

**Geethanjali College of Engineering And Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301**

**PROGRAM STRUCTURE
AND
DETAILED SYLLABUS (Volume-II)**

MECHANICAL ENGINEERING

For

**CBCS BASED B.TECH – FOUR YEAR DEGREE PROGRAM
(Applicable for the batches admitted from AY 2016-17)**



**GEETHANJALI COLLEGE OF ENGINEERING AND TECHNOLOGY (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Pin Code: 501 301**

**Geethanjali College of Engineering And Technology (Autonomous)
Cheeryal (V), Keesara (M), Medchal Dist., Telengana-501301**

B.Tech. MECHANICAL ENGINEERING

Academic Regulations: AR - 16

Academic Year 2017-18

PROGRAM STRUCTURE

FIRST YEAR – SEMESTER– I

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	
1	16EN1101	English - I	HS	2	-	-	30	70	100	2
2	16PH1101	Engineering Physics	BS	3	1	-	30	70	100	3
3	16MA1101	Mathematics – I	BS	4	1	-	30	70	100	4
4	16CS1102	Introduction to Computer Programming	ES	3	-	-	30	70	100	3
5	16ME1102	Engineering Mechanics - I	ES	2	1	-	30	70	100	2
6	16ME1101	Engineering Drawing	ES	2	-	3	30	70	100	4
7	16PH11L1	Engineering Physics Lab	BS	-	-	3	30	70	100	2
8	16CS11L2	Computer Programming Lab	ES	-	-	3	30	70	100	2
9	16WS11L1*	EWS and ITWS	ES	-	-	3	30	70	100	2
Total				16	3	12	270	630	900	24
Total Periods per Week				31						

*CSE BoS specified the syllabus for ITWS while ME BoS specified the syllabus for EWS

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Abbreviation	Description
HS	Humanities and Social Sciences
BS	Basic Sciences
ES	Engineering Sciences
PC	Professional Core
SC	Soft Core
OE	Open Elective
PE	Professional Elective
CC	Core Course

Abbreviation	Description
L	Lecture
T	Tutorial
P	Practical
D	Drawing
CIE	Continuous Internal Evaluation
SEE	Semester End Examination
Tot	Total

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FIRST YEAR – SEMESTER– II

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	
1	16EN1201	English –II	HS	2	-	-	30	70	100	2
2	16PH1203	Physics for Engineers	BS	3	1	-	30	70	100	3
3	16MA1201	Mathematics-II	BS	3	1	-	30	70	100	3
4	16CH1201	Engineering Chemistry	BS	3	-	-	30	70	100	3
5	16MA1202	Mathematics –III	BS	3	-	-	30	70	100	3
6	16ME1201	Engineering Mechanics –II	ES	2	1	-	30	70	100	2
7	16ME12L1	Machine Drawing	PC	1	-	3	30	70	100	3
8	16CH12L1	Engineering Chemistry Lab	BS	-	-	3	30	70	100	2
9	16MA12L1	Computational Mathematics Lab	BS	-	-	3	30	70	100	2
10	16EN12L2	English Lab	HS	-	-	2	30	70	100	1
Total				17	3	11	300	700	1000	24
Total Periods per Week				31						

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SECOND YEAR – SEMESTER– I

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	
1	16ME2101	Thermodynamics	PC	4	1	-	30	70	100	4
2	16ME2102	Mechanics of Solids	PC	4	1	-	30	70	100	4
3	16ME2103	Metallurgy and Material Science	PC	3	-	-	30	70	100	3
4	16MA2101	Probability and Statistics	BS	4	1	-	30	70	100	4
5	16EE2105	Basic Electrical and Electronics Engineering	ES	3	1	-	30	70	100	3
6	16ME21L1	Metallurgy and Mechanics of Solids Lab.	PC	-	-	3	30	70	100	2
7	16ME21L2	Engineering Drawing with Auto CAD	PC	-	-	3	30	70	100	2
8	16EE21L3	Basic Electrical and Electronics Engineering Lab	ES	-	-	3	30	70	100	2
Total				18	4	9	240	560	800	24
Total Periods per Week				31						

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SECOND YEAR – SEMESTER – II

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	
1	16ME2201	Kinematics of Machinery	PC	3	1	-	30	70	100	3
2	16ME2202	Thermal Engineering – I	PC	3	1	-	30	70	100	3
3	16ME2203	Production Technology - I	PC	4	-	-	30	70	100	4
4	16ME2204	Mechanics of Fluids and Hydraulic Machinery	ES	3	1	-	30	70	100	3
5	16CH2201	Environmental Studies	HS	3	-	-	30	70	100	3
6	16ME22L1	Mechanics of Fluids and Hydraulic Machinery Lab	ES	-	-	3	30	70	100	2
7	16ME22L2	Production Technology - I Lab	PC	-	-	3	30	70	100	2
8	16ME22L3	Kinematics of Machinery Lab	PC	-	-	3	30	70	100	2
9	16HS22L1	Gender Sensitization	HS	-	-	3	30	70	100	2
Total				16	3	12	270	630	900	24
Total Periods per Week				31						

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THIRD YEAR – SEMESTER – I

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	
1	16ME3101	Instrumentation and Control Systems	PC	4	1	-	30	70	100	4
2	16ME3102	Production Technology - II	PC	3	1	-	30	70	100	3
3	16ME3103	Thermal Engineering –II	PC	4	1	-	30	70	100	4
4	16ME3104	Design of Machine Elements – I	PC	4	1	-	30	70	100	4
5	Open Elective - I		OE	3	-	-	30	70	100	3
	16MB3121	Intellectual Property Rights								
	16EE3122	Industrial Safety and Hazards								
	16CS3123	JAVA Programming								
	16EC3124	Electronic Measuring Instruments								
	16CE3126	Global Warming and Climate Change								
6	16ME31L1	Thermal Engineering Lab	PC	-	-	3	30	70	100	2
7	16ME31L2	Production Technology - II Lab	PC	-	-	3	30	70	100	2
8	16EN31L1	Advanced English Communication Skills Lab	HS	-	-	3	30	70	100	2
Total				18	4	9	240	560	800	24
Total Periods per Week				31						

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THIRD YEAR – SEMESTER– II

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	
1	16ME3201	Dynamics of Machinery	PC	3	1	-	30	70	100	3
2	16ME3202	Design of Machine Elements – II	PC	3	1	-	30	70	100	3
3	16ME3203	Finite Element Methods	PC	3	-	-	30	70	100	3
4	Soft Core –I		SC	3	-	-	30	70	100	3
	16ME3204	CAD/CAM								
	16ME3205	Design for Manufacturing								
5	Professional Elective – I		PE	3	-	-	30	70	100	3
	16ME3206	Design and Analysis of Experiments								
	16ME3207	Automobile Engineering								
	16ME3208	Materials Management								
	16ME3209	Tool Design								
6	Professional Elective – II		PE	3	-	-	30	70	100	3
	16ME3210	Computational Fluid Dynamics								
	16ME3211	Refrigeration and Air Conditioning								
	16ME3212	Additive Manufacturing								
	16ME3213	Composite Materials								
7	16ME32L1	Digital Fabrication and Instrumentation Lab	PC	-	-	3	30	70	100	2
8	Soft Core - I Lab		SC	-	-	3	30	70	100	2
	16ME32L2	CAM/CAE Lab								
	16ME32L3	Design for Manufacturing Lab								
9	16MB32P1	Human Values and Professional Ethics	HS	-	-	3	30	70	100	2
Total				18	2	9	270	630	900	24
Total Periods per Week				29						

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FOURTH YEAR – SEMESTER– I

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	
1	16ME4101	Heat Transfer	PC	3	1	-	30	70	100	3
2	16ME4102	Operations Research	PC	3	1	-	30	70	100	3
3	Soft Core – II		SC	3	1	-	30	70	100	3
	16ME4103	Industrial Engineering and Management								
	16ME4104	Production Planning and Control								
4	Professional Elective – III		PE	3	-	-	30	70	100	3
	16ME4105	Non-destructive Testing								
	16ME4106	Robotic Engineering								
	16ME4107	Work Study and Ergonomics								
	16ME4108	Mechatronics								
5	Open Elective - II		OE	3	-	-	30	70	100	3
	16MB4131	Supply Chain Management								
	16CS4132	Knowledge Management								
	16EE4133	Energy Conservation and Management								
	16EC4134	Basics of Communication Systems								
	16CE4136	Building Technology								
6	Open Elective – III		OE	3	-	-	30	70	100	3
	16MB4141	Banking and Insurance								
	16CS4142	Database Systems								
	16EE4143	Micro-Electro-Mechanical Systems								
	16EC4144	Principles of Wireless Communication Systems								
	16CE4146	Green Buildings								
	16EN4147	Foreign Language- French								
	16EN4148	Foreign Language-Spanish								
	16EN4149	Foreign Language-German								
7	Soft Core - II Lab.		SC	-	-	3	30	70	100	2
	16ME41L1	Work Study Lab								
	16ME41L2	Facility Design Lab								
8	16ME41L3	Heat Transfer Lab	PC	-	-	3	30	70	100	2
9	16ME4111	Industry Oriented Mini Project	CC	-	-	-	-	100	100	1
10	16ME4112	Major Project Seminar	CC	-	-	2	100	-	100	1
Total				18	3	08	340	660	1000	24
Total Periods per Week				31						

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FOURTH YEAR - SEMESTER – II

S. No	Course Code	Course	Category	No. of Periods per Week			Scheme of Examination with Maximum Marks			No. of Credits
				L	T	P/D	CIE	SEE	Tot	
1	16MB4201	Financial Analysis and Project Management	HS	4	-	-	30	70	100	4
2	Professional Elective – IV		PE	3	-	-	30	70	100	3
	16ME4201	Plant Layout and Materials Handling								
	16ME4202	Un-Conventional Machining Processes								
	16ME4203	Engineering Acoustics								
	16ME4204	Power Plant Engineering								
3	Open Elective –IV		OE	3	-	-	30	70	100	3
	16MB4251	Entrepreneurship								
	16CS4252	Web Development								
	16EE4253	Renewable Energy Sources								
	16EC4254	Biomedical Instrumentation								
	16CE4256	Disaster Mitigation and Management								
	16MA4257	Actuarial Statistics								
4	16ME4206	Technical Seminar	CC	-	-	2	100	-	100	1
5	16ME4207	Comprehensive Viva	CC	-	-	-	-	100	100	3
6	16ME4208	Major Project	CC	-	-	15	30	70	100	10
Total				10	-	17	220	380	600	24
Total Periods per Week				27						

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**Comparison of AICTE Guidelines for Curriculum Structure of B.Tech.
Degree Program in Mechanical Engineering Vis-a-vis GCET program**

S. No.	Broad Course Classification	Course Group/ Category	Course Description	Proposed Credits (%)	Range of Credits given by AICTE
1	Foundation Courses (FnC)	BS –Basic Sciences	Includes - Mathematics, Physics and Chemistry Subjects	29 (15.10%)	15% - 20%
2		ES – Engineering Sciences	Includes fundamental engineering subjects	26 (13.54%)	15% - 20%
3		HS – Humanities and Social Sciences	Includes subjects related to Humanities, Social Sciences and Management	16 (8.33%)	5%-10%
4	Core Courses (CoC)	PC – Professional Core	Includes core subjects related to the Parent Discipline/ Department/ Branch of Engineering.	70 (36.45%)	30% - 40%
5	Elective Courses (EIC)	SC- Soft Core	Includes core elective courses with the associated lab	10 (5.2%)	10% -15%
		PE – Professional Electives	Includes Elective subjects related to the Parent Discipline/ Department/ Branch of Engg.	13 (6.77%)	
6		OE – Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the Parent Discipline/ Department/ Branch of Engg.	12 (6.25%)	5% - 10%
7	Core Courses (CC)	Project Work	B.Tech. Project or UG Project or UG Major Project	16 (8.3%)	10% - 15%
8		Industrial Training/ Mini- Project	Industrial Training/ Internship/ UG Mini-Project/ Mini-Project		
9		Seminar	Seminar/ Colloquium based on core contents related to Parent Discipline/ Department/ Branch of Engineering.		
10		Minor Courses	1 or 2 Credit Courses (subset of HS)	included	
Total Credits for B. Tech. Programme				192 (100%)	

IV Year B.Tech (ME)

I Sem

Detailed Syllabus

**Geethanjali College of Engineering And Technology (Autonomous)
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16ME4101 – Heat Transfer

IV Year B.Tech MEI Semester

Pre-requisites: 16ME2101-Thermodynamics

L	T	P/D	C
3	1	-/-	3

Course Objectives: Develop ability to

1. To demonstrate basic knowledge by understanding different modes of heat transfer.
2. Students will acquire the basic knowledge in estimating the effectiveness of extended surfaces.
3. Students will acquire knowledge in estimating the relationship between various dimensionless numbers for free convection and forced convection.
4. Students will acquire the basic knowledge in understanding the principles of radiation and also the application of heat exchangers.

Course Outcome: At the end of the course, student would be able to:

CO1: Explain the basic modes of heat transfer

CO2: Perform one dimensional steady state heat transfer with and without heat generation

CO3: Analyze heat transfer through extended surfaces

CO4: Understand the principles of boiling, condensation and radiation heat transfer

CO5: Design of heat exchangers using LMTD and NTU methods.

UNIT – I: Introduction

Modes and mechanisms of heat transfer – Basic laws of heat transfer –General discussion about applications of heat transfer.

Conduction Heat Transfer: Fourier rate equation – General heat conduction equation in Cartesian, Cylindrical and Spherical coordinates – simplification and forms of the field equation – steady, unsteady and periodic heat transfer – Initial and boundary conditions

One Dimensional Steady State Conduction Heat Transfer

Homogeneous slabs, hollow cylinders and spheres- Composite systems– overall heat transfer coefficient – Electrical analogy – Critical radius of insulation.

UNIT – II: One Dimensional Steady State Conduction Heat Transfer

Variable Thermal conductivity – systems with heat sources or Heat generation-Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin, Application to error measurement of Temperature.

One Dimensional Transient Conduction Heat Transfer: Systems with negligible internal resistance – Significance of Biot and Fourier Numbers –Infinite bodies- Chart solutions of transient conduction systems- Concept of Semi-infinite body.

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UNIT – III: Convective Heat Transfer

Classification of systems based on causation of flow, condition of flow, configuration of flow and medium of flow – Dimensional analysis as a tool for experimental investigation – Buckingham Π Theorem and method, application for developing semi – empirical non-dimensional correlation for convection heat transfer – Significance of non-dimensional numbers – Concepts of Continuity, Momentum and Energy Equations – Integral Method as approximate method -Application of Von Karman Integral Momentum Equation for flat plate with different velocity profiles.

Forced Convection: External Flows -Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer -Flat plates and Cylinders.

UNIT – IV: Internal Flows

Concepts about Hydrodynamic and Thermal Entry Lengths – Division of internal flow based on this –Use of empirical relations for Horizontal Pipe Flow and annulus flow.

Free Convection: Development of Hydrodynamic and thermal boundary layer along a vertical plate - Use of empirical relations for Vertical plates and pipes.

Heat Transfer with Phase Change: Boiling – Pool boiling – Regimes – Calculations on Nucleate boiling, Critical Heat flux and Film boiling

Condensation: Film wise and drop wise condensation –Nusselt’s Theory of Condensation on a vertical plate - Film condensation on vertical and horizontal cylinders using empirical correlations.

UNIT V: Radiation Heat Transfer

Emission characteristics and laws of black-body radiation – Irradiation – total and monochromatic quantities – laws of Planck, Wien, Kirchoff, Lambert, Stefan Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

Heat Exchangers: Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

TEXT BOOKS:

1. “Heat Transfer”, M NecatiOzisik, McGraw-Hill Publishers, 1994.
2. “Heat and Mass Transfer”, R S Yadav, Centre Publishing House, 1992
3. “Heat and Mass Transfer”, D.S.Kumar, S.K.Kataria& Sons Publishers, 2013.

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REFERENCE BOOKS:

1. “Fundamentals of Heat Transfer & Mass Transfer”, Frank P. Incropera, David P. Dewitt, Theodore L Bergman & Adrienne S. Lavene Wiley India Pvt Ltd, New Delhi.
2. “Fundamentals of Engineering Heat and Mass Transfer”, R.C.Sachdeva New Age International, 2010.
3. “Heat Transfer”, P.K.Nag TMH Publications, 2011.

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16ME4102 – Operations Research

IV Year B.Tech ME I Semester

Pre-requisites: None

L	T	P/D	C
3	1	-	3

Course Objectives: Develop ability to

1. Students will understand the significance of Operations Research concept and techniques and formulation of LPP models.
2. Students will understand the Algorithms of Graphical and Simplex Methods.
3. Students will understand the Transportation and Assignment techniques.
4. Students will understand the concepts of sequencing and Replacement.
5. Students will understand the concepts of Game theory and Inventory Control.
6. Students will understand the concepts of queuing theory and DPP.

Course Outcomes: At the end of the course, student would be able to:

CO1: Recognize the importance and value of Operations Research and mathematical formulation in solving practical problems in industry and Formulate a managerial decision problem into a mathematical model;

CO2: Formulate and solve engineering and managerial situations as Transportation and Assignment problems.

CO3: Apply sequencing and replacement concepts in industry applications

CO4: Apply game theory and inventory concepts in industry applications

CO5: Formulate multi-stage applications into a dynamic programming framework and Apply queuing theory concepts in industry applications

UNIT-I: Development

Definition– Characteristics and Phases – Types of models – Operations Research models – applications.

Allocation: Linear Programming Problem - Formulation – Graphical solution – Simplex method – Artificial variables techniques: Two–phase method, Big-M method; Duality Principle.

UNIT-II: Transportation Problem:

Formulation – Optimal solution, unbalanced transportation problem – Degeneracy.

Assignment Problem: Formulation – Optimal solution - Variants of Assignment Problem; Traveling Salesman problem.

UNIT-III: Job Sequencing:

Introduction – FlowShop sequencing, n jobs through 2 machines, n jobs through 3 machines, Job shop sequencing, 2 jobs through ‘m’ machines-graphical model.

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Replacement Model: Introduction – Replacement of items that deteriorate with time, when money value is not counted and counted, Replacement of items that fail completely, Group Replacement.

UNIT-IV: Theory of Games:

Introduction –Terminology– Solution of games with saddle points and without saddle points, 2 x 2 games, m x 2 and 2 x n games - graphical method, m x n games, dominance principle.

Inventory Models: Introduction – Concept of EOQ, Single item - Deterministic models – Types - Purchase inventory models with one price break and multiple price breaks, Stochastic models – demand discrete variable or continuous variable – Single Period model with no setup cost.

UNIT-V:Queuing Theory:

Introduction – Terminology-Single Channel – Poisson arrivals and Exponential Service times – with infinite population and finite population models– Multichannel – Poisson arrivals and exponential service times with infinite population.

Dynamic Programming: Introduction – Terminology- Bellman’s Principle of Optimality – Applications of dynamic programming- shortest path problem – linear programming problem.

TEXT BOOKS:

1. Operation Research, J.K.Sharma, MacMilan India Ltd, 5th edition, 2012.
2. Operations Research,A.C.S.Kumar, Yesdee, 2015.

REFERENCE BOOKS:

1. Operations Research,Maurice Saseini, ArhurYaspan and Lawrence Friedman, Literary Licensing, LLC, 2013.
2. Operations Research,A.M.Natarajan, P.Balasubramaniam, A. Tamilarasi, Pearson Education,2009
3. Principles of Operations Research,HarveyM.Wagner, Prentice Hall,1975.
4. Introduction to Operation Research, Frederick S.Hillier&Gerald J.Libermann, TMH, 2001.
5. Introduction to Operation Research, HamdyA.Taha, Prentice Hall, 1997.

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**16ME4103 - Industrial Engineering and Management
(Soft Core Elective- II)**

IV Year B.Tech ME I Semester

L	T	P/D	C
3	1	-/-	3

Pre-requisites: None

Course Objectives: Develop ability to

1. Able to identify and implement effective solutions to real problems by applying contemporary industrial engineering tools and cutting-edge technology in various domains of the business operations.
2. Perform as industry leaders in the global marketplace, capable of successfully, Planning, controlling, and implementing large-scale projects.
3. Flourish and work effectively in diverse, multicultural environments emphasizing the application of teamwork and communication skills.
4. Understand and apply the principles of Management, science, technology, engineering, and mathematics involving industry-relevant problems.
5. Maintain high standards of professional and ethical responsibility.

Course Outcomes: At the end of the course, student would be able to:

CO1: Design, develop, implement, and improve integrated systems that include people, materials, information, equipment, and environments

CO2: Effectively manage business operations, project management teams

CO3: Analyze and adopt suitable Quality and Inventory control models and techniques

CO4: Derive knowledge on contemporary and emerging issues important to professional practice.

CO5: Identify, formulate, and provide optimal solutions to Engineering problems

UNIT I: Introduction to Management

Entrepreneurship and organization – Nature and Importance of Management, Functions of Management, Taylor’s Scientific Management Theory, Fayol’s Principles of Management, Maslow’s Theory of Human Needs, Douglas McGregor’s Theory X and Theory Y, Herzberg’s Two-Factor Theory of Motivation, Systems Approach to Management, Leadership Styles, Social responsibilities of Management.

UNIT II: Designing Organizational Structures

Departmentalization and Decentralization, Types of Organization structures – Line organization, Line and staff organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less

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organization, inverted pyramid structure, lean and flat organization structure and their merits, demerits and suitability.

UNIT III: Operations Management

Objectives- product design process- Process selection-Types of production system(Job, batch and Mass Production),Plant location – factors – Urban-Rural sites comparison- Types of Plant Layouts- Design of product layout- Line balancing(RPW method) Value analysis – Definition- types of values – Objectives- Phases of value analysis- FAST diagram.

Inventory Management: Functions of Inventory management, Relevant inventory costs, Selective control Techniques - ABC analysis – VED analysis – FSN analysis, EOQ models - P-Systems and Q – Systems.

UNIT IV: Method Study and Time Study

Introduction - definition - objectives - steps in work study - Method study - definition - objectives - steps of method study. Work Measurement - purpose - types of study - stop watch methods - steps - key rating - allowances - standard time calculations - work sampling. Job evaluation and merit rating.

Quality Management: Variables-attributes, Shewart control charts for variables- chart, R chart, – Attributes – Defective – Defect- Charts for attributes-p-chart -c chart (simple Problems), Acceptance Sampling- Single sampling- Double sampling plans-OC curves.

UNIT V: Project Management (PERT/CPM)

Network Analysis, Programme Evaluation and Review Technique (PERT), Critical Path Method (CPM), identifying critical path, Probability of Completing the project within given time, Project Cost Analysis, Project Crashing.

TEXT BOOKS:

1. Industrial Engineering and Management, Dr O P Khanna, 2nd Edition, DhanpatRai, 2014.
2. Industrial Engineering and Production Management, M. Mahajan, 2nd Revised Edition, DhanpatRai Publishing Co., 2007
3. Industrial Engineering and Management Science”, T.R. Banga, S.C. Sharma and N.K.Agarwal, Khanna Publishers, 1992

REFERENCES:

1. Industrial Engineering and Management” N.V.S. Raju, 1st Edition, Cengage Learning India, 2013.
2. Industrial Engineering and Management”, Dr. I Ravi Shankar, 2nd Edition, Galgotia Publications, 2009
3. Motion and Time Study”, Ralph M. Barnes, 7th Edition, John Willey & Sons, 1980.

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**16ME4104 – Production Planning and Control
(Soft Core Elective–II)**

IV Year B.Tech ME I Semester

Pre-requisites: Materials Management

L	T	P/D	C
3	1	-/-	3

Course Objectives: Develop ability to

1. To understand the basic concepts of production planning and control functions, methods and systems, currently in use by industrial companies.
2. The ability to apply principles and techniques in the design, planning and control of these systems to optimize/make best use of resources in achieving their objectives.
3. Understanding of the Lean Manufacturing philosophy and identifying different strategies employed in manufacturing, service industries to plan production and control inventory.
4. To gain the ability to develop a systematic approach to the solution of planning and control problems and to measure the effectiveness, identify likely areas for improvement, develop and implement improved planning and control methods for production systems in wide variety of industrial and business organizations.

Course Outcomes: At the end of the course, student would be able to:

CO1: Explain the various parts of the production planning and control processes and their interaction with other business functions (strategy, engineering, finance, marketing, HRM, project management and innovation)

CO2: Analyze forecasts in the manufacturing and service sectors using selected quantitative and qualitative techniques

CO3: Describe the importance and function of inventory, Manufacturing Requirements Planning (MRP2), Just - In -Time (JIT) techniques and the application of the Lean Manufacturing process in Lean World Class Manufacturing for its control and management under dependent and independent demand circumstance

CO4: Identify operational methodologies to assess and improve an organization's Performance

CO5: Design an integrated framework for strategic thinking and decision making to analyze the enterprise as a whole with a specific focus on the wealth creation processes.

UNIT – I Introduction

Definition – Objectives of production Planning and Control – Functions of production planning and control – Elements of production control – Types of production – Organization of production planning and control department – Internal organization of department.

UNIT – II Forecasting

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Importance of forecasting – Types of forecasting, their uses – General principles of forecasting – Forecasting techniques – qualitative methods and quantitative methods.

UNIT – III Inventory Management

Functions of inventories – relevant inventory costs – ABC analysis – VED analysis – EOQ model – Inventory control systems – P-Systems and Q-Systems

Introduction to MRP & ERP: Aggregate planning, Chase planning,. LOB (Line of Balance), JIT inventory, and Japanese concepts.

Lean Manufacturing Concepts: Value creation and waste elimination – Types of waste - Takt time – Takt time calculation – Practical exercise of an industry - Continuous flow - Continuous improvement / Kaizen- worker involvement -Cellular layout – Administrative lean.

UNIT –IV Routing: Definition – Routing procedure –Route sheets – Bill of material – Factors affecting routing procedure. Schedule –definition – Difference with loading

Scheduling: Policies – Techniques, Standard scheduling methods, job shop, flow shop,. Line Balancing.

UNIT – V:Dispatching:Activities of dispatcher – Dispatching procedure – follow up – definition – Reason for existence of functions – types of follow up, Expediting, controlling aspects, applications of computer in production planning and control.

TEXT BOOKS:

1. Elements of Production Planning and Control, Samuel EilonMcGraw-Hills,*3rd Edition* 1987.
2. Modern Production/ operation management, Buffa & Rakesharin JohnWiley and Sons (WIE); Publication New York, 8 th Edition 2007

REFERENCES:

1. Production and Operations Management, S.N. Chary Tata McGraw-Hill Education, 2004
2. Inventory Control Theory and Practice, Martin K. Starr and David W. Miller. Englewood
3. Cliffs, N.J.: Prentice-Hall, 1962.
4. Reliability Engineering & Quality Engineering Dr. C. Nadha Muni Reddy and Dr. K. Vijaya Kumar Reddy, Galgotia Publications, Pvt., Limited, First Edition,2008
5. Production Control A Quantitative Approach, John E. Biegel Englewood Cliffs, N.J. : Prentice-Hall, 1971
6. Moore and Ronald Jablonski Production Control,Mc Graw-Hill,1969
7. Joseph Monks Operations Management, McGraw-Hill, 1987

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**16ME4105– Non-Destructive Testing
(Professional Elective - III)**

IV Year B.Tech ME I Semester

Pre-requisites: None

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop an ability to

1. Understands the application of nondestructive techniques in general.
2. Know the advantages and the limits nondestructive techniques.
3. Importance of standards, technical specifications, and test procedures.
4. Test some important industrial components such as welded and cast samples by visual inspection.
5. Take a decision: acceptance or rejection by evaluating the test results according to the related standards (ASME, EN, etc.).

Course Outcomes: At the end of the course, student would be able to:

CO1: State all the possible inspection methods

CO2: Describe the principles of operation of each method

CO3: State the sensitivity of each method

CO4: List the major advantages and disadvantages of each method

CO5: Select appropriate inspection methods for different components

UNIT I Introduction; Visual Methods

Optical aids, In-situ metallography, Optical holographic methods, Dynamic inspection.

UNIT – II: Penetrant Flaw Detection

Principles, Process, and Penetrant systems; Liquid penetrant materials; Emulsifiers; cleaners developers, sensitivity; Advantages, Limitations, applications. **MAGNETIC METHODS:** Advantages, Limitations, Methods of generating fields; magnetic particles and suspending liquids Magnetography, field sensitive probes; applications. Measurement of metal properties.

UNIT– III: Electrical Methods

Eddy current methods; potential-drop methods, applications.

Electromagnetic Testing: Magnetism; Magnetic domains; Magnetization curves; Magnetic Hysteresis; Hysteresis-loop tests; comparator - bridge tests Absolute single-coil system; applications.

UNIT – IV: Ultrasonic Testing of Materials

Advantages, disadvantages, Applications, Generation of Ultrasonic waves, general characteristics of ultrasonic waves; methods and instruments for ultrasonic materials testing; special techniques. Acoustic emission methods: Basic Principles, methods and applications.

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UNIT– V:Radiographic Methods

Limitations; Principles of radiography; sources of radiation, Ionising radiation - X-rays sources, gamma-rays sources Recording of radiation; Radiographic sensitivity; Fluoroscopic methods; special techniques; Radiation safety.

TEXT BOOKS:

1. Non-Destructive Testing, R. Halmshaw, The British Institute of NDT. 2nd edition
2. Testing of Materials, A. V. K. Suryanarayana, BS publications, 2007. 2nd edition

REFERENCES:

1. Metals Handbook Vol. II, Nondestructive inspection and quality control
2. Non-destructive Testing Hand Book Vol. I & II, R. C. Mc Master Ed., Ronald Press Company
3. Non-destructive Testing, J. F. Himsley, Macdonald and Evans, London, 1959.
4. Ultrasonic Testing of Metals, J Krantkramer and H. Krantkramer, SpringerVekg, 1987

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**16ME4106 – Robotic Engineering
(Professional Elective - III)**

IV Year B.Tech ME I Semester

Pre-requisites: None.

Course Objectives: Develop ability to

L	T	P/D	C
3	0	-/-	3

1. Practice in applying their knowledge of mathematics, science, and Engineering and to expand this knowledge into the vast area of robotics.
2. Expose to the concepts of robot kinematics, Dynamics, Trajectory planning.
3. Use mathematical approach to explain how the robotic motion can be described.
4. Understand the functioning of sensors and actuators.

Course Outcomes: At the end of the course, student would be able to:

CO1: Identify various robot configuration and components

CO2: Select appropriate actuators and sensors for a robot based on specific application

CO3: Carry out kinematic and dynamic analysis for simple serial kinematic chains

CO4: Perform trajectory planning for a manipulator by avoiding obstacles.

CO5: Identify the robots for different applications

UNIT-I: Introduction

An Overview of Automation and Robotics, Classification by coordinate system and control systems, Components of the Industrial robotics, Degrees of freedom, end effectors- Mechanical gripper, Magnetic, Vacuum and other types of grippers, General considerations on gripper selection and design.

UNIT-II: Motion Analysis

Basic rotation matrices, Composite rotation matrices, Euler Angles, Equivalent angle and Axis, Homogeneous transformation matrices.

Manipulator Kinematics: D-H notations, Joint coordinates and world coordinates, Forward and inverse kinematics.

UNIT-III: Differential Kinematics:

Differential kinematics of planar and spherical manipulators, Manipulator Jacobian.

Robot Dynamics: Lagrange-Euler formulations, Newton-Euler formulations.

UNIT-IV: Trajectory Planning:

Joint space scheme, Cubic polynomial fit, Avoidance of obstacles. Types of motion- Slew motion, Joint interpolated motion, Straight line motion.

Robot Actuators and Feedback Components: Actuators- Pneumatic, Hydraulic and Electric Actuators, DC servo motors, stepper motors.

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Feedback Components: Sensors- Position Sensors- Potentiometers, Resolvers and encoders, Velocity sensors.

UNIT-V: Robot Application in Manufacturing

Material Transfer – Material handling, loading and unloading, Processing – spot and continuous arc welding & spray painting, Assembly and Inspection.

TEXT BOOKS:

1. Industrial Robotics, Groover M P / Pearson Edu.
2. Robotics and Control, Mittal R K & Nagrath I J / TMH.

REFERENCES:

1. Robotics, Fu K s / McGraw Hill
2. Introduction to Robotic Mechanics and Control, JJ Craig, Pearson, / 3rd edition.
3. Robot Dynamics & Control, Mark W. Spong and M. Vidyasagar I John Wiley & Sons / (ASIA) Pvt. Ltd.

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**16ME4107– Work Study and Ergonomics
(Professional Elective –III)**

IV Year B.Tech ME I Semester

L	T	P/D	C
3	-	-/-	3

Pre-requisites: None

Course Objectives: Develop ability to

1. To recognize and use the tools and techniques of work study.
2. To explain about work measurement.
3. To design, perform and analyze the studies and experiments related to work study.
4. To develop knowledge to apply methods engineering and ergonomics or human factors design principles to the analysis and redesign of an existing work station, work task, etc.

Course Outcomes: At the end of the course, student would be able to:

CO1: Define the reasons and logic behind work station design, model work systems using standard techniques for the purposes of analysis and design.

CO2: Identify the structured engineering process to work system development.

CO3: Calculate the time required to do a job using standard data, activity sampling, and time study and predetermined time systems.

CO4: Recognize and constructively address ethical, social, and environmental issues that arise in a work systems engineering project.

CO5: Design the human indicators of fatigue and stress

UNIT-I: Work Study

Purpose of Work Study, Objectives, Procedure, and Applications of Work Study, Prerequisites of conducting Work Study, the human factor in the application of Work Study, The influence of working condition on work study.

UNIT-II: Method Study

Method Study definition and objective of Method Study, Basic procedure, Process Analysis, Process Chart Symbols. Selection of job, Various Recording techniques, Process Charts, Man Machine Chart, String diagram, Flow diagram, multiple activity chart, SIMO CHART, Cyclographs and Chrono-cyclographs.

Study in Method Study- Principles of Motion Economy, Therbligs, Micro motion study, Memo motion study.

UNIT-III: Work Measurement

Introduction and Definition, Objectives and basic procedure of Work Measurement, Time study, basic procedure, equipment's needed, Methods of Measuring time, Selection of jobs, Breaking a job into Elements, Numbers of Observations, Performance Rating, Rating Procedure

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Allowances, Calculation of Standard Time, Predetermined motion time system (PMTS), Method time measurement (MTM).

UNIT-IV: Job Evaluation and Merit Rating

Concept and objectives of Job Evaluation and Merit Rating, Job Evaluation Methods, Different Methods of Merit Rating.

Wage Incentive Plans-Requirement, Objectives of Wage Incentive Plans, Types of Wage Incentive Plans.

Work Sampling- Basic procedure, determining time standards by Work Sampling, Procedure for selecting random observations, Work Sampling errors.

UNIT-V: Ergonomics

Human Factor in Engineering- Objective of Ergonomics, Applications of Ergonomics, Man-Machine System, Characteristics of Man-Machine System, Classification of Man-Machine System, Working environment, Workplace design.

Physical work capacity - Maximum oxygen uptake, Energy expenditure and work load guidelines, Applied physiology in the workplace - Calculation of rest periods in manual work – Murrell's empirical formula, Stress and Fatigue - Fatigue allowance determination, Lighting design considerations, Principles for the design of visual and auditory displays.

TEXT BOOKS:

1. Motion and Time Study: Design and Measurement of Work, Ralph M. Barnes, John Wiley & Sons, 1980.
2. Introduction to Work Study, Kanawaty G., ILO, 1992.

REFERENCES:

1. Introduction to Work Study, Curie R., McGraw Hill 1992.
2. Methods, Standards and Work Design. Benjamin Niebel and Andris Freivalds. McGraw Hill, 2003.
3. Introduction to Ergonomics, Bridger R. S., McGraw Hill 2008.
4. Human Factors in Engineering and design, Sandera M and McCormick E, McGrawHill.

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**16ME4108– Mechatronics
(Professional Elective –III)**

IV Year B.Tech ME I Semester

Pre-requisites: None

L	T	P/D	C
3	-	-	3

Course Objectives:

Course Objectives: Develop ability to

1. Develop an ability to identify, formulate, and solve engineering problems,
2. Develop an ability to design a system, component, or process to meet desired needs within realistic constraints.
3. Develop an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Course Outcomes: At the end of the course, student would be able to:

CO1: Describe model and analyze electrical and mechanical systems and their interconnection.

CO2: Compare integrate mechanical, electronics, control and computer engineering in the design of Mechatronics systems.

CO3: Evaluate complete design, building, interfacing and actuation of a Mechatronic system for a set of specifications

CO4: Be proficient in the programming of microcontrollers.

CO5: Evaluate the performance of Mechatronic systems.

UNIT – I: Introduction

Definition – Trends - Control Methods: Standalone, PC Based (Real Time Operating Systems, Graphical User Interface, Simulation) - Applications: identification of sensors and actuators in Washing machine, Automatic Camera, Engine Management, SPM, Robot, CNC, FMS, CIM.

Signal Conditioning : Introduction – Hardware - Digital I/O , Analog input – ADC , resolution, Filtering Noise using passive components – Resistors, capacitors - Amplifying signals using OP amps –Software - Digital Signal Processing – Low pass , high pass , notch filtering

UNIT – II: Precision Mechanical Systems

Modern CNC Machines – Design aspects in machine structures, guideways, feed drives, spindle and spindle bearings, measuring systems, control software and operator interface, gauging and tool monitoring.

Electronic Interface Subsystems :TTL, CMOS interfacing - Sensor interfacing – Actuator interfacing – solenoids , motors Isolation schemes- opto-coupling, buffer IC's - Protection schemes – circuit breakers , over current sensing , resettable fuses , thermal dissipation - Power Supply - Bipolar transistors / MOSFETs

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UNIT – III: Electromechanical Drives

Relays and Solenoids - Stepper Motors - DC brushed motors – DC brushless motors - DC servo motors - 4-quadrant servo drives , PWM's - Pulse Width Modulation – Variable Frequency Drives, Vector Drives - Drive System load calculation.

Microcontrollers Overview : 8051 Microcontroller , micro processor structure – Digital Interfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors - Applications. Programming –Assembly, C (LED Blinking , Voltage measurement using ADC).

UNIT – IV: Programmable Logic Controllers

Basic Structure - Programming : Ladder diagram -Timers, Internal Relays and Counters - Shift Registers - Master and Jump Controls - Data Handling -Analog input / output - PLC Selection - Application.

UNIT – V: Programmable Motion Controllers

Introduction - System Transfer Function – Laplace transform and its application in analysing differential equation of a control system - Feedback Devices : Position , Velocity Sensors - Optical Incremental encoders - Proximity Sensors : Inductive , Capacitive , Infrared - Continuous and discrete processes - Control System Performance & tuning - Digital Controllers - P , PI , PID Control - Control modes – Position , Velocity and Torque - Velocity Profiles – Trapezoidal- S. Curve - Electronic Gearing - Controlled Velocity Profile - Multi axis Interpolation , PTP , Linear , Circular - Core functionalities – Home , Record position , GOTO Position - Applications : SPM, Robotics.

TEXT BOOKS:

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, W Bolton, Pearson Education Press, 3rd edition, 2005.
2. Mechatronics, M.D.Singh & J.G.Joshi, PHI.

REFERENCES:

1. "Introduction to Mechatronics and Measurement Systems", Michael B.Histand and David G. Alciatore, McGraw-Hill International Editions, 1999.
2. "Mechatronics ", Bradley, D.A., Dawson, D, Buru, N.C. and Loader, AJ, Chapman and Hall, 1993.
3. "Microprocessor Architecture, Programming and Applications" Ramesh.S, Gaonkar, Wiley Eastern, 1998.
4. "Understanding Electro-Mechanical Engineering, an Introduction to Mechatronics ", Lawrence J.Kamm, Prentice-Hall, 2000.

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**16MB4131 – Supply Chain Management
(Open Elective –II)**

IV Year B.Tech ME I Semester

Pre-requisites: None

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop ability to:

1. Distinguish the different functional areas in businesses management; understand the cross functional integrations and map supply chains of various business sectors.
2. Identify different types of distribution/ modes of transport/ network design.
3. Analyze the operational issues in SCM.
4. Recognize the drivers of supply chain.
5. Interpret the importance of relationships with suppliers and customers.

Course Outcomes(COs):At the end of the course, student would be able to:

CO1: Understand the role of an Engineer as well as Manager in Supply chain management

CO2: Appreciate the importance of logistics in integrating different functional areas.

CO3: Integrate operations with functional areas.

CO4: Visualize the role of logistics and distribution as supply chain drivers

CO5: Understand the importance of supplier and customer relationship management.

UNIT I: Introduction to Supply Chain Management

Understanding the Supply Chain, Supply Chain Performance: Achieving Strategic Fit and Scope including: Customer and Supply Chain Uncertainty, Competitive and Supply Chain Strategies, Product development strategy, Marketing and sales strategy, Supply chain strategy, Scope of strategic fit; Supply Chain Drivers and Metrics.

UNIT II: Logistics Management

Designing distribution networks and applications to e-Business, Network design in the Supply Chain, Designing global supply chain, network design, 3 PL, 4 PL, Transportation in supply chain management.

UNIT III: Planning and managing inventories

Managing Economies of Scale in a Supply Chain: Cycle Inventory, Managing Uncertainty in a Supply Chain: Safety Inventory, Determining the Optimal Level of Product Availability. Demand Forecasting in a Supply Chain, Aggregate Planning in a Supply Chain, Sales and Operations Planning: Planning Supply and Demand in a Supply Chain, Coordination in a Supply Chain. E- Procurement, Global alliances.

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UNIT IV: Managing Cross-Functional Drivers in a Supply Chain

Importance of sourcing decisions in Supply Chain Management, Price and Revenue management, role of Information Technology in a Supply Chain, Sustainability and the Supply Chain. Customer Relationship management.

UNIT V: Logistics and supply chain relationships

Identifying logistics performance indicators- channel structure- economics of distribution- channel relationships- logistics service alliance. Managing global logistics and global supply chains: Logistics in a global economy- Views of global logistics- global operating levels interlinked global economy. Global supply chain, Supply chain management in Global environment Global strategy- Global purchasing- Global logistics- Global alliances- Issues and Challenges in global supply chain management.

TEXT BOOKS

- 1 Sunil Chopra, Peter Meindle, D.V Kalra, Supply Chain Management 6/e, Pearson.
- 2 Donald J. Bowersox and David J. Closs, Logistics Management: The Integrated Supply Chain Process, TMH, 2006.
- 3 Sridhara Bhatt, “Logistics and Supply Chain Management”, EXCEL, 2009

REFERENCE BOOKS

1. The Toyota Way Paperback by Jeffrey Liker.

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**16CS4132 – Knowledge Management
(Open Elective –II)**

IV Year B.Tech ME I Semester

Prerequisite(s): None

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop ability to

1. Understand Knowledge Management systems for access and coordination of knowledge assets.
2. Understand technologies namely, intranets, groupware, weblogs, instant messaging, content management systems and email in both individual and organizational contexts.
3. Use case studies, research methods of knowledge organization.

Course Outcomes: At the end of the course, student would be able to:

CO1: Evaluate and implement Knowledge Management Systems to facilitate individual and group work

CO2: Develop a thorough review of Knowledge Management concepts, both historical and speculative

CO3: Originate and distribute research on a Knowledge Management System topic.

CO4: Analyze and design KM processes and systems.

UNIT I - KNOWLEDGE MANAGEMENT

KM Myths – KM Life Cycle – Understanding Knowledge – Knowledge, intelligence – Experience – Common Sense – Cognition and KM – Types of Knowledge – Expert Knowledge – Human Thinking and Learning.

UNIT II - KNOWLEDGE MANAGEMENT SYSTEM LIFE CYCLE

Challenges in Building KM Systems – Conventional Vs KM System Life Cycle (KMSLS) – Knowledge Creation and Knowledge Architecture – Nonaka's Model of Knowledge Creation and Transformation. Knowledge Architecture.

UNIT III - CAPTURING KNOWLEDGE

Evaluating the Expert – Developing a Relationship with Experts – Fuzzy Reasoning and the Quality of Knowledge – Knowledge Capturing Techniques, Brain Storming – Protocol Analysis – Consensus Decision Making – Repertory Grid- Concept Mapping – Black boarding.

UNIT IV - KNOWLEDGE CODIFICATION

Modes of Knowledge Conversion – Codification Tools and Procedures – Knowledge Developer's Skill Sets – System Testing and Deployment – Knowledge Testing – Approaches to Logical Testing, User Acceptance Testing – KM System Deployment Issues – User Training – Post implementation.

UNIT V - KNOWLEDGE TRANSFER AND SHARING

Transfer Methods – Role of the Internet – Knowledge Transfer in e-world – KM System Tools – Neural Network – Association Rules – Classification Trees – Data Mining and Business Intelligence – Decision Making Architecture – Data Management – Knowledge Management Protocols – Managing Knowledge Workers.

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TEXT BOOKS

1. Elias.M. Award & Hassan M. Ghaziri – “Knowledge Management” Pearson Education.

REFERENCE BOOKS

1. Guus Schreiber, Hans Akkermans, AnjoAnjewierden, Robert de Hoog, Nigel Shadbolt, Walter Van de Velde and Bob Wielinga, “Knowledge Engineering and Management”, Universities Press, 2001.
2. C.W. Holsapple, “Handbooks on Knowledge Management”, International Handbooks on Information Systems, Vol 1 and 2, 2003

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16EE4133 – Energy Conservation and Management

(Open Elective –II)

IV Year B.Tech. ME I Semester

Prerequisites : None

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop ability to

1. Understand different basic terms related to Indian Energy Scenario and Energy Conservation Act.
2. Understand the principles of energy conservation, audit and management.
3. Understand energy conservation in different mechanical utilities.
4. Understand efficient heat and electricity utilization, saving and recovery in different thermal and electrical systems.
5. Understand different basic terms related to Energy economy, Financial Management and to understand the role of Energy Service Companies.

Course Outcomes: On completion of this course, student would be able to

CO1: Perform energy accounting and balancing

CO2: Prepare energy audit report for different energy conservation instances.

CO3: Suggest energy saving methodologies.

CO4: Evaluate the energy saving and conservation in different mechanical utilities.

CO5: Evaluate the energy saving and conservation in different electrical utilities.

UNIT-I: Energy Scenario, Conservation Act and related policies

Classification of Energy, Indian energy scenario, Sectorial energy consumption(domestic, and other sectors), energy needs of growing economy, energy intensity, long term energy scenario, energy pricing, energy security, energy conservation and its importance, energy strategy for the future. Energy conservation Act 2001 and its features, notifications under the Act, Schemes of Bureau of Energy Efficiency (BEE) including Designated consumers, State Designated Agencies, Electricity Act 2003, Integrated energy policy, National action plan on climate change, ECBC code for Building Construction.

UNIT-II: Energy Management and Audit

Principles of Energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting – Energy management qualities and functions, language Questionnaire – check list for top management. Definition, energy audit, need, types of energy audit. Energy management (audit) approach – understanding energy costs, Bench marking, energy performance, matching energy use to requirement, maximizing system

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efficiencies, optimizing the input energy requirements, fuel and energy substitution, energy audit instruments and metering.

UNIT-III: Energy Efficient Systems-I

Energy efficient motors, factors affecting efficiency, loss distribution, constructional details, characteristics – variable speed, variable duty cycle systems, RMS hp–voltage variation – voltage unbalance – over motoring – motor energy audit.

Power Factor Improvement, Lighting and Energy Instruments

Power factor – methods of improvement, location of capacitors, power factor with non-linear loads, effect of harmonics on power factor, power factor motor controllers – Good lighting system design and practice, lighting control, lighting energy audit – energy instruments – wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers, application of PLC's.

UNIT-IV: Energy Efficient Systems-II

Thermal utilities and systems: Boilers – types, combustion in boilers, performances evaluation, analysis of losses, feed water treatment, blow down, energy conservation opportunities. Boiler efficiency calculation, evaporation ratio and efficiency for coal, oil and gas, soot blowing and soot deposit reduction.

Heat Exchangers: Types, networking, pinch analysis, multiple effect evaporators, condensers, distillation column, etc.,

Waste Heat Recovery: Classification, advantages and applications, commercially viable waste heat recovery devices, saving potential

Cogeneration: Definition, need, application, advantages, classification, saving potentials, heat balance, steam turbine efficiency, tri-generation, micro turbine.

UNIT-V: Energy Economics

Discount rate, payback period, internal rate of return, net present value, life cycle costing, role of energy service companies (ESCOs), investment – need, appraisal and criteria, financial analysis techniques, simple payback period, return on investment, net present value, internal rate of return, cash flows, risk and sensitivity analysis; financing options, energy performance contracts.

TEXT BOOKS:

1. Energy Manager Training Manual (4 Volumes) available at www.energymanagertraining.com, a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.

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REFERENCE BOOKS:

1. Witte. L.C., P.S. Schmidt, D.R. Brown, "Industrial Energy Management and Utilisation" Hemisphere Publ, Washington, 1988.
2. Callaghn, P.W. "Design and Management for Energy Conservation", Pergamon Press, Oxford, 1981.
3. Dryden. I.G.C., "The Efficient Use of Energy" Butterworths, London, 1982.
4. Turner. W.C., "Energy Management Hand book", Wiley, New York, 1982.
5. Murphy. W.R. and G. Mc KAY, "Energy Management", Butterworths, London 1987.
6. Energy Conservation Guidebook, Dale R Patrick, Stephen W Fardo, 2nd Edition, CRC Press
7. Handbook of Energy Audits, Albert Thumann, 6th Edition, The Fairmont Press
8. Bureau of Energy Efficiency Reference book: No.1, 2, 3 4
9. Energy Management Handbook, W.C. Turner, John Wiley and Sons, A Wiley Inter-science publication
10. Carbon Capture and Sequestration: Integrating Technology, Monitoring, and Regulation edited by E J Wilson and D Gerard, Blackwell Publishing
11. Heating and Cooling of Buildings - Design for Efficiency, J. Krieder and A. Rabl, McGraw Hill Publication, 1994.

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**16EC4134 – Basics of Communication Systems
(Open Elective - II)**

IV Year B.Tech ME I Semester

Pre requisite(s): Nil

L	T	P/D	C
3	-	-/-	3

**Note: Only Block Diagram Approach with Qualitative Treatment of the topics is required.
Detailed mathematical treatment is not required.**

Course Objectives:

1. Introduce the students to modulation and various analog and digital modulation schemes.
2. They can have a broad understanding of satellite, optical, cellular, mobile, wireless and telecom concepts.

Course Outcomes: After completion of this course, the students would be able to

CO1: Distinguish various types of modulations.

CO2: Explain different communication modules and their implementation.

CO3: Distinguish various wireless and cellular, mobile and telephone communication systems.

Unit I: Introduction

Need for Modulation, Frequency translation, Electromagnetic spectrum, Gain, Attenuation and decibels.

Unit II: Simple description on Modulation

Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, AM Radio, FM Radio, Transmitters and Receivers

Unit III: Telecommunication Systems

Telephones Telephone system, Paging systems, Internet Telephony, **Networking and Local Area Networks:** Network fundamentals, LAN hardware, Ethernet LANs, Token Ring LAN.

Unit IV: Satellite Communication:

Satellite Orbits, Satellite communication systems, Satellite subsystems, Ground Stations, Satellite Applications, Global Positioning systems.

Optical Communication: Optical Principles, Optical Communication Systems, Fiber – Optic Cables, Optical Transmitters & Receivers, Wavelength Division Multiplexing.

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Unit V: Cellular and Mobile Communications

Cellular telephone systems, AMPS, GSM, CDMA, WCDMA. **Wireless Technologies:** Wireless LAN, PANs and Bluetooth, ZigBee and Mesh Wireless networks, Wimax and MANs, Infrared wireless, RFID communication, UWB.

TEXT BOOKS:

1. “Principles of Electronic Communication Systems”, Louis E. Frenzel, 3e, McGraw Hill publications, 2008.
2. “Electronic Communications systems”, Kennedy, Davis, 4e, TMH, 1999.

REFERENCE BOOKS:

1. “Introduction to Telecommunications Network Engineering”, TarmoAnttalainen, Artech House Telecommunications Library.
2. “Wireless Communications-Principles and practice”, Theodore Rappaport, Prentice Hall, 2002.
3. “Fundamentals of Telecommunications”, Roger L. Freeman, 2e, Wiley publications.
4. “Introduction to data communications and networking”, Wayne Tomasi, Pearson Education, 2005.

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**16CE4136–Building Technology
(Open Elective – II)**

IV Year B.Tech ME I Semester

Pre Requisites: None.

Course Objectives: Develop ability to

1. Study the basic building materials, properties and their applications.
2. Grasp the knowledge of planning of buildings.
3. Understand the concepts of fire safety, ventilation and plumbing services provided for a building.

L	T	P/D	C
3	-	-/-	3

Course Outcomes: At the end of the course, student would be able to

- CO1:** Explain characteristics of building materials.
- CO2:** Apply basic principles to develop stable and sustainable buildings.
- CO3:** Explain the principles of planning of building including building bye-laws.
- CO4:** Identify different materials, quality and methods of fabrication and construction.
- CO5:** Adopt standard building provisions for natural ventilation and lighting.
- CO6:** Explain principles of acoustics in building and plumbing.

UNIT – I

Stones: Uses of stones as building materials, Characteristics of good building stones. Types of stones and their significance.

Bricks: Characteristics of good building bricks. Types of bricks and their significance.

Cement and Concrete: Ingredients of cement – Types of cement, properties and uses of cement.

Overview on concrete.

UNIT – II

Building: Basic definitions, Types, components, economy and design, principles of planning of buildings and their importance, building bye-laws.

Ventilation: Definitions and importance of circulation; Lighting and ventilation; how to consider these aspects during planning of building.

UNIT – III

Repairs in Buildings: Inspection, control measures and precautions for various construction defects, General principles of design of openings, and various types of fire protection measures to be considered while planning a building.

Vertical transportation in buildings: Types of vertical transportation, Stairs, different forms of stairs, planning of stair cases, other modes of vertical transportation – lifts, ramps, escalators.

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UNIT – IV

Prefabrication systems: Prefabrication systems in residential buildings – walls, openings, cupboards, shelves, etc., planning and modules and sizes of components in prefabrication.

Air conditioning: Process and classification of air conditioning, Dehumidification. Systems of air conditioning, ventilation, functional requirements of ventilation.

UNIT – V

Acoustics: Acoustics, effect of noise, properties of noise and its measurements, Principles of acoustics of building. Sound insulation – Importance and measures.

Plumbing services: Water supply system, maintenance of building pipe line, Sanitary fittings, principles governing design of building drainage.

TEXT BOOKS:

1. Building Materials, P.C. Varghese, Prentice Hal India Learning Pvt. Ltd., 2015.
2. Building Construction, B.C.Punmia, Er. Ashok Kumar Jain and Dr.Arun Kumar Jain, Laxmi Publications, 2016.

REFERENCE BOOKS:

1. Building Materials, S.K. Duggal, New Age, 2016.
2. Building Materials, S.S. Bhavikatti, Vikas Publishers, 2016.
3. Engineering Materials and Building Construction, Rangwala, Charotar Publishing House, 2015.
4. A Text book of Building Construction, Arora and Bindra, DhanpatRai Publications, 2014.

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**16MB4141-Banking and Insurance
(Open Elective –III)**

IV Year B.Tech ME I Semester

Prerequisite(s): None

Course Objectives: Develop ability to

1. Learn the importance of banking business and its functions.
2. Understand the services in banking sector.
3. Examine the importance of RBI and its significance.
4. Understand the insurance sector.
5. Identify regulatory framework of insurance sector.

Course Outcomes (COs): At the end of the course, student would be able to:

- CO1:** Acquire the knowledge of banking system.
- CO2:** Acknowledge banking services and types of banks.
- CO3:** Absorb regulation pattern on banking sector.
- CO4:** Identify the need of insurance sector and its significance.
- CO5:** Acknowledge IRDA and other insurance patterns in India.

UNIT-I: Introduction to banking business

Concept and history of banking system in India, banking structure – types of accounts, advances and deposit system in India-cheque process and clearing system.

UNIT-II: Card System and classification of banks

Types of cards and its importance (Debit, credit, smart-card) net banking, mobile banking, KYC system, Nationalization of banks- commercial, private, public and foreign banks- regional rural banks and local bankers- money lenders and pawn brokers.

UNIT-III: Reserve Bank of India Act 1934

Establishment of RBI Act and Banking Regulation Act 1949-features-functions- Mint (coin printing) -money control, deficiencies in Indian banking system- problem and challenges, Non-Performing Assets (NPA's).

UNIT-IV: Introduction to Insurance sector

Concept and nature of insurance- principles of insurance- new insurance products, bank assurance. Types of plans pricing and underwriting documentation. Channels of distribution-policy servicing and settlement of clients.

UNIT-V: Insurance Regulatory Development Authority 1999

L	T	P/D	C
3	-	-/-	3

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History –features- importance of IRDA- general insurance Act 1972- feature and functions– LIC Act 1956, features and functions. Non-life insurance and its kinds – difference between general insurance and life insurance.

TEXT BOOKS

1. Vijayragavan Iyengar, “Introduction to banking”, Excel publications.
2. S.Arjunatesan and T.R. Vishwanthan, “Risk Management and Insurance”, Macmillan.
3. Hals.Scott, “Capital Adequacy beyond Basel banking securities and insurance”, Oxford.

REFERENCE BOOKS

1. Mishra, M.N, “Insurance principle and practice”, Sultan Chand & Sons, New Delhi
2. VarshneyP.N., “Banking law and Practice”, Sultan Chand & Sons, New Delhi
3. Reddy K S and Rao R.N, “Banking and Insurance”, Paramount Publisher 2013.
4. George E.Rejda, “Principles of risk Management & Insurance”, 9/e, Pearson Education.

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**16CS4142– Database Systems
(Open Elective - III)**

IV Year B.Tech ME I Semester

Prerequisite(s): None

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop ability to

1. Learn and practice data modeling using entity-relationship and develop database design.
2. Understand the features of database management systems and Relational database.
3. Understand Structured Query Language (SQL) and learn SQL syntax.
4. Understand normalization process of a logical data model and correct any anomalies.
5. Understand needs of database processing and learn techniques for controlling the consequences of concurrent data access.

Course Outcomes: At the end of the course, student would be able to:

CO1: Design and describe data models and schemas in DBMS.

CO2: Use SQL - the standard language of relational databases, for database processing.

CO3: Implement Transaction and Query processing techniques for data storage and retrieval.

CO4: Use backup and recovery techniques for handling the databases.

CO5: Use PL/SQL for database administration and performance optimization.

UNIT – I: Introduction

Data base System Applications, Purpose of Database Systems, View of Data – Data Abstraction , Instances and Schemas , Data Models ,Introduction to Data base design , ER diagrams, Beyond ER Design, Entities, Attributes and Entity sets , Relationships and Relationship sets , Additional features of ER Model , Conceptual Design with the ER Model , Conceptual Design for Large enterprises, database Access for applications Programs ,Data Storage and Querying,– data base Users and Administrator ,data base System Structure ,History of Data base Systems. Database Languages–DDL, DML,DCL.

UNIT – II: Relational Model

Introduction to the Relational Model - Integrity Constraint Over relations – Enforcing Integrity constraints – Querying relational data, Logical data base Design, Introduction to Views – Destroying /altering Tables and Views.

UNIT – III: Form of Basic SQL Query

Examples of Basic SQL Queries , Introduction to Nested Queries, Correlated Nested Queries Set

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– Comparison Operators – Aggregative Operators , NULL values – Comparison using Null values – Logical connectivity’s – AND, OR and NOT – Impact on SQL Constructs ,Outer Joins , Disallowing NULL values.

UNIT – IV: Transaction Management

Transaction Concept- Transaction State- Implementation of Atomicity and Durability – Concurrent – Executions – Serializability- Recoverability – Implementation of Isolation – Testing for serializability.

Concurrency Control - Lock –Based Protocols – Timestamp Based Protocols- Validation- Based Protocols – Multiple Granularity.

Recovery system – Failure Classification- Storage Structure- Recovery – Atomicity – Log – Based Recovery- Recovery with Concurrent Transactions – Buffer Management – Failure with loss of no-volatile storage - Advance Recovery systems- Remote Backup systems.

UNIT – V: PL/SQL and Database Administration

Fundamentals, Defining variables and data types, using SQL in PL/SQL, Program Structures to Control Execution Flow, Using Cursors and Parameters, Using Composite Data Types, Exception Handling, Using and Managing: Procedures, Functions, Packages and Triggers, Improving PL/SQL performance, Recognizing and Managing Dependencies, Using the PL/SQL Compiler.

TEXT BOOK (S):

1. Fundamentals of Database Systems, Elmasri, Navathe, 7th Edition, Pearson Education, 2016.
2. Oracle PL/SQL Programming, Steven Feuerstein, Bill Pribyl, O’Reilly, 5th Edition, 2009.

REFERENCE BOOK(S):

1. Data base System Concepts, Silberschatz, Korth, McGraw hill, VI edition.
2. Data base Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition.
3. Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition
4. Introduction to Database Systems, C.J.Date Pearson Education

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16EE4143 Micro – Electro – Mechanical Systems

IV Year B.Tech ME I Semester

Prerequisite(s): None

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop ability to

1. Understand semiconductors and solid mechanics used to fabricate MEMS devices.
2. Understand basics of Micro fabrication techniques.
3. Understand various sensors and actuators
4. Understand different materials used for MEMS
5. Understand applications of MEMS to disciplines beyond Electrical and Mechanical engineering.

Course Outcomes: At the end of the course, student would be able to

- CO1:** Identify different types of semiconductor and solid mechanic materials that are used to fabricate MEMS devices.
- CO2:** Apply basic science, circuit theory, Electro-magnetic field theory, control theory in Micro fabrication techniques
- CO3:** Distinguish between different sensors and actuators
- CO4:** Distinguish between various processes involved in Micro machining
- CO5:** Apply the knowledge of MEMs to other advanced applications such as polymer and optical MEMs

UNIT-I

Basics: Intrinsic Characteristics of MEMS, Energy Domains and Transducers, Sensors and Actuators, Introduction to Micro fabrication, Silicon based MEMS processes, New Materials, Review of Electrical and Mechanical concepts in MEMS, Semiconductor devices, Stress and strain analysis, Flexural beam bending, Torsional deflection

UNIT-II

Sensors and Actuators-I:Electrostatic sensors, Parallel plate capacitors, Applications, Inter-digitated Finger capacitor, Comb drive devices, Micro Grippers, Micro Motors, Thermal Sensing and Actuation , Thermal expansion, Thermal couples, Thermal resistors, Thermal Bimorph, Applications, Magnetic Actuators, Micro-magnetic components, Actuation using Shape Memory Alloys

UNIT-III

Sensors and Actuators-II:Piezoresistive sensors, Piezoresistive sensor materials, Stress analysis of mechanical elements, Applications to Inertia, Pressure, Tactile and Flow sensors,

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Piezoelectric sensors and actuators, piezoelectric effects, piezoelectric materials, Applications to Inertia , Acoustic, Tactile and Flow sensors.

UNIT –IV

Micromachining: Silicon Anisotropic Etching, Anisotropic Wet Etching, Dry Etching of Silicon, Plasma Etching, Deep Reaction Ion Etching (DRIE), Isotropic Wet Etching, Gas Phase Etchants, Case studies, Basic surface micro machining processes, Structural and Sacrificial Materials, Acceleration of sacrificial Etch, Striction and Antistriction methods

UNIT –V

Polymer and Optical MEMS Polymers in MEMS, Polimide, SU-8, Liquid Crystal Polymer (LCP), PDMS, PMMA, Parylene, Fluorocarbon, Application to Acceleration, Pressure, Flow and Tactile sensors, Optical MEMS, Lenses and Mirrors, Actuators for Active Optical MEMS.

TEXT BOOKS:

1. Chang Liu, “Foundations of MEMS”, Pearson Education Inc., 2006.
2. Stephen D Senturia, “Microsystem Design”, Springer Publication, 2000.
3. Tai Ran Hsu, “MEMS & Micro systems Design and Manufacture” Tata McGraw Hill, New Delhi, 2002.

REFERENCE BOOKS:

1. NadimMaluf,“ An Introduction to Micro Electro Mechanical System Design”, Artech House, 2000.
2. Mohamed Gad-el-Hak, editor, “ The MEMS Handbook”, CRC press Baco Raton, 2000
3. Julian w. Gardner, Vijay K. Varadan, Osama O. Awadelkarim, “Micro Sensors MEMS and Smart Devices”, John Wiley & Son LTD,2002
4. James J.Allen, “Micro Electro Mechanical System Design”, CRC Press Publisher, 2010
5. Thomas M.Adams and Richard A.Layton, “Introduction MEMS, Fabrication and Application,” Springer 2012.

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**16EC4144 – Principles of Wireless Communication Systems
(Open Elective- III)**

IV Year B.Tech ME I Semester

L	T	P/D	C
3	-	-/-	3

Prerequisite: Nil

Note: No detailed mathematical treatment is required.

Course Objectives: Develop ability to

1. To discuss the fundamentals of cellular mobile wireless networks.
2. To provide an overview of various approaches to communication networks.
3. To study the numerous different-generation technologies with their individual pros and cons.
4. To discuss about the principles of operation of the different access technologies like FDMA, TDMA, SDMA and CDMA and their pros and cons.

Course Outcomes: At the end of the course, student would be able to:

CO1: Explain different generations of Cell phone technology

CO2: Explain different cellular, communication networks and different access techniques

CO3: Distinguish between different personal communication services

CO4: Explain the development of Wireless technologies beyond 2 G

CO5: Explain mobile data services and short range networks.

UNIT – I: Transmission Fundamentals

Cell phone Generations: 1G, 2G, 2.5G, 3G & 4G

Transmission Fundamentals: Time domain & Frequency domain concepts, Radio, Analog Vs Digital, channel capacity, transmission media, carrier-based signaling, spread-spectrum signaling.

UNIT – II: Network Concepts

Communication Networks: LANs, MANs, WANs, circuit switching, packet switching, ATM

Cellular Networks: Cells, duplexing, multiplexing, voice coding

Multiple Access Techniques: FDMA, TDMA, SDMA, CDMA, spectral efficiency.

UNIT – III: Personal Communication Services

GSM, HSCSD, GPRS, D-AMPS, CDMA One, CDMA Two, Packet Data Systems.

UNIT – IV: 3G & Beyond

IMT-2000, W-CDMA, CDMA 2000, EDGE, Wi-Fi, WiMAX, OFDM.

UNIT – V: Mobile Data Services & Short-Range Networks

Mobile Data Services: Messaging, wireless web, WAP, site design

Short-Range Wireless Networks: Unlicensed spectrum, WLANs, cordless telephony, IrDA, Bluetooth

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Smart Phones: Future phones, mobile OSs, smart phone applications.

TEXT BOOKS:

1. “The essential guide to wireless communications applications: from cellular systems to Wi-Fi”, Andy Dornan, 2nd Edition, Prentice Hall, 2002.
2. “Wireless Communications and Networks: 3G & Beyond”, Misra, Tata McGraw-Hill, 2009.

REFERENCES:

1. “Wireless Communications: Principles and Practice”, Theodore S. Rappaport, 2nd Edition, Pearson Education, 2009.
2. “Wireless communications and networking”, William Stallings, Prentice Hall, 2002.

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**16CE4146–Green Buildings
(Open Elective– III)**

IV Year B.Tech ME I Semester

Pre Requisites: None.

Course Objectives: Develop ability to

1. Impart knowledge on the sustainable construction strategies.
2. Understand the concepts of green buildings.
3. Know emerging building materials.
4. Understand LEED building assessment and certification process.

Course Outcomes: At the end of the course, student would be able to:

CO1: Describe the need of green buildings for environmental sustainability.

CO2: Select suitable sustainable planning and construction strategies.

CO3: Determine the building rating systems and the process and implementation of green buildings.

CO4: Describe emerging materials in the field of Civil Engineering construction.

CO5: Explain the future scope of Green building technology in India.

UNIT – I: Sustainable Construction and Green Building Requirements

Ethics and sustainability – Increased CO₂ trade – Sustainable construction – Major environmental and resource concerns – Green building movement and obstacles – Green building requirements – Perceived use of green building – Relationship between comfort level and performance ability.

UNIT – II: Green Building Process and Assessment

Conventional versus green building delivery systems – Execution of green building process – Integrated design process – Ecological design – Merits and demerits – Historical perspective – Contemporary and future ecological designs – LEED building assessment standard – LEED certification process – International building assessment standards – Building rating system and its future – Case study of a green building.

UNIT – II: Sustainable landscaping, Energy and Atmosphere

Land and landscape approaches for green buildings – Sustainable landscapes – Enhancing ecosystems – Storm water management – Heat island mitigation – Building energy issues – Building energy design strategies – Building envelope – Active mechanical systems – Electrical power systems – Innovative energy optimization strategies – Smart buildings and energy management systems – Ozone depleting chemicals in HVAC & R and fire suppression.

L	T	P/D	C
3	-	-/-	3

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UNIT – IV: Building Hydrologic System and Material Loops

Energy policy act of 1992 – High performance building hydrologic strategy - High performance building water supply strategy - High performance building wastewater strategy – Landscaping water efficiency – Green building materials issues and priorities – Difference between green building buildings and green building materials – LCA of building materials and products – Emerging construction materials and products – Design for deconstruction and disassembly – Closing material loops in practice.

UNIT – V: Green Building Implementation

Site protection planning – Health and safety planning – Construction and demolition – Waste management – Reducing the footprint of construction operations – Essentials of building commissioning – Costs and benefits of building commissioning – Case study for high performance green buildings – The economics of green buildings – Quantifying green building costs – Future directions in green buildings.

TEXT BOOKS:

1. Sustainable Construction: Green Building Design and Delivery, Charles.J.Kibert, John Wiley & Sons, New Jersey, 2008.
2. Green Building: Guidebook for Sustainable Architecture, M.Bauer, P. Mosle and M. Schwarz, Springer, Verlag Berlin Heidelberg, 2010.

REFERENCE BOOKS:

1. Marketing Green Building Services: Strategies for success, Jerry Yudelson, Elsevier, 2008.
2. Marketing Green Buildings: Guide for Engineering, Construction and Architecture, Jerry Yudelson, The Fairmont Press INc., 2006.
3. Green by Design: Creating a Home for Sustainable Living, Angela M. Dean, Gibbs Smith Publication, 2003.
4. Indian Green Building Council Website: <https://igbc.in/igbc/>
5. http://cpwd.gov.in/Publication/Guideleines_Sustainable_Habitat.pdf
6. For case studies: <http://www.nmsarchitects.com/>

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16EN4147–FOREIGN LANGUAGE-FRENCH

(Open Elective - III)

IV Year. B.Tech. ME– I Semester.

Prerequisite(s): None.

L	T	P/D	C
3	-	-/-	3

Course Objectives:

Develop ability to

1. Recognize and pronounce French alphabet
2. Apply grammatical concepts in both oral and written communication.
3. Appreciate the culture of Francophone countries.
4. Read authentic texts.

Course Outcomes:

At the end of the course, student would be able to:

CO 1.Demonstrate competence in basic vocabulary and grammar

CO 2.Understand the culture of Francophone countries.

CO 3.Read with accurate pronunciation.

CO 4.Understand short and simple oral and written communication.

Syllabus:

UNIT–I

Functional Aspects:

Greetings, introductions, asking/giving information, pronunciation and Spellings of Francophonic names, family relations, professions, days of the week and months, nationalities, languages, cardinal numbers and ordinal numbers, descriptions.

Grammatical Aspects:

Definite and Indefinite articles, numbers, adjectives, interrogation, negation, conjugation of the verbs in the present tense.

UNIT–II

Functional Aspects:

Intonation, vowels, orals and nasals, Inviting and responding to invitations, describing people.

Grammatical Aspects:

Past Tense- verbs used

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UNIT–III

Functional Aspects:

Polite expressions-expressing opinions, making suggestions, expressing ideas and dislikes, agreeing and disagreeing.

Describing places, professions, dress and monuments of Paris and other public places.

Grammatical Aspects:

Regular and irregular verbs, conjugations, writing simple sentences using the verbs in present and past tense.

UNIT–IV

Functional Aspects:

Semi-vowels, consonant sounds, Invitations, accepting and refusing invitations, fixing appointments, Inviting through telephone and e-mail.

Grammatical Aspects:

Partitif articles, adjectives, demonstrative and possessive, prepositions and adverbs of quantity and quality.

UNIT–V

Functional Aspects:

Asking for information in a restaurant, Ordering food in a restaurant, appreciating, describing leisure of Francophone cultures.

Grammatical Aspects:

Future Tense-Verbs used

Text Book:

1. Dominique, Philippe, et al. 1999. Le Nouveau sans Frontières -I (Including Exercise Book). Paris: Clé, International (Indian Edition).

Reference Books:

1. Alter Ego I & II. Published by Hachette
2. Connexion I & II. Published by Didier
3. Echo I & II. Clé International publishers
4. Latitude I & II. Published by Didier

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16EN4148–FOREIGN LANGUAGE-SPANISH

(Open Elective - III)

L	T	P/D	C
3	-	-/-	3

IV Year. B.Tech.ME– I Semester.

Prerequisite(s): None.

Course Objectives:

Develop ability to:

1. Identify Spanish sounds and participate in social interactions.
2. Read authentic texts in Spanish.
3. Write small and simple messages in Spanish.
4. Understand the nuances of Hispanic culture.

Course Outcomes:

At the end of the course, student would be able to:

- CO 1. Apply basic vocabulary and grammatical structures in Spanish.
- CO 2. Demonstrate competence in functional and grammatical structures of the language.
- CO 3. Read with accurate pronunciation.
- CO 4. Participate in simple conversations based on everyday situations.

UNIT–I

Functional Aspects:

Greetings, introductions, asking/giving information, pronunciation and Spellings - Hispanic names, family relations, professions, days of the week and months, nationalities, languages.

Grammatical Aspects:

Basic structure of spelling and pronunciation; present indicative of the regular verbs ('ar/er/ir) and 'querer'; subject pronouns; interrogative sentences with 'Porque', and 'quien'; causal phrase with 'porque'; 'ser' and 'estar'; negative sentences; adjectives of nationality.

UNIT–II

Functional Aspects:

Ordinal and cardinal numbers, quantities, shopping, describing things(material, colour, size etc.) and people (food habits, dress etc.)

Grammatical Aspects:

Gender and number of nouns and adjectives; the verb 'tener'; interrogative sentences; demonstrative and qualitative adjectives.

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UNIT–III

Functional Aspects:

Polite expressions- expressing opinions, making suggestions, expressing ideas and dislikes, agreeing and disagreeing.

Grammatical Aspects:

Qualitative adjectives, forms and usage, gradations, superlative adjectives, exclamatory sentences; the verb 'gustar', forms and syntax; personal Pronouns; definite and indefinite pronouns, direct object pronouns, Prepositions; verbs like 'parecer' and 'encontrar and preferir, their form and syntax, interrogative pronouns.

UNIT–IV

Functional Aspects:

Invitations; accepting and refusing invitations; fixing an appointment; Inviting through telephone and or e-mail.

Grammatical Aspects:

Present indicative of irregular verbes, expressions with 'tener' and 'estar'; Prepositional pronouns; interrogative sentences.

UNIT–V

Functional Aspects:

Expression of time; Making comparisons- Indian and Hispanic. Describing events - festivals - Indian and Hispanic

Grammatical Aspects:

Time with 'ser', expression s relating to festivals.

Text Book:

1. NOUVEAU ELE INICIAL 1

Reference Books:

1. Espanol sin Fronteras, A. Sanchez, M. Rios, J.A. Metella, SGEL. Madrid, 1997
2. Entre Nosotros A. Sanchez, M. Rios, J.A. Metella, SGEL. Madrid, 1997

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16EN4149–FOREIGN LANGUAGE-GERMAN

(Open Elective -III)

L	T	P/D	C
3	-	-/-	3

IV Year. B.Tech. ME– I Semester.

Prerequisite(s): None.

Course Objectives:

Develop ability to:

1. Understand and participate in social interactions in everyday situations.
2. Write simple messages in German on topics related to personal interest and everyday life.
3. Read authentic texts in German.
4. Demonstrate insight into significant cultural products and historical events in German.

Course Outcomes:

At the end of the course, student would be able to:

- CO 1. Converse in day to day situations.
- CO 2. Demonstrate proficiency in writing.
- CO 3. Read with accurate pronunciation.
- CO 4. Display greater insight of German culture.

UNIT–I

Functional Aspects:

Greetings, introductions, asking/giving information, pronunciation and Spellings –German names, family relations, professions, days of the week and months, nationalities, languages.

Grammatical Aspects:

Definite and Indefinite articles(including negation)

Noun: Gender and Plural forms, cases (nominative, accusative, dative & genitive)

UNIT–II

Functional Aspects:

Ordinal and cardinal numbers, quantities, shopping, describing things (material, colour, size etc.) and people (food habits, dress etc.)

Grammatical Aspects:

Verb: Strong and Weak verbs, Verbs with separable and inseparable prefixes, modal verbs, position of verb in the main and subordinate clauses, auxiliary verbs, reflexive verbs in accusative and dative cases, imperative constructions

UNIT–III

Functional Aspects:

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Polite expressions- expressing opinions, making suggestions, expressing ideas and dislikes, agreeing and disagreeing.

Grammatical Aspects:

Pronouns: personal, possessive, reflexive, interrogative and demonstrative, Prepositions: with the accusative, dative and with both these cases

UNIT-IV

Functional Aspects:

Invitations; accepting and refusing invitations; fixing an appointment; Inviting through telephone and or e-mail.

Grammatical Aspects:

Adjective: declension with the Indefinite article, Definite article, without article, with the indefinite pronoun, Degrees of comparison (also adverbs), ordinal numbers, adjectives as nouns

Conjunctions: subordinating and coordinating with respect to the position of the verb.

Functional Aspects:

Expression of time; Making Comparison - Indian and Germanic. Describing events - festivals - Indian and Germanic.

Grammatical Aspects:

Negation: of a sentence and words therein. .Sentence structure: general principles observed in German Language

Text Book

1. Hermann Funk, Christina Kuhn, Oliver Bayerlein., Studio d A 1.2005 ComelsenVerlag, Berlin.

Reference Book(s)

1. Rosa –Marie Dallapiazza, Eduard von Jan, Till Schonherr,unterMitarbeit von JuttaOrth-Chambah.
2. Tangram aktuell 1 –Lektion 1-4, Lektion 5 - 8
3. Max Hueber Verlag. Munchen. 2009

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16ME41L1-Work Study Lab

(Soft Core Elective -II)

IV Year B.Tech ME I Semester

Pre-requisites: None

L	T	P/D	C
-	-	3/-	2

Course Objectives: Develop ability to

1. Impart thorough knowledge to the students about various techniques of work-study for improving the productivity of an organization.
2. Inculcate the skill among the students for analyzing and improving existing methods of working on the shop floor of an organization.
3. Apply through knowledge and skills to students with respect to allowances, rating, calculation of basic and standard time for manual operations in an organization.
4. Provide thorough knowledge about assessment about occupational exposure to heat, stress, noise, vibrations and RSPM.

Course Outcomes: At the end of the course, student would be able to:

CO1: Understand the reasons and logic behind work station design.

CO2: Model work systems using standard techniques, for purposes of work system documentation, analysis and design.

CO3: Calculate the basic work content of a specific job for employees of an organization and the production capacity of man power of an organization

CO4: Recognize and measure the human indicators of fatigue and stress and able to rate a worker engaged on a live job and calculate basic, allowed and standard time for the same.

CO5: Students will be able to analyze the existing methods of working for a particular job and develop an improved method through questioning technique.

LIST OF EXPERIMENTS:

1. Preparation of two handed process chart.
2. Preparation of Multiple Activity chart.
3. Preparation of flow process charts on activities in Workshop/ Laboratory/Office.
4. To conduct time study of the bulb holder assembly operation for the existing method.
5. Determination of time standard for a given job using stopwatch time-study.
6. Preparation of man-machine charts for an existing setup and development of an improved process.
7. Determination of time by Method Time Measurement (MTM).
8. Even distribution of workers.

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9. To study and to find the load per worker in a factory.
10. Compare the performance of one another.
11. Carryout the study of Members of your Group on Jogging Machine.
12. Determine Mental Work Load (MWL) doing different tasks.

ADDITIONAL EXPERIMENTS:

1. Determine standard time by work sampling.
2. Determine physiological work for doing different tasks.
3. Determine stress and fatigue for doing different tasks.
4. To study the operator's performance under different working conditions (light, temp., sound, atmosphere etc.)

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**16ME41L2 - Facility Design Lab
(Soft Core Elective –II)**

IV Year B.Tech ME I Semester

Pre-requisites: Auto-CAD

L	T	P/D	C
--	--	3/-	2

Course objectives:

Course Outcomes: At the end of the course, student would be able to

CO1: Apply principles to improve manufacturing and service facilities

CO2: Apply techniques to design effective storage systems

CO3: Develop alternate facility designs for optimum layout

CO4: Conduct financial analysis for the alternate facilities designed

CO5: Analyze to justify the final facility designed

List of Experiments:

1. Preparation of Production Routing sheet for each 'makes' part.
2. Preparation of Flow Process chart for each 'makes' part.
3. Computation of Plant services space requirement.
4. Computation of Total space requirement.
5. Preparation of from-To chart for the departments.
6. Preparation of activity relationship charts.
7. Development of Initial departmental layouts.
8. Development of Final departmental layout.
9. Development of Initial layouts of production facilities.
10. Development of Final layout of production facilities.
11. Preparation of the Initial layouts for Storage space.
12. Preparation of the Final layout for Storage space.

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16ME41L3 – Heat Transfer Lab

IV Year B.Tech ME I Semester

Pre-requisites: 16ME2101 - Thermodynamics

L	T	P/D	C
-	-	3/-	2

Course Objectives: Develop ability to:

1. Heat transfer is the one of the important subjects which is commonly applied in Renewable energy, industrial, commercial and domestic systems.
2. The experiments are designed to provide exposure of practical aspects of the various theoretical concepts developed under the course heat and Mass transfer.
3. The laboratory consists of experiments on conduction, convection, radiative boiling and condensing mechanisms of heat transfer.

Course Outcomes: At the end of the course, student would be able to:

CO1: Perform steady state conduction experiments to estimate thermal conductivity of different materials

CO2: Obtain variation of temperature along the length of the pin fin under forced and free convection

CO3: Model transient heat conduction experiment

CO4: Determine surface emissivity of a test plate and Stefan- Boltzmann's constant and compare with theoretical value

CO5: Estimate heat transfer coefficients in forced convection, free convection , condensation and correlate with theoretical values

Experiments:

1. Composite Slab Apparatus – Overall heat transfer co-efficient.
2. Heat transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere.
4. Thermal Conductivity of given metal rod.
5. Heat transfer in pin-fin.
6. Experiment on Transient Heat Conduction.
7. Heat transfer in forced convection apparatus.
8. Heat transfer in natural convection.
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Stefan Boltzman Apparatus.
12. Study of heat pipe and its demonstration.

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13. Critical Heat flux apparatus.
14. Heat transfer in film and drop wise condensation.

Additional Experiments

- 1) Heat transfer in pin-fin(Natural convection)
- 2) Heat transfer in natural convection(Vertical type)

IV Year B.Tech (ME)

II Semester

Detailed Syllabus

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16MB4201-Financial Analysis and Project Management

IV Year B.Tech ME II Semester

Pre requisites: None

L	T	P/D	C
4	-	-	4

Course Objective: Develop ability to:

1. Familiarize and acquaint the student with accounting concepts and analysis.
2. Evaluate alternative techniques for analyzing project opportunities and budgeting capital.
3. Understand the various costs of capital and calculate these costs.
4. Recognize the significance of capital structure and examine its importance in decision making along with dividends and working capital.
5. Understand the concept and stages in project management.

Course Outcomes (COs): At the end of the course, Students would be able to:

CO1: Learn financial accounting concepts and analyze data.

CO2: Understand the role of capital budgeting in decision making.

CO3: Apply the concepts of capital structure in financial decision making.

CO4: Applications of Project management.

CO5: Appreciate Risk Management concepts

UNIT-I: Introduction to Financial Accounting

Definition, branches of accounting, accounting concepts and conventions, types and principles of accounting, accounting cycle, journal, ledger and Trial Balance and final accounts (simple problems) and types of financial statement analysis.

Financial Statement Analysis: Introduction, meaning of ratio, steps in Ratio analysis, classification of Ratios. Advantages and Limitation of Ratio analysis, (simple problems).

UNIT-II: Introduction to Financial Management and Capital Budgeting

Concept, functional areas and objectives of financial management. Capital Budgeting- meaning – importance – process – techniques of capital budgeting. Traditional techniques – Payback Period – Accounting / Average Rate of Return, Discounted techniques – discounted Payback Period – Net Present Value – Internal Rate of Return – Profitability Index. (Simple Problems).

UNIT-III: Financing Decision

Concepts and measurement of cost of capital, computation of cost of debt, cost of equity, cost of preference shares, and cost of retained earnings; concept weighted average cost of capital and marginal cost of capital.

Capital Structure: Optimal capital structure, factors influencing the capital structure, financial leverage, operating leverage and combined leverage.

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UNIT-IV: Dividend decision and Working Capital Management

Concept, types of dividends, models of dividend theories. Concepts of working capital management, types and components of working capital (cash, marketable securities, receivable management inventory management).

UNIT-V

A) Basics of Project Management: Introduction, need for project management, project management knowledge areas and processes, the project life cycle.

B) Project Risk Management: Introduction, risk, risk management, role of risk management in overall project management, steps in risk management, risk identification, risk analysis, reducing risks.

Text Books:

1. MY Khan and PK Jain: Financial Management--Text and Problems, Tata McGraw Hill. 2009.
2. Harold Kerzner, "Project Management: A Systems Approach to Planning, Scheduling and Controlling", New Delhi, CBS Publications, 1994.

REFERENCE BOOKS:

1. Prasanna Chandra. "Project Planning, Analysis, Selection, Implementation and Review", New Delhi, Tata McGraw Hill Publications, 2000.
2. P. Gopalkrishnan and E. Rama Moorthy. "Text book of Project Management". New Delhi, McGraw Hill Publications, 2000.

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**16ME4201 – Plant Layout and Materials Handling
(Professional Elective - IV)**

IV Year B.Tech ME II Semester

L	T	P/D	C
3	-	-/-	3

Pre-requisites: None

Course Objectives: Develop ability to:

1. Understand and be able to complete the following charts with regard to a specific Product, assembly chart, route sheet, operations process chart, from-to chart, and activity relationship chart.
2. Identify equipment requirements for a specific process.
3. Understand the benefit of an efficient material handling system.
4. Understand the effect of process layout in the material handling system.
5. Recommend improvements to existing plant layouts from the standpoint of material handling and product flow.
6. Design flexibility into a plant layout to accommodate changes in product volume or product line.
7. Integrate concepts and techniques learned through this course in order to design and efficient plant layout in a team environment.

Course Outcomes: At the end of the course, student would be able to:

CO1: Understand the types of layouts, selection of layout type in a given scenario, ensuring flow of materials in a plant.

CO2: Identify the role that each department plays in achieving the goals of an organization

CO3: Explain the problems in organizing, planning and controlling the use of men, money, materials and machines for industrial production.

CO4: Apply industrial engineering principles to solve the problems in organizing, planning and controlling the use of men, money, materials and machines for industrial production.

CO5: Apply the group technology, and use of software for designing layouts.

UNIT-I: Plant Layout

Introduction, Classification of Layout, Advantages and Limitations of different layouts, Layout design procedures.

Process layout & Product layout: Selection, specification, Implementation and follow up, comparison of product and process layout.

UNIT-II: Heuristics for Plant layout

ALDEP, CORELAP, CRAFT, Fixed position layout, Group Layout, Quadratic assignment model, Branch and bound method.

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Warehouse operations: function, storage operations.

UNIT-III: Material Handling

Material handling principles, Material handling equipment, systems and their classification, Relationship of material handling to plant layout.

UNIT –IV: Basic Material Handling systems

Selection, Material Handling method- path, equipment, function oriented systems.

UNIT-V: Cost minimization methods of material handling

Maintenance of Material Handling Equipment's, Safety in material handling, Ergonomics of Material Handling equipment- Design, Miscellaneous equipment's.

TEXT BOOKS:

1. Operations Management, PBMahapatra, / PHI, 2009.
2. Plant Layout and Material Handling, James M. Apple, John Wiley & Sons, 1973.

REFERENCES:

1. Facility Layout & Location an analytical approach ,RL Francis/ LF McLinnisJr, White, 2nd Edition/ PHI.
2. Plant Layout and Material Handling, B. K. Aggarwal, Jain Brothers, 2008.
3. Plant Layout and Material Handling, S. C. Sharma, Jain Brothers, 2010.
4. Plant Layout and Material Handling, Fred E. Meyers, Prentice Hall, 1993.
5. Introduction to Material handling, Ray, Siddhartha, / New Age, 2008.
6. Plant Layout and Material Handling, RB Chowdary, /Khanna Publishers, 2001.

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**16ME4202– Un-Conventional Machining Processes
(Professional Elective - IV)**

IV Year B.Tech ME II Semester

Pre-requisites: 16ME3102-Production technology-II

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop ability to:

1. To demonstrate the need for development of newer/ non-traditional machining processes.
2. The student will be able to compare the traditional machining processes with nontraditional machining processes with respect to the advantages, applications.
3. The student will be able to identify different energy sources like fluid motion, electric current, high speed electrons, high energy radiation, etc.
4. To analyze the concept, mechanism, parameters associated with the processes.
5. To demonstrate the operational principles, advantages applications, limitations of the various non-traditional machining processes.
6. To selectively select a process /a combination of processes for a specific application/ need/situation depending upon the availability of sources.

Course Outcomes: At the end of the course, student would be able to:

- CO1:** Identify basic techniques of machining processes modeling & the mechanical aspects of orthogonal cutting mechanics
- CO2:** Demonstrate the thermal aspects of orthogonal cutting mechanics & Ability to extend, through modeling techniques, the single point, multiple point and abrasive machining processes
- CO3:** Estimate the material removal rate and cutting force, in an industrially useful manner, for practical machining processes
- CO4:** Prediction of the surface finish in machining processes & Selection of the tool material and machining process parameters
- CO5:** Organize the practical aspects of tool wear and tool life, and their influence on economics

UNIT-I: Introduction

Need for Unconventional machining (UCM) methods- Classification of UCM – considerations in process selection, Materials, Applications.

Abrasive jet machining, Water jet machining and Abrasive water jet machining: Basic principles, equipments, process variables, mechanics of metal removal, MRR, application and limitations.

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UNIT-II

Ultrasonic machining: Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent development.

Electro – Chemical Machining Processes (ECM): Fundamentals of ECM, metal removal rate in ECM, Tool design, economic aspects of ECM, Applications of ECM. Electro-Chemical Grinding (ECG), Electro Chemical Honing and deburring process.

Chemical machining: principle-mask ants-etchants-applications.

UNIT-III

Thermal Metal Removal Processes: General Principle of Electric Discharge Machining (EDM) – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, surface finish and machining accuracy, applications of EDM. Wire EDM-principle and applications.

Generation and control of Electron Beam for Machining (EBM), theory of electron beam machining, Applications of EBM

UNIT-IV

Laser Beam Machining (LBM): General Principle and Generation of laser beam – Classification and applications of LBM, thermal features, cutting speed and accuracy of cut.

Plasma Arc Machining (PAM): Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries.

UNIT- V

Magnetic abrasive finishing, Abrasive Flow Finishing, Electro Stream drilling, Shaped tube Electrolytic machining.

TEXT BOOKS:

1. Advanced machining processes, VK Jain, Allied publishers

REFERENCES:

1. Modern Machining Process, Pandey P.C and Shah H.S., TMH
2. New Technology, Bhattacharya A, the Institution of Engineers, India 1984.
3. Unconventional Machining Processes, C. Elanchezhian, B. VijayaRamnath and M Vijayan, Anuradha Publications, 2005.
4. Unconventional manufacturing processes, M.K. Singh, New Age International Publishers.

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**16ME4203 - Engineering Acoustics
(Professional Elective –IV)**

IV Year B.Tech ME II Semester

Pre-requisites: Engineering Physics, Physics for Engineers

L	T	P/D	C
3	-	-/-	3

Course Objective: Develop ability to:

1. The course aims at presenting the fundamental ideas and theories necessary to understand and analyze elastic wave phenomena in fluid or solid media.
2. The course also gives an introduction to signal analysis and measurement techniques as well as human response to sound and vibration.
3. The objective is to give the student a good understanding of the theory and illustrate important applications ranging from design of concert halls to quite vehicles and low noise fans.

Course Outcomes: At the end of the course, student would be able to:

CO1: Describe fundamental concepts of engineering noise and vibration, measurement techniques and instruments.

CO2: Explain the effect of noise and vibrations on human and equipment.

CO3: Implement the knowledge of frequency content of periodic and transient signals to analyze mechanical systems.

CO4: Understand the physical foundations and the mathematical models of sound waves in fluids and solids.

CO5: Apply mathematical models to sound and vibration problems in mechanical and vehicle engineering

UNIT-I: Characteristics of Sound – definitions of acoustic intensity, energy, impedance, and various units of noise measurement – sound pressure level (SPL), sound power level (PWL). Theory for elastic waves in fluids and solids, Human response to sound and vibration

UNIT-II: The wave equation:

- in Cartesian, Cylindrical-polar, and Spherical polar coordinates, 1-D, 2-D, and 3-D sound waves, Green's functions, Solutions for point (compact) sources – monopole, dipole, and quadrupole

UNIT-III: Vibration isolation, **Vibrations** in beams and plates

UNIT-IV: Jet noise: exhaust from jet engines Lighthill's acoustic analogy, Eighth-power law.

Sound Propagation in free space: Ray/geometric theory of acoustics

- Snell's law
- Refraction of sound by temperature/wind gradients

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UNIT-V: Flow Acoustics, Sound in ducts and mufflers, **Sound** Propagation in ducts: Duct acoustics(Normal mode analyses, concept of cut-off modes, Flow effects: no flow, uniform flow, non-uniform (swirling) flow), Measurement Methods.

TEXT BOOKS:

1. Noise Control for Engineers, Lord, H.W., Gatley, W.S., and Evensen, H.A.; Krieger, Malabar, 1987.
2. Sound Analysis and Noise Control, Foreman, J.K.; Van Nostrand Reinhold, New York, 1990. *Basic principles, illustrated with many simple and practical examples of different noise control techniques.*
3. Noise and Vibration Control Engineering: Principles and Applications, Beranek, L.L., and Ver, I.L. (editors); J. Wiley & Sons, New York, 1992. *Advanced handbook on noise control.*

REFERENCE BOOKS:

1. Acoustics: An Introduction to its Physical Principles and Applications, Pierce, A.D.; published by the Acoustical Society of America, 1993. *A comprehensive treatment of the foundations of physical acoustics.*
2. Aeroacoustics of Flight Vehicles, Hubbard, H.H. (editor); 2 Vols., published by the Acoustical Society of America, 1995. *Aeroacoustics and noise control of aircrafts.*
3. Active Control of Sound, Nelson, P.A. and Elliott, S.J.; Academic Press, London, 1991. *An introduction to active noise control.*
4. Sound Intensity, Fahy, F.J.; E & FN Spon, London, 1995. *A book on acoustic intensity.*
5. Mechanics of Flow-Induced Sound and Vibration, Blake, W.K.; 2 volumes, Academic Press, London, 1986. *Comprehensive review of the basic principles of hydro-acoustics.*

LINKS TO PROFESSIONAL SOCIETIES

1. Acoustical Society of America (www.asa.aip.org)
2. Institute of Noise Control Engineering (www.users.aol.com/inceusa)

JOURNALS:

1. Noise Control Engineering Journal
2. Journal of the Acoustical Society of America
3. Journal of Sound and Vibration
4. Journal of Fluids and Structures
5. Journal of Vibration and Acoustics,
6. Applied Acoustics,
7. Acustica

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**16ME4204 – Power Plant Engineering
(Professional Elective-IV)**

IV Year B.Tech ME II Semester

L	T	P/D	C
3	-	-/-	3

Pre-requisites: Thermodynamics, TE-I, TE-II

Course Objectives: Develop ability to:

1. Analysis and preliminary design of the major systems of conventional fossil-fuel steam-cycle power plants.
2. A working knowledge of the basic design principles of nuclear, gas turbine, combined cycle, hydro, wind, geothermal, solar, and alternate power plants.
3. Awareness of the economic, environmental, and regulatory issues related to power generation

Course Outcomes: At the end of the course, student would be able to:

CO1: Know the concepts of generation of power by using various types of fuels and conventional & non- conventional resources.

CO2: Design the layout of power plant its circuits , coal ,fuel , ash handling equipment and properties of coals and types of furnaces and stokers

CO3: Describe the diesel power plant, construction, layout with auxiliaries and lubrication system, fuel supply system, cooling system, its equipments.

CO4: Develop the cycle structure and improving the efficiency. Also develop the reactor shielding design.

CO5: Analyze the plant economic and environmental conditions.

UNIT – I:

Introduction to the Sources of Energy – Resources and Development of Power in India.

Steam Power Plant: Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems.

Combustion Process: Properties of coal , overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors, cooling towers and heat rejection. Corrosion and feed water treatment.

UNIT – II: Internal Combustion Engine Plant

Diesel Power Plant: Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging.

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Gas Turbine Plant: Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison.

UNIT – III: Hydro Electric Power Plant

Water power – Hydrological cycle / flow measurement – drainage area characteristics – Hydrographs – storage and Pondage. Classification of dams and spill ways.

Hydro Projects And Plant: Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants.

UNIT – IV: NUCLEAR POWER STATION: Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation.

TYPES OF REACTORS: Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor. Radiation hazards and shielding – radioactive waste disposal.

UNIT-V: POWER PLANT ECONOMICS AND ENVIRONMENTAL

CONSIDERATIONS: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, Load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises. Effluents from power plants and Impact on environment – pollutants and pollution standards – Methods of Pollution control.

TEXT BOOK:

1. Power Plant Engineering, P.C.Sharma,S.K.Kataria Pub.
2. Power Plant Engineering, Arora and S. Domkundwar, DhanpatRai& co.
3. Power Plant Engineering, Manojkumarguptha, PHI Pub.

REFERENCES:

1. Power Plant Engineering, Rajput, Laxmi Publications.
2. Power plant Engineering, Ramalingam,Sci-tech Publishers.
3. Power Plant Engineering, P.K.Nag, II Edition /TMH.
4. An Introduction to Power Plant Technology, G.D. Rai- .
5. Power plant Engineering, Elanchezhian, I.K. International Pub.

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16MB4251-Entrepreneurship

(Open Elective –IV)

IV Year B.Tech ME II Semester

Pre requisites: None

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop ability to

1. Understand the mindset of the entrepreneurs.
2. Analyze the financial aspects of establishing an enterprise.
3. Learn entrepreneurial activities and determine strategies for launching.
4. Identify the challenges of entrepreneurship and develop an idea on the entrepreneurial frame work.
5. Apply strategic perspectives in entrepreneurship.

Course Outcomes (COs): At the end of the course, student would be able to

- CO1 Explore and identify the entrepreneurial traits.
- CO2 Identify various funding agencies and role of IPR.
- CO3 Imagine and identify opportunities to launch new ventures.
- CO4 Address entrepreneurial challenges.
- CO5 Develop strategies for bringing stability and growth in business.

UNIT-I: Introduction to Entrepreneurship

Meaning, importance, entrepreneurship characteristics, women entrepreneurs, classifications of entrepreneurs, myths of entrepreneurship, qualities of entrepreneurship, competencies, attitude function and nature of forms of entrepreneurship.

UNIT-II: Promotion and financial aspects of entrepreneurship

Idea generation- opportunities- SWOT analysis, patents and trademark, intellectual property rights, source of capital, debt capital, seed capital, venture capital- informal agencies in financing entrepreneurs. Government grants and subsidies, types of investors and private offerings.

UNIT-III: Launching entrepreneurial ventures

Opportunities identification- entrepreneurial imagination and creativities – the nature of the creativity process innovation and entrepreneurial- methods to initiate venture creating, new ventures-acquiring and established entrepreneurial venture, franchising hybrid-disadvantage of franchising.

UNIT-IV: Legal challenges of entrepreneurship

Intellectual property protection patents, copy rights-trademarks and trade secret. Avoiding pitfalls-formulation of the entrepreneurial plan-the challenges of new venture startups-poor

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financial understanding-critical factors for new venture development, the evaluation process, feasibility criteria approach.

UNIT-V: Strategic perspectives in entrepreneurship

Strategic planning-strategic actions-strategic positioning-business stabilization-building the adoptive firms-understanding the growth stage unique managerial concern of growing ventures.

TEXT BOOKS

1. "Entrepreneurship- A South - Asian Perspective" D F Kuratko and T V Rao Cengage Learning, 1/e, 2012.
2. "Small Scale industries and entrepreneurship" Vasanth Desai Himalaya Publishing 2012.

REFERENCE BOOKS

1. "Entrepreneurship Development: Text & Cases" B. Janakiram and M. Rizwana Excel Books, 2011.
2. Effectual Entrepreneurship, Stuart Read, Routledge, 2013.
3. Fundamentals of Entrepreneurship, Nandan H, PHI, 2013.

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16CS4252 - Web Development

(Open Elective - IV)

IV Year B.Tech ME II Semester

Prerequisite(s): None

Course Objectives: Develop ability to

1. Understand the basic web concepts and Internet protocols
2. Understand XML and processing of XML data
3. Understand client side scripting with Javascript and DHTML
4. Understand server side programming with PHP
5. Understand file handling and database connectivity with PHP

L	T	P/D	C
3	-	-/-	3

Course Outcomes (COs): At the end of the course, student would be able to:

CO1: Create dynamic and interactive web sites

CO2: Write and execute client side scripts using Javascript and DHTML.

CO3: Write, parse and execute XML schemas.

CO4: Write, implement, deploy and execute server side programs and components using PHP.

CO5: Handle files, store, retrieve and process data using database connectivity with PHP

UNIT – I: HTML:

Common Tags – List, Tables, images, forms, frames; Cascading Style Sheets.

Client side Scripting: Introduction to JavaScript: JavaScript language – declaring variables, Scope of variables, functions, event handlers (on click, on submit etc.), Document Object Model, Form validation.

UNIT – II: XML:

Introduction to XML, Defining XML tags, their attributes and values, Document Type Definitions, XML Schemas, Document Object Model, XHTML

Parsing XML Data – DOM and SAX Parsers in Java.

UNIT - III: Introduction to PHP

Declaring variables, data types, arrays, strings, operators, expressions, control structures, functions, Reading data from web form controls like text boxes, radio buttons, lists etc., Handling File Uploads, Http sessions and cookies.

UNIT – IV: File Handling PHP

File operations like opening, closing, reading, writing, appending, deleting etc. on text and binary files, listing directories.

UNIT - V: Connecting to Database

(MYSQL as reference), executing simple queries, Storing form data into tables, handling results.

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TEXT BOOK(S):

1. Web Technologies, Uttam K Roy, Oxford University Press.
2. The Complete Reference PHP – Steven Holzner, Tata McGraw – Hill.

REFERENCE BOOK(S):

1. Web Programming, building internet applications, Chirs Bates 2nd edition, Wiley Dreamtech.
2. Java Server Pages – Hans Bergsten, SPD O'Reilly.
3. Java Script, D.Flanagan, O'Reilly, SPD
4. Beginning Web Programming – Jon Duckett WROX.
5. Programming World Wide Web, R.W.Sebesta, Fourth Edition, Pearson.
6. Internet and world wide web – How to program, Dietel and Nieto, Pearson.

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**16EE4253 – Renewable Energy Sources
(Open Elective -IV)**

IV Year B.Tech ME II Semester

Prerequisites: None

Course Objectives: Develop ability to

L	T	P/D	C
3	-	-/-	3

1. Understand the basic concepts of solar energy
2. Understand the methods of storage of solar energy
3. Understand basic concepts of wind energy, biomass energy.
4. Understand basic concepts of geothermal energy and ocean energy
5. Understand the need of direct energy conversion.

Course Outcomes: At the end of the course student would be able to

CO1: Get thorough knowledge on various types of renewable energy sources

CO2: Develop storage systems of solar energy for different applications.

CO3: Get thorough knowledge on hybrid energy systems

CO4: Get thorough knowledge on principles of direct energy conversion

CO5: Apply the above conceptual things to real world electrical and electronic problems

UNIT-I

Principles of solar radiation: Role and potential of new and renewable source, the solar energy option, Environmental impact of solar power, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, solar radiation data.

UNIT-II

Solar Energy Collection, Storage & Applications:

Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

Storage & Applications: Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications - solar heating / cooling technique, solar distillation and drying, photovoltaic energy conversion.

UNIT -III

Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Bertz criteria.

Bio-mass: Principles of Bio-conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C Engine operation and economic aspects.

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UNIT- IV

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.

Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants and their economics.

UNIT-V

Direct Energy Conversion: Need for DEC, Carnot cycle, limitations, and principles of DEC.

TEXT BOOKS:

1. Non-Conventional Energy Sources, G.D.Rai, Khanna Publishers.
2. Introduction to renewable energy, Vaughn Neison, CRC Press (Taylor & Francis)

REFERENCE BOOKS:

1. Renewable Energy Resources, Twidell&Wier, CRC Press (Taylor & Francis)
2. Renewable Energy sources and Emerging Technologies, D.P. Kothari, K.C Singal, RakeshRanjan, PHI Learning Private Limited.
3. Fundamentals of Renewable Energy systems, D. Mukherjee, S. Chakrabarty, New age International.
4. Renewable Energy Power for a sustainable Future, Godfrey Boyle, Oxford University Press.

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16EC4254 - Biomedical Instrumentation

(Open Elective- IV)

IV Year B.Tech ME II Semester

Prerequisite(s): None

L	T	P/D	C
3	-	-/-	3

Note: No detailed mathematical treatment is required and only elementary treatment is sufficient.

Course Objectives: Develop ability to

1. Learn the basics of human physiology
2. Understand the basics of bio-medical transducers and recorders.
3. Understand the applications of measuring, recording and monitoring instruments.
4. Understand the concepts of various medical instruments
5. Understand the concepts of various supporting systems.

Course Outcomes: At the end of the course, student would be able to

- CO1:** Explain the functioning of different human physiological systems.
- CO2:** Explain the operations of transducers and recorders used for bio-medical applications.
- CO3:** Explain the principles of medical imaging systems.
- CO4:** Explain the principles of monitoring instruments used for bio-medical application
- CO5:** Explain the need for health supporting systems

UNIT I - Human Physiology

Introduction to generalized medical instrumentation system, components of instrumentation system, physiological system of human body, cardiovascular system. Respiratory system, Nervous system, generation of bioelectric potentials, Action potential, resting potential, Neuronal communication.

UNIT II - Bio- Potential Electrodes, Transducers and Recorders

The electrode – electrolyte interface, Polarization, Ag/Agcl Electrodes, Body surface electrodes, Internal Electrodes. Transducers in general, Pressure Transducers, Temperature transducers, pulse sensors, Basic recording systems.

UNIT III - Medical Imaging Systems

Basics of medical imaging systems, block diagrams and applications of - X-ray machine, Computer Tomography, Magnetic Resonance Imaging systems, Ultrasonic Imaging systems.

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UNIT IV - Monitoring Systems

Basic principles of -Stethoscope, BP measuring Instrument, Electrocardiography(ECG), Electroencephalography(EEG) and Electromyography(EMG) recorders,

UNIT V - Supporting Systems

Basic principles of Pacemaker system, Transcutaneous Electrical Nerve stimulation (TENS), surgical diathermy, Heart lung machine, Hemo Dialysis, Lithotripsy.

TEXT BOOKS

1. Cromwell, "*Bio-Medical Instruments and Measurements*", Prentice Hall of India, 1990.
2. Dr.Arumugam, "*Bio-Medical Instrumentation*", Anuradha Agencies, 1994.

REFERENCES

1. Prof. Venkataram.S.K, "Bio-Medical Electronics & Instrumentation", Galgotia Publications, 2000.
2. John. Can. Brown, "Introduction to Bio Medical Equipment Technology", Pearson Education of ASIA, 2001.
3. Khandpur.R.S, "Hand book of Bio-Medical Instrumentation", Tata McGraw –Hill, 1987

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16CE4256–Disaster Mitigation and Management

(Open Elective –IV)

IV Year B.Tech ME II Semester

Prerequisite(s): None.

Course Objectives: Develop ability to

1. Acquire knowledge on disasters and assess their impact.
2. Comprehend the monitoring techniques of disasters
3. Understand the issues and policies involved in the disaster management.
4. Evaluate the pre-disaster risk and vulnerability reduction strategies.
5. Assess the role of NGO's, Government bodies and Public in the disaster mitigation and Management.

L	T	P/D	C
3	-	-/-	3

Course Outcomes: At the end of the course, student would be able to

CO1: Explain the different types of disasters.

CO2: Evaluate the impact of disasters on the community.

CO3: Suggest a suitable monitoring technique for disasters.

CO4: Recommend appropriate vulnerability reduction strategy and risk reducing techniques.

CO5: Estimate the disaster infrastructure development and role of NGO's, Government bodies and Public in the disaster mitigation and management.

UNIT–I: Introduction

Meaning and Concept of Environmental hazards, Environmental Disasters and Environmental stress. Different approaches and relation with human Ecology - Landscape Approach – Ecosystem Approach – Perception approach – Human ecology and its application in geographical researches.

UNIT–II: Types of Environmental hazards & Disasters

Natural and Man induced. Natural Hazards – Planetary Hazards/ Disasters – Extra Planetary Hazards/ disasters – Planetary Hazards – Endogenous Hazards – Exogenous Hazards.

UNIT–III: Endogeneous Hazards/ Disasters

Volcanos –Earthquakes - Landslides – Earthquake Hazards/ disasters – Causes of Earthquakes – Distribution of Earthquakes – Hazardous effects of earthquakes – Earthquake Hazards in India – Human adjustment, perception & mitigation of earthquake.

UNIT–IV

Exogenous Hazards/ Disasters: Infrequent events – Cumulative atmospheric hazards/ disasters.

Infrequent events: Cyclones – Lightning – Hailstorms.

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Cyclones: Tropical cyclones & Local storms – Destruction by tropical cyclones & local storms (causes, distribution, human adjustment, perception & mitigation)

Cumulative Atmospheric Hazards/ Disasters: Floods – Droughts – Cold waves – Heat waves.

Floods: Causes of floods – Flood hazards – Flood control measures (Human adjustment, perception & mitigation).

Droughts: Impacts of droughts – Drought hazards in India – Drought control measures.

Extra Planetary Hazards/ Disasters – Man induced Hazards/ Disasters – Physical hazards/ Disasters – Soil Erosion.

Soil Erosion: Mechanics & forms of Soil Erosion – Factors & causes of soil erosion – Conservation measures of Soil Erosion.

Chemical Hazards/ Disasters: Release of toxic chemicals, nuclear explosion – Sedimentation processes:- Global Sedimentation problems – Regional Sedimentation problems – Sedimentation & Environmental problems – Corrective measures of Erosion & Sedimentation.

Biological hazards/ disasters: Population Explosion.

UNIT–V: Emerging approaches in Disaster Management- Three Stages

- 1) Pre-disaster stage (preparedness)
- 2) Emergency Stage
- 3) Post Disaster stage – Rehabilitation

TEXT BOOKS:

1. Manual on National Disaster Management Plan, National Disaster Management Authority, Ministry of Home affairs, Government of India (<http://ndma.gov.in/images/policyplan/dmplan/National%20Disaster%20Management%20Plan%20May%202016.pdf>)
2. Disaster Management, Dr. Mrinalini Pandey, Wiley India Pvt Ltd., 2014.
3. Disaster Science and Management, Tushar Bhattacharya, McGraw Hill Education, 2015.

REFERENCE BOOKS:

1. Disaster Mitigation: Experiences and Reflections, PardeepSahni, PHI Learning, 2010.
2. Natural Hazards and Disasters, Donald Hyndman and David Hyndman, Cengage Learning, 2013.
3. Disaster Management Global Challenges and Local Solutions, Rajib, S and Krishna Murthy, R.R, Universities Press Hyderabad, 2012.
4. Earth and Atmospheric Disaster Management: Nature and Manmade,NavalePandharinath& C.K. Rajan, B.S. Publications, Hyderabad, 2009.
5. Disaster Risk Reduction in South Asia, Sahni and Pardeep, PHI learning Pvt Ltd, 2003.

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16MA4257-Actuarial Statistics

(Open Elective –IV)

IV Year B.Tech ME II Semester

Prerequisite(s): None

L	T	P/D	C
3	-	-/-	3

Course Objectives: Develop ability to

1. Determine present and future values of investment projects, annuities and be able to compute outstanding principal (capital) as well as interest using loan schedules.
2. Provide a motivation, based on a normative theory of individual behavior in the face of uncertainty, for the study of insurance models.
3. Measure the number of deaths (in general, or due to a specific cause) in a particular population, scaled to the size of that population, per unit of time.
4. Understand benefits of life insurance, various insurance policies, payments and premiums.
5. Predict future trends and patterns in the data behavior of processes or metrics over a period of time using time series models. Fit a model and proceed to forecasting and monitoring.

Course Outcomes: At the end of the course, the student would be able to

- CO1:** Assess financial loss and profit of an organization or in any business, shares.
- CO2:** Apply an economic theory that explains the mathematical expectation of the insured loss and profit.
- CO3:** Organize to assess various risks involved in terms of mortality, claims which can be received, profitability analysis for organization and individuals.
- CO4:** Analyze Life Insurance policies, Pension plans and Health Care Plans.
- CO5:** Apply time series models in Economic, Sales, Weather forecasting, Budgetary and stock market analysis, Inventory and Utility studies etc.

UNIT-I: Financial mathematics

Rate of Interest; Normal and effective rates of interest and discount; Accumulated Value; Present value of cash flows; Valuing Cash Flows; Present Value Principals of compound interest; force of interest and discount compound interest; Annuities certain; Deferred annuities, Concepts of different annuities, annuities due, Redemption of Loans, Sinking Funds and Capital redemption assurance.

UNIT-II: Utility Theory

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Insurance and Utility Theory; Models for Individual Claims and their sums; Approximations for the distribution of Sums; Application to Insurance; Survival function Time until-death for a person age x ; Curate future life time.

UNIT-III: Mortality

Functions and laws of mortality tables; Select ultimate and aggregate mortality tables; Functions other than yearly policy Values; Surrender values and paid up Values; Bonus Special policies; Joint life and last survivor statuses; The Mortality tables.

UNIT-IV: Life Insurance and Premiums

Insurance payable at the moment's of death and at the end of the year of death-level benefit insurance; endowment insurance; differed insurance and varying benefit insurances; recursions; commutation functions; Single payment. Net Premiums and Net Premium Reserves of insurance policies; Insurance policies with expenses and bonuses introduced; Gross premiums and Gross premium reserves of insurance policies.

UNIT-V: Time Series Analysis and Forecasting

Basic concepts of Time Series Analysis; Components of Time Series: Moving Averages, Exponential Smoothing, Autoregressive and Partial Autoregressive Functions; Forecasting Models: Moving/Autoregressive Moving Averages (MA,AR,ARMA and ARIMA); Prediction limits, Forecast Updating and Holt-Winter's Methods; Box-Jenkins Method of modeling.

TEXT BOOKS

1. Actuarial Mathematics society of Actuaries, Itasca, Illinois, USA Second Edition (1997), Newton.L.Bower, JR. Hanes.U. Gerber, James .C.Hickman, Donald. A.Jones and Cecil .J.Nesbitt (1986).
2. Actuarial Statistics: An Introduction Using R (2009) by Shailaja R. Deshmukh, Universities Press; Third edition

REFERENCE BOOKS

1. Introduction to Time Series Analysis and Forecasting, Cheryl L. Jennings, Douglas C. Montgomery, and Murat Kulahci
2. An Introduction to Actuarial Mathematics, Springer-Science+Bussiness Media Dordrecht (2002),A.K.Gupta and T.Varga.
3. Fundamentals of Actuarial Mathematics, Second Edition, S. David Promislow
4. Life Contingencies, Spurgeon E.T. (1972), Cambridge University Press
5. Time series analysis, forecasting and control Book by George E. P. Box