commissioners; Various committee constitute by the Government of India (Ministry Of Labour). –	6
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Course Outcome:

- 1.To understand the concept of grievances & disputes in industry
2. To understand role of ILO & various labor legislation.
- 3.To know welfare activities & social security measures in industry.
4. To build uniformity in wage distribution policy.
5. To highlight the importance of workers participation in an organization.

Suggested Books:

Name of Department: Department of Management studies

Subject Code: MBLD 311 **Course Title:**Family Business Management

Contact Hours: 30 **L:** 2 **T:**0 **P:**0

Examination Duration (Hrs.) : 3

Relative Weight age:

TAE- 10 CAE- 15 ESE-25 Total-50

Credits :02 Semester : 2

Subject Area : Entrepreneurship

Course Objectives:

2. Improve communication, family council meetings, conflict resolution and lead family members towards positive changes for the family and business.
3. Importance of family constitution Learn parallel strategic planning for the family and business.

Details of Course:

S. No.	Contents	Hrs.
1	Family Relationships and Family Systems Meaning of family Family systems What is a healthy family? Individual roles/functions in the family Conflicts in the family / Resolving conflicts in the family	6
2	Family Business / Governance Close look on the entrepreneur Family business systems vs. Family systems Session / Family Council/Family Governance /Need to Plan / Parallel Planning Process Need to plan Planning process /Family business planning questions	6
3	Balancing family and business planning /How to run a Successful Family Business /Professional Management Effective Outside Boards Other topics related to professional mgmt.	6

S r. N o.	Title	Author Name	publisher	Publi sher	Year of Public ation	Edit ion
1	Personnel Mgmt and Industrial Relation	N.G. Nair, Latha Nair	S. CHAND	PHI.	2012	14th

Course Objectives

1. To Understand Enterprise Resource Planning System.
2. To understand the gap analysis with implementation strategy for successful implementation for competitive advantages

	Management.					
4	Family Constitution /Planning for Succession In-laws Discussions on characteristics of successful Family businesses					6
5	Case Study					6

Course Outcome:

1. To develop an awareness of the need for project planning and management and apply professional attitudes and techniques.
2. To perform function effectively on a project team.

3. To deals with the basics of project management.
4. A basic understanding of computation of Income under the head Business/ Profession.
5. A basic idea about the incomes exempt from tax and deductions.

Suggested Book:

Sr. No.	Title	Publish er	Year of Publicati on	Editio n
Project Managemen t, A Managerial Approach	Meredith and Mantel, John Wiley and Sons	Oxford University Press, New Delhi	2012	14th
The New Project Managemen t	J. Davids on Frame, Jossey-Bass	Pearson Press, New Delhi	2011	12 th

Name of Department: Department of Management studies

Subject Code: MBLE 210 Course Title: Enterprise Resource Planning

Contact Hours:30 L: 2 T: 0 P: 0

Examination Duration (Hrs.): Theory

Relative Weight age:

TAE- 10 CAE-15 ESE-25 Total-50

Credits: 02 Semester: 1st

Subject Area: Creativity and Innovation

Details of Course:

Sr. No.	Contents	Contact Hours
1	Unit-I – Introduction to Enterprise Resource Planning – An Overview ERP, characteristics, Features of ERP ,Benefits of ERP	6Hrs.
2	Unit-II-ERP and Related Business Processing Reengineering(BPR), Data Warehousing, Data Mining, On-line Analytical Processing(OLAP), Supply Chain Management (SCM), Customer Relationship Management(CRM), MIS -Management Information System, DSS - Decision Support System, EIS - Executive Information System	6Hrs.
3	Unit-III-ERP Modules- Sales and Distribution, Financial, HRM, CRM	6Hrs.
4	Unit-IV-Estimation Procedures - System Evaluation, RFI, FRS, RFP, Evaluation Components, Build / Buy Decisions ERP and BPR - Reengineering concept, BPR Steps, ERP / BPR Relationship, GAP analysis	6Hrs.
5	Unit-V –Case Studies	6Hrs

Course Outcome: The Student should be able -

1. To understand Enterprise Resource Planning (ERP) System
2. To know the technologies related Enterprise Resource Planning
3. To understand implementation of ERP.
4. To know various ERP packages in market.
5. To understand various business process of various companies,.

Name of Department: Department of Management studies

Subject Code: MBLE 211 Course Title:

Applicable to Programme - Semester :

1. MBA 3rd Sem

Examination Duration (Hrs.): Theory

100

Relative Weight age:

TAE- 10 CAE-15 ESE-25 Total-50

Credits:02

Semester: 1st -

SEM

Subject Area: Creativity and Innovation

Details of Course:

Sr. No.	Contents	Contact Hours
1	Unit-I – Overview of Business Analytics: Introduction, Overview of BA models, Deployment of BA models, Data Sources: IT Operations and Development	6Hrs.
2	Unit-II-Decision support System and Business Intelligence: Changing Business Environment and Computerized decision support, Concepts of DSS, Framework for BI, Major Tools and techniques of Managerial Decision Support, Roadmap to implementing a BI infrastructure	6Hrs.
3	Unit-III-Business Performance Management : BPM Overview, Strategies, Plan, Monitor, Act and Adjust, Performance Management, BPM Methodologies, BPM Technologies and Applications	6Hrs.
4	Unit-IV-Business Performance Management : BPM Overview, Strategies, Plan, Monitor, Act and Adjust, Performance Management, BPM Methodologies, BPM Technologies and Applications	6Hrs.
5	Unit-V –Case Studies 1 and 2	6Hrs

Course Outcome: The Student should be able -

1. To understand Enterprise Resource Planning (ERP) System
2. To know the technologies related Enterprise Resource Planning
3. To understand implementation of ERP.
4. To know various ERP packages in market.
5. To understand various business process of various companies

Course Objectives

1. To demystify Enterprise Resource Planning
2. To understand the gap analysis with implementation strategy for successful implementation for competitive advantages

Name of Department: Department of Management Studies

Subject Code: MBLE 310

Course

Title: Consumer Psychology

Contact Hours: 30 **L:** 2 **T:** 0 **P:** 0

Examination Duration (Hrs.): Theory

Relative Weightage:

TAE- 10 CAE-15 ESE-50 Total-50

Credits: 02 **Semester:** 2nd

Subject Area: CREATIVITY & INNOVATION.

Course Objectives

- 1 To develop Acumen for Psychological influence on consumer decision making
- 2 To develop Acumen for Sociological influence on consumer decision making
- 3 To develop acumen for consumer psychology.
- 4 To understand consumer decision making
- 5 To understand the consumer perceptions about product or services.
- 6 To understand the concept of diffusion of innovation.

Details of Course:

S. N o.	Contents	Co nt Hr s.
1	Psychological Influences on Consumer Decision Making: Consumer Needs & Motivation, Emotions and Mood, Consumer Involvement. Consumer Learning. Personality, Self-concept and Self-image. Consumer Perception, Risk and Imagery. Consumer Attitude: Belief, Affect, Attitude and Intention, Attitude Formation and Attitude Change. Consumer Communication.	6
2	Sociological Influences on Consumer Decision Making: Consumer groups. Consumer reference groups. Family and Life cycle. Social class and mobility, lifestyle analysis. Culture; Sub-Culture. Cross Culture. Interpersonal Communication and influence. Opinion Leadership.	6
3	Introduction to Consumer Psychology: Overview of foundation of consumer behavior. Defining Consumer Behavior. Scope and Application of Consumer Behavior. Why Study Consumer Behavior. Evolution of Consumer Behavior as a Field Of Study and its relationship with Marketing: Behavioral Dimension. The Interdisciplinary Nature of Consumer Behavior.	6
4	Consumer Decision Making: Need and Information Search, Alternate Evaluation and Choice Consumption and Post-Purchase Behaviour The Individual Consumer: Consumer perceptions Memory and Learning Mood, Emotion and Involvement, Consumer Attitude, Marketing communications	6
5	Diffusion of innovation. Diffusion Process. Adoption Process. Consumer Innovators. Multiplicative innovation adoption (MIA) model.	6

Course Outcome: The Student should be able to understand -

1. The psychological influence on consumer decision making.
2. The sociological influence on consumer decision making
3. To understand the basics of consumer psychology.

4. The consumer decision making process and apply to real world problem.
5. The consumer perception formation about any product or services.
6. The diffusion of innovation in consumer psychology.

Suggested Books

Sr. No.	100 Title	Author Name	Applicable to Programs- Semester:		
			1. MBA2nd		
1	Consumer Behavior and Marketing Action	Henry Assael	Cengage Learning		
2	Consumer Behavior	Jay Lindquist	Cengage Learning		
3	Consumer Behavior	Leon Schiffman	Pearson Press		

Name of Department: Department of Management Studies

Subject Code: MBLE 311 **Course Title:**

PROJECT MANAGEMENT

Contact Hours: 30 **L:** 2 **T:** 0 **P:** 0

Examination Duration (Hrs.): Theory 03

Relative Weightage:

TAE-10 CAE-15 ESE-25 Total-50

Credits: 02 **Semester:** 2nd

Subject Area: CREATIVITY & INNOVATION.

Course Objectives

1. Develop Acumen for Indian Taxation system.
2. To Understand Project Management Techniques.

Details of Course:

S. No.	Contents	Cont Hr s.
1	Project Management Concepts - Characteristics of a project Need for project management, Roles of project managers. Project Planning: Statement of work (SOW) and overall project goals, Work breakdown structure (WBS), Preparation of Task-Flow network, CPM-PERT, Gantt chart, Schedule the completion of all work elements, Planning project communication, Quality	6

	Planning..	
2	Construction Management - a)Project Controlling: Monitoring and Control, Crashing, Resource Leveling, Updating.b) Construction site management: Site mobilization – demobilization aspects, various Resources management based on funds availability, coordinating, communicating & reporting Techniques, Application of MIS to construction, Training for Construction Managers,Engineers, Supervisors.	6
3	Project Performance Measurement and Control - Concept of earned value performance measurement, Use of Project Management Information Systems (PMIS) to monitor, evaluate, and control planned cost and schedule performance, Conducting periodic project performance evaluation audits.	6
4	Project Evaluation and Termination - Analyzing project performances versus cost and schedule constraints, Identify causes associated with project success and failure. Ways in which a project can be terminated upon completion.	6
5	Contracting For Project Managers - Define contract administration and its role in project management, .Project Procurement cycle, Contract Administration policies and procedures, Select contract types for various situations, Contract Proposal Development, Contract Terms & Conditions, Contract Negotiation.	6

Course Outcome: The Student should be able -

7. To develop an awareness of the need for project planning and management and apply professional attitudes and techniques.
8. To perform function effectively on a project team.
9. To deals with the basics of project management.
10. A basic understanding of computation of Income under the head Business/ Profession.
11. A basic idea about the incomes exempt from tax and deductions.
12. A basic understanding of GST.

Suggested Books:

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition		Communication - Role of IMC in Marketing and Brand Management; How Marketing Communication Work; Setting IMC objectives.	
1	Project Management, A Managerial Approach	Meredith and Mantel, John Wiley and Sons	Course Text.	2003	5th	2	Communication and Branding - Marketing Communications Functions, Brands, and Integrated Marketing Communication, Integrated Marketing Communication Partners and Industry, Organizations; Using Advertising and Promotion to Build Brands; Brands and Stakeholder Relationships; Basic Marketing Communication Strategies for Building Brands; Integrating the Brand Communication Process; Customer Brand Decision Making.	6
2	The New Project Management	J. Davidson Frame, Jossey-Bass	Oxford University Press, New Delhi	2011	5rd	3	Research Methods and Application - Role and Relevance of Research in Communication; Types of Research and the Research Process; Advertising Research; Positioning Research, Target Market Research, Pre-test Research and Audience Research. Integrated Marketing Communication and Micro-Marketing - Segmenting, Targeting, and Positioning. Data-Driven Communication; fostering word-of-mouth; Opinion Leaders, Reference Groups	6
3	Project Management	Harold Kerzner, Van Nostrand Reinhold	Pearson Press, New Delhi	2006	4th	4	Creating, Sending, and Receiving Brand Messages -Integrated Marketing, Communication Creative Concept and Messages; Message Execution; Integrated Marketing Communication, Broadcast, Out-of-Home, Product Placement Media; Internet and e-Commerce Media; Integrated Marketing Communication Media Planning.	6
						5	Sales Promotion in Integrated Marketing Communication -Consumer Sales Promotion and Packaging; Channel Marketing; Trade Sales Promotions and Co-Marketing; Personal Selling; Direct Marketing; Trade Shows, Events, Sponsorship and Customer Service. Advertising Concepts and Principles-Principles and Concept of Advertising; Relevance of Advertising in IMC-mix, Overview of the Advertising Scene in India; Social and Economic impact of Advertising; Account Management	6

Name of Department: Department of Management Studies

Subject Code: MBLA 210 Course Title : ADVERTISING& BUSINESS COMMUNICATION

Contact Hours: 30 L: 2 T:0 P:0

Examination Duration (Hrs.) : Theory

Relative Weightage:

TAE-10 CAE-15 ESE-25 Total-50

Credit :02 Semester : 1st -Sem

Subject Area :Marketing Management

Course Objectives

1. To Develop Marketing knowledge and conceptual frame work..
2. To understand dynamics of market structure.
3. To understand integrated marketing strategies.

Details of Course :

S. No.	Contents	Cont Hrs.
1	Marketing Communication - Introduction to Marketing Communication Concept; Elements of Marketing Communications; Unifying the Appeal and the Message across the promotion-mix components. Integrated Marketing	6

Course Outcome : The student should be able -

1. To understand the basic concept of Advertising and its importance in Marketing
2. To know the importance of different elements of Marketing Communication Mix.
3. To identify the procedure for applying research methods in Advertising
4. To understand the concept of Branding & the process of creative brand message
5. To know the impact of Integrated Marketing Communication (IMC) vis a vis individual communication mix element in isolation
6. To study & analyze the Communication Strategies at different stages of Product Life Cycle (PLC).

Suggested Books:

Sr · N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	Advertising Management	Jethwaney & Jain	Oxford University Press, New Delhi	2008	3rd
2	Integrated Marketing Communications,	Pickton, D. and Broderick, A.	Prentice Hall Publication.	2006	5th
3	Using advertising and promotion to build brands,	Blyth, J.	Pearson Publishers Delhi	2006	4th

Name of Department : Department of Management Studies

Subject Code: MBLA 211 Course Title : BRAND MANAGEMENT

Contact Hours: 30 L: 2 T: 0 P: 0

Examination Duration (Hrs.) : Theory

Course Objectives

1. To Develop Brand understanding.
2. To Understand the Nuances of Brand Building

Relative Weightage:

TAE-10 CAE-15 ESE-25 Total-50

Credits :02 SEMESTER- I

Subject Area : Marketing Management

Details of Course :

S. N o.	Contents	Co nt Hr s.
1	Product Management - Basic concepts, Product management process, Product planning system, Product line decision, Product Portfolio - Portfolio concept, Logic for portfolio approach. Overview of the Brand Management Framework - What is a Brand? Why do Brands Matter? Can anything be branded? What are the strongest Brands? Branding challenges and opportunities, The Brand equity concept, Making a Brand Strong: Brand Knowledge; Building A strong	6

	Brand: The four steps of brand building, Brand-Building Implications.	
2	The Value of Branding - Product positioning concept, Perceptual mapping, Brand Positioning and Values - Identifying and Establishing Brand Positioning, Positioning Guidelines, Defining and Establishing Brand Values, Internal Branding. Tools for Measuring the Sources and Consequences of Brand Equity - Developing a Brand Equity Measurement and Management System- The Brand Value Chain, Designing Brand Tracking Strategies, Establishing a Brand Equity Management System; Measuring Sources of Brand Equity-Qualitative Research Techniques, Quantitative Research Techniques; Measuring Outcomes of Brands Equity: Capturing Market Performance, Comparative Methods, Holistic Methods.	7
3	Building and Borrowing Brand Identity - Choosing Brand Elements to build brand equity- Criteria for choosing the brand elements, Options and Tactics for Brand Elements; Integrating Marketing Communications to Build Brand Equity-Information Processing Model of Communications, Overview of Marketing Communication Options, Developing Integrated Marketing Communications Programs; Leveraging Secondary Brand Knowledge to Build Brand Equity-Conceptualizing the Leveraging Process, Country of Origin and other Geographic Areas, Channels of distribution , Co-branding, ,Licensing, Celebrity endorsement, Sporting , Cultural, or Others Events, Third Party Sources.	7
4	Global Brand Expansion - Managing Brands over Geographic Boundaries and Market Segments- Rationale for Going International, Advantages of Global Marketing Programs, Disadvantages of Global Marketing Programs , Standardization Versus Customization, Global Brand Strategy , Building Global Customer-Based Brand Equity.	5
5	Fighting Generics And Private Labels, Brand Extensions - Designing and Implements Branding Strategies- The Brand Product Matrix ,Brand Hierarchy, Designing a Branding Strategy.Brand Architecture - Managing Brands over Time- Reinforcing Brands, Revitalizing Brands, Adjustments to the Brand Portfolio. Branding Licensing - Introducing and Naming New Products and Brand Extensions-New Products and Brand Extensions, Advantage of Extensions, Disadvantages of Brand Extensions , Understanding.	5

Course Outcome : The Student should be able -

- 1.to understand and apply the concepts of Branding in formulating the Marketing Strategies.
2. to apply the concept of Brand Positioning in building the brand.
3. to examine and execute the Integrated Marketing Communication programs.

4. to leverage secondary Brand knowledge to build Brand Equity.
5. to build Global Branding strategies.
6. to design Brand Extension framework to fight Generic and Private Label brands.

Suggested Books :

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Strategic Brand Management:	Keller, Kevin	Prentice Hall	2011	3 rd
2	Strategic Brand Management	Kapferer, Jean-Noël	Tata McGraw-Hill Publishing Company Limited, New Delhi.	2009	5 th
3	Brand Positioning	Sengupta,	Tata McGraw-Hill Education Pvt.Ltd., New Delhi	2007	4 th

Name of Department: Department of Management Studies
Subject Code: MBLA 310 **Course Title:** Retail Management
Contact Hours:30 **L:** 2 Hrs **T:**0 **P:**0
Examination Duration (Hrs.): Theory
Relative Weightage:
TAE-10 CAE-15 ESE-25 Total- 50

Credits: 02 **Semester:** II
Subject Area: Marketing Management

Course Objectives

- 1) To understand the concept of retail formats in the market
- 2) To understand nature & scope of Sales
- 3) To know channel management, distribution planning & cost control.

Details of Course:

S. No.	Contents	Cont Hrs
1	Introduction to Retail Management - Retail & Retailing – definitions, Meaning of Retail Mix, Growth of Retail Industry, Factors responsible for changes in retailing, Challenges & Opportunities to Retail Industry. Store Retail Formats - Independent/ Stand-alone outlet, Convenience Store, Supermarket, Discount Store, Off-price retailer, Department Store, Corporate chains, Consumer co-operatives, Shopping malls, Hypermarkets, Catalogue showroom, Franchising.	07
2	Non-store Retail Formats - Multi-Level marketing, e-tailing, Tele-shopping, Automatic Vending Machines, and Direct Mail Marketing. Retail Planning - Retail Planning Process, Retail Finance, Location Selection Decision, Lay-out Planning Studying Consumer Behavior & Other Related Issues in Retailing -Understanding Consumer Behavior, Cultural & Social Group influence on Consumer Purchase Behavior, Consumerism & Ethics in Retailing, Merchandising .	08
3	Strategy & Planning: Understanding retail consumer, strategic retail, store site selection, franchising, understanding shoppers and shopping. Retail in India, theories of retail development, International retail, retail formats.	07
4	Merchandise Management: Basics of merchandising, process of merchandising, merchandise procurement methods, merchandise performance. Managing Retail: Private labels, category management, store operations and profitability.	04
5	Marketing & Technology: Retail marketing and branding, information systems, human interface, E-retailing, use of IT in retail. Creating and Sustaining Value Designing a store and visual merchandising, servicing the retail customer, establishing a pricing strategy, supply chain Management.	04

Course Outcome: Student should be able to:

1. To analyze the key success factors in Retail Industry.
2. Comprehend the different Retail formats available in market.
3. Understand the Retail business in today's changing business environment.
4. Understand and identify itself as a Retail Entrepreneur.
5. Ability to handle responsibilities in operating retail functions.
6. Understanding of the concept of private labels, category management and large retail establishments.

Suggested Books :

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Retail Management	Barry Berman/Joel R Evans	Pearson Education	2007	10th
2	Retailing Management	Swapna Pradhan	Mc.Graw Hill	2007	2nd
3	Retail Management	Icfai Centre for Management Research	Icfai Press	2003	3rd

Name of Department: Department of Management Studies

Subject Code: MBLA 311 Course Title : TECHNOLOGY MANAGEMENT

Contact Hours: 30 L: 2 T: 0 P: 0

Examination Duration (Hrs.) : Theory

Relative Weightage:

TAE-10 CAE-15 ESE-25 Total-50

Credits :02

Semester : II

Subject Area : Strategic Management

Course Objective:

- 1.To understand the importance & need of technology management in rapidly changing business world.
2. To understand the selection process & implementation of right technology at right time.
3. To manage technological resources in best way.

Details of Course :

S. No.	Contents	Content Hrs.
1	Technology management – introduction – definitions – concepts – main technologies and their characteristics Technology development and acquisition –forecasting – generation and Development Technology absorption and diffusion – absorption – assessment – evaluation diffusion	6
2	Selection and implementation of new technologies – automation decisions, strategic decision models – project management in adoption and implementation of new technologies – strategic cost analysis	6

3	Case Studies on above Topics.	6
4	Managing new generation technologies – commercializing new and innovative technologies – invention – innovation – intellectual property rights, Knowledge based techniques – role of artificial intelligence techniques knowledge management techniques for technology management, E-commerce.	6
5	Competitive advantages through new technologies. Product development –from scientific breakthrough to marketable product Mechanism for technology transfer and acquisitions.	6

Course Outcome: The Student should be able -

1.To know the importance of Technology Management in Marketing and using it strategically to organization's advantage.

2. To understand and apply Strategic Cost Analysis for product or services

3. To understand absorption, competitive

4. To commercialize any new and innovative technologies for company's advantage.

5. To understand the concept of technology management to E-commerce.

6. To take advantages of new technologies for their product or services and make it competitive advantage for their company.

Applicable to Programmes- Semester :

1. MBA 4 th

100

Suggested Books:

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Strategic Management	Azhar Kazmi	Tata McGraw-Hill Education Pvt.Ltd., New Delhi	2011	3 rd
2	Strategic Management: Concepts and cases	Upendra Kachru	Excel Books	2005	1 st

3	Technology Management Handbook	Richard Dorf	--	--	--
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Name of Department: Department Of Management Studies

Subject Code: MBLB 213 Course Title: INDIAN FINANCIAL SYSTEM & INTERNATIONAL FINANCIAL MANAGEMENT

Contact Hours: 30 L: 2 T: 0 P: 0

Examination Duration (Hrs.): Theory

Relative Weight age:

TAE-10 CAE- 15 ESE- 25 Total-50

Credits: 02

Semester: I

Subject Area: FINANCE

	the secondary market, reforms in secondary markets and its impact, Internet trading, Mutual Funds	
3	Debt Markets - Introduction, History of Indian debt market, Debt market participants, Primary and secondary segment, The private Corporate debt market, The public sector undertaking bond market, The government securities Market, Issuance mechanism – auction, sale, private placement; Trading system, SGL A/c, PD system, steps to develop debt markets	06 Hrs
4	Financial Management in global context - Concept, functions, emerging challenges, recent developments, Role of Finance Manager, objectives, Constraints, Economic Exchange Applicable to Programmes - MBA Semester: I markets & the exchange rates; Exchange Rate Mechanism, Spot and Forward Rates, direct & indirect rate; Quoting Foreign Exchange Rates- Spot Rate, Forward Rate, Cross rates and Parity from Exchange rate calculations.	06 Hrs
5	100 in Foreign Exchange Markets - Introduction, Forward contract & option forwards, Hedging, Speculation, Arbitrage, Interest rate Arbitrage-covered & Uncovered, Swaps-characteristics & uses, Indian Forward market International Monetary System - Exchange Rate Regimes, Emergence and Functions of IMF; India's Foreign Exchange Market; Exchange Market; Exchange Dealers; RBI and Exchange Market; Exchange Rate System in India; Floating Vs. Fixed Exchange Rates.	06 Hrs

Details of Course:

S . N .	Contents	Contact Hours
1	Components of Formal Financial System, Functions, Financial system design, Nature and role of financial institutions and financial markets, financial system and economic growth, Pre and post reform scene in financial markets. Money Markets - Treasury Bills and types, Commercial papers, Commercial bills, Certificate of deposit, Call / Notice money market, Money market intermediaries, Money markets and monetary policies in India, overview of money markets.	06 Hrs
2	Capital Markets - History of Indian capital markets, Capital market reforms, Reforms in capital markets, Primary Markets – free pricing, book building, Private placements, Secondary Markets – Organization, membership, and management of stock exchanges, Listing, trading, clearing and settlement mechanism, Listing categories, BSE, NSE, OTCEI, ICSEI, measures to boost liquidity in	06 Hrs

Course Outcome : Student should be able to:

1. Develop acumen for India & International Financial Management.
2. Understand various systems.
3. Understand various financial activities in Indian.
4. Understand how to leverage between equity and debt in capital structure.
5. Understand Foreign exchange market – Risk and control.
6. Calculate Foreign exchange and monitor Global perspectives in Exchange mechanism.

Suggested Books:

Course Objectives

1. To develop acumen for India & International Financial Management.

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
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1	The Indian Financial System	Bharati V. Pathak	Pearson Education	2012	III rd		valuation techniques, Relative valuation models Earnings multiplier model; P/E ratio – uses, implications and limitations.	
2	Financial Management	I.M. Pandey	VIKAS PUBLISHING HOUSE PVT. LTD.-NOIDA	2010	X th	4	Equity Portfolio Management - Passive vs. Active, value vs. growth, Asset allocation strategies – Integrated, strategic, Tactical, Insured; Selecting appropriate allocation	6 hrs
3	Indian Financial system	M. Y. Khan	Tata McGraw Hill	2013	VII th	5	Derivatives - Using the derivatives in your portfolio, Future and Options trading strategies, risk management using the Derivative products, Determining the extent of insurance, Cost and benefit implications. Evaluation of Portfolio performance - Concept, Measures available – Treynor, Sharpe, Jensen, performance attribution analysis, Measuring market timing skills, Evaluation of Bond portfolio performance, Strategies of great masters	6 hrs

Name of Department: Department of Management Studies

Subject Code: MBLB 214 **Course Title:** Security Analysis & Investment Management

Contact Hours: 30 **L:** 2 **T:** 0 **P:** 0

Examination Duration (Hrs.): Theory

Relative Weight age:

TAE- 10 CAE- 15 ESE-25 Total- 50

Credits: 02 **Semester:** II **Subject Area:** Finance

Details of Course:

S. No.	Contents	Contact Hours
1	Investment Basics - Definition, Measures of return and risk – historical rates calculation, Expected rates, required rate of return, risk free rate of return, Investor life cycle and investment goals, Investment options available and their comparison, Portfolio management process. Fundamental analysis - Concept, process, Economy analysis, sector analysis, company analysis; Individual stock and bond analysis – information sources, Tools and techniques of fundamental analysis.	6 hrs
2	Efficient capital markets - Need, EMH – forms, tests and results, Implications of efficient capital markets; Dow Theory, Random walk Hypothesis, Indian Markets and Efficiency. Capital Market theory - Background, risk free asset, the market portfolio; capital asset pricing Model, systematic and unsystematic risk, CML, SML; Arbitrage pricing theory – empirical test of APT, Stability of beta.	6 hrs
3	Technical Analysis - Assumptions, advantages and challenges; Tools and techniques for analysis; basic types of charts, candle stick charts, moving averages and MACD analysis. Security Valuation - Valuation of common stock, goodwill, preferred stock and bonds. Fair value of shares, DCF	6 hrs

Course Outcome: The student should be able -

1. to identify the various investment avenues & their benefit.
2. To exhibit the knowledge about investment process and financial markets
3. To understand the concept of risk , return , its calculation and calculation of value of securities
4. To inculcate the knowledge about fundamental analysis and technical analysis

Course Objectives

1. To Develop Understanding For Analysis of various investment Products.
2. To Understand Investment Management
5. To acquaint knowledge about portfolio construction & evaluation
6. To exhibit the understanding of how derivatives and risk management techniques

Suggested Books:

Sr . N O.	Title	Author Name	Publisher	Year of Publication	Edition
1	Investment Management	Prasanna Chandra	Tata McGraw Hill	2012	4

2	Security Analysis & Portfolio Mgmt	Punitha vathy Pandian	Vikas Publishing House	2013	2
3	Security Analysis and Portfolio Management	<u>M. Ranganatham</u> , <u>R. Madhu mathi</u>	Pearson India	2013	2

Name of Department: Department of Management Studies

Subject Code: MBLB 313 **Course**

Title: Corporate Taxation

Contact Hours:30 **L: 2 T: 0 P: 0**

Examination Duration (Hrs.): Theory

Relative Weightage:

TAE-10 CAE-15 ESE-25 Total-50

Credits :02

Semester : II

Subject Area : Finance

Course Objectives

- 1) To understand the concept of tax planning and different central excise laws applied in business
- 2) To understand the concept of service tax levied.

Details of Course:

S. No	Contents	Contact Hours
1	Definition of Income & Assesse , Previous year, Assessment year, Gross total income, Total taxable income, Residential status, Agricultural income. Distinction between capital and revenue receipts; Income from Business & Profession (excluding professional income).	6 hrs

2	Income from capital gains and income from other sources relating to company assessee only. Income exempt from tax, Tax rebates, Deductions relating to company assessee only. Set off & Carry forward of losses, TDS, Self assessment tax, Filing of return	6 hrs
3	Tax Planning - Concept, Tax Planning with reference to setting up of new business, Financial management decisions & Employees remuneration. Special features of Indirect tax levies - All authorizing the levy and collection of duties of central excise, Customs and central sales tax., tax avoidance vs. tax Evasion.	6 hrs
4	Central Excise Laws - Basis of chargeability of duties of central excise- goods, Manufacture, Classification and valuation of excisable goods- specific issues and case studies; Assessment procedure, Exemption, Payment, Recovery and refunds of duties. Central sales tax - Scope of levy of Central Sales Tax; Inter-State sale, sale outside a State and sale in the course of import and export-basic principles; Registration of dealers and determination.	6 hrs
5	Provisions of law and procedures; VAT – concept, Applicability, Procedures involved and implications of the VAT. Customs Laws – Nature of customs duty, Types of customs duty, Classification for Customs and rate of duty, Valuation for customs duty, Provisions regarding baggage, Courier, Postal articles and stores	6 hrs

Course Outcome: The student should be able -

7. to identify the different Heads of Income.
8. to identify the nature of Incomes and their tax incidence.
9. to calculate income from salary, business and profession.
10. to calculate the tax liability of Partnership firm and Joint stock companies.
11. to file returns, apply appeals & revisions.
12. to understand the Indirect Taxes.

Suggested Books :

Sr. No	Title	Author Name	Publisher	Year of Publication	Edition

1	Systematic Approach to Income Tax.	Ahuja, G. K. & Gupta, Ravi,	Bharat Law House	2008	II
2	Direct Taxes Law & Practice	Bhagwati Prasad	Wishwa Prakashan	2009	III
3	Indirect Taxes	Datey V. S.	Taxmann Publications, New Delhi	2006	I
4	Direct taxes law	Singhan V K Singhan Kapil Singhan Monica	Taxmann Publications, New Delhi	2007	III

Name of Department: Department of Management Studies

Subject Code: MBLB 314 **Course**

Title: Principles & Practice of Banking and Insurance

Contact Hours: 30 **L: 2 T: 0 P: 0**

Examination Duration (Hrs.): Theory

Relative Weightage :

TAE-10 CAE-15 ESE-25

Total-50

Credits : 02 Semester : II

Subject Area : Finance

Course Objective:

1. To understand principles of banking and concept of investment management.
2. To understand various insurance & banking products in the market.
3. To understand the banking sectors to secure customers interest.

Details of Course:

S. No.	Contents	Contact Hours
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1	Principles of Banking - Definition of bank, creation of money, Present structure of commercial banking system in India, Brief history; functions, , Forms of banking – branch banking, mobile banking, Internet Banking, SMS Banking, Chain banking, Satellite Correspondent banking, Managerial functions in banks. Management of deposits and Advances - Deposit mobilization, Classification and nature of deposit accounts, advances, Lending practices, types of advances, principles of sound bank lending, Security, Financial Inclusions	6 hrs
2	Investment management - Nature of bank investment, Liquidity and profitability, preparation of Cheque, bills, endorsements, government securities, Documents of title off goods railway receipt, bill of lading, Book debts, securities government and commercial. Management of Finance - Bank Accounts, Records, Reports, Statement of advances, Evaluation of loan applications, P/L A/c, balance sheet and statutory reports regarding cash revenue; ALM and NPA Management,	6 hrs
3	Fee based and fund based services provided by banks - Fee based Vs. Fund based services, Types of fee based services offered, Mechanism of operation of these services, Merchant banking services – issue management, underwriting, loan syndication etc., BASEL I/II/III	6 hrs
4	Insurance Basics - Insurance Vs. other savings and investment options, tax benefits under insurance policies, life cycle needs including solutions, matching of customer needs and requirements to available products, Comparison between different products offered vis-à-vis chargeable premium and coverage, Including proposal form and other relevant forms, policy contract Life Insurance Products- Traditional and Unit linked policies, individual and group policies, with profit and without profit policies, Different type of insurance products – whole life products, interest sensitive products, term assurance annuities, endowment, assurance.	6 hrs
5	General Insurance Products - Different types of products available in the market, Salient features, Tax treatment, Operations and other procedures involved in claim settlement, other specialty products. Regulation in the Industry - Role of IRDA in regulating the industry, the salient features of KYC and AML Act, Performance evaluation of the regulation in the insurance industry in India.	6 hrs

Course Outcome: The student should be able -

1. To understanding of basic aspects of banking, its regulation in India.
2. To demonstrate understanding of various types of product & services offered by banks.
3. to understand the operational aspects of banking.
4. To exhibit the understanding of functional aspects of life insurance.
5. To exhibit the understanding of functional aspects of non life insurance.
6. To exhibit the understanding of different types of insurances and basis for underwriting of insurance.

Suggested Books:

Sr. No.	Title	Author Name	Publisher	Year of Publication	Edition
1	Banking & Insurance	Gupta & E Gordon	Himalaya Publishing	2012	1
2	Insurance & Risk management	P K Gupta	Himalaya Publishing	2013	2
3	Elements of Banking and Insurance	Jyotsna Sethi, Nishwan Bhatia	PHI Learning	2013	2

Name of Department : MBA

Subject Code: MBLC 220
Conflict and negotiation

Course Title :-

Contact Hours: L: 2 T: 0 P: 0

Examination Duration (Hrs.) : Theory

Relative Weightage:

CAE-10 TAE-15 ESE-25 Total-50

Credits : 2 Semester : I
Subject Area : Human Resource Management

Details of Course:

S. No.	Contents	Cont Hrs
1	Relationship, Role, Structure, Data & Information, Escalation and Effects : Cyclic and Chain reaction, Productive (functional) and Destructive (dysfunctional) – views of conflict: traditional, Contemporary and Integrationist, Causes for work place conflicts – Harassment and discrimination – cost and effects of conflict - organizational and individuals perspectives of conflict.	6

Course Objectives:

- 1.To expose students to the different concepts, theories and practices of conflicts
2. To impart conflict management skills and techniques to effectively manage conflicts at the work place and

2	Approaches and strategies of dealing with conflicts: Conflict Management , Conflict Resolution and Conflict transformation - Five conflict handling styles: competing, collaborating, avoiding, accommodating and compromising. Win – win approach - Different strategies of dealing with conflict: Strike, boycott and other noncooperation methods; coercion, violence and grievance redressal, investigation, arbitration, adjudication and litigation, conflict coaching and Lobbying	8
3	Outcome of negotiation: zero sum, positive sum and negative sum. - Mediation: evaluative and facilitative, Conciliation and hybrid.	6
4	Skills and Techniques for Conflict Management - Lobby, Persuasion, Dialogue, consultation, Trust building, defusing anger, anger management, building rapport, empathetic listening, one-on-one conversation, recognizing different issues and view points, transparent and empathetic communication, sharing of information and	6

	position, conflict analysis and joint costing, Transforming competitive negotiation to collaborative, exploring and choosing alternatives and formalizing agreements	
5	Role of Managers in Conflict Management – kinds of leadership in management: The demagogue, manager and mediator (facilitator) – Keys for leader as mediator: visioning, systems thinking, presence, inquiry, conscious conversation, dialogue, bridging, innovation and crisis intervention and management..	4

Course Outcome:

1. To make them to understand the concept, sources and impact of conflict in workplace and society
2. To help them to understand the different approaches and methods of conflict management
3. To acquire various skills and techniques for conflict Management
4. To cultivate in them effective leadership and managerial skills

Suggested Books:

1	Negotiating Agreement without Giving in	Fisher URI	Hutchinson Business Books
2	Leading Through Conflict	Mark Gerzon	Harvard Business School Press
3	Managing Human Resources	Monappa Publication	Macmillan

Name of Department : **MBA**

Subject Code: **MBLC 221** Course Title : **Training & Development Practices and HRD**

Contact Hours: **L: 2 T: 0 P: 0**

Examination Duration (Hrs.) : **Theory**

Relative Weightage:

TAE-10 CAE-15 ESE-25 Total-50

Credits : **02** Semester : **I**
Subject Area : **Human Resource Management**

Course Objectives

1. To Develop Understanding For Analysis of various investment Products.
2. To Understand Investment Management.

Details of Course:

S. No.	Contents	Contact Hours
1	Unit-I – Human Resource Demand & Supply - Demand Analysis, Models & Techniques of manpower demand forecasting, Status of existing manpower, Requirement of manpower in relation to Technological advancement, Sources of supply of manpower Training and Development - What is training? Nature of training, Significance of training, Importance of training, Scope & Objectives of training, Benefits of training, Philosophy of training.	7HR.
2	Unit-II : Training Need Analysis - Identification of training needs, Environment for training, Areas of training, Responsibilities for providing training, Training Calendar, Facilities for training.	8Hr
3	Unit-III : Training Methods and Techniques - Approaches to Training, On the Job Training & Off the Job Training, Training Methodology – Case Study, Management Games, Brain Storming, Role Play, In- Basket exercises, Group Discussion; Teaching aids and techniques, Audio-visual aids, Cross cultural training.	6Hr
4	Unit IV Comparative Study of Various HR Disciplines: Comparative study of Human Resource Development, Human Resource Management, Human Capital Management and Personnel Management, case studies H.R.D. Culture and Strategies - HRD culture and practices, Recent Scenario and Changes, HRD Barriers in India, Subculture, subsystem, problem, Strategies for adapting changes in external environment, propagation of culture through HRD, Case studies.	6 Hr
5	Unit-V: HR Information System (HRIS) - Objectives, Concept, significance, limitations, steps in HRIS, Process and application in HRIS, Study of HRIS models. HR System Design - HR System Design: Principles and Practices, Machinery and Sub systems of HR system Design, HRD intervention.	6Hr.

Course Outcome : The student should be able -

1. To Develop Understanding for Training and Development Value
2. To understand various practices followed in HRM.
3. To Understand HRM.

4. To do comparative study of various HR disciplines
5. To learn the significance of human resource information system
6. To analyze practically the culture & strategy followed by any organization with the help of case studies.

Examination Duration (Hrs.) : Theory

Relative Weightage :

CAE- 10 TAE-15 ESE-25
Total-50

Credits :02 Semester :II_Sem

Subject Area : Industrial Relations

Course Objectives

1.To understand the concept of grievances & disputes and its impact on industry.

2.To know welfare activities & social security measures in industry.

Suggested Books :

Sr . N o.	Title	Author Name	Publish er	Year of Publicati on	Editio n
1	Personnel Mgmt and Industrial Relation	N.G. Nair, Latha Nair	S. CHAND	2004	1 st
2	Personnel and Human Resource Managem ent.	P. Subba Rao	Himalay a Publishi ng House	2008	2 nd
3	Human Resource Managem ent	K. Aswatha ppa	Mc. Graw-Hill Compan ies	2008	5 th

Suggested Books :

Sr. No .	Title		Publish er	Year of Public ation	Editio n
1	Training and Develop ment	Dr. B. Ratha n Redd y	Himalaya Publishing House	2012	3 rd
2	Human Resourc e Manage ment	S. S. Kank ha	S. CHAND	2003	1 ST
3	Personn el and Human Resourc e Manage ment	P. Subb a Rao	Himalaya Publishing House	2009	3 rd

Name of Department : Department of Management Studies

Subject Code : MBLC 320 Course Title : Industrial Relation and Labor Legislation

Contact Hours : 30 L : 2 T : 0 P : 0

Course details:

Course Outcome : The student should be able -

- 1.To understand the concept of grievances & disputes in industry
2. To understand role of ILO & various labor legislation.
- 3.To know welfare activities & social security measures in industry.
4. To build uniformity in wage distribution policy.
5. To highlight the importance of workers participation in an organization.
6. To learn the significance of peace & harmony to industrial productivity.

Name of Department : __MBA

Subject Code: MBLC 321 **Course**
Title :Advanced HR: Strategic HR

Contact Hours: L: 2 T: 0 P: 0

Examination Duration (Hrs.) : Theory

Relative Weightage:

TAE-10 CAE-15 ESE-25 Total- 50

Credits : 02 Semester : II
Subject Area : Human Resource Management

Course Objective:

- 1.To understand cultural difference in India & Abroad with respect to HRM.
2. To understand different practices adopted by global companies and to study Japanese & American approaches to HRM
3. To broaden the concepts of HRM across the countries.

Details of Course:

S. No.	Contents	Contact Hours
1	Introduction to Strategic HRM Traditional Vs. strategic HR, Typology of HR activities, 'Best fit' approach Vs 'Best practice' approach	6
2	Investment perspective of human resources Investment Consideration, investments in Training and Development, investment Practices for improved Retention, investments job secure work courses, Non-traditional	8

S. No.	Contents	Contact Hours
1	Unit-I – Definition and concept of industrial relation, basic facts, scope, aspects & ideologies of Industrial relations, Approaches to Industrial relations. Industrial Democracy- (A) COLLECTIVE BARGAINING, definition, importance, types ,prerequisites of effective collective Bargaining & Collective Bargaining in India; (B) WORKERS PARTICIPATION: Concept & meaning, Aims & objective, Forms & levels of participation, conditions essential of working of the scheme	6Hrs.
2	Unit-II Grievances & Disputes - Nature & causes, settlement machinery, social obligations, Industrial Disputes, causes, remedial & prevention measures. Consequences of Industrial disputes on Industry & Society, Significance of Peace & Harmony to Industrial Productivity & progress Labour Welfare & Social Security Concept - Meaning & scope, Labour welfare & welfare officer in Indian Industry, his role, perceptive, limitations, role perception and role performance, New challenges & expectations, Training of welfare officers	6Hrs.
3	Unit-III Labour Legislations & ILO - Nature, Scope, character growth & development of labour legislation In India, Legislation & the constitution of India; Constitution, working & impact of ILO on Labour Legislations in India, ILO convention & recommendations	6Hrs.
4	Unit-IV Normative Labour Legislations - Factories Act, 1948, Bombay shop & Establishment Act 1948, PULP Act 1971.Wage Legislation - Minimum wages Act, Payment Of wages Act 1936, Payment of Bonus Act 1965. Industrial Relations Legislations - Trade Union Act 1926, Industrial Employment standing order Act 1946, Bombay Industrial Relations Act, Industrial Dispute Act 1947.	6Hrs.
5	Unit-V Social Security Legislations - Workmen's compensation Act, Employees state Insurance Act 1948, Provident Fund Act 1952 and Payment of Gratuity Act 1972. Functions & Working Of Offices Attached To Labour Ministry - Directorate –General of Employment & Training; Labour Bureau; Welfare Commissioners; Various committee constitute by the Government of India (Ministry Of Labour).	6Hrs.
	investment Approaches.	

3	Planning and Implementing Strategic HR policies	6
4	Linkage of Corporate Strategy, Core Competencies and Competitive Advantage with HRM Linking HRM practices to organizational outcomes assessing and reducing costs,	5
5	Aligning HRM with Business Strategy	5

Course Outcome: The student should be able -

1. to understand cultural difference in India & Abroad with respect to HRM
2. To broaden the concepts of HRM across the countries.
3. To understand different practices adopted by global companies
4. To leverage the various HR practices handled by global manager
5. To understand the importance of career development & succession planning
6. To understand the concept of social environment & staffing with respect to global scenario.

Suggested Books :

Sr. No.	Title	Author	Publisher	Year of Publication	Edition
1	Strategic Human Resource Management	Charles R. Greer,	Pearson Education,	2005	10 th
2	Managing Human Resources	Luis R. Gomez-Mejia, David B. Balkin, Robert L. Cardy	PHI	2005	8 th
3	Strategic human Resource Management	S. SCHULER and SUSAN E JACKSON	Blackwell Publishing,	2007	2 nd

Name of Department: Department of Management Studies

Subject Code: MBLG 237
PROJECT MANAGEMENT

Course Title :

Contact Hours: 30 L: 2 T: 0 P:0

Examination Duration (Hrs.) : Theory

Relative Weight age:

TAE- 10 CAE-15 ESE-25 Total-50

Credits :02 Semester : Ist
Subject Area : Operations Management

Course Objectives

1. Develop Acumen for Operations Management
2. To Understand Project Management Techniques.

Details of Course :

S. No.	Contents	Cont Hrs.
1	Project Management Concepts - Characteristics of a project Need for project management, Roles of project managers. Project Planning: Statement of work (SOW) and overall project goals, Work breakdown structure (WBS), Preparation of Task-Flow network, CPM-PERT, Gantt chart, Schedule the completion of all work elements, Planning project communication, Quality Planning..	6
2	Construction Management - a)Project Controlling: Monitoring and Control, Crashing, Resource Leveling, Updating. b)Construction site management: Site mobilization – demobilization aspects, various Resources management based on funds availability, coordinating, communicating & reporting Techniques, Application of MIS to construction, Training for Construction Managers, Engineers, Supervisors.	6
3	Project Performance Measurement and Control - Concept of earned value performance measurement, Use of Project Management Information Systems (PMIS) to monitor, evaluate, and control planned cost and schedule performance, Conducting periodic project performance evaluation audits.	6
4	Project Evaluation and Termination - Analyzing project performances versus cost and schedule constraints, Identify causes associated with project success and failure. Ways in which a project can be terminated upon completion.	6

5	Contracting For Project Managers - Define contract administration and its role in project management, .Project Procurement cycle, Contract Administration policies and procedures, Select contract types for various situations, Contract Proposal Development, Contract Terms & Conditions, Contract Negotiation.	6
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Course Outcome : The Student should be able -

13. to develop an awareness of the need for project planning and management and apply professional attitudes and techniques.
14. to perform function effectively on a project team.
15. to deals with the basics of project management.
16. To deal with Project Management Information System efficiently.
17. To identify causes associated with Project success or failure.
18. To develop Contract proposal and administer it efficiently.

Suggested Books :

Sr. No	Title	Author Name	Publisher	Year of Publication	Edition
1	Project Management, A Managerial Approach	Meredith and Mantel, John Wiley and Sons	Course Text.	2003	5th
2	The New Project Management	J. Davidson Frame, Jossey-Bass	Oxford University Press, New Delhi	2011	5rd
3	Project Management	Harold Kerzner, Van Nostrand Reinhold	Pearson Press, New Delhi	2006	4 th

Name of Department: Department of Management Studies

Subject Code: MBLG 238
TOTAL QUALITY MANAGEMENT

Course Title :

Contact Hours: 30 L: 2 T:0 P:0

Examination Duration (Hrs.) : Theory

Relative Weight age:

TAE- 10 CAE-15 ESE-25 Total-50

Credits :02 Semester : 1st sem

Subject Area : Operations Management

Course Objectives

1. To Understanding the Need of TQM.
2. To Understand the techniques in TQM.

Details of Course :

S . N O .	Contents	Cont Hrs.
1	Introduction to Quality Concepts - Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs - Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation.	6
2	TQM Principles - Customer satisfaction – Customer Perception of Quality, Customer Complaints, Service Quality, Customer Retention, Employee Involvement – Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement – Juran Trilogy, PDCA Cycle, 5S, Kaizen, Supplier Partnership – Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures – Basic Concepts, Strategy.	6
3	Quality Improvement Techniques - Pareto Diagrams, Cause-Effect Diagrams, Scatter Diagrams, Run Charts, Cause and Effect Diagrams. Statistical Process Control (SPC) - The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, New seven Management tools.	6

Applicable to Programs- Semester:
MBA2nd

4	TQM Tools - Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD) – House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) – Concept, Improvement Needs, FMEA – Stages of FMEA.	6
5	Quality Systems - Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System – Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 – Concept, Requirements and Benefits. Concept of six sigma - Introduction, Design for six sigma, key analytical tools for implementing six sigma, advantages of six sigma, six sigma DMAIC process, Quality Circles - Introduction, Quality Circles, Teams.	6

Course Outcome : The Student should be able -

1. to develop better understanding about the changing trends & various needs of TQM.
2. To apply various techniques in TQM.
3. to understand basics of quality control applications in recent world.
4. To apply the quality improvement techniques effectively in an organization.
5. To design and apply TQM tools.
6. To understand and apply concepts of Six Sigma and know the importance of different Quality Systems.

Suggested Books :

Sr . N o.	Title	Author Name	Publisher	Year of Publication	Edition
1	Total Quality Management	Dale H.Besterfield,	Pearson Education Asia. (Indian reprint 2002).	2002	5th
2	The Management	James R.Evans & William	South-Western	2002	5th

	nt and Control of Quality	M.Lidsay			
3	Total Quality Management	Feigenbaum.A.V	McGraw-Hill, New Delhi	2011	6th

Name of Department: Department of Management Studies

Subject Code : MBLG 337 **Course Title**
SUPPLY CHAIN MANAGEMENT

Contact Hours : 30 **L :** 2 **T :** 0 **P :** 0

Examination Duration (Hrs.) : Theory

Relative Weightage :

TAE- 10 CAE – 15 ESE-25 Total-50

Credits :02 Semester : 2
Subject Area :Operations Management

Course Objectives

- 1) To understand the importance of Supply Chain management in operations.
- 2) To understand the flow of goods, information and other resources, including energy and people, between the point of origin and the point of consumption in order to meet the requirements of consumers.

Details of Course :

S. N o.	Contents	Co nt Hr s.
1	Introduction to SCM - Building Blocks of a Supply Chain Network, Performance Measures, Decisions in the Supply Chain World, Models for Supply Chain Decision-Making. Supply Chain Inventory Management - Economic Order Quantity Models, Reorder Point Models, Multiechelon Inventory Systems	6

2	Mathematical Foundations of Supply Chain Solutions - Use of Stochastic Models and Combinatorial Optimization in: Supply Chain Planning, Supply Chain Facilities Layout, Capacity Planning, Inventory Optimization, Dynamic Routing and Scheduling, Understanding the "internals" of industry best practice solutions.	6
3	competitive advantages through supply chain management - a new paradigm for customer centric Organisation, corporate profitability through supply chain management, maximizing shareholder value through supply chain management. Logistic Management - Strategic Practices of logistic management, strategic management of supply chain for reduction in inventory, supply chain analysis.	6
4	Lean Production - Project Scheduling, Waiting Line Analysis for service improvement, Introduction to Lean Production. Supply Chain Management - Supply Chain Management, Transportation and Transshipment Models, Case study on above topics.	6
5	Modern Manufacturing Systems - Computer Integrated Manufacturing Systems (CIMS), Advanced Production Inventory Management Systems (APIMS). Modern Manufacturing Systems - Flexible Manufacturing System, Production Planning and Control.	6

Course Outcome : The Student should be able -

- To understand and explain different views of Logistics and Supply Chain Management (SCM).
- To understand and explain the role of the SCM function in the wider context of the firm.
- To calculate the Economic Order Quantity to manage the inventory efficiently.
- To apply the mathematical models to optimize operations in Logistics.
- To manage Supply Chain strategically.
- To understand and apply the recent concepts like Computer Integrated Manufacturing System etc.

Suggested Books:

Sr. No	Title	Author Name	Publisher	Year of Publication	Edition
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1	Supply Chain Management Strategy, Planning and Operation	Chopra, S, and P. Meindl	Pearson Education	2004	2nd
2	Logistics and Supply Chain Management,	Raghuram, G. and N. Rangaraj	Macmillan, New Delhi	2006	5th
3	Modelling the Supply Chain	Shapiro, J	Thomson Learning.	2001	4th

Name of Department: Department of Management Studies

Subject Code: MBLG 338 **Course Title:** BUSINESS PROCESS REENGINEERING

Contact Hours:30 **L:** 2 **T:** 0 **P:** 0

Examination Duration (Hrs.): Theory

Relative Weight age:

TAE- 10 CAE-15 ESE-25 Total-50

Credits:02

Semester: 2

Subject Area: Operations Management

Course Objective:

- To understand how to achieve quantum improvements by primarily rethinking and redesigning the way that business processes are carried out.
- To learn how to grow with in business process.
- To understand the consequences of the business process & take a right decision.

Details of Course:

S. No.	Contents	Contact Hours
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1	Introduction to BPR –What is BPR? Need of BPR, BPR in USA, Europe, India.Process Analysis - Identify business process to be redesigned, Measure the existing process; Customer, Competition, Cost and Technology as Drivers	6 hrs
2	IT and Learning in Organizations – Information- A source of knowledge, Integration of knowledge & information. Cultural Factors in Managing Process Improvement -Understanding LPG, Managing people with multi-cultures and ethnic groups in process improvement.	6 hrs
3	Identifying key issues, breakpoints, Selecting the leader and team, technology, designing the process.	6 hrs
4	Introduction –Introduction to manufacturing economics, principal and use of economic analysis. Methods of evaluation - Quantitative methods of evaluating the alternatives, Long and short term consequences, Capital budgeting	6 hrs
5	Replacement analysis – Decision making, Replacement analysis. Econometrics - The effects of income tax on economy studies, Principles of econometrics. Modeling and Simulation - Modeling and simulation of manufacturing systems, Case study on above topics.	6 hrs

Course Outcome : The Student should be able -

1. to understand the need for Business Process Re-engineering and its implementation in different western countries as well as in India.

2. to identify the business processes to be redesigned; re-engineer it keeping in mind the customer, competition, cost and technology.
3. to link Information Technology and learning in an organization by managing cultural factors.
4. to identify key issues in implementing BPR.
5. to implement manufacturing economics efficiently.
6. to design and implement the manufacturing system model.

Suggested Books :

Sr. No	Title	Author Name	Publisher	Year of Publication	Edition
1	BPR for Engineering and Manufacturing Technology	Madsen, David A.; Delmar	Thomson Learning	2010	IInd
2	Redesigning Enterprise Processes	Elias Awad	PHI Publication	2012	Ist
3	Engineering Economics	Garmo	Schaum's	2011	Ist

