PRASAD V. POTLURI
SIDDHARTHA INSTITUTE OF TECHNOLOGY
(AUTONOMOUS)
Kanuru,Vijayawada-520007
AICTE approved, NBA & NAAC accredited, An ISO 9001-2008 certified Institution
Permanent Affiliation to JNTUK, Kakinada.
Ph: 0866-2581699, e-mail: principal@pvpsiddhartha.ac.in, web: www.pvpsiddhartha.ac.in

MECHANICAL ENGINEERING

SYLLABUS BOOK

(PVP 14)

B.TECH DEGREE PROGRAMME

Sponsored by
Siddhartha Academy of General & Technical Education
VIJAYAWADA

VISION OF THE INSTITUTION

To provide rich ambience for academic and professional excellence, research, employability skills, entrepreneurship and social responsibility.

MISSION OF THE INSTITUTION

To empower the students with technical knowledge, awareness of up-to-date technical trends, inclination for research in the areas of human needs, capacity building for employment / entrepreneurship, application of technology for societal needs.

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DEPARTMENT VISION

To enhance the capabilities of students and mould them into innovative, employable, entrepreneurial, socially responsible graduates successful in advanced fields of research

DEPARTMENT MISSION

To impart quality education, ethical values, social responsibility, employability, research and entrepreneurial skills

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

The graduates of Mechanical Engineering programme will

PEO-I Progress in wide range of mechanical engineering fields with solid foundation in physical and engineering sciences.

PEO-II Contribute as members of multi-disciplinary engineering teams, solve mechanical engineering and allied field problems resulting in significant societal development.

PEO-III Achieve goals by pursuing higher studies / research, become entrepreneurs.

PEO-IV Become responsible citizens by undertaking active role in their community

PROGRAMME OUTCOMES (POs)

At the end of the program, the graduate will have:

PO - a: An ability to apply fundamental concepts of mathematics, science and engineering.

PO - b: An ability to design, conduct experiments, as well as analyze and interpret data.

PO - c: An ability to design Mechanical system, components and processes to meet specified needs within realistic constraints such as economic, environmental, safety, manufacturability aspects.

PO - d: An ability to work as an individual (or) as a leader in diverse teams and in multi-disciplinary environment.

PO - e: An ability to identify, formulate and solve Mechanical engineering problems.

PO - f: Apply ethical principles and commit to professional and social responsibilities.

PO - g: An ability to communicate effectively in written, oral and graphical forms.

PO - h: The broad education necessary to understand the impact of engineering solutions in environmental and societal context with sustainability.

PO - i: An ability to engage in life-long learning through recognition of the need.

PO - j: An ability to use techniques, skills, and modern engineering tools to mechanical engineering problems with an understanding of the limitations.

PO - k: An ability to apply the principles of management in their respective areas of work.

Course Structure

(Effective from Academic Year 2014-15)

B.TECH I YEAR - I SEMESTER

Code	Subject	Contact Hours		Marks			Credits
		Theory	Lab	Int	Ext	Total	
ME1T1	Engineering Mathematics -1	3+1*	---	30	**70**	100	3
ME1T2	English for Communication	3	---	30	**70**	100	3
ME1T3	Engineering Physics	3+1*	---	30	**70**	100	3
ME1T4	Environmental Studies	3	---	30	**70**	100	3
ME1T5	Engineering Drawing	2	4	30	**70**	100	3
ME1T6	Engineering Mechanics-I	3+1*	---	30	**70**	100	3
ME1L1	Engineering Physics Lab	---	3	25	**50**	75	2
ME1L2	IT Workshop	---	3	25	**50**	75	2
ME1L3	Engineering Workshop	---	3	25	**50**	75	2
	TOTAL	20	13	255	**570**	825	24

*Tutorial / interactive session

I YEAR II SEMESTER

Code	Subject	Periods/Week		Marks			Credits
		Theory	Lab	Int	Ext	Total	
ME2T1	Engineering Mathematics –II	3+1*	---	30	**70**	100	3
ME2T2	Professional Ethics	3	---	30	**70**	100	3
ME2T3	Engineering Chemistry	3+1*	---	30	**70**	100	3
ME2T4	Engineering Mechanics II	3+1*	---	30	**70**	100	3
ME2T5	Basic Electrical and Electronics Engineering	3+1*	---	30	**70**	100	3
ME2T6	C- Programming	3+1*	---	30	**70**	100	3
ME2L1	Engineering Chemistry Lab	---	3	25	**50**	75	2
ME2L2	English Language Communication Skills Lab	---	3	25	**50**	75	2
ME2L3	C – Programming Lab	---	3	25	**50**	75	2
	TOTAL	23	9	255	**570**	825	24

*Tutorial / interactive session

II YEAR I SEMESTER

Code	Subject	Periods/Week		Marks			Credits
		Theory	Lab	Int	Ext	Total	
ME3T1	Numerical and Statistical Methods	3+1*	---	30	**70**	100	3
ME3T2	Basic Thermodynamic	3+1*	---	30	**70**	100	3
ME3T3	Fluid Mechanics and Hydraulic Machines	3+1*	---	30	**70**	100	3
ME3T4	Metallurgy and Material Science	3+1*	---	30	**70**	100	3
ME3T5	Mechanics of Solids-I	3+1*	---	30	**70**	100	3
ME3T6	Engineering Economics	3+1*	---	30	**70**	100	3
ME3L1	FM and HM Lab	---	3	25	**50**	75	2
ME3L2	Mechanics of Solids and Metallurgy Lab	---	3	25	**50**	75	2
ME3L3	Personality Development Course	---	1	--	**--**	--	--
	TOTAL	24	7	230	**520**	750	22

*Tutorial / interactive session

II YEAR II SEMESTER

Code	Subject	Periods/Week		Marks			Credits
		Theory	Lab	Int	Ext	Total	
ME4T1	Mechanics of Solids-II	3+1*	---	30	**70**	100	3
ME4T2	Applied Thermodynamics	3+1*	---	30	**70**	100	3
ME4T3	IC Engines and Gas Turbines	3+1*	---	30	**70**	100	3
ME4T4	Kinematics of Machinery	3+1*	---	30	**70**	100	3
ME4T5	Production Technology	3+1*	---	30	**70**	100	3
ME4L1	Computer Aided Machine Drawing Practice	--	6	30	**70**	100	3
ME4L2	Production Technology Lab	---	3	25	**50**	75	2
ME4L3	Electrical and Electronics Engg Lab	---	3	25	**50**	75	2
	TOTAL	20	12	230	**520**	750	22

*Tutorial / interactive session

III YEAR I SEMESTER

Code	Subject	Periods/Week		Marks			Credits
		Theory	Lab	Int	Ext	Total	
ME5T1	Dynamics of Machinery	3+1*	---	30	**70**	100	3
ME5T2	Metal Cutting and Machine Tools	3+1*	---	30	**70**	100	3
ME5T3	Heat Transfer	3+1*	---	30	**70**	100	3
ME5T4	Engineering Metrology	3+1*	---	30	**70**	100	3
ME5T5	Design of Machine Members - I	3+1*	---	30	**70**	100	3
ME5T6	CAD/ CAM	3+1*	---	30	**70**	100	3
ME5L1	Fuels and IC Engines Lab	--	3	25	**50**	75	2
ME5L2	Machine Tools Lab	---	3	25	**50**	75	2
ME5L3	CAD/CAM Lab	---	3	25	**50**	75	2
	TOTAL	24	9	255	**570**	825	24

*Tutorial / interactive session

III YEAR II SEMESTER

Code	Subject	Periods/Week		Marks			Credits
		Theory	Lab	Int	Ext	Total	
ME6T1	Mechanical Measurements	3+1*	---	30	**70**	100	3
ME6T2	Design of Machine Members - II	3+1*	---	30	**70**	100	3
ME6T3	Operations Research	3+1*	---	30	**70**	100	3
ME6T4	Refrigeration and Air Conditioning	3+1*	---	30	**70**	100	3
ME6T5	Industrial Engg. and Management	3+1*	---	30	**70**	100	3
ME6T6FE	Free Elective	3+1*	---	30	**70**	100	3
ME6L1	Metrology and Instrumentation Lab	--	3	25	**50**	75	2
ME6L2	Heat Transfer Lab	---	3	25	**50**	75	2
ME6L3	Soft Skills Course	---	1	--	**--**	--	--
	TOTAL	24	7	230	**520**	750	22

*Tutorial / interactive session

Free Elective offered by the department:

- Mechatronics
- Robotics
- Finite Element Methods
- Industrial Engineering and Management

IV YEAR I SEMESTER

Code	Subject	Periods/Week		Marks			Credits
		Theory	Lab	Int	Ext	Total	
ME7T1	Mechatronics	3+1*	---	30	**70**	100	3
ME7T2	Production Planning and Control	3+1*	---	30	**70**	100	3
ME7T3	Finite Element Methods	3+1*	---	30	**70**	100	3
ME7T4	Elective – I	3+1*	---	30	**70**	100	3
ME7T5	Elective – II	3+1*	---	30	**70**	100	3
ME7L1	Simulation Lab	--	3	25	**50**	75	2
ME7L2	Machine Dynamics Lab	---	3	25	**50**	75	2
ME7L3	Mini Project	---	3	75	**--**	75	2
ME7L4	Seminar	---	2	50	**--**	50	1
	TOTAL	20	11	325	**450**	775	22

***** Tutorial / interactive session

Elective – I

ME7T4A - Additive Manufacturing
ME7T4B- Robotics
ME7T4C- Mechanical Vibrations
ME7T4D- Alternative Sources of Energy

Elective – II

ME7T5A- Advanced Machine Design
ME7T5B- Advanced Machining Processes
ME7T5C- Mechanics of Composite Materials
ME7T5D- Computational Fluid Dynamics

IV YEAR II SEMESTER

Code	Subject	Periods/Week		Marks			Credits
		Theory	Lab	Int	Ext	Total	
ME8T1	Power Plant Engineering	3+1*	---	30	**70**	100	3
ME8T2	Elective – III	3+1*	---	30	**70**	100	3
ME8T3	Elective – IV	3+1*	---	30	**70**	100	3
ME8L1	Mechatronics Lab	--	3	25	**50**	75	2
ME8L2	Project Work	---	9	50	**150**	200	9
	TOTAL	12	12	165	**410**	575	20

***** Tutorial / interactive session

Elective – III

ME8T2A- Non Destructive Evaluation
ME8T2B- Automation in Manufacturing
ME8T2C- Quality and Reliability Engineering
ME8T2D- FMS and GT

Elective – IV

ME8T3A- Gas Dynamics and Jet Propulsion
ME8T3B- Automobile Engineering
ME8T3C- Nanotechnology
ME8T3D- Experimental Stress Analysis

I B.TECH - ISEMESTER

ENGINEERING MATHEMATICS-I

Course Code: ME1T1 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- The main purpose of this course is to provide students with skills in solving differential equitation's, evaluating improper integral using beta and gamma functions.
- To prepare students for lifelong learning and successful careers using mathematical concepts of differential integral and vector calculus.

COURSE OUTCOMES:

1. Acquire the knowledge of solving ordinary differential equations
2. Get the knowledge of solving improper integrals using beta, gamma functions.
3. Use the method of least squares to find the curve of best fit for the given data.
4. Ability to apply double integrals to find area of the given region, triple integrals to find volume of the three dimensional objects.
5. Knowledge of finding gradient of scalar point functions, curl, divergence of vector point functions.

UNIT I
ORDINARY DIFFERENTIAL EQUATIONS.
Exact equations, orthogonal trajectories, applications to Newtons Law of cooling, Law of Natural growth and decay. Non-Homogeneous linear Differential equations of second and higher order with constant coefficients with RHS term of the type $e\ ax$, sinax, cosax, polynomials in X, $e\ ax$ V(x), x V(X).

UNIT II
DIFFERENTIAL CALCULUS.
Rolle's theorem, Lagrange's mean value theorem and Taylor's theorem(without proofs),Taylor's and Macluarin's series for functions of one variable. Maxima and Minima of functions of two variables, Lagrange's method of multipliers.

UNIT III
MULTIPLE INTEGRALS.
Multiple integrals -double and triple integrals-change of variables-Change of order of Integration.

UNIT IV
VECTOR DIFFERENTIATION & INTEGRATION.
Gradient-Divergence-Curl and their related properties of sums-products-Laplacian and second order operators (proofs of identities not included) Vector Integration-Line integral–work done–Potential function–area-surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence Theorems (Without proof) and related problems

UNIT V

CURVE FITTING & BETA GAMMA FUNCTIONS

Fitting a straight line-Second degree curve- Exponential curve- power curve by method of least squares. Gamma and Beta functions- properties- Evaluation of improper integrals (applications not included).

Learning Resources

Text Book:

1. Higher Engineering mathematics by B.S. Grewal , Khanna publishers

Reference Books:

1. Higher Engineering Mathematics, H.K.Das, S.Chand Publications.
2. Engineering Mathematics, B. V. Ramana , Tata Mc GrawHill

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

I B.TECH- I SEMESTER
ENGLISH FOR COMMUNICATION

Course Code: ME1T2 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: --- **Semester end examination: 70 marks**

COURSE OBJECTIVES:-

- To expose the students to various socio-cultural contexts
- To impart human values.
- To strengthen the writing skills.
- To enhance their communicative competence.
- To improve their vocabulary
- To make them well versed in grammar.
- To enhance their comprehensive ability.

COURSE OUTCOMES:

1. Improved comprehensive ability Writing skills
2. Acquiring human values.
3. Knowledge of grammar.
4. Cultural adaptability.

UNIT I

1. Unity of minds-Abdul kalam.
2. Communication
   Process of communication Types of communication-----Verbal and nonverbal communication, Listening skills.
3. Synonyms, antonyms from the prescribed syllabus.

UNIT II

1.'NextSunday'--------R.K.Narayan
2. Tenses
3. Active/passive voice

UNIT III

1.'The cop and the anthem'------O.Henry
2. Direct/Indirect speech
3. Letter writing.

UNIT IV

1.'Three Questions'----Leo Tolstoy
2. Degrees of comparison
3. Reading comprehension

UNIT V

1. Kaplan Chawla-----Biographical sketch
2. Correction of sentences.

Learning Resources

Reference Books:

1. Communication skills ------Sanjay kumar & pushpa latha oxford.
2. Communication skills------Leenasen.(PHI)
3. English for engineering students-----G.V.L.N.Sharma.
4. An approach to communication skills----Bhanu ranjan, Dhanpat rai & co.
5. The craft of Business letter writing-----Mathew, Tata Mac GrawHill.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

I B.TECH - I SEMESTER
ENGINEERING PHYSICS

Course Code: ME1T3 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

To make student understand

- The concepts of Quantum Physics.
- The theoretical picture about a crystal structure.
- How to determine the different crystal structures by using X-diffraction techniques.
- The properties of different types of solids and to have the knowledge about the energy-band diagram in the materials.
- The advanced topics such as lasers, fibre optics and nano-materials.

COURSE OUTCOMES:

After completion of the course student will be

1. Acquiring the knowledge of Quantum physics, the student will have the basics about the atomic scale of the systems.
2. Learning crystal structure and the X-ray Diffraction Techniques the student could differentiate the different types of crystals.
3. Getting the knowledge about the different types of solids the student will know to use the appropriate solids as per requirement.
4. Having the knowledge about advanced topics the student will be ready to the upcoming developments in the Engineering Physics.

UNIT I
QUANTUM PHYSICS

Planck's black body theory of radiation - DE Broglie hypothesis – Properties of matter waves – G.P. Thomson experiment– Davison and Germer experiment – Heisenberg uncertainty principle –Time independent & Time dependent Schrödinger wave equation – physical significance of wave function – Particle in one dimensional potential box.

UNIT II
CRYSTAL STRUCTURE & X-RAY DIFFRACTION

Introduction – Space lattice – Basis - unit cell - Lattice parameters – Bravais lattices – Crystal systems – Structure and packing fraction of simple, BCC, FCC crystals. Directions and planes in crystals – miller indices –Distance between successive parallel planes- Diffraction of X rays – Bragg's law –Laue method- Powder method.

UNIT III
PHYSICS OF SOLIDS-I
Classical free electron theory-Quantum free electron theory- Fermi Dirac distribution function- Bloch theorem- Kronig penny model(qualitative treatment)- Classification of materials.
Dielectric constant – electronic, ionic and orientation polarizations–internal fields in solids – Claudius Mossotti relation –causes of dielectric breakdown.

UNIT IV
PHYSICS OF SOLIDS-II
Introduction – intrinsic semiconductor and carrier concentration- Fermi level in intrinsic semiconductor conductivity in intrinsic semiconductor– extrinsic semiconductor –carrier concentration- Fermi level in extrinsic semiconductor – Drift and diffusion current – Einstein's relations – Direct and Indirect band gap semiconductors. Origin of magnetic moment – classification of magnetic materials – Hysteresis curve– soft and hard magnetic materials- applications.

UNIT V
ADVANCED PHYSICS
Lasers Characteristics of lasers – spontaneous and stimulated emission of radiation– population inversion – pumping – Ruby, Helium-Neon & Semiconductor lasers- Applications of lasers.
Fiber optics Principle of optical fiber – Acceptance angle and numerical aperture – Attenuation in optical fibers– applications of optical fibers.
Introduction – Surface to volume ratio- Quantum confinement effect- properties and preparation of nano material – nano tubes – SWNT- MWNT- Applications of nano materials.

Learning Resources

Text Books:

1. Solid state Physics by S.O.Pillai. (New Age International Publications)
2. Engineering physics by M.R.Srinivasan (New Age International Publications).

Reference Books:

1. Engineering physics by D.K.Bhattacharya and A.Bhaskaran.(Oxford Publications).
2. Engineering physics by R.K Gaur and S.L. Gupta, Dhanpat Rai Publications

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

I B.TECH - I SEMESTER
ENVIRONMENTAL STUDIES

Course Code: ME1T4 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Practice: - **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- To develop an awareness, knowledge, and appreciation for the natural environment.
- To understand different types of ecosystems exist in nature.
- To know our biodiversity.
- To understand different types of pollutants present in Environment.
- To know the global environmental problems.

COURSE OUTCOMES:

The student will be able to

1. Develop an appreciation for the local and natural history of the area.
2. Hope for the better future of environment in India which is based on many positive factors like Biodiversity, successive use of renewable energy resources and other resources, increasing number of peoples movements focusing on environment.
3. Know how to manage the harmful pollutants.
4. Gain the knowledge of Environment.
5. Create awareness among the youth on environmental concerns important in the long term interest of the society

UNIT I
NATURAL RESOURCES:

A) Forest resources – Use and over – exploitation, deforestation, case studies – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources - Use and over utilization of surface and ground water–Floods, drought, conflicts over water, dams - benefits and problems.

Land resources: Land as a resource, land degradation, man induced and slides, soil erosion and desertification.

B) Energy resources: Renewable and non-renewable resources-Natural resources and associated problems Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Case studies.

Mineral resources: Use and exploitation problems, environmental effects of extracting and using mineral resources, case studies.

Food resources: World food problems, changes caused by agriculture and overgrazing,\effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. Organic Farming, Bio fertilizers and Bio-pesticides

UNIT II

A) Ecosystems:

Definition, Scope and importance, Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem -Ecological succession. - Food chains, food webs and ecological pyramids, Flow of energy, Bio-geochemical cycles, Bio-magnification, Ecosystem values, Services and carrying capacity.

B) Biodiversity and its conservation:

Introduction - Definition: genetic, species and ecosystem diversity. Bio- geographical classification of India, India as a mega-diversity nation, Hot-sports of biodiversity, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic, option values and ecosystem service values. Threats to biodiversity: habitat loss, poaching of wildlife, man wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT III

A) Environmental Pollution: Definition, Cause, effects and control measures of: Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards

B) Solid waste Management: - Classification and characters of solid waste, factors affecting waste generation, collection and disposal of solid waste. E- waste and management. Role of an individual in prevention of pollution. – Pollution case studies.

UNIT IV

A) Global Environmental problems and Global efforts:

Greenhouse effect, Greenhouse gasses, Global warming, Climate change and their impacts on human environment, ozone layer depletion. International conventions / protocols: Earth summit ,Kyoto protocol &Montreal protocol.

B) Towards Sustainable Future: From Unsustainable to Sustainable development, Population and its explosion, Urban problems related to energy, Consumerism and waste products, Role of IT in Environment and human health. Value Education. HIV/AIDS, Environmental ethics, Concept of green buildings and Clean Development Mechanism.

UNIT V

A) Environmental Impact Assessment & Management plans, Environmental Law:

Definition of impact, Classification of impacts, Impacts of different components such as: human health, resources, air, water, flora &fauna. Environment management plans (EMP): Technological solutions for pollution control, Green-belt- development, Rain water harvesting, Remote sensing and GIS methods. Environmental law (Air, Water, Wild life, Forest Acts): Objectives of Acts, Institutional arrangements for Implementation and Regulation.

B) Fieldwork:

Visit to a local area to document environmental assets River / forest grass l and / hill / mountain -Visit to a local polluted site Urban / Rural / industrial / Agricultural Study of common plants, insects, birds. -Study of simple ecosystems pond, river, hill slopes, etc.

Learning Resources

Text Books:

1. Erach Bharucha, 2010 "Text Book of Environmental Studies", University Grants Commission, Universities Press (India) Pvt. Ltd., Hyderabad
2. Text Book of Environmental Sciences and Technology by M. Anji Reddy, BS Publications.

Reference Books:

1. Text Book of Environmental Studies by Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. Text Book of Environmental Science and Engineering by G.Tyler Miller Jr,2006 Cengage learning
3. Text Book of Environmental Studies from Crisis to Cure by R .Raja Gopalan.
4. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada

e- Learning resources:

- http://nptel.ac.in/courses.php
- http://jntuk-coeerd.in/

I B.TECH- I SEMESTER
ENGINEERING DRAWING

Course Code: ME1T5 **Credits: 3**
Lecture: 2 periods/week **Internal assessment: 30 marks**
Lab Practice: 4 periods/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

1. Explain about conics, curves and orthographic projection of geometrical-entities
2. Transform orthographic to isometric projections and isometric to orthographic Projections.

COURSE OUTCOMES:

At the end of course the student will be able to draw:

1. Regular polygons and construct scales
2. Various conics sections and a cycloidal.
3. Orthographic projections of geometrical entities
4. Orthographic views of sectioned solids
5. Isometric views and orthographic views.

Pre Requisites: Mathematics

UNIT I
INTRODUCTION TO ENGINEERING DRAWING:
Use of Drawing instruments, Dimensioning, Representation of various types of lines, Geometrical constructions. POLYGONS - construction of regular polygons using given length of a side.
SCALES: Construction and use of plain and diagonal scales.
CURVES USED IN ENGINEERING PRACTICE:
CONIC SECTIONS - General construction method for ellipse, parabola and hyperbola. Special methods for conic sections. Cycloidal curves- Cycloid, Epicycloid and Hypocycloid.

UNIT II
PROJECTION OF POINTS AND PROJECTION OF STRAIGHT LINES:
PRINCIPLES OF ORTHOGRAPHIC PROJECTIONS- Projections of points; Projections of straight lines parallel to both the reference planes, parallel to one and inclined to other reference plane and inclined to both the reference planes; Determination of true lengths, angle of inclinations and traces.
PROJECTIONS OF PLANES:
PROJECTIONS OF REGULAR PLANES -parallel to one reference plane and perpendicular to the other reference plane, perpendicular to one reference plane and inclined to other reference plane, perpendicular to both the reference planes, inclined to both the reference planes.

UNIT III

PROJECTIONS OF SOLIDS:

PROJECTIONS OF SIMPLE SOLIDS- Cubes, Prisms, Pyramids, Cylinders and Cones with axis perpendicular to one reference plane and parallel to other reference plane, with axis inclined to one reference plane, with axis inclined to both the reference planes.

UNIT IV

SECTION OF SOLIDS:

SECTIONS OF SOLIDS- Cubes, Prisms, Pyramids, Cylinders and Cones- True shapes of sections. (Limited to the Section Planes perpendicular to one of the Principal Planes).

UNIT V

TRANSFORMATION OF PROJECTIONS:

PRINCIPLES OF ISOMETRIC PROJECTION – Isometric Scale – Isometric Views– Isometric Views of Lines, Plane Figures, Conversion of Isometric Views to Orthographic Views – Conversion of Orthographic Views to Isometric Views. (Treatment limited to simple objects)

Learning Resources

Text Books:

1. Engineering Drawing, by N.D. Bhat V.M. Panchal, (48thEdition), Charotar publishers, 2005.
2. Engineering graphics with Auto CAD, by R.B. Choudary, Anuradha Publishers, 2002.
3. Engineering Drawing, by Narayana and Kannaiah Scietech publishers, 2009.

Reference Books:

1. Engineering Drawing and Graphics, by Venugopal, New age publications, 2007.
2. Engineering Drawing, by Johle, Tata MacgrawHill.2004.
3. Computer Aided Engineering Drawing, (3rdedition), by Trymbaka Murthy, I.K. International publications.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

I B.TECH - I SEMESTER
ENGINEERING MECHANICS-I

Course Code: ME1T6 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

1. To develop an understanding of the principles of statics and the ability to analyze problems using static equilibrium equations.
2. To introduce the basic principles of mechanics applicable to rigid bodies in equilibrium.
3. To develop the fundamentals of engineering mechanics and problem solving skills essential for mechanical engineering.

COURSE OUTCOMES:

At the end of course the student will be able to:

1. Construct free body diagrams and develop appropriate equilibrium equations.
2. Simplify the system of forces and moments to equivalent systems.
3. Determine centroids and determine moment of inertia for composite areas.
4. Determine the axial forces in the members of determinate truss.
5. Analyze systems with friction.
6. Develop the equilibrium conditions in terms of virtual work.

Pre-Requisites: Mathematics, Engineering Physics

UNIT I
ANALYSIS OF FORCES IN APLANE:
Principles of statics, Force, Addition of two forces: Parallelogram Law - Composition and resolution of forces - Constraint, Action and Reaction. Types of supports and support reactions. Free body diagram. Equilibrium of concurrent forces in a plane - Method of projections - Moment of a force, Theorem of Varignon, Method of moments. Types of parallel forces, Resultant. Couple, Resolution of force into force and a couple. General case of parallel forces in a plane.

UNIT II
CENTROIDS AND AREA MOMENTS OF INERTIA:
Introduction, Determination of centroids of simple figures by integration method, Centroids of composite plane figures, Pappustheorem. Area Moments of Inertia, Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures.

UNIT III

ANALYSIS OF TRUSSES BY METHOD OF JOINTS:

Types of Trusses - Assumptions for forces in members of a perfect truss, Force table, Cantilever Trusses, Structures with one end hinged and the other freely supported on rollers carrying horizontal or inclined loads.

UNIT IV

FRICTION:

Introduction, Classification of friction, Laws of dry friction. Co-efficient of friction, Angle of friction, Angle of repose, Cone of friction, Frictional forces on wheel, Wedge friction.

UNIT V

PRINCIPLE OF VIRTUAL WORK:

Principle of virtual work, advantages of principle of virtual work, principle of virtual applied to stability of equilibrium. Application of principle of virtual work limited to beams, ladder problems and trusses only.

Learning Resources

Text Books:

1. Engineering Mechanics, (2nd Edition) by S. Timoshenko & D. H. Young, McGraw Hill publications.
2. Engineering Mechanics Statics and dynamics, by A. K. Tayal, Umesh Publication, Delhi, 2009.

Reference Books:

1. Vector Mechanics for Engineers Statics and Dynamics, (9th edition) by Beer and Johnston, Tata McGraw Hill Publishing Company, New Delhi.
2. Engineering Mechanics, by S.S. Bhavikatti & J.G. Rajasekharappa, New Age International Publishers, New Delhi, 2008.
3. Engineering Mechanics, (3rd edition) by Statics and Dynamics K. Vijaya Kumar Reddy and J Suresh Kumar, BS Publications.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

I B.TECH - I SEMESTER
ENGNEERING PHYSICS LAB

Course Code: ME1L1 **Credits: 2**
Lecture: - --- **Internal assessment: 25 marks**
Lab practice: 3 period/week **Semester end examination: 50 marks**

COURSE OBJECTIVES:

To make student

- Learn how to determine the elastic constant.
- Knowledgeable about the resonance so as to determine the velocity of sound.
- Acquire the concept of diffraction hence determine the wavelength of monochromatic source.
- Gain the knowledge of interference and determine the radius of curvature of a lens.
- Acquainted with geometrical optics and by determining the refractive index of the prism.
- Understand the concept of electromagnetism and determining the magnetic induction.
- Learn the knowledge of electrical circuit by calculating the time constant.
- Study the characteristic curves of zener diode.
- Understand the semiconductors by determining the energy gap of a semiconductor. .
- Study the characteristic curves of thermistor and to determine the thermoelectric coefficient.
- Get the knowledge of advanced topics such as optical fibers by determining numerical aperture and attenuation.

COURSE OUTCOMES:

After completion of this course, student will be able to

1. Determine the elastic constant.
2. Calculate the velocity of sound.
3. Gain the knowledge of diffraction and determines the wavelength of monochromatic source.
4. Understand the rings formation and calculates the radius of curvature of a lens.
5. Understand the geometrical optics and determines the refractive index of prism.
6. Experiences the effect electromagnetism and determines the magnetic induction.
7. Observe the time dependent electric circuit and verifies time constant of a electric circuit.
8. Distinguish the zener breakdown with the p-n diode.
9. Understand about the semiconductors and calculates energy gap of a semiconductor.
10. Study the characteristics of thermistor and determines the thermoelectric coefficient.
11. Gain the knowledge of optical communication through optical fibers.

LIST OF EXPERIMENTS

ANY TEN OF THE FOLLOWING

MECHANICS:

1) Determine the rigidity modulus of the material of the wire using torsional pendulum

SOUND:

2) Determine the velocity of sound by volume resonator method.

OPTICS:

3) Determine the wavelength of a source by normal incidence method using diffraction grating

4) Determine the radius of curvature of a planoconvex lens by forming Newton's rings

5) Determine the refractive index of the material of the prism (minimum deviation method) using spectrometer.

ELECTRICITY AND MAGNETISM:

6) Study the variation of magnetic field along the axis of a solenoid coil using Stewat – Gee's apparatus.

7) Determine the time constant for a C-R circuit.

ELECTRONICS:

8) Study of characteristic curves of a zener diode to determine its break down

Voltage

9) Determine band gap of semiconductor using a p-n junction diode.

10) Draw the characteristic curves and determine thermoelectric coefficient of a thermistor.

11) Determine the Numerical Aperture of an optical fibre.

12) Determine the attenuation in the optical fibre.

I B.TECH - I SEMESTER
IT WORKSHOP

Course Code: ME1L2 **Credits: 2**
Lecture: **Internal assessment: 25 marks**
Lab practice: 3 periods /week **Semester end examination: 50 marks**

COURSE OBJECTIVES:
To provide students with hands-on experience in basic hardware, productivity tools and basic operating system installations.

COURSE OUTCOMES:
After Completion of this Course the Student would be able to
1. Identify the basic computer peripherals.
2. Gain sufficient knowledge on assembling and disassembling a PC.
3. Learn the installation procedure of Windows and Linux OS.
4. Acquire knowledge on basic networking infrastructure.
5. Learn productivity tools like Word, Excel and Power point.
6. Acquire knowledge on basics of internet and World Wide Web.

Prerequisite: Basic Knowledge on Computers.

Task 1:
Identification of the peripherals of a computer: To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices

Task 2:
A practice on disassembling the components of a PC and assembling them.

Task 3:
Basic DOS commands, Installation of MS windows.

Task 4:
Introduction to Linux- Installation Procedure, Basic Linux Commands.

Task 5:
Hardware Troubleshooting (Demonstration): Identification of a problem and fixing the solution (improper assembly or defective peripherals). Software Troubleshooting (Demonstration): Identification of a problem and fixing the PC for any software issues.

Task 6:
Demonstrating Importance of Networking, Transmission Media, Networking Devices Gateway, Routers, Hub, Bridge, NIC, Bluetooth Technology, Wireless Technology, Modem, DSL, Dialup Connection.

Task 7:
MS Word Orientation: Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting ,Drop Cap , Applying Text effects, Using Character Spacing, OLE in Word, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving

Task 8:
Creating project : Abstract Features to be covered:-Formatting Styles, Inserting table, Bullets and Numbering, Changing Text Direction, Cell alignment, Footnote, Hyperlink, Symbols, Spell Check , Track Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.

Task 9:
Using spread sheet features of EXCEL including the macros, formulae, pivot tables, graphical representations **Creating a Scheduler -** Features to be covered:- Gridlines, Format Cells, Summation, auto fill, Formatting Text LOOKUP/VLOOKUP

Task 10:
Performance Analysis - Features to be covered:- Split cells, freeze panes, group and outline, Sorting, Boolean and logical operators, Conditional formatting

Task 11:
Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes :- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in Power point.
Focusing on the power and potential of Microsoft power point. Helps them learn best practices in designing and preparing power point presentation. Topic covered during this week includes: - Master Layouts (slide, template, and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background, textures, Design Templates, Hidden slides, OLE in PPT.

Task 12:
Students should get connected to their Local Area Network and access the Internet. In the process they should configure the TCP/IP setting and demonstrate how to access the websites and email, Customizing web browsers using bookmarks, search toolbars and pop up blockers, Search engines and their usage.

Learning Resources:

Reference Books:

1. Computer Fundamentals, Anita Goel, Pearson
2. Information Technology Workshop,3e, G Praveen Babu, M V Narayana BS Publications.
3. Introduction to Information Technology-ITL Education Solution Limited-Pearson.
4. Fundamentals of Information Technology, 2nd Edition, Alexis Leon, Mathews Leon, (Leon Vikas).

I B.TECH - I SEMESTER
ENGINEERING WORKSHOP

Course Code: ME1L3 **Credits: 2**
Lecture: -- **Internal assessment: 25 marks**
Lab Practice: 3 periods/week **Semester end examination: 50 marks**

COURSE OBJECTIVES:

1. Illustrate about basic hand tools used in various trades such as Carpentry, Tin-Smithy, Fitting House wiring, Black smithy.
2. Imparting skills to prepare basic joints in Carpentry.
3. Imparting skills to fabricate various objects by using sheet metal.
4. Know various basic house wiring connections.
5. Imparting skills to fabricate various shapes by using black smithy.

COURSE OUTCOMES:

At the end of course the student will be able to:

1. Prepare basic joints used in carpentry
2. Prepare edges for better joint for fitting
3. Perform basic house wiring connections
4. Prepare various shapes and objects by using Tin smithy and Black smithy.

ANY TWO EXPERIMENTSFROM EACH TRADE

TRADE:

CARPENTRY
1. T-Lap Joint
2. Cross Lap Joint
3. Dovetail Joint
4. Mortise and Tennon Joint

FITTING
1. V-Fit
2. Square Fit
3. Half Round Fit
4. Dovetail Fit

BLACK SMITHY
1. Round rod to Square
2. S-Hook
3. Round Rod to Flat Ring
4. Round Rod to Square headed bolt

HOUSE WIRING

1.Parallel / Series Connection of three bulbs
2. Stair Case wiring
3. Florescent Lamp Fitting
4. Measurement of Earth Resistance

TIN SMITHY

1. Taper Tray
2. Square Box without lid
3. Open Scoop
4. Funnel

Text Books:

1. Work shop Manual - P.Kannaiah / K.L.Narayana / Scitech Publishers.
2. Workshop Manual - Venkat Reddy / BS Publications/Sixth Edition

I B.TECH - II SEMESTER
ENGINEERING MATHEMATICS-II

Course Code: ME2T1 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- After completion of this course engineers will be able to apply the concepts of matrices, Laplace transforms, Fourier series, Fourier transforms in solving engineering problems.
- Linear algebra in the course cover material which is essential to anyone who does mathematical computation in Engineering and sciences.

COURSE OUTCOMES:

1. students able to solve system of Linear equations, be familiar with properties of matrices, find the inverse, Eigen values and Eigen vectors and use them in diagonalization,
2. Acquire knowledge in Laplace transforms, inverse Laplace transforms and how to get a solution of differential equations by using Laplace transforms.
3. Get knowledge of expanding a function in terms of sine and cosine functions' in Fourier series and also to get knowledge in Fourier transforms.
4. Get knowledge in Z-transforms, inverse Z-transforms, solving difference equations

UNIT –I
MATRICES AND LINEAR SYSTEMS OF EQUATIONS
Rank-Echelon form, Normal form-definition of a vector, linear independence – Solution of Linear System of equations – Direct Methods- Gauss Elimination - Gauss Jordon and Gauss Seidal Methods.

UNIT –II
EIGEN VALUES – EIGEN VECTORS
Eigen values - Eigen vectors - Properties – Cayley-Hamilton Theorem - Inverse and powers of a matrix by using Cayley-Hamilton theorem- some applications of Eigen value problems- Diagonalization of a matrix.

UNIT –III
LAPLACE TRANSFORMS & INVERSE LAPLACE TRANSFORMS
Laplace transforms: Laplace transforms of standard functions –Shifting Theorems, Transforms of derivatives and integrals – Unit step function –Dirac's delta function.
Inverse Laplace transforms: Convolution theorem - Application of Laplace transforms to ordinary differential equations with given initial conditions.

UNIT –IV
FOURIER SERIES AND FOURIER TRANSFORMS
Fourier series: Determination of Fourier coefficients – Fourier series – even and odd functions – Fourier series in an arbitrary interval– Half-range sine and cosine series.

Fourier transforms: Fourier integral theorem (only statement) – Fourier sine and cosine integrals - Fourier transform – sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.

UNIT –V
Z-TRANSFORMS
Introduction, properties of Z-transforms-initial value theorem-final value theorem- inverse Z-transforms-applications to difference equations.

Learning Resources

Text Books:

1. Higher Engineering Mathematics – Khanna Publishers – B.S. Grewal – 42nd Edition.
2. Advanced Engineering Mathematics – Wiley – Erwin Kreyszig- 8th Edition.

Reference Books:

1. Engineering Mathematics Vol-II, Iyengar,T.K.V, Krishna Gandhi, et.al S.Chand Co. NewDelhi.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

I B.TECH - II SEMESTER
PROFESSIONAL ETHICS

Course Code: ME2T2 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: -- **Semester end examination: 70 marks**

COURSE OBJECTIVES:-

- To inculcate the sense of social responsibility.
- To develop a firm ethical base
- To make the students realize the significance of ethics in professional environment.

COURSE OUTCOMES:-

1. Improved knowledge of ethics
2. High sense of responsibility
3. Environmental awareness
4. Professional outlook
5. Developing a broad culture.

UNIT I
Profession-----Definition Three types of ethics. Engineering ethics Rights and responsibilities of an engineer.

UNIT II
Evolution of engineering ethics Code of ethics Kohlberg's theory Gilligan's theory

UNIT III
Engineering as social experimentation Engineer's social responsibility

UNIT IV
Computer ethics Ethical hacking Privacy

UNIT V
Environmental Ethics. Livable environment Technology assessment.

Learning Resources

Reference Books:

1. Ethics in engineering: Mike W.Martin Roland, Mac GrowHill. Schinzinger
2. Engineerinethics-----M.Govindarajan, S.Natarajan & V.S.Senthil Kumar. Eastern economyEdn. PHI
3. Engineering ethics---Harris pitch and Rabbins,cengage.
4. Caroline whit back---Ethics in engineering practice andresearch-----Cambridge.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

I B.TECH - II SEMESTER
ENGINEERING CHEMISTRY

Course Code: ME2T3 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- To acquire knowledge about desalination of brackish water and treatment of municipal water.
- To gain the knowledge of conducting polymers, bio-degradable polymers and fiber reinforced plastics.
- To learn significance of green chemistry and green synthesis and the synthesis of nano materials.
- To understand mechanism of corrosion and preventive methods.
- To understand concept of semi conductivity, superconductivity and liquid crystal and solar energy.

COURSE OUTCOMES:

After studying this course, students will be able to

1. develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.
2. replace metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.
3. produce economical green synthesis and new methods of synthesis of nano materials.
4. find appropriate metals or combination of metals and develop economical methods for minimizing corrosion.
5. bring the new ideas in converting solar energy into most needy electrical energy efficiently and economically to reduce the environmental pollution.

UNIT I

A) WATER TECHNOLOGY

Introduction, Hardness of water, types of hardness (permanent and temporary)- Degree of hardness-Numerical-determination of hardness by EDTA Method- softening methods (line-soda, ion exchange and zeolite process)

B) WATER TREATMENT

Desalination-reverse osmosis-electro dialysis. Municipal water treatment-removal of microorganisms- by irradiation of UV radiation- bleaching powder process- chlorination-break point of chlorination-By using chloramine-By using ozone.

UNIT II

A) POLYMERS

Introduction - Types of polymers (addition and condensation)- mechanism of addition polymerization (free radical, ionic) – Classification - Methods of polymerization – Stereo specific polymers - Ziegler Natta catalysis - Properties of polymers – Conducting Polymers-Engineering applications – Biodegradable polymers - Individual polymers

(Preparation Properties, Uses of Poly Styrene, PVC, PTFE, Bakelite's, Cellulose derivatives, Polycarbonates).

B) LASTICS

Types –Compounding of plastics- Molding(Injection, compression, blow film extrusion and extrusion molding)- Fiber reinforced plastics (Glass and carbon) – Bullet Proof Plastics– Properties of plastics – Engineering applications.

UNIT III

A) GREEN CHEMISTRY

Introduction – Principle of green chemistry, methods of green synthesis (aqueous phase, super critical fluid extraction method, phase transfer catalyst, micro wave induced method, ultrasound method.

B) **NANO MATERIALS**

Introduction to Nano materials -preparation of few Nano materials (Carbon Nano Tubes, Fullerenes etc.)-Properties of Nano materials- Engineering applications.

UNIT IV

A) CORROSION

Definition, causes and consequences of corrosion-mechanism of dry and wet corrosion-galvanic series, Factors influencing rate of corrosion passivity of metal, types of corrosion (galvanic, differentia Aeration, pitting, crevice and stress corrosion).

B) **CORROSION CONTROL**

Cathodic protection (sacrificial anodic protection and Impressed current cathodic protection) and Application of protective coating-metallic coatings (galvanization and tinning) organic coatings (paints (mechanism not required),varnishes, lacquers and enamels).

UNIT V

A) SEMICONDUCTORS & SUPER CONDUCTIVTY

SEMICONDUCTORS-Definition –Types of semiconductors (Stiochiometric, Non Stoichiometric, Organic, Controlled Valence Semiconductors, Doping)-applications SUPERCONDUCTIVTY– Definition-Preparation –Properties –Engineering Applications.

B) **LIQUID CRYSTALS & SOLAR ENERGY**

LIQUID CRYSTALS- Definition –Types - applications in LCD and Engineering Applications.

SOLARENERGY

Introduction – harnessing solar energy – solar heaters – photo voltaic cells – solar reflection –green house concepts.

Learning Resources

Text Books

1. A text book of Engineering chemistry – by N.KrishnaMurthy N.Y.S.Murthy Dr. V.Anuradha.
2. A text book of Engineering chemistry –II by D.Srinivasulu, Srivastava, Roliverma.
3. A text book of Engineering chemistry by JAIN &JAIN.
4. A text book of Engineering chemistry by C.P.Murthy, C.V.Agarwal. Andra Naidu.

Reference Books

1. A text book of Engineering chemistry by S.S.DARA.
2. A text book of Engineering chemistry by Dr.C.DanielYesudian

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

I B.TECH - II SEMESTER
ENGINEERING MECHANICS-II

Course Code: ME2T4 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

1. Gain a basic knowledge of rigid-body mechanics.
2. Know the elasticity and structural analysis concepts
3. Recognize the Moment of inertia of plane areas and to know the behavior of dynamics of particles and rigid bodies.

COURSE OUTCOMES:

At the end of course the student will be able to:

1. Express the knowledge on Kinetics and Kinematics of rectilinear translation
2. Describe the concept of curvilinear motion pertain to Kinetics and Kinematics.
3. Elucidate on Moment of inertia of laminas and 3Dbodies.
4. Enlighten on the kinematic rotation of a rigid body.
5. Illustrate the concept of plane body motion dealing with kinetics and kinematics.

Pre-Requisites:

Engineering Mechanics-I.

UNIT I
KINEMATICS OF RECTILINEAR TRANSLATION: Introduction, displacement, velocity and acceleration. Motion with Uniform and Variable acceleration.
KINEMATICS OF CURVILINEAR MOTION: Introduction, rectangular components of velocity & acceleration. Normal and Tangential acceleration. Motion of projectiles.

UNIT II
KINETICS OF RECTILINEAR TRANSLATION: Equations of rectilinear motion. Equations of Dynamic Equilibrium: D'Alembert's Principle. Work and Energy, Conservation of energy, Impulse and Momentum, Impact-Direct central Impact.
KINETICS OF CURVILINEAR MOTION: D'Alembert's Principle in curvilinear motion-Work and energy.

UNIT III
MOMENT OF INERTIA OF MATERIAL BODIES: Moment of inertia of a rigid body - Moment of inertia of laminas- slender bar, rectangular plate, Circular plate, circular ring, Moment of inertia of 3D bodies- cone, solid cylinder, sphere & parallelepiped.

UNIT IV

ROTATION OF A RIGID BODY ABOUT A FIXED AXIS: Kinematics of rotation Equation of motion for a rigid body rotating about a fixed axis - Rotation under the action of a constant moment.

UNIT V

KINEMATICS OF PLANE MOTION: Concepts of relative velocity and instantaneous center.

KINETICS OF PLANE MOTION: Equations of motion, Dynamic equilibrium of symmetrical rolling bodies.

Learning Resources

Text Books:

1. Engineering Mechanics, (2nd Edition), by S. Timoshenko & D. H. Young, McGraw Hill publications.
2. Engineering Mechanics Statics and dynamics, by A. K.Tayal, Umesh Publication, Delhi, 2009.

Reference Books:

1. Vector Mechanics for Engineers Statics and Dynamics, (9^{th} edition), by Beer and Johnston, Tata McGraw Hill Publishing Company, New Delhi.
2. S Engineering. Mechanics, by .S. Bhavikatti & J.G. Rajasekharappa, New Age International Publishers. New Delhi, 2008.
3. Engineering Mechanics Statics and Dynamics, (3^{ed} edition), by K.Vijaya Kumar Reddy and J Suresh Kumar, BS Publications,.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

I B.TECH - II SEMESTER
BASIC ELECTRICAL & ELECTRONICS ENGINEERING

Course Code: ME2T5 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- To impart the basic knowledge about the Electric circuits
- To understand the working of various Electrical Motors
- To know about working of various Electronic devices and operation
- To impart the basic knowledge about methods of electric power generation

COURSE OUTCOMES:

At the end of the course the students will have:

1. Basic knowledge about different methods of electric power generation
2. Basic knowledge about the Electric circuits
3. Understanding about the working of various Electrical Motors
4. Understanding about the operation of Diode and Transistors

UNIT-I
GENERATION OF ELECTRIC POWER
sources for generating electric power – conventional and nonconventional
Conventional sources:
Hydel stations, thermal stations and gas turbine stations - general layout of hydroelectric plant and function of each component – thermal power station – layout of modern thermal plant – brief description of each component - layout of gas turbine power station
– components of gas turbine power plant–
Non-conventional sources: Solar energy – solar constant – layout of solar thermal power plant – photovoltaic cell – power from solar modules - PV system design – power generation using wind energy

UNIT-II
ELECTRICAL CIRCUITS:
Basic definitions, Types of elements, Classification of different sources, Ohm's Law, Kirchhoff's Laws, Resistive networks, Inductive networks, capacitive networks, Series, Parallel circuits and Star-delta and delta star transformations. (simple problems)

UNIT -III
ELECTRICAL MOTORS
(a) Three phase AC MOTORS:
Construction and principle of operation of a 3 phase induction motor, Types of Rotors- Torque equation- Slip Torque Characteristics, Types of starters. (Descriptive treatment only)
(b) Single phase AC motors
Construction and principle of operation of single phase induction motor viz: capacitor start,

capacitor start and run, split phase, shaded pole and universal motor – speed torque characteristics and their industrial applications

UNIT-IV
TRANSFORMERS
Classification of transformers based on construction, Principle of operation of single phase transformers – emf equation – losses – efficiency and regulation
Welding transformers:
Introduction to Arc welding - construction and principle of single phase welding transformer – and Dc welding generator and their application – comparison between AC and DC welding

UNIT -V
DIODES AND TRANSISTORS:
Semiconductors, Types, Construction and working of P-N junction diode, symbol, Diode Applications, Rectifiers – Half wave, Full wave and Bridge rectifiers (Descriptive treatment only), Principle of Zener diode and application.
Construction and working P-N-P and N-P-N Junction transistor, Transistor as a switch and amplifier, Single stage CE Amplifier, Frequency response of CE amplifier. (Descriptive treatment only)

Learning Resources

Text books:

1. A course in Power systems by JB Gupta, Kataria publications
2. Principles of Electrical and Electronics Engineering, (1st edition) by Mehta, V.K., S. Chand & Co,2012.

Reference books:

1. Introduction to Electrical Engineering by Naidu, M.S. and Kamakshaiah, S., Tata McGraw-Hill,1995.
2. Basic Electrical Engineering, (3rd Edition) by Kothari and Nagarath., TataMcGraw-Hill,2009.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

I B.TECH -II SEMESTER
C- PROGRAMMING

Course Code: ME2T6 **Credits: 3**
Lecture Hours: 3 periods/week **Internal Assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination:70marks**

COURSE OBJECTIVES

- Learn the structure, syntax and semantics of C programming.
- Learn different control structures like decision control, loop control and arrays.
- Learn the modular programming concepts and storage classes.
- Learn the limitations of basic data types and learn the concepts of derived data types and user defined data types.
- Learn how to perform various FILE I/O.

COURSE OUTCOMES:

After completion of this course the student would be able to

1. Understand the fundamentals of C programming.
2. Choose the decision making statements, loops and arrays to solve the problem.
3. Use functions to solve the given problem.
4. Allocate dynamic memory using pointers.
5. Apply the structures, unions and files Operations in a specific need.

UNIT I

Topic Level Objective: Notion of Computer Languages, algorithm, computational procedure, editing and executing programs and C Declarations.

BASICS AND INTRODUCTION TO C:

Basics of Computer, Introduction to C, About ANSI C Standard, Machine, Assembly and High-level Language, Assembler, Compiler and Interpreter, Structure of a C program, Programming Rules, Executing the C Program, Standard Directories, Advantages of C, Header Files, Flow Chart, Algorithm, Analysing Algorithm, Classification Algorithms.

THE C DECLARATIONS: The C-Character set, Delimiters, Types of Tokens, The C keywords, Identifiers, Constants, Variables, C Data types, dynamic initialization, type modifiers, type conversions, constant and volatile variables. Properties of Operators,

Operator Priority, comma and conditional operators, arithmetic, relational, assignment operators and expressions, logical, bitwise operators. Input and output in c: Formatted and Unformatted functions.

UNIT II

Topic Level Objective: Understanding branching, iteration, data representation using arrays and strings.

DECISION STATEMENTS:

The if statement, if-else, nested if else, if-else-if ladder, break, continue, go to, Switch statement, nested switch case, Switch case and nested ifs.

LOOP CONTROL: for loop, nested for loop, while, do-while, do-while statement with while loop.

ARRAYS:
Array initialization, array terminology, characteristics of an array, 1-D array and its operations, predefined streams, 2-D arrays and operations, Multi -dimensional arrays.
STRINGS: Declaration and initialization of string, string standard functions, string conversion functions, memory functions, application of strings.

UNIT III
Topic Level Objective: Modular programming and recursive solution formulation and storage classes.
FUNCTIONS:
Basics, function definition, return statement, types of functions, call by value ,call by reference, function as an argument, Functions with operators, Function and Decision Statements, Functions and loop Statements, Functions with arrays and Pointers,
Recursion-Types of Recursion, Rules for Recursive Function, Recursion versus
Iterations, Advantages and Disadvantages of Recursion, Efficiency of Recursion, Library Functions.
STORAGE CLASS: Variable Lifetime, Automatic Variables, External Variables, Static Variables, Register Variables.

UNIT IV
Topic Level Objective: Understanding pointers, dynamic memory allocation and
Pre-processor Directives.
POINTERS:
Features of pointers, pointers and address, pointer declaration, void pointers, arithmetic operations with pointers, pointers and arrays, array of pointers, pointers to pointers ,pointers and strings. Dynamic memory allocation, memory models, memory allocation functions.
PREPROCESSOR DIRECTIVES:
The #define Directive, Un defining a Macro, Token Pasting and Stringing Operators,
The #include Directive, Conditional Compilation, The Predefined Macros in ANSI and Turbo-C, Standard I/O Predefined Streams in stdio.h, The Predefined Macros in c type.h.

UNIT V
Topic Level Objective: Understanding derived data types of C and basic of file operations.
STRUCTURE AND UNION: Features of Structures, Declaration and initialization of
Structures, Structure within Structure, Arrays of Structure, Pointer to Structure,
Structure and functions, typed, Bit fields, Enumerated Data Type, Union, Union of Structures.
FILES:
Streams and File Types, Steps for File Operations, FILE I/O, Structures Read and
Write, Other file function, Command line Arguments, Application of command line arguments, Environment variables.

Learning Resources

Text Books:

1.Programming in C, by Ashok N.Kamthane, (2nd edition), Pearson publications,2011.

Reference Books:

1. Programming in ANSI C (5th Edition) by E. Balaguruswamy, McGraw-Hill publications.
2. A first book of ANSI C , 3rd edition, by Gray J.Brosin, cengagedelmar Learning India P.ltd publications.
3. Problem Solving with C by M.T Somashekara PHI publications.
4. C Programming Language", (2nd edition) by Brain W.Kernighan & Dennis Ritchie, ", PHI publication

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

I B.TECH - II SEMESTER
ENGNEERING CHEMISTRY LAB

Course Code: ME2L1 **Credits:2**
Theory : --- **Internal assessment: 25 marks**
Lab: 3 periods/week **Semester end examination: 50 marks**

COURSE OBJECTIVES:

- Students must familiar with quality and parameters of water samples, useful for drinking effluent treatment and agriculture purposes.
- Students must awareness of preparation of some plastic material and corrosion kinetics useful in industries.
- Students know about the measuring the properties of the lubricants which are industrially useful.

COURSE OUTCOMES:

1. By learning hardness, alkalinity, turbidity, D.O of water sample students can understand different methods of water treatment.
2. By knowing nature of the soil from PH values the types of fertilizers and pesticides to be used can be decided
3. Students know the preparation of Bakelite and understand to applications in industries.
4. By measuring the viscosity, flash and fire point, saponification value and acid number of different lubricants, these parameters are useful in a voiding in industries

LIST OF EXPERIMENTS

ANY TEN OF THE FOLLOWING

1. Determination of Total Hardness of water sample using EDTA.

2. Determination of Total alkalinity of water sample.

3. Determination of D.O in water.

4. Measurement of Turbidity of water sample.

5. Conduct metric titration of Acid Vs Base.

6. PH of Soil and fruits.

7. Preparation of Phenol-Formaldehyde resin.

8. Determination of Corrosion rate of mild steel in the absence and presence of an inhibitor.

9. Determination of Viscosity of heavy oil RED WOOD Viscometer.

10. Determination of Flash and Fire point of a Lubricating oil by Pen sky- martens apparatus.

11. Determination of Saponification value of Vegetable oil.

12. Determination of Acid number of a Lubricant oil.

I B.TECH - II SEMESTER
ENGLISH LANGUAGE COMMUNICATION SKILLS LAB

Course Code: ME2L2 **Credits: 2**
Theory:------ **Internal assessment: 25 marks**
Lab practice: 3 periods/week **Semester end examination: 50 marks**

COURSE OBJECTIVES: -

- To improve the communicative ability.
- To enhance the general conversational skills in different socio-cultural contexts.
- To strengthen their professional skills.
- To instil confidence and make them competent enough to express themselves fluently.
- To expose the students to various spoken skills.

COURSE OUTCOMES

1. Better pronunciation and accent
2. Ability to use functional English
3. Improved comprehensive ability
4. Enhanced analytical skills
5. Good negotiation skills.

TASK 1: PHONETICS
Introduction to sounds of English.
Phonetic transcription of simple words.
Word stress or accent.
Intonation.

TASK II: SPOKEN SKILLS
JAM
Public speaking
Debate

TASK III : CONVERSATION SKILLS
Introducing
Extending Invitations
Apologizing
Lodging complaints.

TASK IV: DESCRIBING
Describing an object
Describing a process
Describing situations

TASK V: GROUP DISCUSSION
Dynamics of Group Discussion
Various strategies
Discussion on various topics

Learning Resources

Reference Books:

Everyday dialogues in English---------- Robert J.Dixon.

Speak well---------- orient black swan.

I B.TECH - II SEMESTER
C – PROGRAMMING LAB

Course Code: ME2L3 **Credits: 2**
Lecture hours: --- **Internal Assessment: 25 marks**
Lab hours: 3 periods/ week **Semester end examination: 50 marks**

COURSE OBJECTIVES:

- To make the student learn a programming language.
- To learn problem solving techniques.
- To teach the student to write programs in C and to solve the problems.

COURSE OUTCOMES:

After Completion of this course the student would be able to

1. Read, understand and trace the execution of programs written in C language.
2. Write the C code for a given algorithm.
3. Implement Programs with pointers and arrays, perform pointer arithmetic, and use the pre-processor.
4. Write programs that perform operations using derived data types.

Exercise 1: Basics

1. Write a program to print sample strings like "hello world", "Welcome to C Programming" with different formats using escape sequences.
2. Write a Program to print different data types in 'C' and their ranges.
3. Write a Program to initialize, assignment & printing variables of different data types.

Exercise 2: Operators

1. Write a Program to demonstrate arithmetic operators. (+,-,*,/,%)
2. Write a Program to demonstrate logical operators.(logical AND, logical OR)
3. Write a Program to read radius value from the keyboard and calculate the area of circle and print the result in both floating and exponential notation.
4. Write a Program to calculate simple interest.
5. Write a Program to convert temperature. (Fahrenheit –Centigrade an device-versa)

Exercise 3: Operators

1. Write a Program to demonstrate relational operators. (<,>,<=,>=,==,!=)
2. Write a program to check equivalence of two numbers using conditional operator.
3. Write a Program to demonstrate pre increment and post increment.(++a, a++ where a is a value to be initialized)
4. Write a Program to demonstrate pre decrement and post decrement.(--a, a--where a is a value to be initialized)
5. Write a program for computing the volume of sphere, cone and cylinder assume that dimensions are integer's use type casting where ever necessary.

Exercise 4: Decision Statements

1. Write a Program to read marks of a student in six subjects and print whether pass or fail (using if-else).
2. Write a Program to calculate roots of quadratic equation (using if-else).
3. Write a Program to calculate electricity bill. Read starting and ending meter reading. The charges are as follows.

No. of Units Consumed	Rate in (Rs)
1-100	1.50 per unit
101-300	2.00 per unit for excess of 100units
301-500	2.50 per unit for excess of 300units
501-above	3.25 per unit for excess of 500units

Exercise 5: Switch operations

1. Write a Program to perform arithmetic operations using switch case.
2. Write a Program to display colors using switch case(VIBGYOR).
3. Write a Program to display vowels and consonants using switch case.
4. Write a Program to display names of days in a Week using switch case.

Exercise 6: Basic Loop operations

Do the Following Programs Using for, while, do-while loops.

1. Write a program to calculate sum of individual digits of a given number.
2. Write a program to check whether given number is palindrome or not.
3. Write a program to print prime numbers in the given range.
4. Write a program to display multiplication tables from 1 to 10 except 3 and5.

Exercise 7: Advanced loops

1. Write a program to print the Fibonacci series for given 'N' value.
2. Write a program to check whether a given number is a Fibonacci number or not.
3. Write a program to read 2 numbers x and n then compute the sum of the Geometric Progression. $1+x+ x^2+x^3+- - - - - - -+x^n$
4. Write a program to print the following formats.

```
1          *
1 2        * *
1 2 3      * * *
1 2 3 4    * * * *
```

Exercise 8: 1-D arrays

1. Write a program to store 10 elements in the 1-D array and print sum of the array.
2. Write a program to print minimum and maximum elements in the 1-Darray.
3. Write a program to count no. of positive numbers, negative numbers and zeros in the array.
4. Write a program to search the given element by using linear search.
5. Write a program to sort the given elements using bubble sort technique.

Exercise 9: 2-D arrays

1. Write a program to perform matrix addition and matrix subtraction.
2. Write a program to perform matrix multiplication by checking the compatibility.
3. Write a program to print the transpose of a matrix.

Exercise10: Strings

1. Write a program to perform various string manipulations using built-in functions.
2. Write a program to print the given strings in ascending order.
3. Write a program to verify the given string is palindrome or not (without built-in functions, with using built-in functions).
4. Write a program to concatenate two strings using arrays.

Exercise 11: Math Functions and I/O Functions

1. Write a program to read values from keyboard and find the values using abs(), sqrt(),floor(),ceil()and pow().
2. Write a program to read and display a value using getch() an dputch().
3. Write a program to read and display a value using getchar(), putchar(),gets() and puts().

Exercise 12: Functions

1. Write a program to find sum of two numbers using functions.
2. Write a program to find product of two numbers using functions without arguments, without return type.
3. Write a program to find difference of two numbers using functions without arguments, with return type.
4. Write a program to find sum of two numbers using functions with arguments &without return type.
5. Write a program to find product of two numbers using functions with arguments, with return type.

Exercise13: Functions and Recursion

1. Write a program to swap two numbers using
   a) Call By Value b) Call By Reference.
2. Write a program to calculate factorial, gcd using recursion and non-recursion functions.
3. Write program to perform arithmetic operations using pointer.
4. Write a program matrix addition using pointers.

Exercise14: Structures

1. Write a program to create structure for an account holder in a bank with following Fields: name, account number, address, and balance and display the details of five account holders.
2. Write a program to find total marks of individual student and average marks for10 students using structures.
3. Write a program to create structure called traveler and members of structure are train no, coach no, seat no, source ,destination , gender, age, name and departure date.
4. Write a program to illustrate passing an entire structure to a function.

Exercise15: File operations using command line arguments

1. Write a program which copies the contents of one file to another file using command line arguments.
2. Write a program to reverse the first n characters in a file use command line arguments.

Learning Resources

Reference Books:

1. Problem Solving and Program Design in C, 4th edition, by jeri R. Hanly and Elli B.Koffman.
2. Programming C by PradipDey, Manas Ghosh, 2nd edition Oxford University Press.
3. E.Balaguruswamy, Programming in ANSI C 5th Edition McGraw-Hill
4. A first book of ANSI C by Gray J.Brosin 3rd edition Cengagedelmer Learning IndiaP.Ltd
5. AL Kelly, Iraphol,Programming in C,4th edition Addison-Wesley – Professional
6.Brain W.Kernighan & Dennis Ritchie, C Programming Language, 2nd edition,PHI

II B. TECH - I SEMESTER
NUMERICAL AND STATISTICAL METHODS

Course Code: ME3T1 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester End Examination: 70 marks**

COURSE OBJECTIVES:

- Students able to find approximate root of algebraic and transcendental equations and get familiarity with interpolation. They get good exposure to numerical solution of Ordinary differential equation. Interpret ideas of random variables, population, sample, sampling distributions. Demonstrate skills in test of hypothesis concerning mean, proportions, difference of means and proportions.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Approximate root of algebraic and transcendental equations andget the familiarity with interpolation and different interpolation formulae.
2. Solve ordinary differential equations for numerical solution
3. Describe Probability, conditional probability, Baye's theorem, Random variables and distributions
4. Explain about Population and samples and able to find the sampling distributions, Point and Interval estimations of means, proportions.
5. Test the hypothesis concerning means proportions and their differences using z-test, t-test.

UNIT I

SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS:

Introduction – Bisection method – Method of false position – Iteration method – Newton-Raphson's method

INTERPOLATION:

Introduction- Errors in polynomial interpolation – finite differences- forward differences-backward differences – central differences – Symbolic relations -Differences of a polynomial - Newton's formulae for interpolation – Interpolation with unevenly spaced points - Lagrange's Interpolation formula.

UNIT II

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS:

Solution by Taylor's series method - Picard's Method of successive approximations - Euler's Method - Runge-Kutta Methods – Predictor - Corrector Methods - Milne Thompsons's method.

UNIT III

PROBABILITY:

Binomial sample space and events- probability – the axioms of probability- some elementary theorems- conditional probability- Baye's theorem.

RANDOM VARIABLES:
Discrete and continuous distributions – Distribution function.
DISTRIBUTIONS: Binomial, Poisson, Normal distribution – related properties.

UNIT IV
POPULATION AND SAMPLES:
Sampling distribution of mean with known and unknown variance, proportion, variances, Sampling distribution of sums and differences.
Estimation: Point and interval estimators for means, variances, proportions.

UNIT V
STATISTICAL HYPOTHESIS:
Errors of Type I and Type II errors. one tail, two-tail tests. Testing hypothesis concerning means, proportions and their differences using Z-test, t- test.

Learning Resources

Text Books:
1. A Textbook on Mathematical Methods - Himalaya Publishing House- V. Ravindranath, P. Vijayalaxmi- 1st Revised Edition: 2011.
2. Higher Engineering Mathematics – Khanna Publishers – B.S. Grewal – 42nd Edition: 2012, June.
3. Engineering Mathematics (Volume – II) - S. Chand - T. K. V. Iyengar, B. Krishna Gandhi, S. Ranganatham, M.V.S.S.N. Prasad- 9th Revised Edition: 2012.
4. A Text Book of Probability & Statistics –Lakshmi publications- P.Tirupati Rao

Reference Books:

1. Advanced Engineering Mathematics – Wiley – Erwin Kreyszig- 8thEdition:2006
2. A Text Book of Engineering Mathematics – Tata McGraw Hill - B. V. Ramana- 3rd Edition: 2008.

E-learning resources:
1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

II B.TECH -I SEMESTER
BASIC THERMODYNAMICS

Course Code: **ME3T2** **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES

- Acquire knowledge on laws of thermodynamics, properties of pure substance
- Evaluate power cycle efficiencies

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Recall basic concepts of thermodynamics and calculate work and heat
2. Analyse zeroth and first law of thermodynamics and working of various heat engines
3. Assess quality and quantity of energy and degree of disorder ness
4. Analyse cycles using pure substances, perfect gas laws and mixtures of gases
5. Compare efficiencies of various thermodynamic cycles

UNIT I
INTRODUCTION

Basic Concepts - System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermo dynamic Equilibrium, State, Property, Process, Cycle, Reversibility, Quasi static Process, Irreversible Process, Causes of Irreversibility, Energy in State and in Transition, Types, Work and Heat, Point and Path function.

UNIT II
ZEROTH LAW OF THERMODYNAMICS

Concept of Temperature, Measurement of temperature, Scales of Temperature, Ideal Gas Scale, PMM I, Joule's Experiments.

FIRST LAW OF THERMODYNAMICS

First law applied to a Process, applied to a flow system, Steady Flow Energy Equation. LIMITATIONS OF THE FIRST LAW: Thermal Reservoir, Heat Engine, Heat pump, Parameters of performance.

UNIT III
SECOND LAW OF THERMODYNAMICS

Kelvin-Planck ,Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle - Carnot cycle and its specialties, Thermodynamic scale of Temperature, Clausius Inequality, Entropy - Principle of Entropy Increase, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations – Elementary Treatment of the Third Law of Thermodynamics.

UNIT IV
PURE SUBSTANCES

p-V-T- surfaces, T-S and h-s diagrams, properties during change of phase, Dryness Fraction, Clausius Clapeyron Equation, Property tables.

PERFECT GAS LAWS

Equation of State - specific and Universal Gas constants, Throttling and Free Expansion Processes, Flow processes, Deviations from perfect Gas Model, Vanderwaals Equation of State , Compressibility charts, Variable specific Heats, Gas Tables.

MIXTURES OF PERFECT GASES

Mole Fraction, Mass fraction ,Gravimetric and volumetric Analysis, Dalton's Law of partial pressure, Avogadro's Laws of additive volumes, Mole fraction, Volume fraction and partial pressure, Equivalent Gas const. and Molecular Internal Energy, Enthalpy, sp. Heats and Entropy of Mixture of perfect Gases and Vapour.

UNIT V

THERMODYNAMIC CYCLES

Otto, Diesel, Dual Combustion cycles, Sterling Cycle, Atkinson Cycle, Ericsson Cycle, Lenoir Cycle, Brayton Cycle – Description and representation on P–V and T-S diagram, Thermal Efficiency, Mean Effective Pressures on Air standard basis – comparison of Cycles.

Learning Resources

Text Books:

1. P.K.NAG, Engineering Thermodynamics, Tata McGraw Hill Publications -1995.
2. Mahesh M Rathore, Thermal Engineering, McGraw Hill Publications - 2012.

Reference Books:

1. J.P.Holman, Thermodynamics, McGraw Hill Publications -2003.
2. Cengel & Boles, Thermodynamics, Tata McGraw Hill Publications - 2009.
3. V.P. Vasandani and D.S. Kumar "Treatise on Heat Engineering" Metropolitan book Co Pvt Ltd , 2000
4. K Ramakrishna, Engineering Thermodynamics, Anuradha Publishers – 2003

Data books to be allowed in examinations:

1. S.C. Jain, Steam Tables, Birla Publications Pvt. Ltd – 2011
2. R.S. Khurmi & N. Khurmi, Steam Tables, S.Chand Publications – 2014

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

II B.TECH -I SEMESTER

FLUID MECHANICS AND HYDRAULIC MACHINES

Course Code: ME3T3 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

The objectives of the course are to enable students to:

- Demonstrate the fluid properties, fundamentals of fluid statics and fluid flow.
- Interpret the concepts of flow measurements and flow through pipes.
- Acquire knowledge of various turbines and pumps.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Describe the concepts of fluids and its properties; apply fluid mechanics equations in solving fluid statics such as finding pressure difference in manometers.
2. Classify the concept of fluid flows, solve flow calculations in various types of pipes and apply equation of continuity of mass, energy and momentum equation for analysis of dynamic problems.
3. Solve various velocity diagrams for stationary, moving and inclined cases of flat and curved blades of turbo machinery.
4. Distinguish various hydraulic turbines and pumps with working proportions and efficiencies.

Prerequisites: Engineering Mechanics

UNIT I

FLUID STATICS:

Dimensions and units: physical properties of fluids- specific gravity, viscosity, surface tension and vapour pressure - Pascal's law, Hydrostatic law - Measurement of pressure: Piezo meter, U-tube and differential manometers.

FLUID KINEMATICS:

Description of fluid flow, Stream line, path line, streak lines and stream tube.

Classification of flows: Steady, unsteady, uniform, nonuniform, laminar, turbulent, rotational and irrational flows.

UNIT II

FLUID DYNAMICS:

Surface and body forces-Equation of continuity for one, two, three dimensional flows, Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

CLOSED CONDUIT FLOW:

Reynold's experiment- Darcy Weisbach equation- Minor losses in pipes- pipes in series and pipes in parallel- total energy line-hydraulic gradient line.

UNIT III

MEASUREMENT OF FLOW:

Pitot tube, Venturi meter and orifice meter – classification of orifices, flow over rectangular, triangular, trapezoidal and stepped notches - Broad crested weirs.

IMPACT OF JETS:

Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip – velocity triangles at inlet and outlet – expressions for work done and efficiency - angular momentum principle.

UNIT IV

HYDRAULIC TURBINES:

Classification-Pelton wheel-Reaction Turbines-Inward and Outward radial flow reaction turbines-Francis Turbine- Axial flow reaction turbine - Kaplan turbine - Draft tube- Types- Theory- and efficiency of draft tube.

PERFORMANCE OF HYDRAULIC TURBINES:

Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine.

UNIT V

CENTRIFUGAL PUMPS:

Classification, working, work done – manometric head - losses and efficiencies- specific speed- pumps in series and parallel - performance characteristic curves, NPSH.

RECIPROCATING PUMPS:

Main parts - Classification - Discharge - Slip - Velocity and acceleration variation in suction and delivery pipes due to piston acceleration- Effect of variation of velocity on friction in suction and delivery pipes- Effect of acceleration in suction and delivery pipes on indicator diagram- Effect of friction.

Learning Resource

Text Books:

1. Hydrualics and Fluid Mechanics, by P.N.Modi and S.M.Seth, Standarard book house, 2000, New Delhi.
2. Fluid Mechanics and Hydraulic Machines, by Sukumar Pati, Mc Graw Hill Education Private Limited, 2014, New Delhi.

Reference Books

1. Fluid Mechanics and Hydraulic Machines, by R.K.Bansal, Laxmi publications (P) Ltd., 2011, New Delhi.
2. Fluid Mechanics and Hydraulic Machines, by R.K.Rajput, S.Chand limited publications, 2008, New Delhi.
3. Fluid Flow Machines by N.S.Govinda Rao, Tata Mc Graw Hill publishing company Ltd.
4. Fluid Mechanics and Hydraulic Machines by K.R.Arora, Standard Publishers Distributors.
5. Elements of Hydraulic Machines & Fluids by Jagadish Lal, Metropolitan Book Co.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

II B. TECH – I SEMESTER

METALLURGY & MATERIALSCIENCE

Course Code: ME3T4 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- This course provides students an understanding of basic structure and crystal arrangement of materials, the phase diagrams, advantages of heat treatment and the method of heat treatment processes, powder metallurgy processes, the need and application of composite materials.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Identify the properties of metals with respect to crystal structure and grain size
2. Interpret the phase diagrams of materials
3. Classify and Distinguish different types of cast irons, steels and non-ferrous alloys
4. Describe the concept of heat treatment of steels & strengthening mechanisms
5. Explain the powder metallurgy process, types and manufacturing of composite materials

UNIT I

INTRODUCTION:

Introduction to metallurgy, Mechanical properties of materials

CRYSTALLOGRAPHY:

Classification of crystals – Brava is lattices – Miller Indices – Packing factor in cubic systems – coordination number – crystal imperfections – crystal deformation –Slip and Twinning.

STRUCTURE OF METALS:

Crystallization of metals, Effect of grain size on properties of metals, Determination of grain size

UNIT II

CONSTITUTION OF ALLOYS:

Types of solid solution- substitutional and interstitial solid solutions, Humerothery rules for solid solution

PHASE DIAGRAMS:

Phase, Phase equilibrium, Gibbs Phase rule – one component system, two component system, Construction of binary phase diagram, isomorphous, eutectic, eutectoid, paratactic and peritectoid systems, Fe-Fe3C equilibrium diagram

UNIT III

STEELS AND CAST IRONS: Classification of steels-Plain carbon steels, Stainless steels, Tool steels, Structure and properties of White Cast iron, Malleable Cast iron, Grey cast iron, Spheroidal graphite cast iron.

NON-FERROUS METALS AND ALLOYS: Structure and properties of Copper and its alloys, Aluminium and its alloys.

UNIT IV

HEAT TREATMENT PROCESSES: Annealing, Normalizing, Hardening, Tempering, TTT diagram of eutectoid steel, Austempering, Martempering, Flame hardening, Induction hardening ,carburizing, cyaniding, nitriding, Harden ability concept and experimental determination using jominy end quench test.

STRENGTHENING MECHANISMS: Grain Refinement, Strain hardening, solid solution strengthening, dispersion strengthening

UNIT V

POWDER METALLURGY: Powder metallurgy process, Preparation of powders, Characteristics of metal powders, Mixing, Compacting, Sintering, Applications of powder metallurgy.

COMPOSITE MATERIALS: Classification of composites, particle reinforced materials, fiber reinforced composite materials and metal matrix composites,

Manufacture of composites: Hand layup, Spray–up, Vacuum–bag molding, Pressure–bag molding, Thermal expansion molding, Autoclave molding, pultrusion

Learning Resources

Text Books:

1. Sidney H. Avener, "Introduction to Physical Metallurgy", Tata McGraw Hill - 2nd edition - 1997.
2. V.D. Kodgire, "Material Science and Metallurgy", Everest Publishing House - 25th Edition – 2009.

Reference Books:

1. Donald R. Askeland, the Science and engineering of Materials Cengage learning
2. B.K.Agarwal, "Introduction to Engineering Materials", Tata McGraw Hill-1stEdition.
3. V. Raghavan, "Material Science and Engineering", PHI Learning - 5th Edition.
4. R.K.Rajput, "Engineering Materials and Metallurgy", - S.Chand - 1st Edition-2011
5. William D. Callister, "Materials Science and Engineering", John Wiley & Sons Inc-2010.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

II B.TECH -I SEMESTER
MECHANICS OF SOLIDS -I

Course Code: ME3T5 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- The student will acquire the fundamental concepts of deformable bodies.
- The student will describe force-deformation, and stress-strain relationships for isotropic materials.
- The student will be able to analyze axially loaded members, beams, plane trusses, thin and thick cylinder for induced stresses, strains and deformations under static loads

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Calculate stresses, strains and deflections in structural members subjected to various types of loadings.
2. Determine the principal stresses and maximum shear stresses subjected to combined loading.
3. Analyze the stresses in statically indeterminate structures and relate the elastic constants.
4. Draw shear force and bending moment diagrams of simple beams subject to combination of loads.
5. Plot the stress distribution in section of the beam subjected to bending and shear loads.

Pre-Requisites: Engineering Mathematics-1, Engineering Mathematics-2,
Engineering Mechanics,

UNIT I

TYPES OF STRESSES:

Introduction, Normal Stress and Strain, Stress-Strain Diagrams, Elasticity , Plasticity, Linear Elasticity and Hooke's Law, Shear Stress and Strain, Factor of safety. Margin of safety Analysis of bars of varying sections, analysis of uniformly tapering circular rod and rectangular bar. Elongation of a bar due to its self-weight.

UNIT II

PRINCIPAL STRESSES:

Stresses on inclined Sections, Plane Stress, Principal Stresses and Maximum Shear Stress. Mohr's Circle for Plane Stress, Hooke's Law for Plane Stress.

UNIT III

STATICALLY INDETERMINATE STRUCTURES & ELASTIC CONSTANTS: Analysis of bars of composite sections, thermal stresses in composite bars, Strain Energy of Axially Loaded Members subjected to static load. Strain energy in members due to impact

loads, Lateral strain, Poisson's Ratio, volumetric strain, relation between E and G, relation between E and K, relation between E, G and K,

UNIT IV

SHEAR FORCE AND BENDING MOMENT:

Types of Beams, Shear Force and Bending Moment, Relationships between Load, Shear Force and Bending Moment, Shear Force and Bending Moment Diagrams for cantilever, simply supported and overhang beams with various combinations of loads.

UNIT V

SIMPLE BENDING& SHEAR STRESSES IN BEAMS:

Introduction, pure or simple bending, bending stresses in symmetrical sections, section modulus, composite / fletched beams. Shear Stress at a section, Shear Stresses distribution for different sections.

Learning Resources

Text Books:

1. Stephen P. Timoshenko, James M. Gere "Mechanics of Materials", 2nd edition, CB S Publishers, 2011.
2. S.S. Rattan, "Strength of Materials", 2nd edition, Tata Mc-Graw Hill Private Limited, New Delhi, 2012

Reference Books:

1. James M. Gere, "Mechanics of Materials",7th edition, Cengage learning India,2010
2. Adarsh Swaroop, "Mechanics of Materials" 1st edition, New Age International Pvt. Ltd, 2012.
3. Abdul Mubeen, "Mechanics of Solids" 2nd Edition, Pearson Education, Noida, 2011
4. R. K. Bansal, "Strength of Materials", Revised 4th edition, Laxmi Publishers, New Delhi.2010

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

II B. TECH - I SEMESTER
ENGINEERING ECONOMICS

Course Code: ME3T6 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester End examination: 70 marks**

COURSE OBJECTIVES:

- Acquire basic knowledge about managerial economics, fore casting, market structures and industrial organization.
- Justify cost/revenue data and carry out make economic analyses in the decision making process to justify or reject alternatives/projects on an economic basis

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Use the theory of managerial economics, demand analysis and fore casting theories to model business organization.
2. Analyze production functions and cost-price functions to manage production, markets and Break-even point.
3. Theorize about characteristics features and types of industrial organization, concept of changing business environment in post-liberalization scenario.
4. Justify about types and functions of financial management.
5. Evaluate the best alternative from various capital budgeting options and calculate.

UNIT I

INTRODUCTION TO MANAGERIAL ECONOMICS:

Introduction to Managerial Economics & Demand Analysis: Definition of Managerial Economics, Characteristics and Scope – Managerial Economics and its relation with other subjects- Basic economictoolsin Managerial Economics.

Demand Analysis: Meaning- Demand distinctions- Demand determinants- Law of Demand and its exceptions.

ELASTICITY OF DEMAND & DEMAND FORECASTING:

Definition -Types of Elasticity of demand - Measurement of price elasticity of demand: Total outlay method, Point method and Arc method- Significance of Elasticity of Demand. Demand Forecasting: Meaning - Factors governing demand forecasting - Methods of demand forecasting (surveyofbuyers' Intentions ,Delphimethod,Collective opinion, AnalysisofTimeseriesandTrendprojections,EconomicIndicators,Controlled experiments and Judgmental approach) - Forecasting demand for new products- Criteria of a good forecasting method.

UNIT II

THEORY OF PRODUCTION AND COST ANALYSIS- INTRODUCTION TO MARKETS-PRICING POLICIES & E-COMMERCE:

Production Function- Isoquants and Isocosts, MRTS, Law of variable proportions- Law of returns to scale- Least Cost Combination of Inputs, Cobb-Douglas Production function- Economies of Scale.

COST ANALYSIS: Cost concepts, Opportunity cost, Fixed Vs Variable costs, Explicit costs Vs. Implicit costs, Out of pocket costs vs. Imputed costs.-Determination of Break- Even Point (Simple problems) - Managerial Significance and limitations of BEP.

Market structures: Types of competition, Features of Perfect Competition, Monopoly and Monopolistic Competition.
Internet Pricing Models: Flat rate pricing, Usage sensitive pricing, Transaction based pricing, Priority pricing, charging on the basis of social cost, Precedence model, Smart market mechanism model. Introduction to e-commerce-types of e-commerce; M-commerce.

UNIT III
TYPES OF INDUSTRIAL ORGANIZATION & INTRODUCTION TO BUSINESS CYCLES:
Characteristic features of Industrial organization, Features and evaluation of Sole Proprietorship, Partnership, Joint Stock Company, State/Public Enterprises and their types. Changing business environment in post-liberalization scenario.

UNIT IV
FINANCIAL MANAGEMENT AND INTRODUCTION TO FINANCIAL ACCOUNTING
Functions of financial management, simple and compound interest, Methods of evaluating alternatives- Present Worth method. Future worth Method, Annual equivalent method.
Introduction to Double-entry system.

UNIT V
DEPRECIATION: Introduction, common methods of depreciation: straight line method, Declining balance method, sum of year's digits method.
CAPITAL AND CAPITAL BUDGETING: Meaning of capital budgeting, Need for capital budgeting – Capital budgeting decisions (Examples of capital budgeting) - Methods of Capital Budgeting: Payback Method, Accounting Rate of Return (ARR), IRR and Net Present Value Method (simple problems)

Learning Resources

Text Books:
1. ENGINEERING ECONOMICS, R. Panneerselvam, 2nd Edition, PHI Learning Pvt. Ltd, 2013
2. Managerial Economics and Financial Analysis, by J.V.Prabhakar Rao, Maruthi Publications, 2011

Reference Books:
1. Managerial Economics and Financial Analysis, by A R Aryasri, TMH 2011.
2. Management- Aglobal Entrepreneurial Perspective,Weihrich,Cannice,Koontz, 13th Edition, Tata Mc Graw Hill.2012.
3. Financial Accounting, SN Maheswari, SK Maheswari, Vikas Publishing House Pvt Ltd., New Delhi, 4th Edition,2006.
4. Managerial Economics by Suma damodaran, Oxford 2011.
5. Managerial Economice and Financial Analysis by S.A. Siddiqui & A.S. Siddiqui, New Age International Publishers, 2011.
6. Engineering economy- Theusen & Theusen, 8th edition,1993,Prentice Hall.

Web references:
1. www.tectime.com
2. www.exinfm.com
3. www.economywatch.com

II B.TECH -I SEMESTER
FM & HM LAB

Course Code: ME3L1 **Credits: 2**
Lecture: -- **Internal assessment: 25 marks**
Lab Practice: 3 periods/week **Semester end examination: 50 marks**

COURSE OBJECTIVES:

- Measure the losses in pipes, coefficient of discharge using notch, Venturimeter and orifice meter, Jet on Vanes and Bernoulli's Theorem that are studied in a lecture course.
- Experiment the performance of hydraulic machines viz. Turbines and Pumps.

COURSE OUTCOMES:

Upon the completion of this course the student will be able to:

1. Estimate minor and major losses in the pipe lines.
2. Calculate the coefficient of discharge through various devices like Venturimeter, orifice meter and Notches.
3. Test the impact of jet on vanes and validation of Bernoulli's Theorem.
4. Assess the performance of Centrifugal pumps, Reciprocating pumps &Hydraulic Turbines.

LIST OF EXPERIMENTS:

ANY 12 EXPERIMENTS FROM THE FOLLOWING

Fluid Mechanics Experiments:

1. Determination of loss of head due to sudden contraction in a pipeline.
2. Determination of friction factor for a given circular pipe line.
3. Coefficient of Discharge of Triangular Notch/Rectangular Notch
4. Determination of Coefficient of Discharge of Venturimeter.
5. Determination of Coefficient of Discharge of Orifice meter.
6. Determination of coefficient of Impact of jets on Stationary Flat, Inclined and Hemispherical Vanes.
7. Experimental Verification of Bernoulli's Theorem.

Hydraulic Machines Experiment:

8. Performance Test on Single Stage Centrifugal Pump.
9. Performance Test on Multi Stage Centrifugal Pump.
10. Performance Test on Reciprocating Pump.
11. Performance Test on Pelton Wheel.
12. Performance Test on Kaplan Turbine.
13. Performance Test on Francis Turbine.

II B. TECH -I SEMESTER
MECHANICS OF SOLIDS & METALLURGY LAB

Course Code: ME3L2 **Credits: 2**
Lecture: -- **Internal assessment: 25 marks**
Lab Practice: 3 periods/week **Semester end examination: 50 marks**

COURSE OBJECTIVES:

- To familiarize the students with the use equipment's to determine mechanical Properties of materials to acquire the knowledge in Material Testing.

COURSE OUTCOMES

Upon the completion of this course the student will be able to:

1. Apply methods to determine Mechanical properties and Elastic Constants
2. Appraise the students with the use of testing machines
3. Characterize the microstructures of different ferrous and nonferrous metals.
4. Identify the effect of heat treatment and cooling rates on the properties of steels

Pre-Requisites: Engineering Mechanics

Twelve Experiments out of the following are to be performed

(6 from MOS Lab and 6 from Metallurgy Lab):

1. Tension Test on UTM - Determination of the strength, percentage elongation and percentage reduction in area of the given specimen
2. Deflection Test on Simply supported beam - Determination of Young's modulus of Simply Supported beam material
3. Deflection Test on Cantilever beam - Determination of Young's modulus of cantilever beam material
4. Torsion Test – Determination of modulus of rigidity of circular rod
5. Brinnell's Hardness Test - Determination of Hardness Number for given specimen
6. Rockwell Hardness test - Determination of Hardness Number for given specimen
7. Izod Impact Test - Determination of impact strength of given specimen
8. Charpy Impact Test - Determination of impact strength of given specimen
9. Tests on helical spring - Determination of Modulus of Rigidity of Helical spring material
10. Double shear Test - Determination of shear strength of given specimen
11. Preparation and study of the microstructure of Iron and steels
12. Preparation and study of microstructure of Cast Irons
13. Preparation and study of the microstructure of Copper and its alloys
14. Preparation and study of microstructure of Aluminum and its alloy
15. Study of microstructure of various treated and untreated steels.
16. Hardenability of Steels by Jominy end Quench test.
17. Hardness of various treated and untreated steels.

II B. TECH - I SEMESTER

PERSONALITY DEVELOPMENT COURSE

Course Code: ME3L3 **Credits:--**
Lecture : --- **Internal assessment: --**
Practice: 1 period/week **Semester end examination:--**

COURSE OBJECTIVES:

- To introduce fundamentals of various aspects of personality traits.
- To give them adequate exposure to the basic aspects which mould the Personality.
- To enable them to develop humble nature. To create in them the love for Human values.

COURSE OUTCOMES:

Upon the completion of this course the student will be able to:

1. Demonstrate Leadership skills
2. Demonstrate Nonverbal skills
3. Exhibit Team culture
4. Exhibit Managerial qualities and communication skills

Pre- Requisite: English

I PERSONALITY:

1. Grooming one's personality
2. Influence of heredity and environment on personality
3. Different personality types.

Personality Development

1. Freudian Analysis
2. Vivekananda concept

II LEADERSHIP QUALITIES

1. Communication skills
2. Attitude
3. Empathy
4. Adaptability
5. Conflict Resolution

III SOFT SKILLS IN WORKPLACE

1. Time management
2. Planning &organization
3. Parkinson's law

4 Team work

5. Assertiveness

IV BODY LANGUAGE

1. Aggressiveness
2. Submissiveness
3. Attentiveness
4. Nervousness

5 Defensiveness

6. Handshake

V GROUP DISCUSSION

1. Steps to attain success in a G.D.
2. Do's and Don'ts in G.D.

Learning Resources

Text Book

1.Personality development &soft skills, by Barun K.Mithra, Oxford

Reference Books:

1. Personal &emotional competence, by V.Bhaskara Rao, B.S.P
2. Step by step, by Niruparani.K, Jayasree mohanraj, Pearson.

II B. TECH - II SEMESTER
MECHANICS OF SOLIDS-II

Course Code: ME4T1 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- The student will compute beam deflections under transverse loads using various methods.
- The student will describe State of stress at a point and compute principal stresses under bi-axial loading conditions.
- The student will be able to analyze curved beams, thick cylinders and rotating discs for induced stresses, strains and deformations under static loads

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Determine the shear stresses and modulus of rigidity in shafts.
2. Calculate deflections of statically determinate and indeterminate beams.
3. Solve problems relating to bending of continuous and curved beams.
4. Analyze and evaluate critical buckling loads of columns under various boundary conditions
5. Evaluate stresses in thin and thick cylinders.

Pre-Requisites: Engineering Mechanics, Mechanics of Solids-I

UNIT I
TORSION

Introduction, Torsion of Circular shafts, Transmission of power by circular shafts, Strain Energy in pure Shear and uniform Torsion for Statically determinate Members.

UNIT II
DEFLECTIONS OF STATICALLY DETERMINATE AND INDETERMINATE BEAMS:

Introduction, Differential Equations of the Deflection Curve, determination of deflections for Simple beams, Fixed beams by Integration of the Bending Moment Equation, Moment Area Method and Macaulay's Method.

UNIT III
CONTINUOUS BEAMS:

Clapeyron's theorem of three moments, Beams with constant moments of inertia.

CURVED BEAMS:

Stresses in Beams of small and large initial curvature, The Winkler-Bach theory, Stresses in Crane Hook and C-Clamp with Rectangular, Circular and Trapezoidal cross sections.

UNIT IV

COLUMNS:

Buckling and Stability, Crippling load of Columns with Pinned ends, fixed-free, fixed-fixed and fixed-pinned effective length of a column, Limitations of Euler's Formula, Rankine's Formula, Columns with eccentric Axial Loads, Secant formula.

UNIT V

THIN CYLINDERS AND THICK CYLINDERS:

Thin Cylinders subjected to internal pressure, efficiency of boiler joints, changes in dimensions of cylinder when subjected to internal pressure, Spherical shell and Wire Wound Cylinders.

Thick Cylinders: Stresses in thick Cylindrical shell (Lame's theory), Radial Deflection, Stresses in Compound Cylinders.

Learning Resources

Text Books:

1. Mechanics of Materials, (2nd edition), by Stephen P. Timoshenko, James M. Gere, C B S Publishers, 2011.
2. Strength of Materials (2nd edition) by S.S. Rattan, Tata Mc-Graw Hill Private Limited, New Delhi, 2012.

Reference Books:

1. Mechanics of Materials, (7th edition) by James M. Gere, Cengage learning India,2010.
2. Mechanics of Materials, (1st edition) by Adarsh Swaroop, New Age International Pvt. Ltd, 2012.
3. Strength of Materials (Mechanics of Solids), revised edition by R.K. Rajput S. Chand Publications.
4. Strength of Materials, (4th edition) by R. K. Bansal, revised, Laxmi Publishers, New Delhi.2010.
5. Abdul Mubeen, "Mechanics of Solids" 2nd Edition, Pearson Education, Noida, 2011

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

II B. TECH - II SEMESTER
APPLIED THERMODYNAMICS

Course Code: ME4T2 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Explain the basic concepts of steam power plant
- Describe the working principle of various components of steam power cycle

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Describe the thermodynamic analysis of Rankine cycle, combustion phenomenon.
2. List the classifications and working principles of different boilers and steam nozzles
3. Classify the steam turbines along with the thermodynamic analysis
4. Recall the requirement and working principles of steam condensers
5. Reproduce the mechanical details and principle of operation for different types of compressors

UNIT I

BASIC CONCEPTS:

Rankine cycle - schematic layout, thermodynamic analysis, methods to improve cycle performance – regeneration & reheating. COMBUSTION: Fuels and combustion, adiabatic flame temperature.

UNIT II

BOILERS:

Classification – working principles – with sketches including H.P.Boilers – mountings and accessories – working principles, boiler horse power, equivalent evaporation, efficiency and heat balance – draught, classification – height of chimney for given draught and discharge, condition for maximum discharge, efficiency of chimney – artificial draught- induced and forced.

STEAM NOZZLES:

Function of a nozzle – applications – types- velocity of fluid at nozzle exit-Ideal and actual expansion in a nozzle, velocity coefficient, condition for maximum discharge, critical pressure ratio, Super saturated flow

UNIT III

STEAM TURBINES:

Classification Impulse turbine; mechanical details – velocity diagram – effect of friction – power developed, axial thrust, blade or diagram efficiency – condition for maximum efficiency. De-laval turbine - methods to reduce rotor speed velocity compounding, pressure compounding and velocity & pressure compounding,

REACTION TURBINE: Mechanical details – principle of operation, thermodynamic analysis of a stage, degree of reaction –velocity diagram – Parson's reaction turbine – condition for maximum efficiency – calculation of blade height.

UNIT IV

STEAM CONDENSERS:

Requirements of steam condensing plant – classification of condensers – working principle of different types – vacuum efficiency and condenser efficiency – air leakage, sources and its affects, air pump.

UNIT V

COMPRESSORS

Classification RECIPROCATING COMPRESSORS: Principle of operation, work required, Isothermal efficiency volumetric efficiency and effect of clearance, stage compression, under cooling, saving of work, minimum work condition for stage compression.

DYNAMIC COMPRESSORS:

Centrifugal compressors: Mechanical details and principle of operation – velocity and pressure variation. Energy transfer, slip factor, power input factor, pressure coefficient and adiabatic coefficient – velocity diagrams.

AXIAL FLOW COMPRESSORS: Mechanical details and principle of operation – velocity triangles and energy transfer per stage, degree of reaction, work done factor - isentropic efficiency- pressure rise calculations – Polytropic efficiency.

Learning Resources

Text Books:

1. Cengle and Boles, "Engineering Thermodynamics" MC Graw Hill publications , 2002
2. V.P. Vasandani and D.S. Kumar "Treatise on Heat Engineering" Metropolitan book Co Pvt Ltd , 2000

Reference Books:

1. Mahesh M.Rathore, Thermal Engineering, MC Graw Hill publications,2012
2. Achuthan ,"Engineering Thermodynamics", PHI, 2005.
3. Rajput, "Thermal Engineering", Lakshmi publications, 2005

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

II B. TECH - II SEMESTER
IC ENGINES AND GAS TURBINES

Course Code: ME4T3 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

1. Acquire knowledge about the IC engine cycles, classification and working Principles
2. Describe the testing and performance parameters along with heat balance Sheet
3. Explain different alternate fuels, gas turbines and about jet propulsion

COURSE OUTCOMES:

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

1. Explain basic concepts of actual cycles with analysis and to describe the fundamental concepts of IC engines along with its working principles.
2. Describe the combustion phenomenon in SI and CI engines.
3. Evaluate the performance of IC engines and the importance of alternate fuels.
4. Classify the essential components of gas turbine along with its performance improving methods.
5. Illustrate the working principle of different types of Jet propulsive engines and Rockets.

Pre-Requisite

Basic Thermodynamics

UNIT I

ACTUAL CYCLES AND THEIR ANALYSIS:

Introduction, Comparison of Air Standard and Actual Cycles, Time Loss Factor, Heat Loss Factor, Exhaust Blow down-Loss due to Gas exchange process, Volumetric Efficiency. Loss due to Rubbing Friction, Actual and Fuel-Air Cycles Of CI Engines.

I.C. ENGINES:

Classification - Working principles, Valve and Port Timing Diagrams, Air – Standard, air-fuel and actual cycles - Engine systems – Fuel, Carburetor, Fuel Injection System, Ignition, Cooling and Lubrication, principle of wankle engine.

UNIT II

COMBUSTION IN S.I. ENGINES: Normal Combustion and abnormal combustion – Importance of flame speed and effect of engine variables – Type of Abnormal combustion, pre-ignition and knocking – Fuel requirements and fuel rating, antiknock additives – combustion chamber – requirements, types.

COMBUSTION IN C.I. ENGINES: Four stages of combustion – Delay period and its importance – Effect of engine variables – Diesel Knock– Need for air movement, suction, compression and combustion induced turbulence – open and divided combustion chambers and nozzles used – fuel requirements and fuel rating.

UNIT III

TESTING AND PERFORMANCE OF IC ENGINES: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, Brake power – Determination of frictional losses and
Indicated power – Performance test – Heat balance sheet and chart.

ALTERNATIVE FUELS:

Liquid fuels – Alcohols - Methanol, Ethanol, Alcohols for SI and CI engines, Gaseous fuels – Hydrogen, Natural gas, CNG and LPG, other possible fuels.

UNIT IV

GAS TURBINES:

Simple gas turbine plant – ideal cycle, essential components – parameters of performance – actual cycle – regeneration, inter cooling and reheating –closed and semi-closed cycles – merits and demerits, types of combustion chambers.

UNIT V

JET PROPULSION:

Principle of operation –classification of jet propulsive engines – working principles with schematic diagrams and representation on t-s diagram - thrust, thrust power and propulsive efficiency – turbo jet engines – needs and demands met by turbo jet –schematic diagram, thermodynamic cycle, performance evaluation, thrust augmentation
– methods.

ROCKETS: Application – working principle – classification – propellant types

Learning Resources

Text books:

1. I.C. Engines, by V. Ganesan, TMH publications - 2008
2. Gas Turbines, by V.Ganesan, TMH publications - 2010
3. Heat engines, by Vasandan & Kumar - - Metropolitan Book Co Pvt Ltd – 2000

References books:

1. IC Engines, by Mathur & Sharma, Dhanpath Rai & Sons - 2005
2. Thermal Engineering, by Rudramoorthy, TMH publications - 2003
3. I.C. Engines, by Heywood - - McGrawHIll publications- 1998

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

II B. TECH - II SEMESTER
KINEMATICS OF MACHINERY

Course Code: ME4T4 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Comprehend the concept of machines, mechanisms and related terminologies. Discriminate mobility (number of degrees-of-freedom) of the member and enumeration of rigid links and types of joints within mechanisms.
- Formulate the concept of synthesis and analysis of different mechanisms. Distinguish a mechanism for displacement, velocity and acceleration at any point in a moving link.
- To analyze Principles and working of various straight line motion mechanisms and understand Steering gear mechanisms and working of hooks joint.
- Perceive the working principles in power drives which includes theory of gears, gear trains and cams

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Build up critical thinking and problem solving capacity of various mechanical engineering problems related to kinematics of machines.
2. Analyze design related problems of straight line motion mechanisms effectively.
3. Asses various concepts of Steering gear mechanisms and working principles of gears and cams
4. velocity and acceleration analysis of simple four bar mechanisms

Pre-Requisite subjects: Engineering Graphics, Engineering Mechanics.

UNIT I

INTRODUCTION:

Elements or Links – Classification – Rigid Link, flexible and fluid link – Types of kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs – closed and open pairs – constrained motion – completely, partially or successfully constrained and incompletely constrained .

MACHINES : Mechanism and machines – classification of mechanisms – kinematic chain – inversion of mechanism – inversions of quadric cycle chain – single and double slider crank chains.

UNIT II

KINEMATICS: Velocity – Motion of link in machine – Determination of Velocity diagrams- Graphical method – Application of relative velocity method four bar chain. Analysis of slider crank chain for displacement, velocity.

ACCELERATION ANALYSIS:

Angular acceleration of Links, Acceleration of Intermediate and offset points- Four Link Mechanism- Slider Crank Mechanism, Corrilies component of acceleration.

PLANE MOTION OF BODY: Instantaneous center of rotation, Three centres in line theorem – Graphical determination of instantaneous centre for Four Bar Mechanism.

UNIT III

STRAIGHT LINE MOTION MECHANISMS:

Exact and approximate copiers and generated types –Peaucellier, Hart and Scott Russul – Grasshopper – Watt T. Chebicheff and Robert Mechanisms and Straight line motion, Pantograph.

STEERING MECHANISMS:

Conditions for correct steering – Davis Steering gear, Ackermans steering gear. HOOKE'S JOINT: Single and double Hooke's joint – velocity ratio –application – simple problems.

UNIT IV

CAMS:

Definitions of cam and followers – their uses – Types of followers and cams – Terminology – Types of follower motion - Uniform velocity – Simple harmonic motion and uniform acceleration. Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

UNIT V

GEARS:

Introduction, Classification of gear terminology, Law of Gearing, Velocity of Sliding, Forms of Teeth, Cycloidal Profile Teeth, Involute Profile Teeth, Path of contact, Arc of contact, Number of pairs of Teeth in contact, Interference in Involute Gears.

GEAR TRAINS:

Introduction, simple Gear Train, Compound Gear Train, Reverted Gear train, Planetary or Epicyclic Gear Train, Analysis of Epicyclic Gear Train, Torques in Epicyclic Trains. Tabular Method.

Learning Resources

Text Books:

1. Theory of Machines, (3 ed Edition) by S.S.Rattan, Tata Mc-Graw Hill, New Delhi, 2012.
2. Theory of machine and Mechanisms, 2 nd Edition by J.E. Shigley, Mc-Graw Hill, New Delhi,1994.

Reference Books:

1. Theory of Mechanisms and Machines, (I st Edition) by C S Sharma and Kamlesh Purohit , Prentice Hallof India pvt.ltd, , New Delhi, 2006.
2. Theory of Machines, (3 ed edition), by Ballaney, P.L, Khanna Publishers, New Delhi 2002.
3. Theory of Mechanisms and Machines, (2nd Edition), by A. Ghosh and ak Mallik, East-West Press (P) Ltd., New Delhi, , 1988.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

II B.TECH -II SEMESTER
PRODUCTION TECHNOLOGY

Course Code: ME4T5 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Specify various casting and welding processes with applications
- Study various metal forming processes.
- Familiarize with the processing of plastics

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Explain fundamentals in the sand casting process.
2. Illustrate various special casting processes
3. Select suitable welding technique based on their application
4. Describe the necessity of metal forming processes
5. Discuss the types of polymers and their processing methods

UNIT I

CASTING : Steps involved in making a casting, Advantages of casting and its applications. Patterns and Pattern making: Types of patterns, Materials used for patterns, pattern allowances.

SAND MOLDING: Basic steps in mold preparation, materials used for mould, types of molds, sand tests as per AFS. Introduction to Gating, Gating ratio and design of gating systems.

METHODS OF MELTING: Crucible melting and cupola operation and charge calculations.

UNIT II

SPECIAL CASTING METHODS:

Permanent Mould Casting, Die Casting: Hot chamber die casting, Cold chamber die casting, Centrifugal casting: True centrifugal casting, Semi – centrifugal casting, Centrifuging. Investment casting, Shell moulding, CO_2 Molding, Continuous casting. Fettling of castings, casting defects: causes and remedies.

UNIT III

WELDING:

Classification of welding process, types of welded joints, Gas welding, Sub merged Arc welding, electron beam welding, solid state welding processes: Forge welding, resistance welding, Friction welding, Induction welding, Explosive welding. Thermit welding and Plasma welding, TIG & MIG welding, Laser welding, Destructive and nondestructive testing of welds. ALLIED PROCESSES: Soldering & Brazing.

UNIT IV

BULK FORMING PROCESSES:

Introduction, Hot and Cold working of metals. Rolling, Forging, Extrusion, Tube making, Drawing and Wire drawing.

SHEET METAL WORKING OPERATIONS: Introduction, Sheet metal Blanking and Piercing operations. Clearance and shear as applied to Punching/Blanking operations. Coining, Hot and Cold Spinning and Stretch Forming.

UNIT V

PROCESSING OF PLASTICS:

Introduction to polymers, Classification of Polymers: Plastics and Elastomers, Comparision of Thermo Plastics and Thermo setting Plastics, Moulding Techniques: Compression Moulding, Transfer Moulding, Injection Moulding, Blow Moulding and Extrusion of Plastics.

Learning Resources

Text Books:

1. Manufacturing Technology – Foundry, Forming and Welding by P. N. Rao, TMH Publications, 2nded, 2000.
2. Manufacturing Engineering and Technology, by Kalpakjian S, Pearson Edu.., 4th edition, 2001.

Reference Books:

1. Fundamentals of Modern Manufacturing, by Mikell P. Groover, Materials, Processes, and Systems", Wiley publications. 5thed, 2013.
2. Principles of Metal Castings, by Richard Heine, Carl Loper, Philip Rosenthal, TMH, 2001.
3. Manufacturing Science, by Amitabha Ghosh and Asok Kumar Mallik, East West Press, 2nd Edition, 2010.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

II B. TECH -II SEMESTER
COMPUTER AIDED MACHINE DRAWING PRACTICE

Course Code: ME4L1 **Credits: 3**
Lecture: --- **Internal assessment: 30 marks**
Practical: 6 periods/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- To acquire the knowledge of drafting software.
- To provide hands on experience to develop 2D models of machine components.

COURSE OUTCOMES:

Upon the completion of this course the student will be able to:

1. Develop engineering drawings for the machine components as per Indian Standard Code of practice using a drafting software.
2. Prepare assembly drawings from part drawings.

Pre-Requisites: Engineering Drawing, Introduction to Computer.

List of Tasks:

S. No	Name of the task	No.of periods	Cumulative no. of periods
1.	Drawing commands	03	03
2.	Editing commands	03	06
3.	Dimensioning commands, Layers	03	09
4.	Principles of Drawing: Title block, Borders, scales and their specifications	03	12
5.	Lines and sections and Dimensioning principles	03	15
6.	Conventional Representation of Materials	03	18
7.	Conventional Representation of Machine components-I	03	21
8.	Conventional Representation of Machine components-II	03	24
9.	Thread Profiles	03	27
10.	single and multi-start threads, left and right hand threads	03	30
11.	Bolts and Nuts: Hexagonal and square headed nuts and bolts;	03	33
12.	Flanged Nut, Dome Nut, Ring Nut, Washer, Lock Nut, Castle Nut, Eye Foundation Bolt	03	36
13.	Cotter Joint with socket and Spigot Ends	03	39
14.	Cotter Joint with Gib	03	42
15.	Knuckle joint	03	45
16.	Riveted Joints: Rivet heads; Double strap diamond butt Joint	03	48
17.	Double riveted chain Lap joint; double riveted double strap zig-zag butt joint	03	51
18.	Keys: Taper Key, Sunk Taper Key, Round Key, Saddle Key, Feather Key, Splined Shaft, Woodruff	03	54

S. No	Name of the task	No.of periods	Cumulative no. of periods
	Key		
19.	Shaft Couplings: Bushed pin type flange coupling	03	57
20.	Universal Coupling	03	60
21.	Oldham's Coupling.	03	63
22.	Involute tooth profile of a spur gear	03	66
23.	Assembly Drawings: Any **four** of the following Stuffing Box of Steam Engine, Eccentric of Steam Engine, Connecting Rod of an IC Engine, Screw Jack, Plumber Block, Tool Post of Lathe Machine.	12	78/3=26 lab sessions per semester

Note:

1) The above Mechanical Components can be Drawn using Mechanical Drafting packages like AutoCAD/ IronCad.
2) Drawings as per IS.
3) All Drawings are in 2-D

Learning Resources

Text Books:

1. Machine Drawing by K.L.Narayan, P.Kannaiah and K.Venkata Reddy, 3rd edition, New Age publications 2006.
2. Machine Drawing with Auto CAD, (1st edition) by GowthamPohit and Goutam Ghosh, Pearson Education, Delhi, 2004.

Reference Books:

1. Machine Drawing, by R.K.Dhawan, S.Chand Publications, New Delhi, 1996.
2. Machine Drawing by K.C.John, PHI Learning Pvt.Ltd.,New Delhi, 2009.

II B.TECH -II SEMESTER
PRODUCTION TECHNOLOGY LAB

Course Code: ME4L2 **Credits: 2**
Lecture: ----- **Internal assessment: 25 marks**
Lab Practice: 3 periods /week **Semester end examination: 50 marks**

COURSE OBJECTIVES:

- Preparation of wooden pattern using carpentry tools.
- Making sand mold using pattern.
- Various operations performed on press tools.
- Simple joints like T-joint, butt joint are prepared using arc, oxy-acetylene, MIG, TIG welding techniques.
- Preparation of gear wheel and hub nut cover using injection molding machine.

COURSE OUTCOMES:

Upon the completion of this course the student will be able to:

1. Make the wooden pattern using carpentry tools.
2. Use the pattern for creating mould cavity.
3. Perform blanking and piercing operations on press tools.
4. Fabricate welded structures for engineering applications.
5. Prepare components using blow and injection molding.

Any 12 Experiments of the following

I) FOUNDRY

1) Preparation of single piece pattern
2) Preparation of split pattern
3) Sand Molding
4) Testing Sand Properties

II) WELDING

1) Arc welding – Two exercises
2) Spot Welding
3) TIG welding
4) Gas Welding

III) PRESS WORKING

1) Piercing and Blanking

IV) PLASTICS PROCESSING

1) Injection Molding – Two exercises
2) Blow Molding

II B.TECH - II SEMESTER
ELECTRICAL & ELECTRONICS ENGG LAB

Course Code: ME4L3 **Credits: 2**
Lecture: ----- **Internal assessment: 25 marks**
Lab Practice: 3 periods/week **Semester end examination: 50 marks**

COURSE OBJECTIVES:

- To provide students with practical knowledge of basic laws i.e ohms law, Kirchhoff's law and measure resistance.
- To help students find V-I relationship for P-N Junction diodes, rectifiers and transistors.
- To brief the students about magnetic and electric devices like transformers and motors

COURSE OUTCOMES:

Upon the completion of this course the student will be able to:

1. To verify various laws using electrical instruments
2. Students are expected to perform open circuits and short circuit tests on transformers and get familiar with various electric motors.
3. To get familiar with various electrical equipment liken-junction diodes, transistors and plot their characteristics w.r.t reading taken.
4. Students are expected to know about the latest practical trends in electrical and electronic fields.

Pre-Requisites: Basic Electrical and Electronics Engineering

PART A: ELECTRICAL ENGINEERING LAB:

The following experiments are required to be conducted as compulsory experiments:

1. Swinburne's test on D.C. Shunt machine. (Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator).
2. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation a given power factors)
3. Brake test on 3-phase Induction motor (Determination of performance characteristics)
4. Speed control of D.C. Shunt motor by
   a) Armature Voltage control b) Field flux control method
5. Brake test on D.C Shunt Motor
6. Open circuit Characteristics of DC shunt generator

SECTION B: ELECTRONICS ENGINEERING:

1. Transistor CE Characteristics (Input and Output)
2. Full wave Rectifier with and without filters.
3. Frequency response of CE Amplifier.
4. RC Phase Shift Oscillator
5. V-I Characteristics of a P-N Junction Diode
6. V-I Characteristics of a SCR

III B.TECH- I SEMESTER
DYNAMICS OF MACHINERY

Course Code:ME5T1 **Credits: 3**
Lecture: 4 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

1. Develop understanding of dynamic analysis like gyroscopic forces and moments, friction of fixed axis rotation of rigid bodies.
2. Determine the dynamic behavior principles and operations of clutches, breaks, flywheels and governers.
3. Relate static and dynamic balancing analysis as applied to machines.

COURSE OUTCOMES:

At the end of course the students will be able to:

1. Apply friction principles to clutches& brakes
2. Determine the gyroscopic effects on rotating elements and compute inertia forces in reciprocating parts.
3. Describe the operation and analysis of flywheel and governors.
4. Calculate static and dynamic balancing for rotating and reciprocating machinery.
5. Analyze the natural frequencies & vibration analysis for single degree of freedom systems

Pre-Requisites:

Kinematics of Machinery

UNIT I
FRICTION CLUTCHES
Introduction, uniform pressure, uniform wear theory, Pivot and Collar bearings. Single Disc or plate clutch, Multiple Disc Clutch, Cone Clutch, Centrifugal Clutch.
Brakes: Radial Brakes-Simple block brakes, band brakes, Band and Block Brakes, Internal expanding brake, braking of a Vehicle

UNIT II
GYROSCOPE
Introduction to Precession, Gyroscopic Couple and its effect on an aero planes and Naval Ships
DYNAMIC FORCE ANALYSIS:
Introduction, D-Alembert's Principle, Angular velocity and Angular acceleration of the Piston and Connecting rod, Forces on the Reciprocating parts of an Engine, Equivalent Dynamical system, Inertia force and Inertia Torque in a reciprocating Engine

UNIT III
TURNING MOMENT DIAGRAM: Introduction, Turning moment diagram for Multi cylinder Engine, Fluctuation of energy. Coefficient of fluctuation of Speed, Energy Stored in a

Flywheel, Flywheel in Punching Press

GOVERNORS

Introduction, Watt, Porter, Proell Governors, Hartnell, Hartung Governors, Sensitiveness of a Governor, Hunting, Isochronisms, Stability, Controlling Force Diagrams

UNIT IV

BALANCING OF ROTATING MASSES:

Introduction, Static balancing, Dynamic balancing, Balancing of single unbalanced rotating mass, Balancing of Several Masses in the same planes, Balancing of Several Masses in Different planes.

BALANCING OF RECIPROCATING MASSES

Introduction to Primary and Secondary balancing. Balancing of Multi cylinder in-line and radial engines

UNIT V

FREE VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS:

Introduction, Definitions, types of vibrations and causes of vibrations, Basic features of Vibrating system, Degree of freedom, D Alembert's Principle, Energy method, Un damped free longitudinal, transverse and torsional vibrations of single degree of freedom systems, equivalent stiffness

Learning Resources

Text Books:

1. Theory of Machines, (3rd Edition) by S.S.Rattan ,Tata Mc.Graw Hill, New Delhi, 2012

Reference Books:

1 Theory of Machines: Kinematics & Dynamics, by P.L. Ballaney, I.K.International Pvt. Ltd., New Delhi,2010
2. Theory of Machines, by B.V.R. Guptha, Khanna Publications, New Delhi,11th Edition,1980
3. Theory of Machines, (5th Edition) by R.K.Bansal, Laxmi Publications(p) ltd. New Delhi, ,2010

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

III B. TECH - I SEMESTER
METAL CUTTING & MACHINE TOOLS

Course Code: ME5T2 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Provide the basic concepts in mechanics of metal cutting, chip formation, various tool materials and tool life.
- Impart the concept of types of lathe, various operations that can be performed in various lathes, various mechanisms adopted.
- Instruct the working principle, operations performed, work, tool holding devices and different attachments in milling and drilling machines.
- Educate the basic fundamentals of reciprocating machine tools shaper, slotter and planning machines.
- Acquaint with the fundamentals of finishing process, super finishing process and their associated machine tools.

COURSE OUTCOMES:

At the end of course the students will be able to:

1. Demonstrate fundamentals of metal removal processes
2. Illustrate working principle, mechanism and various operations performed on lathe
3. Explain the mechanisms of shaper, planner and slotter and various machining operations Performed.
4. Describe drilling and grinding machines, various operations and Nomenclature of Cutters
5. Discuss milling machines, various operations and Nomenclature of Cutters

UNIT I

BASICS OF METAL CUTTING: Elementary treatment of metal cutting theory – elements of cutting process – geometry of single point cutting tools, chip formation and types of chips – built up edge and its effects, chip breakers. Mechanics of orthogonal cutting – Merchant's force diagram, cutting forces, Tool wear, tool life, machinability, cutting fluids, tool materials.

UNIT II

LATHE: Engine lathe – principle of working, specification of lathe – types of lathe – work, tool holding devices for lathes, accessories and attachments- Taper turning, Thread cutting – lathe operations, Capstan and Turret lathes – collet chucks – other work holding, tool holding devices –tool layout.

Principal features of automatic lathes – classification – single spindle and multi-spindle automatic lathes.

UNIT III

SHAPING, SLOTTING AND PLANING MACHINES: Types, Principles of working – principal parts – specifications, operations performed, work holding devices, machining time calculations.

UNIT IV

DRILLING & BORING MACHINES: Principles of working, specifications, types, operations performed – tool holding devices, work holding devices – twist drill –reamers-Boring Machines – fine Boring Machines – jig boring machine, deep hole Drilling Machine.

GRINDING: Theory of grinding – classification of grinding machines, cylindrical and surface grinding machines, tool and cutter grinding machines, different types of abrasives, bonds, specification and selection of a grinding wheel. Lapping, Honing & Broaching operations, comparison to grinding.

UNIT V

MILLING MACHINE: Types, Principles of working – specifications – classification of Milling Machines – principal features of horizontal, vertical and universal Milling Machine, machining operations, types of cutters, geometry of milling cutters, work holding devices, cutter holding devices – methods of indexing, accessories to milling machines, gear cutting.

Learning Resources

Text Books:

1. Manufacturing technology - Metal cutting and Machine tools, 2nd edition by P.N Rao, TMH publications, 2000.
2. Machining and machine tools, by A.B. Chattopadhyay, wiley india pvt. Limited, 2011.

Reference Books:

1. Metal cutting Principles, by M.C. Shaw, 3rd ed., Oxford, 1957.
2. Production Technology, by HMT, (Hindustan Machine Tools), TMH publications 2001.
3. Workshop Technology Vol II, (10th edition), by B.S.Raghu Vamshi, Dhanpat Rai & co (p) Ltd., 2009.
4. Manufacturing Science, by Amitabha Ghosh and Asok Kumar Mallik, East West Press, 2nd Edition, 2010.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

III B. TECH -I SEMESTER
HEAT TRANSFER

Course Code: ME5T3 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Interpret modes and mechanism of heat transfer
- Acquire knowledge on boiling and condensation and to solve problems on heat exchangers

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Describe modes of heat transfer.
2. Formulate one dimensional steady and transient conduction heat transfer problems and explain concept of fins.
3. Explain concepts on forced convective heat transfer, significance of non dimensional numbers and free convection heat transfer
4. Solve problems based on boiling, condensation, LMTD and NTU methods.
5. Describe basic concepts of radiation heat transfer including both black body radiation and gray body radiation.

Pre-Requisites: Applied Thermodynamics

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.

UNIT II

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 – overall heat transfer coefficient – electrical analogy – Critical radius of insulation - Variable Thermal conductivity – systems with and without 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 Chart solutions of transient conduction systems.

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 Pi 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.

FORCED CONVECTION: EXTERNAL FLOWS:

Concepts about hydrodynamic and thermal boundary layer and use of empirical correlations for convective heat transfer Flat plates and Cylinders.

FREE CONVECTION:

Development of Hydrodynamic and thermal boundary layer along a vertical plate – Use of empirical relations for Vertical plates.

UNIT IV

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.

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.

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 and Boltzmann– heat exchange between two black bodies – concepts of shape factor – Emissivity – heat exchange between grey bodies – radiation shields – electrical analogy for radiation networks.

Learning Resources

Text Books:

1. Heat and Mass Transfer by Y.A Cengel, A J Ghajar, Mc Graw Hill education,2011.
2. Heat transfer, by J.P.Holman, TMH publications, 2008 .
3. Heat and Mass Transfer, by Sachdeva, New age International.

Reference Books:

1. Engineering Heat & Mass transfer by Mahesh.M.Rathor ,University science press ,2006
2. Heat Transfer -A Basic Approach, by N.Ozisik , MC Grawhill,1985
3. Heat transfer, by S.P.Sukhatme , Orient longman Pvt. Ltd. 2005
4. Introduction to Heat Transfer, by lncropera and Dewitt, Wiley Publishers,2001
5. Heat Transfer, by D.S. Kumar, SK. Kataria & sons,2009

Data book to be allowed in examination:

- C.P.Kothandaraman & S. Subramanyam, Heat and Mass Transfer Data Book, New Age International Publishers – Sixth edition

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

III B. TECH - I SEMESTER
ENGINEERING METROLOGY

Course Code: ME5T4 **Credits: 3**
Lecture: 3 Periods/week **Internal assessment: 30 Marks**
Tutorial: 1 Period/week **Semester end examination: 70 Marks**

COURSE OBJECTIVES:

- Demonstrate the concept of limits, fits, tolerance and dimensional standard systems.
- Know the working principle of different instruments to measure length, angle, flatness, surface roughness, elements of threads and gears
- Identify the need of comparators and machine tool alignment tests.

COURSE OUTCOMES:

At the end of course the students will be able to:

1. Describe limits, fits, tolerance, Hole and Shaft basis systems and standard systems.
2. Demonstrate the principles of linear and angular measurement, Taylor's principle for the design of Go & No Go gauges.
3. Discuss the construction and working of optical measuring instruments, methods used to estimate flatness and surface roughness.
4. Describe different elements of Gear and Screw thread and their measurement.
5. Illustrate different comparators and Machine tool alignment tests.

Pre-Requisites:

Engineering Physics, Production Technology, Metal cutting and Machine tools

UNIT I

SYSTEMS OF LIMITS AND FITS:

Introduction, Nominal Size, Tolerance, Limits, Deviations, Fits and their types – Unilateral and Bilateral tolerance system, Hole and Shaft basis systems – Interchangeability,
Selective assembly. British standard system, International Standard System, Application of Limits and Tolerances for correct functioning.

UNIT II

LINEAR MEASUREMENT:

Line standards, End standards, wavelength standards, slip gauges, calibration of slip gauges, Dial indicators, Micrometers.

MEASUREMENT OF ANGLES AND TAPERS: Different methods – Bevel protractor,
Angle gauges –Clinometer-Angle dekkor- Spirit levels – Sine bar – Sine table, Rollers
and Spheres used to determine the tapers.

LIMIT GAUGES: Taylor's principle – design of Go and No Go gauges, Plug, Ring, Snap, Gap, Taper, Profile and Position gauges.

UNIT III

OPTICAL MEASURING INSTRUMENTS:

Tool maker's microscope and uses – Collimators, Optical projector, Optical flats and their uses

INTERFEROMETRY: Interference of light, Michaleson's interferometer, NPL flatness interferometer and NPL gauge interferometer.

FLATSURFACE MEASUREMENT: Measurement of flat surfaces – instruments used – Straight edges – Surface plates – Auto collimator.

SURFACE ROUGHNESS MEASUREMENT:
Differences between surface roughness and surface waviness-Numerical assessment of surface finish – CLA,Rt., R.M.S., Rz,R10 values, Method of measurement of surface finish-Profilograph. Talysurf, ISI symbols for indication of surface finish.

UNIT IV
GEAR MEASUREMENT:
Nomenclature of gear tooth, tooth thickness measurement with Gear tooth Vernier and Flange micrometer, Pitch measurement, Total composite error and Tooth to tooth composite errors, Rolling gear tester, Involute profile checking.
SCREWTHREAD MEASUREMENT:
Elements of measurement – Errors in screw threads – Concept of virtual effective diameter, measurement of effective diameter, angle of thread and thread pitch and profile thread gauges.

UNIT V
COMPARATORS:
Types- Mechanical, optical, electrical and electronic, pneumatic comparators and their uses.
MACHINE TOOL ALIGNMENT TESTS:
Machine Tool Alignment Test on lathe, drilling and milling machines.

Learning Resources

Text Books:
1. A Textbook of Engineering Metrology, by I.C.Gupta, Danpath Rai Publications, 7th Edition
2. A Textbook of Metrology, by M. Mahajan, DanpathRai Publications,

Reference Books:
1. Engineering Metrology, by R.K. Jain, Khanna Publishers
2. Precision Engineering in Manufacturing, by R.L.Murthy, New Age Publications
3.Metrology for Engineers, by J.F.W. Galyer , Charles Reginald Shotbolt, Cengage Learning EMEA; 5th edition

E-learning resources:
1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

III B.TECH - I SEMESTER
DESIGN OF MACHINE MEMBERS-I

Course code: ME5T5 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- To introduce the fundamental knowledge of design, which deals about the shape, size and material of a particular machine element.
- To implement the failure theory in designing and predicting the behavior of machine components.
- To introduce the basic principles for design of some machine elements such as riveted joints, welded joints, bolted joints, cotter join and springs.

COURSE OUTCOMES

At the end of the course the students will be able to

1. Describe the Design Procedure and evaluate the size of simple mechanical components subjected to static loads considering theories of failure
2. Apply knowledge in designing mechanical components subjected to stress concentration and Fatigue loads
3. Design and analyze permanent joints such as riveted and welded joints under loading conditions
4. Design and analyze temporary joints such as bolted and cotter joints under loading conditions
5. Design and Analyze springs for the given loading

Pre Requisites: Mechanics of Solids

UNIT I
DESIGN FOR STATIC STRENGTH:
Basic Procedure of Machine Design, Classifications of Machine design, Factors to be considered in Machine Design, Preferred numbers and significance.
Simple Stresses - Combined stresses - Torsion and bending stresses - stress strain relations, Theories of elastic failure – Maximum Principal stress theory, Maximum shear stress theory, Distortion energy theory

UNIT II
DESIGN FOR FATIGUE STRENGTH:
Fluctuating Stresses, Fatigue Failure, Fatigue strength and endurance limit, Endurance limit - Approximate estimation, Stress concentration – theoretical stress concentration factor – Reduction of Stress Concentration, Fatigue stress concentrations factor, Design for fluctuating stresses – Gerber Method, Goodman Method, Soderberg Method.

UNIT III

RIVETED JOINTS:

Types of riveted joints, Types of Failure, efficiency of riveted joint, Design of Joints for boiler Shell, eccentrically loaded riveted joints.

WELDED JOINTS:

Types of welded joints, Strength of Parallel Fillet welds, Strength of Transverse Fillet welds, Axially Loaded Unsymmetrical welded Joints, eccentrically loaded welded joints.

UNIT IV

BOLTED JOINTS: Load on bolt due to initial tightening, external loading, combined loading, Eccentrically loaded bolted joints in shear, Eccentric load perpendicular to axis of bolt

COTTER JOINTS: Types of cotter joints, Design of Socket and Spigot Joint, Design of Sleeve and Cotter Joint, Design of Gib and Cotter Joint, kunekle joint

UNIT V

SPRINGS:

Types of springs, Terminology of Helical Springs, Styles of End, Stress and Deflection Equations, Series and parallel Connections, Design of Helical springs, Design against Fluctuating load

Leaf springs, Design of Leaf spring, nipping of Leaf Spring

Learning Resources

Text books:

1. Design of Machine Elements, (3rd Edition) by V.B. Bhandari, Tata McGraw Hill Publishers, New Delhi, 2014.
2. Machine Design an Integrated Approach, (5th Edition) Robert L. Norton, Pearson Education Limited, New Delhi, 2013.

Reference books:

1. A Textbook of Machine Design (SI Units) (12th Edition) by P. C. Sharma, Dr. D. K. Aggarwal, S. K. Kataria & Sons, New Delhi, 2012.
2. Mechanical Engineering Design, (8th Edition) by Joseph Shigley, Charles R Mischke, Tata McGraw Hill Publishers, New Delhi, 2008.
3. Design of Machine Elements, by C. S. Sharma, Kamlesh Purohit, Prentice Hall of India Private Limited (PHI), New Delhi, 2009.
4. A Textbook of Machine Design by R S Khurmi, J K Guptha, S Chand & Company Ltd., New Delhi., (25th Edition), 2005.
5. Design of Machine Elements, (2nd Edition) by P. Kannaiah, Scitech Publications India Private Limited, Chennai, 2009.

DATA BOOKS TO BE ALLOWED IN EXAMINATION:

1 Design data hand book by K Mahadevan & K Balaveera Reddy, (4th Edition), CBS Publishers, 2013.

2 Design Data Hand Book by S. Md. Jalaluddin, First Edition, Anuradha Publications, Chennai, 2009.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

III B. TECH - I SEMESTER
CAD/CAM

Course Code: ME5T6 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

The objective of the course is to enable students to

- Provide basic foundation in computer aided design / manufacturing
- Understand the fundamentals used to create and manipulate geometric models
- Get acquainted with the basic CAD software designed for geometric modeling
- Learn working principles of NC machines CNC control and part programming
- Understand concept of Group Technology, FMS and CIM

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Describe basic structure of CAD workstation, Memory types, input/output devices and display devices and computer graphics
2. Acquire the knowledge of geometric modeling and Execute the steps required in CAD software for developing 2D and 3D models and perform transformations
3. Explain fundamental and advanced features of CNC machines
4. Illustrate Group Technology, CAQC and CIM concepts

Pre Requisites: Metal Cutting and Machine Tools

UNIT I

INTRODUCTION: Computers in Industrial Manufacturing, Product cycle, CAD / CAM Hardware, Basic structure, CPU, Memory types, input devices, display devices, hard copy devices, storage devices.

COMPUTER GRAPHICS:

Raster scan graphics coordinate system, database structure for graphics modeling, transformation of geometry, 3D transformations, mathematics of projections, clipping, hidden surface removal.

UNIT II

GEOMETRIC MODELING:

Requirements, geometric models, geometric construction models, curve representation methods, surface representation methods, modeling facilities desired.

DRAFTING AND MODELING SYSTEMS:

Basic geometric commands, layers, display control commands, editing, dimensioning, solid modeling.

UNIT III
NUMERICAL CONTROL:
NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools, features of Machining center, turning center, CNC Part Programming: fundamentals, manual part programming methods, Computer Aided Part Programming.

UNIT IV
GROUP TECHNOLOGY:
Part family, coding and classification, production flow analysis, advantages and limitations, Computer Aided Processes Planning, Retrieval type and Generative type.

COMPUTER AIDED QUALITY CONTROL:
Terminology in quality control, the computer in QC, contact inspection methods, noncontact inspection methods-optical, noncontact inspection methods-non-optical, computer aided testing, integration of C AQC with CAD/CAM.

UNIT V
COMPUTER INTEGRATED MANUFACTURING SYSTEMS:
Types of Manufacturing systems, Machine tools and related equipment, material handling systems, computer control systems, human labor in the manufacturing systems, CIMS benefits.

Learning Resources

TEXT BOOKS:
1. CAD / CAM A Zimmers & P.Groover/PE/PHI
2. CAD / CAM Theory and Practice / Ibrahim Zeid / TMH
3. CAD/CAM by P.N. Rao/TMH.

References books:
1. Automation, Production systems & Computer integrated Manufacturing/ Groover /P.E
2. CAD / CAM / CIM / Radhakrishnan and Subramanian / New Age
3. Principles of Computer Aided Design and Manufacturing / Farid Amirouche / Pearson
4. CAD/CAM: Concepts and Applications/Alavala/ PHI
5. Computer Numerical Control Concepts and programming / Warren S Seames / Thomson.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

III B.TECH - I SEMESTER
FUELS & IC ENGINES LAB

Credits: 2

Course Code: ME5L1
Lecture: - **Internal assessment: 25 marks**
Practice: 3 periods/week **Semester end examination: 50 marks**

COURSE OBJECTIVES:

- Determine the calorific value of different types of solid, liquid and gaseous fuels by using bomb calorimeter and Junker's gas calorimeter and to estimate quality of the fuel using canradson's carbon residue tester.
- Evaluate the performance of various types of petrol, diesel engines and reciprocating air compressor, study of boilers.

COURSE OUTCOMES:

Upon the completion of this course the student will be able to:

1. Test the performance of different types of petrol engine and diesel engine
2. Assess the performance of reciprocating air compressor, boilers, disassembly and assembly of engine.
3. Calculate calorific values among different types of solid, liquid and gaseous fuels.
4. Measure the quality of the fuel by estimating the carbon residue of the fuel.

Pre Requisites : IC engines and gas turbines

ANY 12 EXPERIMENTS FROM THE FOLLOWING

I.C. Engines Lab

1. I.C. Engines valve/ port time diagram
2. I.C. Engines Performance Test (4-stroke Diesel Engines)
3. I.C. Engines Performance Test on 2-stroke petrol engine
4. Evaluation of Engine friction by conducting Morse test on 4-stroke Multi cylinder petrol Engine
5. Retardation test on diesel engine
6. I.C. Engines Heat Balance
7. I.C. Engines Air/Fuel Ratio and Volumetric Efficiency
8. Performance test on computer based 4 stroke multi cylinder petrol engine
9. Performance Test on Reciprocating Air-Compressor unit
10. Study of Boilers
11. Disassembly/Assembly of Engines.

Fuels Lab :

1. Junker’s gas calorimeter
2. Bomb calorimeter
3. Canradson’s carbon residue tester

III B.TECH I SEMESTER
MACHINE TOOLS LAB

Course Code: ME5L2 **Credits: 2**
Lecture: - **Internal assessment: 25 marks**
Tutorial: 3 periods/week **Semester end examination: 50 marks**

COURSE OBJECTIVES:

- Familiarize different machine tools used in production floor.
- Impart hands on experience on lathe, drilling, shaping, milling, slotting, Grinding, Planning and tool and cutter grinding machines.

At the end of course the students will be able to:

1. Perform step, taper turning, threading, knurling and Form turning.
2. Perform Drilling & Tapping operations on given work piece.
3. Produce plain or stepped surface using shaper, planner and surface grinder.
4. Fabricate keyway slot using milling machine and slotter.
5. Prepare different cutting tool angles using Tool and cutter grinder.

Pre-Requisites: Metal cutting and Machine Tools

Any 12 Experiments of the following
Lathes

1. Plain Turning
2. Step turning
3. Taper turning by swiveling compound rest
4. Taper turning by taper turning attachment
5. Threading
6. Knurling
7. Form Turning

Non-Lathes

1. Drilling and tapping on Square block
2. Shaping a stepped surface
3. Slotting a Rectangular slot
4. Milling a Keyway
5. Surface grinding of Rectangular block
6. Grinding of single point cutting tool angles.
7. Planing a stepped surface

III B.TECH -I SEMESTER
CAD/CAM LAB

Course Code: ME5L3 **Credits: 2**
Lecture: --- **Internal assessment: 25 marks**
Lab Practice: 3 periods/week **Semester end examination: 50 marks**

COURSE OBJECTIVES:

COURSE OUTCOMES:
Upon completion of this course the students will be able to

- Execute steps required for modeling 3D objects by using protrusion, cut, sweep, extrude commands
- Convert 3D solid models into 2D drawing-different views, sections
- Use isometric views and dimensioning of part models
- Machine simple components on CNC machines
- Use CAM software to generate NC code

CAD LAB

LIST OF EXPERIMENTS

Performing following experiments using Pro-E software

1. Solid modeling of screw with thread
2. Solid modeling of bolt and nut
3. Solid modeling of connecting rod
4. Solid model of screw jack body or casting, screw and nut
5. Solid models of screw jack bodies' Cup, Washer, Set Screw and Tommy Bar
6. Assembly of screw jack parts and constructions of 2D drawings

CAM LAB

(A) Machining of simple components on NC lathe and Mill by transferring NC :
7. Rectangular contouring on XL MILL
8. Arbitrary contouring on XL MILL
9. Step turning on XLTURN
10. Taper Turning on XLTURN

(B) Development of NC code using CAM package:
11. Rectangular and Arbitrary contouring NC code generation using ESPRIT
12. Step turning and Taper Turning NC code generation using ESPRIT

III B.TECH- II SEMESTER
MECHANICAL MEASUREMENTS

Course Code: ME6T1 **Credits: 3**
Lecture: 3 Periods/week **Internal assessment: 30 marks**
Tutorial: 1 Period /week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Demonstrate fundamentals, basic procedures for operating, testing, calibration and the characteristics of an instrument.
- Select different types of instruments their construction details, working principle which are used to measure different parameters like displacement, pressure, temperature, level, flow, speed, vibration etc.
- Know the construction details, working principle and mounting of strain gauges for measurement of bending, compressive and tensile forces.
- Interpret working principle of various instruments used for measurement of humidity, torque and power.
- Illustrate various basic reasons for pollution, methods used for controlling pollution.

COURSE OUTCOMES:

At the end of course the students will be able to:

1. Identify the basic elements, configuration, errors and characteristics of an instrument.
2. Describe the instruments for the measurement of displacement, temperature, pressure, fluid flow, level.
3. Explain the instruments used for the measurement of speed, acceleration and vibration.
4. Discuss the measurement of force, torque, power & applications of strain gauges.
5. Discuss about the humidity measurement equipment, Air pollution sampling & control.

Pre Requisites: Basic Electrical and Electronics.

UNIT I

DEFINITION:

Basic principles of measurement, measurement systems, generalized configuration and functional descriptions of measuring instruments- examples, static and dynamic performance characteristics, sources of error, classification and elimination of error, calibration procedure.

MEASUREMENT OF DISPLACEMENT:

Theory and construction of various transducers to measure displacement, piezoelectric, inductive, capacitance, resistance, ionization and photo electric transducers,

MEASUREMENT OF TEMPERATURE: Classification, ranges, various principles of measurement- expansion, electrical resistance, thermistor, thermocouple, pyrometers temperature indicators.

UNIT II

MEASUREMENT OF PRESSURE:

Units- classification- different principles used, manometers, piston, bourdon the pressure gauges, bellows- diaphragm gauges, low pressure measurement- thermal conductivity gauges, ionization pressure gauges, Mcleod pressure gauge.

MEASUREMENT OF LEVEL:
Direct method- Indirect methods- capacitive, ultrasonic, magnetic, cryogenic fuel level indicators-bubbler level indicators
FLOW MEASUREMENT: Rota meter, magnetic, ultrasonic, turbine flow meter, hot-wire anemometer, Laser Doppler Anemometer (LDA).

UNIT III
MEASUREMENT OF SPEED:
Mechanical tachometers, electrical tachometers, stroboscope, noncontact type of tachometer
MEASUREMENT OF ACCELERATION AND VIBRATION: Different simple instruments, principles of seismic instruments- vibro meter and accelerometer using this principle.

UNIT IV
MEASUREMENT OF FORCE,TORQUE AND POWER: Elastic force meters, load cells ,torsion meters, dynamometers
STRESS STRAIN MEASUREMENTS:
Various types of stress and strain measurements- electrical strain gauge-gauge factor, method of usage of resistance strain gauge for determining bending, compressive and tensile strains-usage for measuring torque, strain gauge rosettes.

UNIT V
MEASUREMENT OF HUMIDITY: Moisture content of gases, sling psychomotor, absorption psychomotor, Dew point meter.
MEASUREMENT OF POLLUTION CONTROL: Introduction- Air pollution, Metrological aspects, air pollution sampling and measurement -Air pollution control methods and equipment, control of specific gaseous pollutants.

Learning Resources

Text books:
1. Mechanical measurements, by Thomas G. Beckwith, Nelson Lewis Buck, Roy D. Marangoni, Addison-Wesley Pub. Co
2. Mechanical Measurements, by Beckwith, Marangoni, Linehard, PHI, PE
3. Environmental pollution control Engineering, by Rao. C.S, New Age International Pvt. Ltd., 2nd Edition, 2006.
Reference books:
1. Measurement systems: Application and design, by Doeblin Earnest. O.Manik and Dhanesh TMH
2. Experimental Methods for Engineers by Holman, McGraw Hill
3. Mechanical Measurements and control, by Dr. D.S.Kumar, Metropolitan Book Co. Pvt. Ltd.
4. Instrumentation Measurement and Analysis, by B.C.Nakra and K.K.Chaudhry, Mc Graw Hill Education (India) Private Limited.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

III B.TECH - II SEMESTER

DESIGN OF MACHINE MEMBERS - II

Course Code: ME6T2 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 Period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- To introduce the concept, procedures, and data to analyze machine elements in power transmission systems.
- To apply principles of design to mechanical power transmission elements such as shafts, keys & couplings, bearings, belts and gears.
- Analyze the mechanical power drives by considering the stresses and interrelationships among the elements.
- Implement basic principles for design of power screws

COURSE OUTCOMES

At the end of the course the students will be able to

1. Analyze and Design shafts keys and couplings under loading conditions
2. Select suitable bearings and its constituents from manufacturers catalogues under given loading conditions
3. Select suitable belt drives and associated elements from manufacturers catalogues under given loading conditions
4. Analyze wire ropes and power screws subjected to loading
5. Apply the design concepts to estimate the strength of the gear

Pre Requisites: Design of machine Members-I, Kinematics of Machinery

UNIT I
SHAFTS:
Design of solid and hollow shafts for strength – For Bending, Torsion, Combined bending and torsion and combined bending, torsion and axial loads
KEYS & COUPLINGS:
Types of Keys, Design of square and flat keys, Rigid couplings – Muff, split muff and Flange couplings, Flexible coupling- Bushed-Pin Flexible coupling

UNIT II
SLIDING CONTACT BEARINGS:
Types of Bearings, Bearing materials, Lubrication, types of lubricants, properties of lubricants, Journal bearing design (using Mckee's equation and Raimondi and Boyd charts & tables)

ROLLING CONTACT BEARINGS: Types of Bearings, Static load, Dynamic load, Equivalent radial load, selection of bearings from Manufacturers catalogue

UNIT III

BELT DRIVES:

Flat belts, Belt constructions, Geometrical relationships, Analysis of belt tensions, condition for maximum power, Selection of Flat belts from manufacturer's catalogue V Belts, Selection of V-belts from manufacturer's catalogue, Chain drives, Selection of chains from manufacturer's catalogue

UNIT IV

WIRE ROPES: Wire ropes construction, classification, Designation, stresses in wire ropes, selection of wire ropes

POWER SCREWS:

Forms of threads – Torque required to lift and lower the load, self-locking screw, efficiency, collar friction, Design of screw and Nut, Design of Screw Jack

UNIT V

SPUR GEARS: Classification of gears, Terminology of spur gear, Force analysis, Gear tooth failures, Beam Strength of gear teeth, Dynamic tooth Load, wear tooth load, Lewis Equation.

HELICAL GEARS: Terminology of helical gears, force analysis, Beam Strength of helical gears, effective load on gear tooth, wear strength of helical gears, Lewis Equation.

Learning resources

Text books:

1. Design of Machine Elements, (3rd Edition) by V.B. Bhandari, Tata McGraw Hill Publishers, New Delhi, 2014.
2. Machine Design an Integrated Approach, (5th Edition) Robert L. Norton, Pearson Education Limited, New Delhi, 2013.

Reference books:

1. A Textbook of Machine Design (SI Units) (12th Edition) by P. C. Sharma, Dr. D. K. Aggarwal, S. K. Kataria & Sons, New Delhi
2. Mechanical Engineering Design, (8th Edition) by Joseph Shigley, Charles R Mischke, Tata McGraw Hill Publishers, New Delhi, 2008.
3. Design of Machine Elements by C. S. Sharma, Kamlesh Purohit, Prentice Hall of India Private Limited (PHI), New Delhi, 2009.
4. A Textbook of Machine Design by R S Khurmi, J K Guptha, (25th Edition), S Chand & Company Ltd., New Delhi, 2005.

DATA BOOKS TO BE ALLOWED IN EXAMINATION:

1 Design data hand book by K Mahadevan & K Balaveera Reddy, (4th Edition), CBS Publishers, 2013.

2 Design Data Hand Book, (First Design Data Hand Book, (First Edition),

S. Md. Jalaluddin, Anuradha Publications, Chennai, 2009.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

III B.TECH - II SEMESTER
OPERATIONS RESEARCH

Course Code: ME6T3 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

The objective of the course is to enable students to

- Obtain mathematical skills for solving engineering and economic problems; determine optimal solutions to a variety of situations, and present managerial recommendations based on optimal solutions.
- Acquire the skills for solving real time problems, using numerical techniques.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Formulate practical situations by using linear programming and solving problems such as transportation, allocation and sequencing of jobs.
2. Establish decisions about replacement of items that deteriorate with time and solve game theory problems.
3. Assess the utilization of facility by applying waiting line theory and solve inventory problems.
4. Solve practical problems by using integer, Dynamic programming and simulate real time problems.

UNIT I

INTRODUCTION TO 'OR'– Definition, Characteristics and Phases of OR, Operation Research models, applications.

LINEAR PROGRAMMING: 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, U-V method, unbalanced transportation problems, Degeneracy.

ASSIGNMENT PROBLEM: Formulation, Optimal solution, Variants of Assignment Problem-Traveling Salesman problem.

SEQUENCING: Introduction, sequencing of n jobs through two machines, n jobs through three machines –two jobs through 'm' machines.

UNIT III

REPLACEMENT THEORY: Introduction, Replacement of items that deteriorate with time, when money Value is not counted and counted- Replacement of items that fail completely, group Replacement.

GAME THEORY: Introduction, Mini-max (maxi-min) Criterion and optimal Strategy Solution of games with saddle points Rectangular games without saddle point's - 2X2 games dominance principle–mX2 & 2Xn games-graphical method.

UNIT IV

QUEUEING THEORY: Introduction- parameters of queueing system-kendall's notation-single-server model-finite capacity queue system-multi-server model.

INVENTORY CONTROL: Introduction–Single item–Deterministic models- with and without shortages -Purchase inventory models with one price break and multiple price breaks– probabilistic models–Demand maybe discrete variable or continuous variable–Instantaneous production.

UNIT V

DYNAMIC PROGRAMMING: Introduction, Bellman's Principle of optimality, Applications of dynamic programming-simple problems.

SIMULATION: Definition, Types of simulation models, phases of simulation, applications of simulation, Queuing problems, Advantages and Disadvantages Simulation Languages.

Learning Resources:

Text Books:

1. Operations Research, by S.D.Sharma, Kedarnath & Ramnath publications (15th edition),2013.
2. Introduction to Operations Research, by Taha, Pearson Education,New Delhi, (8^{th} edition), 2008.

Reference Books:

1. Operations Research, (4^{th} edition) by A.M .Natarajan, P. Balasubramani, ATamilarasi, Pearson Education, New Delhi, 2009.
2. Operations Research, (2nd edition) by R.Pannerselvam, 2009,PHI Publications, Noida
3. Operations Research, (2nd edition) by Wagner, 2007, PHI Publications, Noida
4. Operation Research, (4th edition) by J.K.Sharma, 2009, MacMilan publishers, india Ltd. New Delhi.

web resources:

1. http://nptel.ac.in/courses/112106134/
2. http://nptel.ac.in/courses/112106131/

III B.TECH -II SEMESTER
REFRIGERATION AND AIR CONDITIONING

Course code: ME6T4 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

The objectives of the course are:

- To make the students understand the concepts of various refrigeration systems
- To estimate the loads for different applications of air conditioning.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Calculate the COP of air refrigeration systems
2. Describe various components used in vapour-Compression refrigeration system and Estimate the performance
3. Discuss the working principles of vapour absorption, steam jet, thermoelectric and vortex tube refrigeration systems
4. Recognize the properties of air, summarize the various Psychometric processes and acquire the knowledge of load estimation.
5. Evaluate cooling and heating loads in an air conditioning and describe the various components of air conditioning system

Pre-Requisite Basic thermodynamics

UNIT I

INTRODUCTION TO REFRIGERATION:

Necessity of refrigeration and air conditioning, applications, unit of refrigeration

Refrigeration:

Carnot cycle, Bell Coleman cycle and Brayton Cycle, Open and Dense air systems, Actual air refrigeration system –numerical problems.

Refrigeration needs of air craft's, methods of air refrigeration systems

UNIT II

VAPOUR COMPRESSION REFRIGERATION SYSTEM:

Cycles and performance

Simple Vapour compression refrigeration cycle -working principle, essential components, COP, representation of cycle on T–S and p-h charts, effect of sub cooling and super heating–cycle analysis. Actual cycle, Influence of various parameters on system performance - numerical Problems

Components

Compressors – classification –single stage reciprocating compressors- Working Principle, work done with and without clearance volume, capacity control.

Condensers –classification–Working of evaporative condensers

Evaporators– classification–Working of flooded and dry expansion evaporators

Expansion devices–Types–capillary tube, automatic expansion valve, thermostatic expansion

valve. Refrigerants: Desirable properties–classification refrigerants

UNIT III

Performance of vapor absorption refrigeration system:

Calculation of max COP, description and working of NH_3–water system and Li Br– water (Two shell & Four shell) System. Principle of operation of three fluid absorption system, salient features.

Steam jet refrigeration system:

Working Principle and Basic Components

Nonconventional refrigeration methods:

Principle and operation f(i) Thermoelectric refrigerator (ii) Vortex tube or Hilsch tube.

UNIT IV

INTRODUCTION TO AIR CONDITIONING:

Psychometric Properties & Processes–Characterization of Sensible and latent heat loads—Need for Ventilation, Consideration of Infiltration, Load concepts of RSHF, GSHF, ESHF and ADP.

UNIT V

Human comfort and load calculations

Requirements of human comfort and concept of effective temperature-Comfort chart– Com fort Air conditioning –Requirements of Industrial air conditioning, Air conditioning Load Calculations.

Air Conditioning Systems

Classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers fans and blowers. Heat Pump –Heat sources– different heat pump circuits.

Learning Resources

Text Books:

1. A Course in Refrigeration and Air conditioning / SC Arora & Domkundwar / Dhanpatrai
2. Refrigeration and Air Conditioning / CP Arora / TMH.

Reference Books:

1. Refrigeration and Air Conditioning by R K Rajput, S K kataria & sons , 2010
2. Refrigeration and Air Conditioning / Manohar Prasad / New Age.
3. Principles of Refrigeration, by Dossat ,Prentice Hall,1997
4. Refrigeration and air conditioning, by Stoecker , Mc Graw hill Edu.,2004
5. Basic refrigeration and air conditioning/PN Ananthanarayanan/Mc Graw hill education

Data Books

1. Refrigeration and Air conditioning Data book, CP Kothandaraman /New age publishers
2. Refrigeration and Air conditioning Data book-Domakundwar & Domakundwar / Dhanpathi rai & CO

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

III B.TECH - II Semester

INDUSTRIAL ENGINEERING & MANAGEMENT

Course code: ME6T5 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30marks**
Practice: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Understand fundamental functions of management
- Get the knowledge of choosing best location for plants
- Know the application of tools of operation management.
- Identify the statistical techniques to improve the quality

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Describe the role and responsibilities of management and the organizational Structures
2. Explain the leadership qualities and concept of plant layout.
3. Apply different quality control techniques
4. Discuss various operations management Techniques
5. Solve operations management and project management problems

UNIT I

Introduction: Definition of Industrial Engineering, Applications, Role of Industrial Engineer, Quantitative tools of IE, Functions of Management, Taylor's Scientific Management, Fayol's Principles of Management, Douglas Mc-Gregor's Theory X and Theory Y, Hertzberg's Two Factor Theory of Motivation, Maslow's Hierarchy of Human Needs.

UNITII

ORGANISATIONAL STRUCTURES: Basic concepts related to Organization – Depart mentation and Decentralization, Flat and Tall organizations, Organizational chart, Line organization, Line and staff organization, functional organization

LEADER SHIP: Introduction, Definition, Types of leadership based on authority- their area of applicability and suitability, advantages and limitations, Traits approach to leadership

PLANT LOCATION: Definition, factors affecting the plant location, comparison of rural and urban sites. Plant Layout – definition, objectives, types of production, types of plant layout – various data analyzing forms-travel chart.

UNIT III

INSPECTION AND QUALITY CONTROL: Types of inspections - Statistical Quality Control-techniques-variables and attributes-assignable and non-assignable causes- variable control charts, and R charts, attributes control charts, p charts and c charts. Acceptance sampling- Single Sampling-OC curves. Introduction to TQM-Quality Circles, ISO 9000 series procedures.

UNIT IV

WORK STUDY: Definition, objectives, method study - definition, objectives, steps involved- various types of associated charts-out line process charts, flow process charts, two handed process charts and SIMO charts- difference between micro motion and memo motion studies.

TIME STUDY: definition, time study, steps involved-equipment, different methods of performance rating- allowances, standard time calculation.

UNITV

PROJECT MANAGEMENT: Network modeling, Probabilistic model-various types of activity times estimation, programme evaluation review techniques (PERT), probability of completing the project, deterministic model- critical path method (CPM), critical path calculation, crashing of simple of networks.

Learning Resources

Text Books:

1. O.P. Khanna, "Industrial Engineering and Management", DhanpatRai
2. T. R. Banga, S. C. Sharma, N. K. Agarwal, "Industrial Engineering and Management Science" Khanna Publishers.

Reference Books:

1. PannerSelvam, Production and Operations Management, PHI, 2004.
2. Ralph M Barnes, Motion and Time Studies, John Wiley and Sons, 2004.
3. Chase, Jacobs, Aquilano, Operations Management, TMH 10th Edition, 2003.
4. L.S.Srinath, PERT / CPM, affiliate East-West Press, New Delhi, 2000.
5. Phillip Kotler, Marketing Management, Pearson, 2004.
6. S. Bhaskar, "Management Science" Anuradha Publications.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

III B.TECH - II SEMESTER
MECHATRONICS

Course code: ME6T6FE1 **Credits: 3**
Lecture: 3 Periods/week **Internal assessment: 30 Marks**
Tutorial: 1 Period/week **Semester end examination: 70 Marks**

COURSE OUTCOMES:
At the end of course the students will be able to:
1. Demonstrate the mechatronic systems and sensors used in building mechatronic systems
2. Illustrate various types of actuation systems.
3. Discuss the modeling of basic systems and their dynamic response.
4. Describe the basic structure and functions of closed loop controllers, Microprocessor and micro controllers.
5. Discuss the basics of digital logic, PLC programming and applications of Fuzzy logic.

Pre-Requisites:
Basic electrical and electronics

UNIT I
INTRODUCTION: Definition of Mechatronics, evolution of mechatronics, systems, measurement systems, control systems, mechatronic design process, traditional design and mechatronic design, applications of mechatronic systems, advantages and disadvantages of mechatronic systems.
SENSORS: classification of sensors, basic working principles, Velocity sensors – Proximity and Range sensors, ultrasonic sensor, laser interferometer transducer, Hall Effect sensor, inductive proximity switch. Light sensors – Photodiodes, phototransistors, tactile sensors – PVDF tactile sensor, micro-switch and reed switch Piezoelectric sensors, vision sensor

UNIT II
PNEUMATIC AND HYDRAULIC ACTUATION SYSTEMS: Actuation systems, Pneumatic and Hydraulic systems- constructional details of filter, lubricator, regulator, direction control valves, pressure control valves, flow control valves, actuators-linear and rotary.
ELECTRICAL ACTUATION SYSTEMS: Electrical systems, Mechanical switches, solid state switches, solenoids, DC motors, AC motors, stepper motors. Characteristics of pneumatic, hydraulic, electrical actuators and their limitations.

UNIT III
BASIC SYSTEM MODELS: Mathematical models, mechanical system building blocks, electricl system building blocks, fluid system building blocks, thermal system building blocks,
DYNAMIC RESPONSES OF SYSTEMS: Transfer function, Modelling dynamic systems, first order systems, second order systems.

UNIT IV

CLOSED LOOP CONTROLLERS: Classification of control systems, feedback, closed loop and open loop systems, continuous and discrete processes, control modes, two step mode, proportional mode, derivative control, integral control, PID controller.

MICROPROCESSOR AND MICRO CONTROLLER: Introduction, Architecture of a microprocessor (8085), Architecture of a Micro controller, Difference between microprocessor and a micro controller.

UNIT V

DIGITAL LOGIC: Digital logic, number systems, logic gates, Boolean algebra, Karnaugh maps, application of logic gates, sequential logic, transducer Signal Conditioning and devices for data conversion.

PROGRAMMABLE LOGIC CONTROLLERS: Introduction, basic structure, input/output processing, programming, mnemonics, timers, internal relays and counters, shift register, master and jump controls. Data handling, Analog input/output, selection of a PLC.

FUZZY LOGIC APPLICATIONS IN MECHATRONICS: Fuzzy logic systems, Fuzzy control Uses of Fuzzy expert systems.

Learning Resources

Text Books:

1. Mechatronics Electronic Control Systems in Mechanical and Electrical Engineering, (3rd edition), by W Bolton, Pearson Education Press, 2005.
2. Mechatronics System Design, 5th Indian reprint, 2009, by Devdas shetty, Richard A. kolk, PWS Publishing Company

Reference Books:

1. Mechatronics Source Book, by Newton C Braga, Thomson Publications, Chennai.
2. Mechatronics, by N. Shanmugam, Anuradha Agencies Publishers.
3. Control sensors and actuators, by C.W.Desilva, Prentice Hall.
4. Design with Microprocessors for Mechanical Engineers, by Stiffler, A.K.McGraw- Hill (1992).
5. Mechatronics – N. Shanmugam / Anuradha Agencies Publishers.
6. Mechatronics – Principles and Application Godfrey C. Onwubolu, Wlsevier, 2006 Indian print.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

III B.TECH -II SEMESTER
ROBOTICS

Course Code: ME6T6FE2 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:
The objective of the course is to enable students to

- Understand robot configuration, structures, basic components, workspace and generations of robots.
- Get acquainted with performing spatial transformations and solve kinematics of the robot
- Get knowledge and analysis skills associated with trajectory planning
- Learn about various sensors, actuators, robot programming
- Understand the present & future applications of a robot

COURSE OUTCOMES:
Upon completion of this course the students will be able to:

- Demonstrate knowledge of industrial robots, characteristics
- Explain basic **c**omponents of robot and end effectors
- Apply spatial transformation to obtain forward kinematics
- Obtain basic idea on working principle of various actuators and sensors.
- Program different robot operations and appreciate applications of robots in industry.

UNIT I
INTRODUCTION: Automation and Robotics– An over view of Robotics-historic back ground-types of robots – present and future applications
CLASSIFICATION OF ROBOTS: by coordinate system and control system. Performance characteristics-selection of robot-economic considerations

UNIT II
COMPONENTS OF THE INDUSTRIAL ROBOTS: Basic **c**omponents of robot, common types of arms, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors.

UNIT III
MOTION ANALYSIS: Homogeneous transformations as applicable to rotation and translation problems
TRANSFORMATIONS AND KINEMATICS: Objectives, homogenous coordinates, forward solution, Denavit Hartenberg (D-H) Notation, simple problems involving planar manipulators.

UNIT IV
ROBOT ACTUATORS: Pneumatic, Hydraulic actuators, electric & stepper motors.
ROBOT SENSORS: Feedback components: position sensors, potentiometers, resolvers, encoders, Velocity sensors **Proximity sensors:** Contact type, non-contact type – reflected light scanning laser sensors

UNIT V

ROBOT PROGRAMMING: programming methods, programming languages- levels of Robot programming and simple programs.

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

Learning Resources

Text Books:

1. Robotic Engineering by Richard D.Klafter, Prentice Hall
2. Industrial Robotics by Mikell P.Groover, McGraw-Hill Int. Edition
3. Robotics and Control / Mittal R K & Nagrath I J / TMH.

Reference Books:

1. Introduction to Robotics – John J. Craig, Addison Wesley
2. Robotics – K. S. Fu, Gonzalez & Hee
3. Introduction to Robotics – Saeed B.Niku, Prentice Hall

Web resources:

1. http://nptel.ac.in/downloads/112101098/

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

III B.TECH - II SEMESTER
FINITE ELEMENT METHODS

Course Code: ME6T6FE3 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 periods/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Development of numerical formulation to solve Engineering structural and field problems with an intension to extension of the procedure to address complicated problems that cannot be solved by classical analytical methods.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Apply governing principles of the structural mechanics problems at element level and develop element equations
2. Assemble element matrices based on local-global connectivity to generate total system equations
3. Impose boundary conditions and solve for unknown field variables
4. Interpret results from the calculated field variables.
5. Analyze of linear static structural and steady state heat transfer problems

Prerequisites: Mechanics of Materials, Heat Transfer

UNIT I
FUNDAMENTAL CONCEPTS:

Discrete and continuous systems, Stress and Equilibrium, Boundary conditions, Strain-displacement relations, stress-strain relations, potential energy and equilibrium, the Rayleigh-Ritz method, Galerkin method.

UNIT II
AXIALLY LOADED BARS:

Fundamental concepts, two node bar element, Shape functions, Natural Coordinates, Element Stiffness Matrix and Load Vectors, Assembly of element stiffness matrices and load vectors, treatment of boundary conditions, solution to axially loaded bar problems. Temperature Effects, thermal stress problems

UNIT III
ONE DIMENSIONAL SCALAR FIELD PROBLEMS:

Heat transfer: Equilibrium equations, heat conduction in plane walls, convection heat transfer in fins.

FLUID FLOW THROUGH POROUS MEDIUM:

Basic Differential equation, finite element formulation, simple problems

UNIT IV

ANALYSIS OF PLANE TRUSSES:

Plane Trusses, Local and Global Coordinate systems, Element Stiffness Matrix, Stress Calculations, Example of plane Truss with three members.

ANALYSIS OF BEAMS:

Two nodes beam Element, shape functions, element stiffness matrix and load vectors, simple problems on beams with distributed and point loads.

UNIT V

TWO DIMENSIONAL PROBLEMS:

Finite Element Modeling, Constant Strain Triangle (CST) Element Stiffness, Force terms, Stress calculation, Problem modeling and boundary conditions. Plane Stress and plane Strain Problems using CST Element.

ISOPERIMETRIC FORMULATION:

Isoperimetric, sub and super parametric formulations, numerical integration, formulation of 4 node quadrilateral element. Problems on isoperimetric formulation of 4 node quadrilateral element

DYNAMIC ANALYSIS:

Introduction, Lumped and consistent mass matrices for bar and beam elements, simple and Eigen value Eigen vector problems of bars and beams.

Learning Resources

Text Books:

1. Tirupathi R. Chandrupatla, Ashok D. Belegundu “Introduction to Finite Elements in Engineering” revised 4th edition,Pearson Education Limited, 2011

Reference Books:

1. Cook, Robert Davis et al, "Concepts and Applications of Finite Element Analysis" , 4th edition,Wiley, John & Sons,2001
2. K J Bathe "Finite Element procedures in engineering analysis", 2nd edition,Prentice-Hall India Pvt. Ltd., 1996.
3. Daryl L. Logan, “ A first course in the finite element method” 4th edition, Cengage Learning India, 2007
4. G. Lakshmi Narasaiah” Finite Element Analysis by”1st edition, BS Publications,2009

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

III YEAR II Semester

INDUSTRIAL ENGINEERING & MANAGEMENT

Course Code: ME6T6FE4 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Practice: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Understand fundamental functions of management
- Get the knowledge of choosing best location for plants
- Know the application of tools of operation management.
- Identify the statistical techniques to improve the quality

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Describe the role and responsibilities of management and the organizational Structures
2. Explain the leadership qualities and concept of plant layout.
3. Apply different quality control techniques
4. Discuss various operations management Techniques
5. Solve operations management and project management problems

UNIT I

Introduction: Definition of Industrial Engineering, Applications, Role of Industrial Engineer, Quantitative tools of IE, Functions of Management, Taylor's Scientific Management, Fayol's Principles of Management, Douglas Mc-Gregor's Theory X and Theory Y, Hertzberg's Two Factor Theory of Motivation, Maslow's Hierarchy of Human Needs.

UNITII

ORGANISATIONAL STRUCTURES: Basic concepts related to Organization – Departmentation and Decentralization, Flat and Tall organizations, Organizational chart, Line organization, Line and staff organization, functional organization

LEADERSHIP: Introduction, Definition, Types of leadership based on authority- their area of applicability and suitability, advantages and limitations, Traits approach to leadership

PLANT LOCATION: Definition, factors affecting the plant location, comparison of rural and urban sites. Plant Layout – definition, objectives, types of production, types of plant layout – various data analyzing forms-travel chart.

UNIT III

INSPECTION AND QUALITY CONTROL: Types of inspections - Statistical Quality Control-techniques-variables and attributes-assignable and no assignable causes- variable control charts, and R charts, attributes control charts, p charts and c charts. Acceptance sampling- Single Sampling-OC curves. Introduction to TQM-Quality Circles, ISO 9000 series procedures.

UNIT IV

WORK STUDY: Definition, objectives, method study - definition, objectives, steps involved- various types of associated charts-out line process charts, flow process charts, two handed process charts and SIMO charts- difference between micro motion and memo motion studies.

TIME STUDY: definition, time study, steps involved-equipment, different methods of performance rating- allowances, standard time calculation.

UNITV

PROJECT MANAGEMENT: Network modeling, Probabilistic model-various types of activity times estimation, programme evaluation review techniques (PERT), probability of completing the project, deterministic model- critical path method (CPM), critical path calculation, crashing of simple of networks.

Learning Resources

Text Books:

1. O.P. Khanna, "Industrial Engineering and Management", Dhanpat Rai
2. T. R. Banga, S. C. Sharma, N. K. Agarwal, "Industrial Engineering and Management Science" Khanna Publishers.

Reference Books:

1. Panner Selvam, Production and Operations Management, PHI, 2004.
2. Ralph M Barnes, Motion and Time Studies, John Wiley and Sons, 2004.
3. Chase, Jacobs, Aquilano, Operations Management, TMH 10th Edition, 2003.
4. L.S.Srinath, PERT / CPM, affiliate East-West Press, New Delhi, 2000.
5. Phillip Kotler, Marketing Management, Pearson, 2004.
6. S. Bhasakar, "Management Science" Anuradha Publications.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

III B.TECH - II SEMESTER
METROLOGY AND INSTRUMENTATION LAB

Course Code: ME6L1 **Credits: 2**
Lecture: - **Internal assessment: 25 marks**
Lab Practice: 3 Periods/week **Semester end examination: 50 marks**

NOTE: MINIMUM OF **6 EXPERIMENTS** FROM **EACH SECTION**

COURSE OBJECTIVES:

- Measurement of linear and angular dimensions
- To perform various alignment tests on machine tools
- Estimation of surface roughness
- Measurement of pressure, flow, speed, displacement and temperature.

COURSE OUTCOMES:

At the end of course the students will be able to:

1. Demonstrate the use of instruments for measuring linear (internal and external), angular dimensions and surface roughness.
2. Perform alignment tests on various machine tools.
3. Demonstrate the use of instruments for measuring pressure, flow, speed, displacement and temperature
4. Calibrate the Bourdon tube pressure gauge

Pre-Requisites: Engineering Metrology, Mechanical measurements

METROLOGY LAB

1. Measurement of lengths, heights, diameters by Vernier calipers, Micrometers etc.
2. Measurement of bores by internal micrometers and dial bore indicators
3. Use of gear tooth vernier calipers for checking the chordal thickness of spur gear.
4. Machine tool alignment test on the lathe.
5. Machine tool alignment test milling machine.
6. Angle and taper measurement by bevel protractor and Sine bar.
7. Thread measurement by two wire, three wire method and tool makers microscope.
8. Surface roughness measurement by Talysurf.
9. Measurement of internal and external taper by using rollers and spheres

INSTRUMENTATION LAB

1. Calibration of pressure gauge using dead weight pressure gauge tester.
2. Pressure measurement using strain gauge setup.
3. Temperature measurement using resistance temperature detector/ thermocouple/ thermistor.
4. Displacement measurement using LVDT.
5. Measurement of angular displacement using capacitance transducer.
6. Speed measurement using photo electric/ magnetic speed pickup transducer.
7. Flow measurement using rotameter.
8. Low pressure measurement using McLeod gauge.

III B.TECH- II SEMESTER
HEAT TRANSFER LAB

Course Code: ME6L2 **Credits: 2**
Lecture: - **Internal assessment: 25 marks**
Lab Practice: 3 periods/week **Semester end examination: 50 marks**

COURSE OBJECTIVES:

- Define the fundamental concepts to students in the area of heat transfer and its applications.
- Recognize the practical significance of various parameters those are involved in different modes of heat transfer.
- Apply the knowledge of heat transfer in an effective manner for different applications.

COURSE OUTCOMES:

Upon the completion of this course the student will be able to:

1. Evaluate heat transfer through lagged pipe, Insulating powder and Drop and Film wise condensation.
2. Experiment the Thermal conductivity of a given metal Rod.
3. Measure the Heat transfer coefficient for Pin Fin, Forced convection, Natural Convection and parallel and counter flow heat exchanger and to Experiment on Transient heat conduction.
4. Test Emissivity, Stefan Boltzmann Constant and Critical Heat flux.
5. Asses the performance of Refrigeration and Air conditioning and to determine the overall heat transfer coefficient for a composite slab.

Pre-Requisite: Heat Transfer

ANY <u>TWELVE</u> EXPERIMENTS OF THE FOLLOWING:

1. Determination of Heat Transfer through Lagged Pipe.
2. Measurement of Thermal Conductivity for a given Asbestos Insulating powder.
3. Determination of Thermal Conductivity for a Given Copper Metal Rod.
4. Determination of Heat Transfer through Pin-Fin.
5. Experimentation on Transient Heat Conduction.
6. Determination of Heat Transfer through Forced Convection
7. Determination of Heat Transfer through Natural Convection.
8. Determination of overall heat transfer coefficient for Parallel and Counter Flow Heat Exchanger.
9. Emissivity Measurement.
10. Measurement of Stefan Boltzmann constant.
11. Determination of Heat Transfer through Drop Wise and Film Wise Condensation.
12. Determination of Critical Heat Flux for a given Nichrome wire.
13. Determination of Overall Heat Transfer Co-Efficient for Composite Wall.
14. Performance Evaluation of Refrigeration Test Rig.
15. Performance Evaluation of Air Conditioning Test Rig.

III B.TECH - II SEMESTER
SOFT SKILLS COURSE

Course Code: ME6L3 **Credits: 1**
Lecture: --- **Internal assessment: --**
Lab Practice: 1 period/week **Semester end examination: --**

COURSE OBJECTIVES:

- To introduce them to various higher traits of personality.
- To introduce personality patterns.
- To enable the students to mould themselves into full-fledged individuals with
- holistic personality. To enable them to develop a broad outlook and refined culture.

COURSE OUTCOMES:

Upon the completion of this course the student will be able to get:

- Self-motivation
- Professionalism
- Cultural adaptability
- Personal quality enhancement

Pre –Requisites: Personality development

I. SELF ESTEEM
Self-esteem and self-image.
Turn failure into success.
SELF IMPROVEMENT:
Self-confidence.
Goal setting.
Action plan.

II. IMAGE BUILDING
What is image.
Behavior.
Importance of etiquette.
Positive traits to acquire.
Negative traits to avoid.

III. MEETING SKILLS.
Types of meetings.
Conducting the meetings

IV. CROSS CULTURALISM.
Understanding other cultures
Respecting differences
Adaptability to multiculturalism.

V. EMPOWERING AND INFLUENCING
Delegating
Mentoring
Leadership
INNORATION
Need for change
Continuous improvement.
SELF MANAGEMENT
Balancing life and work
Emotional balance

Learning Resources

Reference Books:
1. Master Wallace, "Peronal development for life and work" ,Cengage Publications (10th edition)
2. J.K .Pillalamarri , "Practical personality & development", Scitech Publications.
3. A.H. Maslow , "Motivation & personality", Pearson Publications

IV B.TECH- I SEMESTER
MECHATRONICS

Course Code: ME7T1 **Credits: 3**
Lecture: 3 Periods/week **Internal assessment: 30 Marks**
Tutorial: 1 Period/week **Semester end examination: 70 Marks**

COURSE OUTCOMES:
At the end of course the students will be able to:

1. Demonstrate the mechatronic systems and sensors used in building mechatronic systems
2. Illustrate various types of actuation systems .
3. Discuss the modeling of basic systems and their dynamic response.
4. Describe the basic structure and functions of closed loop controllers, Microprocessor and micro controllers.
5. Discuss the basics of digital logic, PLC programming and applications of Fuzzy logic.

Pre-Requisites:
Basic electrical and electronics

UNIT I
INTRODUCTION: Definition of Mechatronics, evolution of mechatronics, systems, measurement systems, control systems, mechatronic design process, traditional design and mechatronic design, applications of mechatronic systems, advantages and disadvantages of mechatronic systems.

SENSORS : classification of sensors, basic working principles, Velocity sensors – Proximity and Range sensors, ultrasonic sensor, laser interferometer transducer, Hall Effect sensor, inductive proximity switch. Light sensors – Photodiodes, phototransistors, tactile sensors – PVDF tactile sensor, micro-switch and reed switch Piezoelectric sensors, vision sensor

UNIT II
PNEUMATIC AND HYDRAULIC ACTUATION SYSTEMS: Actuation systems, Pneumatic and Hydraulic systems- constructional details of filter, lubricator, regulator, direction control valves, pressure control valves, flow control valves, actuators-linear and rotary.
ELECTRICAL ACTUATION SYSTEMS: Electrical systems, Mechanical switches, solid state switches, solenoids, DC motors, AC motors, stepper motors. Characteristics of pneumatic, hydraulic, electrical actuators and their limitations.

UNIT III

BASIC SYSTEM MODELS: Mathematical models, mechanical system building blocks, electric system building blocks, fluid system building blocks, thermal system building blocks,

DYNAMIC RESPONSES OF SYSTEMS: Transfer function, Modelling dynamic systems, first order and second order systems.

UNIT IV

CLOSED LOOP CONTROLLERS: Classification of control systems, feedback, closed loop and open loop systems, continuous and discrete processes, control modes, two step mode, proportional mode, derivative control, integral control, PID controller.

MICROPROCESSOR AND MICRO CONTROLLER: Introduction, Architecture of a microprocessor (8085), Architecture of a Micro controller, Difference between microprocessor and a micro controller.

UNIT V

DIGITAL LOGIC: Digital logic, number systems, logic gates, Boolean algebra, Karnaugh maps, application of logic gates, sequential logic, transducer Signal Conditioning and devices for data conversion.

PROGRAMMABLE LOGIC CONTROLLERS: Introduction, basic structure, input/output processing, programming, mnemonics, timers, internal relays and counters, shift register, master and jump controls. Data handling, Analog input/output, selection of a PLC.

FUZZY LOGIC APPLICATIONS IN MECHATRONICS: Fuzzy logic systems, Fuzzy control, Uses of Fuzzy expert systems.

Learning Resources

Text books:

1. Mechatronics Electronic Control Systems in Mechanical and Electrical Engineering, (3rd edition), by W Bolton, Pearson Education Press, 2005.
2. Mechatronics System Design, 5th Indian reprint, 2009, by Devdas shetty, Richard A. kolk, PWS Publishing Company

Reference books:

1. Mechatronics Source Book, by Newton C Braga, Thomson Publications, Chennai.
2. Mechatronics, by N. Shanmugam, Anuradha Agencies Publishers.
3. Control sensors and actuators, by C.W.Desilva, Prentice Hall.
4. Design with Microprocessors for Mechanical Engineers, by Stiffler, A.K.McGraw- Hill (1992).

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - I SEMESTER
PRODUCTION PLANNING AND CONTROL

Course Code: ME7T2 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- To understand the problems and opportunities faced by the operations manager in manufacturing and service organizations.
- To develop an ability to apply PPC concepts in a various areas like marketing, accounting, finance, engineering, personnel management, logistics, etc.
- To integrate operations concepts with other functional areas of business
- To understand the PPC function in both manufacturing and service organizations.
- To examine several classic Operations Management planning topics including production planning and inventory control.
- To learn several important contemporary topics relevant to business managers of all functional disciplines, including quality management, lean concepts, and sustainability.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Recognize the objectives, functions, applications of PPC and forecasting techniques.
2. Explain different Inventory control techniques.
3. Solve routing and scheduling problems
4. Summarize various aggregate production planning techniques.
5. Describe way of integrating different departments to execute PPC functions

Pre-Requisites: Industrial Engineering and Management

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.

FORECASTING

Importance of forecasting –Types of forecasting, their uses –General principles of Forecasting –Forecasting techniques– qualitative methods- Jury/Expert Method , Survey of Expert opinion method , Sales force composite method, Survey of buyers intention method and quantitative methods-Simple average, moving average, smoothing coefficient, Least Square method.

UNIT II

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-I, MRP-II & ERP, JIT inventory, Kanban system

UNIT III

ROUTING

Definition – Routing procedure –Route sheets – Bill of material – Factors affecting routing procedure.

SCHEDULING

Definition – Activities-Difference with loading, Scheduling types: Forward, Backward scheduling, Job shop scheduling methods – Arrival pattern, processing pattern, number of workers available, machine varieties available, Priority rules for job sequencing FIFO, SPT, SOT, EDD, STR, CR, LISO, Random Orders. Scheduling Techniques Gantt Charts, LOB, Johnson's job sequencing rules- n jobs on 2machines, n jobs on 3 machines, n jobs on m machines.

UNIT IV

LINE BALANCING:

Introduction, objectives, terms related to line balancing, procedures, simple problems

AGGREGATE PLANNING:

Introduction, Inputs to aggregate planning, strategies- Line strategy, chase strategy, capacity options, demand options.

UNIT V

DISPATCHING

Centralized and Decentralized Dispatching- Activities of dispatcher – Dispatching procedure – follow-up – definition – Reason for existence of functions – types of follow up, applications of computer in production planning and control.

Learning Resources

Text Books:

1. Samuel Eilon, "Elements of Production Planning and Control", Universal Publishing Corporation.
2. Baffa & Rakesh Sarin , "Modern Production & Operations management", 8th edition, John Wiley,.

References Books:

1. S.N. Chary, "Production & Operations Management", (4th Edition), TMH.
2. Martin K. Starr and David W. Miller ,"Inventory Control Theory and Practice", Prentice Hall.
3. Dr. C. Nadha Muni Reddy and Dr. K. Vijaya KumarReddy "Reliability Engineering & Quality Engineering", Galgotia Publications, Pvt., Limited.
4. S.k Sharma, savita Sharma, "A Course in Industrial Engineering and Operations Management", Tata McGraw Hill publications.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B. TECH - I SEMESTER
FINITE ELEMENT METHODS

Course Code: ME7T3 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 periods/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Implement the basics of FEM to relate stresses and strains.
- Formulate the design and heat transfer problems with application of FEM.
- Solve 1 D, 2 D and dynamic problems using Finite Element Analysis approach.

COURSE OUTCOMES

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

1. Implement numerical methods to solve mechanics of solids problems.
2. Formulate and Solve axially loaded bar Problems.
3. Formulate and analyze truss and beam problems.
4. Implement the formulation techniques to solve two-dimensional problems using triangle and quadrilateral elements.
5. Formulate and solve Axi-symmetric and heat transfer problems.

Pre-Requisites
Engineering Mathematics-II, Mechanics of Solids, Heat Transfer.

UNIT I
FUNDAMENTAL CONCEPTS:
Discrete and continuous systems, Stress and Equilibrium, Boundary conditions, Strain-displacement relations, stress-strain relations, potential energy and equilibrium, The Rayleigh-Ritz method, Formulation of Finite Element Equations.

UNIT II
AXIALLY LOADED BARS:
Fundamental concepts, two node bar element, Shape functions, Element Stiffness Matrix and Load Vectors, Assembly of element stiffness matrices and load vectors, treatment of boundary conditions, Temperature effects, Examples of Axially Loaded Members.

UNIT III
ANALYSIS OF PLANE TRUSSES:
Plane Trusses, Local and Global Coordinate systems, Element Stiffness Matrix, Stress Calculations, Example of plane Truss with three members.
ANALYSIS OF BEAMS: Two nodes beam Element, shape functions, element stiffness matrix and load vectors, simple problems on beams with distributed and point loads.

UNIT IV

TWO DIMENSIONAL PROBLEMS:

Finite Element Modeling, isoperimetric formulation Constant Strain Triangle (CST) Element Stiffness, Force terms, Stress calculation, Problem modeling and boundary conditions. Plane Stress and plane Strain Problems using CST Element, formulation of 4-noded quadrilateral element. Problems on isoperimetric formulation of 4-noded quadrilateral element.

UNIT V

AXISYMMETRIC PROBLEMS:

Axisymmetric formulations, Element matrices, Boundary conditions.

ONE DIMENSIONAL SCALAR FIELD PROBLEMS:

Heat transfer: equilibrium equations, heat conduction in plane walls, convection heat transfer in fins, finite element formulation, simple problems.

Learning resources

Text books:

1. Introduction to Finite Elements in Engineering (revised 4th edition), by Tirupathi R. Chandrupatla, Ashok D. Belegundu, Pearson Education Limited, 2011.

Reference books:

1. Concepts and Applications of Finite Element Analysis", (4th edition), by Cook, Robert Davis et al", Wiley, John & Sons, 2001.
2. Finite Element procedures in engineering analysis",(2nd edition), by K J Bathe, Prentice- Hall India Pvt. Ltd., 1996.
3. A first course in the finite element method" (4th edition), by Daryl L. Logan, Cengage Learning India, 2007.
4. Finite Element Analysis, (1st edition) by G. Lakshmi Narasaiah", BS Publications, 2009.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - I SEMESTER

ADDITIVE MANUFACTURING

Course Code: ME7T4A **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- To introduce students the basics of additive manufacturing/rapid prototyping and its applications in various fields, reverse engineering techniques.
- To familiarize students with different processes in rapid prototyping systems.
- To teach students about mechanical properties and geometric issues relating to specific rapid prototyping applications.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Demonstrate the knowledge of Additive Manufacturing and Rapid Prototyping technologies.
2. Describe different RP techniques.
3. Discuss fundamentals of Reverse Engineering.

UNIT I

INTRODUCTION AND BASIC PRINCIPLES:

Definition , Generic Additive Manufacturing (AM) Process, Terms related to AM, Benefits of AM, Distinction between AM and CNC machining, Additive manufacturing process chain: Variation between different AM machines, Metal systems, Maintenance of Equipment, Material Handling Issues.

UNIT II

Introduction to rapid prototyping (RP), Need of RP in context of batch production, Basic principles of RP, Steps in RP, Process chain in RP in integrated CAD- CAM environment, Advantages of RP, Medical applications.

UNIT III

Classification of different RP techniques – based on raw materials, layering technique (2-D or 3-D) and energy sources: Process technology, Stereo-lithography (SL), photo polymerization, liquid thermal polymerization, Solid foil polymerization

UNIT IV

Selective laser sintering, Selective powder binding, ballistic particle manufacturing – both 2-D and 3-D, Fused deposition modeling, Shape melting, Laminated object manufacturing, Solid ground curing, 3 D printing

UNIT V
INTRODUCTION TO REVERSE ENGINEERING
Meaning, Use, RE-The generic process, Phase of RE–scanning, Contact Scanners, Noncontact Scanners, Point Processing, Application Geometric Model, Development.

Learning Resources

Text Books:

1. Ian Gibson, David W. Rosen, Brent Stucker , "Additive Manufacturing Technologies" ,Springer,2009
2. Chua C. K., Leong K. F., and Lim C. S., "Rapid Prototyping: Principles and Applications", Second Edition, World Scientific Publishers (2003),.
3. Patri K. Venuvinod, Weiyin Ma "Rapid Prototyping: Laser-Based and Other Technologies" Springer , 2004

Reference Books :

1. Peter D. Hilton, Hilton/Jacobs, Paul F. Jacobs, "Rapid Tooling: Technologies and Industrial Applications", CRC Press,2000.
2. Burns. M, "Automated fabrication", Prentice-Hall,1993.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH -I SEMESTER
ROBOTICS

Course Code: ME7T4B **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

The objective of the course is to enable students to

- Understand robot configuration, structures, basic components, workspace and generations of robots.
- Get acquainted with performing spatial transformations and solve kinematics of the robot
- Get knowledge and analysis skills associated with trajectory planning
- Learn about various sensors, actuators, robot programming
- Understand the present &future applications of a robot.

COURSE OUTCOMES:

Upon completion of this course the students will be able to

1. Demonstrate knowledge of industrial robots, characteristics, end effectors and actuators.
2. Apply spatial transformation to obtain forward and inverse kinematics
3. Solve robot dynamics problems, generate joint trajectory for path planning
4. Describe working principle of various sensors and program different operations
5. Appreciate applications of robots in industry.

UNIT I

INTRODUCTION TO ROBOTICS: Automation and Robotics, major components of a robot, robotic like devices, Classification by coordinate system and by control method, Specifications of robots, Architecture, number of degrees of freedom, economic analysis, and overview of robot present and future applications.

Robot end effectors: Introduction, end effectors, types of end effectors, grippers and tools, Requirements and challenges of end effectors.

Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors.

UNIT II

TRANSFORMATIONS: Homogeneous coordinates, transformations as applicable to translation, rotation, problems.

KINEMATICS: Introduction to Robot Kinematics-forward solution, Denavit-Hartenberg (D-H) Notation, Forward kinematics, Simple problems involving planar manipulators, Simple inverse kinematic problems.

UNIT III

DIFFERENTIAL TRANSFORMATIONS: Differential transformations of manipulators, Jacobians, problems.

DYNAMICS: Lagrange Euler and Newton Euler formulations, Problems.

TRAJECTORY PLANNING:
Path planning, avoidance of obstacles, path planning algorithms, trajectory planning with cubic polynomial, blending, higher order trajectories.

UNIT IV
ROBOTIC SENSORY DEVICES: Introduction, Non-optical position sensors– potentiometers, synchros, optical. position sensors – optical interrupters, optical encoders (absolute & incremental). **Proximity sensors:** Contact type, noncontact type – reflected light scanning laser sensors. **Touch & slip sensors:** Tactile sensors – proximity rod & photo detector sensors, Slip sensors- Forced oscillation slip sensor, interrupted type slip sensors.
ROBOT PROGRAMMING: Robot programming, languages and software packages**.**

UNIT V
ROBOT APPLICATION IN MANUFACTURING: Material Transfer, Material handling, loading and unloading, Processing, spot and continuous arc welding & spray painting Assembly and Inspection.

Learning Resources

Text books:

1. Industrial Robotics by Mikell P.Groover, McGraw-Hill Int. Edition
2. Robotics and Control / Mittal R K & Nagrath I J / TMH.

Reference Books:

1. Robotic Engineering by Richard D.Klafter, Prentice Hall
2. Introduction to Robotics – Saeed B.Niku, Prentice Hall
3. Introduction to Robotics – John J. Craig, Addison Wesley

Web resources:
1.http://nptel.ac.in/downloads/112101098/

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - I SEMESTER
MECHANICAL VIBRATIONS

Course Code: ME7T4C **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Introduce the knowledge about vibrations and their applications
- Propose the concept of single, double and multi degree freedom systems for un damped and damped free vibrations
- Study different types of forced vibrations and vibration measuring instruments
- Analyze different problems in shaft due to vibrations
- Determine the natural frequencies in continuous system

COURSE OUTCOMES:
Upon completion of this course the student will be able to:

1. Analyze single degree freedom system for its natural frequency and damped response.
2. Analyze the response of Single degree freedom systems under harmonic excitations
3. Determine the response of Two degree freedom systems under free and forced vibrations
4. Perform modal analysis to determine the natural frequencies of a multi degree of freedom system
5. Analyze continuous systems for the determination of natural frequencies

Pre-Requisites: Dynamics of Machinery

UNITI
FREE RESPONSE OF SINGLE DEGREE FREEDOM SYSTEMS:
Introduction to vibrations, SHM, causes of vibrations, types of vibrations, Free Vibrations D Alembert's Principle, Energy method, Damped Free Vibrations, different types of damping, Viscous damping, critical, under and over damping, logarithmic decrement.

UNIT II
FORCED RESPONSE OF SINGLE DEGREE FREEDOM SYSTEMS:
Introduction, Response of SDF systems to Harmonic excitations, Frequency response plots, Systems with rotating unbalanced masses, whirling of rotating shafts, harmonic motion of base, vibration isolation and transmissibility, vibration measuring instruments.

UNIT III
TWO DEGREE OF FREEDOM SYSTEMS:
Equations of motion, Equilibrium method, Lagrangian method, Free vibration response, Eigen values and Eigen vectors, coordinate Transformations, Coordinate coupling, Orthogonality of Modes, Natural coordinates, semi definite systems undamped vibration absorbers.

UNITIV
MULTI-DEGREE OF FREEDOM SYSTEMS
Equations of motion for linear systems, Flexibility and stiffness influence coefficients, un damped free vibration, the Eigen Value problem, Natural frequencies and mode shapes, Orthogonally of modal vectors, normalization of modal vectors, Decoupling of modes, modal analysis, mode superposition technique, Free vibration response through modal analysis, Forced vibration analysis by modal analysis, proportional damping.

UNIT V
CONTINUOUS SYSTEMS
Free vibration of a string, longitudinal vibrations of bar, transverse vibration of beam, torsion of vibrations of circular shaft for various end conditions. Introduction to Finite element method.

Learning Resources

Text Books

1. L. Meirovich, Elements of Vibration analysis, (2nd edition). Tata Mc-Graw Hill 2007
2. Fundamentals of Vibrations by S. Graham Kelley, Mc Graw Hill publications New Delhi 1996.

Reference Books.

1. Mechanical vibrations, (4th edition) by Singiresu S. Rao Pearson education publications, Delhi, 2004.
2. Theory and problems of mechanical vibrations by S. Graham Kelley, Schaum's outline series Mc Graw Hill publications New Delhi 1996.
3. Theory of vibration with applications by W.T., Thompson. CBS Publishers

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - I SEMESTER

ALTERNATIVE SOURCES OF ENERGY

Course Code: ME7T4D **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- The main objective of this course is to let the students recognize various non-conventional energy resources

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Explain the fundamental principles, classification of collectors, methods of storage and application of solar Energy
2. Describe the basic concepts of Wind Energy and Biomass Energy
3. Discuss the fundamentals of Geothermal Energy and Ocean Energy.
4. Recall different energy conversion Techniques.

Pre-Requisite: Basic Thermodynamics

UNIT I
SOLAR ENERGY PRINCIPLES AND APPLICATIONS:
Role and potential of new and renewable source, solar energy option, Environmental impact of solar power, solar constant, extraterrestrial and terrestrial solar radiation, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.
Applications- solar heating/cooling technique, solar distillation and drying, Central Power Tower, photovoltaic energy conversion.

UNIT II
SOLAR ENERGY COLLECTION AND STORAGE:
Flat plate collectors: Liquid Flat plate collector construction and working principle, Factors effecting performance, Evacuated tube collector, concentrating collectors: Working principle- Modified Flat plate collector, Hemi Spherical Bowl Mirror Concentrator, Linear Fresnel Lens Concentrator, Circular Fresnel Lens Concentrator, Cylindrical Parabolic collector, Compound parabolic collector, Orientation and tracking modes of cylindrical parabolic collector.
Storage: Different methods: Sensible, latent heat and stratified storage, solar ponds.

UNIT III
WIND ENERGY:
Origin and types of wind, Wind Data Measurement, Applications of Wind Energy, Components of horizontal axis windmill and Darrieus vertical axis windmill, Power extraction and Betz criteria, Power vs wind speed characteristics

BIO-MASS:
Principles of Bio-Conversion, Biomass gasification, combustion characteristics of bio-gas, utilization for cooking, I.C Engine operation. Anaerobic digestion, types of Bio-gas digesters, Factors effecting biomass digestion.

UNIT IV
GEOTHERMAL ENERGY:
Resources, types of wells, methods of harnessing the energy, potential in India.
OCEAN ENERGY:
OTEC: Origin and resource, Principles of OTEC Technology
TIDAL ENERGY: Origin and Potential, conversion techniques: types of basins
WAVE ENERGY**:** Origin and Potential, conversion techniques: Heaving Float type, Pitching type, Heaving and Pitching type, Oscillating water column type, Surge devices.

UNIT V
DIRECT ENERGY CONVERSION:
Need for DEC, principles of DEC: Thermo-electric generators, seebeck, peltier and joul Thomson effects, Figure of merit, MHD generators, principles, faraday's laws, FUEL CELLS: principle, Classification, PAFC, PEMFC: Construction and working, Advantages and disadvantages of fuel cells, thermodynamic aspects.

Learning Resources

Text Books:

1. B. H. Khan "Non-Conventional Energy Sources", Tata Mc Graw Hill-2009
2. G.D. Rai – "Non-Conventional Energy Sources", Khanna publishers – 2009

Reference Books:

1. S. P. Sukhatme, " Solar Energy- Principles and Applications", Tata Mc Graw Hill-2006
2. G.N Tiwari and M.K Ghosal – "Renewable energy resources" -Narosa Publishing House-2005
3. Twidell & Weir- "Renewable Energy Sources" ,Taylor & Francis Group-2006

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - I SEMESTER
ADVANCED MACHINE DESIGN

Course Code: ME7T5A **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

1. Introduce Knowledge about the advance failure theories
2. Acquire the Knowledge to design IC engine components
3. Design the gear box and valve mechanism for engines.
4. Introduce concept of optimization in machine design

COURSE OUTCOMES

At the end of the course the students will be able to

1. Predict the mode of failure for ductile and brittle materials under fatigue loading
2. Identify the surface failure due to contact of components
3. Design and Analyze the IC Engine Components
4. Design gear box and valve mechanism for engines
5. Implement the optimization techniques for design

Pre Requisites: Design of Machine Members, Dynamics of Machinery

UNIT I
ADVANCE FAILURE THEORIES
Failure of ductile materials under static loading, failure of brittle materials under static loading, mechanism of fatigue failure, fatigue failure models, estimating fatigue failure criteria, residual stresses

UNIT II
SURFACE FAILURE
adhesive wear, abrasive wear, corrosion wear, surface fatigue, spherical contact, cylindrical contact, general contact, surface fatigue failure modes, dynamic contact, surface fatigue strength

UNIT III
I. C. ENGINE COMPONENTS:
Cylinder and cylinder liner, Design of trunk type piston, Design of connecting rod and Design of overhung Crank shaft, Center crankshaft

UNIT IV
GEAR BOX DESIGN:
Function of Gear Box, Components of Gear Box, Progression Ratio, Speed Diagram, Kinematic Arrangement, Design Procedure
Valve gear mechanism, Design of Valves, Design of Valve Spring, Design of Push rod

UNIT V
DESIGN OPTIMISATION

Optimization function of single variable and multi variables, optimization techniques, Interval halving and Golden section methods, optimum design of tension bar for minimum deflection, cost and weight, Torsion member for minimum deflection, cost and weight.

Learning Resources

Text books:

1. Design of Machine Elements by V. B. Bhandari, Third Edition, Tata McGraw Hill Publishers, New Delhi, 2014.
2. Machine Design an Integrated Approach, (5th Edition) Robert L. Norton, Pearson Education Limited, New Delhi, 2013.
3. Engineering Optimization - Theory and Practice by Singeresu S. Rao, Revised Third Edition, New Age International Publishers, New Delhi, 2008.

Reference books:

1. Mechanical Engineering Design, (8th Edition) by Joseph Shigley, Charles R Mischke, Tata McGraw Hill Publishers, New Delhi, 2008.
2. Design of Machine Elements, by C. S. Sharma, Kamlesh Purohit, Prentice Hall of India Private Limited (PHI), New Delhi, 2009.
3. A Textbook of Machine Design by R S Khurmi, J K Guptha, (25th Edition), S Chand & Company Ltd., New Delhi, 2005.
4. A Text book of Machine design (in SI units) by S Md. Jalaluddin, (Third Enlarged Edition), Anuradha Publications, Chennai, 2006.

DATA BOOKS TO BE ALLOWED IN EXAMINATION:

1. Design data hand book by K Mahadevan & K Balaveera Reddy, (4th Edition), CBS Publishers, 2013.
2. Design Data Hand Book, First Edition, S. Md. Jalaluddin, Anuradha Publications, Chennai, 2009

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - I SEMESTER

ADVANCED MACHINING PROCESSES

Course Code: ME7T5B **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Define various advanced machining processes.
- Acquire knowledge in the elementary mechanism and the machin ability of materials with different advanced machining processes.
- Determine basic principles of operation and various parameters influencing for each machining process and their applications.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Illustrate advanced machining processes, mechanism of Mechanical machining processes, its applications and limitations.
2. Classify the Electro Chemical machining process, economic aspects of ECM.
3. Interpret Thermal Metal Removal Processes, characteristics of spark eroded surface & machine tool selection.
4. Relate Generation and control of electron beam for machining and laser beam for machining.

Pre-Requisites: Machine Tools, Production Technology

UNIT I

INTRODUCTION:

Need for non-traditional machining methods, Classification of modern machining processes, considerations in process selection, Materials, Applications.

ULTRASONIC MACHINING-Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations, recent development.

UNIT II

ABRASIVE JET MACHINING, WATER JET MACHINING AND ABRASIVE WATERJET MACHINEING:

Basic principles, equipments, process variables, mechanics of metal removal, MRR, application and limitations, Magnetic abrasive finishing, Abrasive flow finishing.

UNIT III

ELECTRO–CHEMICAL PROCESSES:

Fundamentals of electro chemical machining, electrochemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy, economic aspects of ECM–Simple problems for estimation of metal removal rate. Electro stream drilling, Shaped tube electrolytic machining: Basic Principle of operation, advantages, disadvantages and applications.

CHEMICAL MACHINING: Principle, maskants, etchants and applications.

UNIT IV

THERMAL METAL REMOVAL PROCESSES:

General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electric discharge wire cutting processes – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of toolelectrode and dielectric fluids, methods, surface finish and machining accuracy, characteristics of spark eroded surface and machine tool selection. Wire EDM, principle, applications. Comparison of thermal and non-thermal processes.

ELECTRON BEAM MACHINING

Generation and control of electron beam for machining, theory of electron beam machining.

UNIT V

LASER BEAM MACHINING, PLASMA ARC MACHINING

General Principle and application of laser beam machining, thermal features, cutting speed and accuracy of cut.

Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish,other applications of plasma in manufacturing industries.

Learning Resources

Text Book:

1. VK Jain, “Advanced machining processes”, Allied publishers, New Delhi,2005.

Reference Books:

1. Pandey P.C. and Shah H.S, “Modern Machining Process”, Tata McGraw-Hill Publishing. 1984
2. McGeough, J. A, “Advanced Methods of Machining” Springer publisher; 1988

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - I SEMESTER
MECHANICS OF COMPOSITE MATERIALS

Course Code: ME7T5C **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Explain the behavior of constituents in the composite materials
- Enlighten the students in different types of reinforcement
- Develop the student's skills in understanding the different manufacturing methods available for composite material.
- Illuminate the knowledge and analysis skills in applying basic laws in mechanics to the composite materials.

COURSE OUTCOMES:
Upon completion of this course the student will be able to:

1. Explain the mechanical behavior of layered composites compared to isotropic materials.
2. Apply constitutive equations of composite materials and understand mechanical behavior at micro and macro levels.
3. Determine stresses and strains relation in composites materials.

Pre-Requisites: Mechanics of solids, Metallurgy& material science

UNIT I
INTRODUCTION TO COMPOSITE MATERIALS:
Introduction, Classification: Polymer Matrix Composites, Metal Matrix Composites, Ceramic Matrix Composites, nature-made composites, and applications. Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosetts, Metal matrix and ceramic composites.

UNIT II
ELASTIC BEHAVIOR OF COMPOSITE LAMINA USING MICROMECHANICS:
Introduction, Strength of Materials Approach, Semi- Empirical Models, Elasticity Approach, Volume and Mass Fractions, Density, and Void Content, Evaluation of the Four Elastic Moduli, , Ultimate Strengths of a Unidirectional Lamina

UNIT III
ELASTIC BEHAVIOR OF COMPOSITE LAMINA USING MACROMECHANICS:
Introduction, Definitions: Stress, Strain, Elastic Moduli, Strain Energy, stress strain relations for general anisotropic materials, specially orthotropic materials, transversally isotropic materials, orthotropic material under plane stress and isotropic materials, relations between mathematical and engineering constants.

UNIT IV
ELASTIC BEHAVIOR OF MULTIDIRECTIONAL LAMINATES
Basic assumptions, laminate code, strain-displacement relations, stress-strain relations of a layer within a laminate, force and moment resultants, Laminate stiffness and laminate compliance, symmetric laminates, balance laminates

UNIT V
FAILURE, DESIGN OF LAMINA AND LAMINATES:
Lamina Strength Failure Theories of an Angle Lamina: Maximum Stress Failure Theory Strength Ratio, Failure Envelopes, Maximum Strain Failure Theory, Tsai–Hill Failure Theory, Tsai–Wu
Laminate: Introduction, Special Cases of Laminates, and Failure Criterion for a Laminate, and Design of a Laminated Composite

Learning Resources

Text Books:

1. Engineering Mechanics of Composite Materials, (2nd edition), by Isaac and M Daniel, Oxford University Press, 2006 .
2. Analysis and performance of fibre Composites, (Second Edition), by B. D. Agarwal and L. J. Broutman, John Wiley & sons, NewYork , New York, 1990.

Reference Books:

1. Mechanics of Composite Materials, (3ed edition), by R. M. Jones, Mc Graw Hill Company, New York, 2006.
2. Analysis of Laminated Composite Structures, by L. R. Calcote, Van Nostrand Rainfold, New York, 1969.
3. Mechanics of Composite Materials, (Second Edition), by Autar K. Kaw, CRC, 2010.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - I SEMESTER

COMPUTATIONAL FLUID DYNAMICS

Course Code: ME7T5D **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Propose an overview of numerical techniques applied to fluid flow and heat transfer and introducing the student to the fundamental principles of discretization techniques.
- Specify need for implementation aspects to finite difference equations, consistency, explicit and implicit methods.
- Acquire knowledge of first order wave equation, stability of hyperbolic and elliptic equations.
- Recognize finite volume method, linear interpolation and quadratic interpolation. Common matrix methods such as direct methods for matrix inversion and direct methods for banded matrices.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Form the governing equations for fluid dynamics problems
2. solve partial differential equations and analyze the behavior of them
3. Apply Numerical techniques and matrix methods to solve banded matrices
4. Apply finite difference techniques to solve the heat transfer and fluid flow equations
5. Apply energy equations to solve fluid flow and heat transfer problems

Prerequisite: Engineering Mechanics, Numerical Methods, Fluid Mechanics, Heat Transfer

UNIT I
FORMATION OF GOVERNING EQUATIONS OF FLUID DYNAMICS
Definition of Computational fluid dynamics (CFD) Applications in Engineering, Models of Fluid flow, Substantial derivative the divergence of the velocity
Continuity equation, the momentum equation, energy equation, physical boundary conditions Forms of governing equations particularly suited to CFD

UNIT II
MATHEMATICAL BEHAVIOR OF PARTIAL DIFFERENTIAL EQUATIONS :
Introduction Classification of Quasi linear partial differential equations General method of determining the classification of partial differential equations, General behavior of different classes of partial differential equations, Hyperbolic parabolic and elliptic equations

UNIT III

ELEMENTARY DETAILS IN NUMERICAL TECHNIQUES AND ENERGY EQUATIONS:

Number system and errors, Representation of integers, Fractions, Floating point Arithmetic, loss of significance and error propagation, condition and instability, Computational methods for error estimation, Convergence of Sequences. Stokes equation, conservative body force fields, stream function – Vorticity formulation.

UNIT IV

FINITE DIFFERENCE AND ITS APPLICATIONS IN HEAT CONDUCTION AND CONVECTION

Discretization, consistency, stability, and Fundamentals of fluid flow modeling: Introduction, elementary finite difference quotients, implementation aspects of finite difference equations, consistency, explicit and implicit methods.

Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, finite difference application in convective heat transfer.

UNIT V

REVIEW OF EQUATIONS GOVERNING FLUID FLOW AND HEAT TRANSFER:

Introduction, conservation of mass, Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle, special forms of the Navier-stokes equations

Learning Resources

Text Book:

1. Computational fluid dynamics - Basics with applications, by John. D. Anderson, Mc Graw Hill, Singapur, International Edition, 1995.
2. Numerical heat transfer and fluid flow, by Suhas V. Patankar, Butter-worth Publishers, Washington, 1980.

References Books:

1. Computational Fluid Flow and Heat Transfer, (1st Edition) by by Pradip Niyogi, Tata McGraw-Hill Education.
2. Fundamentals of Computational Fluid Dynamics, by Tapan K. Sengupta, Universities Press, Hyderabad, 2004.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH- I SEMESTER
SIMULATION LAB

Course Code: ME7L1 **Credits: 2**
Lecture: --- **Internal assessment: 25 Marks**
Lab practice: 3 Period/week **Semester end examination: 50 Marks**

COURSE OBJECTIVES:

- Simulation lab course provides the undergraduates to perform the computational analysis and scientific computing in structural mechanics and heat transfer areas using FEA software.

COURSE OUTCOMES:

Upon the completion of this course the student will be able to:

1. Demonstrate the main stages of Finite Element analysis
2. Perform modeling and analysis of structural and heat transfer problems.

Any 12 of the following

1. Static analysis of indeterminate/ composite bars
2. Shear force and bending moment diagrams of a beam
3. Maximum deflection in a fixed/continuous beam with combination of loads
4. Thermal stress in bar
5. static analysis of plane or 3-space truss/frame
6. Evaluation of Stress concentration factor in a rectangular plate with central hole
7. Stress distribution in thick a cylinders subjected to internal and/external pressures
8. steady state heat transfer in cylinder
9. Transient heat transfer in a sphere
10. A calculation of buckling load of a column
11. Natural frequency of a spring mass system
12. Natural frequencies of a continuous system
13. Harmonic analysis of a bar/beam
14. Velocity and acceleration analysis of a slider crank mechanism
15. Dynamic force analysis of a slider crank mechanism
16. Study of h-type and p-type convergence

Note:

1. The above tasks are to be performed Using FEA Software ANSYS

Reference Books:

1. Finite Element Analysis Using ANSYS by P. Srinivas, Krishna Chaitanya S., Rajesh Kumar D., PHI Learning Pvt. Ltd.2012.
2. Ansys Reference Manuals

IV B.TECH - I SEMESTER

MACHINE DYNAMICS LAB

Course Code: ME7L2 **Credits: 2**
Lecture: -- **Internal assessment: 25 marks**
Practice: 3 periods/week **Semester end examination: 50 marks**

COURSE OBJECTIVES:

- Determine the vibration parameters of a vibrating system
- Predict the radius of gyration and moment of inertia of vibrating system
- Verify the static and dynamic balancing
- Study the effect of gyroscopic couple and operations of robotic arm

COURSE OUTCOMES:

Upon the completion of this course the student will be able to:

1. Evaluate the natural frequencies in different vibrating systems and effect of gyroscopic couple
2. Compute the radius of gyration & Moment of Inertia of oscillating part in vibration system
3. Apply the concepts of damping to determine damping coefficient
4. Measure the amplitude of vibration in damped and un damped vibrating system
5. Verify the static balancing and dynamic balancing
6. Implement the operations to manipulate the robot arm in industries

Prerequisites: Dynamics of Machinery

Any 12 Experiments from following

LIST OF EXPERIMENTS

1. Determination of Natural frequency of single mass, single helical spring system
2. Determination of Natural frequency of combination of springs – springs in parallel or springs in series
3. Determination of Natural frequency of un damped torsional single rotor system
4. Determination of radius of gyration of a given compound pendulum
5. Determination of radius of gyration, moment of inertia – bifilar suspension Method
6. To find Damping coefficient of torsional single rotor system
7. Determination of amplitude of vibration of damped vibrating system
8. Determination of amplitude of vibration of un damped vibrating system
9. Verify the Static balancing using steel balls
10. Verify the Dynamic balancing using steel balls
11. Whirling of shafts/ determination of critical speed with Rotors
12. Gyroscopic couple verification

13. Palletizing operation using Robot Arm
14. Direct Kinematic Analysis of Robot Arm

Reference Books

1. Mechanical vibrations, (4th edition) by S.S.Rao Pearson education publications, Padparganj Delhi reprint 2004.

IV B.TECH - I SEMESTER

MINI PROJECT

Course Code: ME7L3 **Credits: 2**
Lecture: --- **Internal assessment: 75 Marks**
Lab: 3 Periods/week **Semester end examination: --**

COURSE OBJECTIVES:

- To make the students to set the industrial exposure.
- To implement the knowledge, technology, innovational ideas for solving the industrial problems.

COURSE OUTCOMES:

Up on completion of this course its student will be able to:

- Describe the basic functions of various departments of an industry.
- Identify the importance of the activity / operation of the industry to solve the industrial problems by using theoretical knowledge.
- Get the knowledge in the field of optimization techniques.

IV B.TECH - I SEMESTER
SEMINAR

Course Code: ME7L4 **Credits: 1**
Lecture: --- **Internal assessment: 50 Marks**
Lab: 2 Periods/week **Semester end examination: --**

Student should prepare and present brief ideas on new trends in the mechanical engineering

COURSE OBJECTIVES:

- To get acquainted with the recent technologies.
- To learn about presentation and communication skills.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

- Adopt good oral and presentation skills.
- Compile effective power point presentations.
- Develop better body language.
- Enhance students' knowledge on recent advancements and technologies in mechanical domain.

IV B.TECH- II SEMESTER
POWER PLANT ENGINEERING

Course Code: ME8T1 **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- List the various sources of energy
- Acquire the knowledge of power generation from steam, diesel, gas, hydro, nuclear and non- conventional energies.
- Define power plant economics and environmental considerations.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Describe various energy sources and combustion processes in steam power plants.
2. Classify diesel and gas turbine power plants layout with auxiliaries.
3. Relate hydro projects classifications, fusion and fission reactions in nuclear power plants and types of reactors.
4. Estimate the advantages of combined working of different power plants and importance of measurement and instrumentation in power plant.
5. Explain the concepts of power plant economics and impact of its effluents on environment.

Prerequisite: IC Engines and gas turbines.

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, and spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, Dust collectors, cooling towers and heat rejection, dearation. Corrosion and feed water treatment.

UNIT II
DIESEL POWER PLANT:
Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging, application and comparison with other plants.

GAS TURBINE POWER PLANT:
Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison, Permanence evaluation of the gas turbine plant.

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 – Site selection of hydro plant - plant auxiliaries – plant operation pumped storage plants.
NUCLEAR POWER PLANT:
Fusion and fission Reactions, Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation, Fuel moderator and coolant. 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 IV
HYBRID POWER PLANTS:
Introduction, Advantages of combined working, Load division between power stations, Storage type hydro-electric plant in combination with steam plant, Run off River plant in combination with steam plant, Pump storage plant in combination with steam or Nuclear power plant, Coordination of hydro electric and gas turbine stations, coordination of hydro-electric and Nuclear power stations, coordination of different types of Power plants.
POWER PLANT INSTRUMENTATION AND CONTROL:
Importance of measurement and instrumentation in power plant, measurement of water purity, Gas analysis, O_2 and CO_2 measurements, measurement of smoke and dust, measurement of moisture in CO_2 circuit, Nuclear measurements.

UNIT V
POWER PLANT ECONOMICS AND ENVIRONMENTAL CONSIDERATIONS:
Capital cost, investment of fixed charges, operating costs, cost per KWh, 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.

Learning Resources

Text Book:

1. A Course In Power Plant Engineering by – Arora and Domkundwar, Dhanpatrai & co.2011
2. Power Plant Engineering, by P.K.Nag, TataMcHill-2008.

References Books:

1. A Text Book of Power Plant Engineering, by R K Rajput, Lakshmi Publications, 2008.
2. Power Plant Engineering, by P.C.Sharma, S.K.Kataria Publications, 2009.
3. Power plant Engineering, by Ramalingam, Scietech Publishers-2010.
4. An Introduction to Power Plant Technology, by G.D. Rai, Khanna publications-1996.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - II Semester
NON DESTRUCTIVE EVALUATION

Course Code: ME8T2A **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Familiarize with various ultrasonic hardness tests.
- Gain knowledge about X-ray radiography.
- Acquire knowledge on different types of radiographic tests.
- Get educated on Holography and applications of NDT.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Demonstrate the knowledge about different acoustic flaw detection techniques.
2. Familiarize with basic principles of electromagnetic NDT methods.
3. Explain X-ray and gamma ray radiography inspection process.
4. Apply different holography techniques and know about real time applications of NDT.

Pre-Requisites: Production Technology

UNITI

ACOUSTICAL METHODS: Ultrasonic testing- Generation of ultrasonic waves, Horizontal and shear waves, Near field and far field acoustic wave description, Ultrasonic probes- Straight beam, direct contact type, Angle beam, Transmission/reflection type, and delay line transducers, acoustic coupling and media.

ULTRASONIC TESTS: Transmission and pulse echo methods, A-scan, B-scan, C-scan, F-scan and P-scan modes, Flaw sizing in ultrasonic inspection: AVG, Amplitude, Transmission, TOFD, Satellite pulse, Multi-modal transducer, zonal method using focused beam. Flow location methods, Signal processing in Ultrasonic NDT; Mimics, spurious echo's and noise. Ultrasonic flaw evaluation.

UNIT II

ELECTRO-MAGNETIC METHODS- magnetic particle inspection-introduction to electrical impedance, principles of eddy current testing, flaw detection using eddy currents.

UNIT III

RADIOGRAPHIC METHODS: Introduction to x-ray radiography, the radiographic process, X-ray and Gamma ray sources, Geometric principles, Factors governing exposure, radio graphic screens, scattered radiation, arithmetic of exposure, radiographic image quality and detail visibility, industrial X-ray films.

X-RAY RADIOGRAPHY PROCESES: Fundamentals of processing techniques, process control, the processing room, special processing techniques, paper radiography, sensitometric characteristics of X-ray films, film graininess signal to noise ratio in radiographs. The photographic latent image, radiation protection.

UNIT IV

OPTICAL METHODS: holography- Principles and practices of Optical holography, acoustical, microwave, x-ray and electron beam holography techniques.

UNIT V

APPLICATIONS: NDT in flaw analysis of Pressure vessels, piping
NDT in Castings, Welded constructions, etc., Case studies.

Learning Resources

Text Books:

1. Ultrasonic testing, (3rd edition), by Krautkramer and Krautkramer, Springer-Verlag; .1983.
2. Ultrasonic inspection to Training for NDT, by E.A. Gingel, Prometheus Press,2006.
3. Metals and alloys, by ASTM Standards, Vol 3.01.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - II SEMESTER
AUTOMATION IN MANUFACTURING

Course Code: ME8T2B	**Credits: 3**
Lecture: 3 periods/week	**Internal assessment: 30 marks**
Tutorial: 1 period/week	**Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Describe the basic concepts of automation in manufacturing systems.
- Acquire the fundamental concepts of automated flow lines and their analysis.
- Classify automated material handling, automated storage and retrieval systems.
- Illustrate adaptive control systems and automated inspection methods.

Course Outcomes:

Upon completion of this course the student will be able to:

1. Illustrate the basic concepts of automation in machine tools.
2. Analyze various automated flow lines, Explain assembly systems and line balancing methods.
3. Describe the importance of automated material handling and storage systems.
4. Interpret the importance of adaptive control systems, automated inspection systems.

Pre-Requisites: Machine Tools, Cad/ Cam

UNIT I

INTRODUCTION- Single-Station Manufacturing Cells, types and strategies of automation, Automation in machine tools, automation principles, Mechanical feeding and tool changing, machine tool control, elements in product realization.

AUTOMATED FLOW LINES:

Methods of work part transport, transfer mechanisms, buffer storage, control function, Design and fabrication consideration.

UNITII:

ANALYSIS OFAUTOMATED FLOW INES

General terminology, analysis of transfer lines with and without buffer storage, partial automation, implementation of automated flow lines.

ASSEMBLY SYSTEMS AND LINEBALANCING:

Assembly process, Manual Assembly Lines, Line balancing methods, ways for improving line balance, flexible assembly lines.

UNITIII:

AUTOMAT EDMATERIAL HANDLING:

Types of equipment, functions, analysis and design of material handling systems conveyor systems, automated guided vehicle systems.

AUTOMATED STORAGE SYSTEMS: Automated storage and retrieval systems work in process storage, inter facing and ling and storage with manufacturing.

UNITIV

ADAPTIVE CONTROL SYSTEMS:

Introduction – Adaptive control with optimization, Adaptive control with constraints, Application of Adaptive control in Machining operations. Uses of various parameters such as cutting force, Temperature, vibration and acoustic emission Adaptive control.

UNITV

AUTOMATED INSPECTION: Fundamentals, types of inspection methods and equipment, CMM, Types, methods of CMM control, Machine vision- Introduction, image acquisition, and image processing applications of machine vision.

Learning Resources

Text Book:

1. Automation, Production Systems and Computer Integrated Manufacturing: M.P. Groover./PE/PHI

2. Computer Control of Manufacturing Systems: Yoram Coren.

Reference Books:

1. CAD/CAM/CIM, (2nd Edition),by Radhakrishnan and Subramanian, NewAge Publications,
2. CAD / CAM/ CIM by Radhakrishnan.
3. Automation by W. Buekinsham.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - II SEMESTER
QUALITY AND RELIABILITY ENGINEERING

Course Code: ME8T2C **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Demonstrate the approaches and techniques to assess and improve process and/or product quality and reliability.
- Introduce the principles and techniques of Statistical Quality Control and their practical uses in product and/or process design and monitoring
- Illustrate the basic concepts and techniques of modern reliability engineering tools.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Attain the basic techniques of quality improvement, fundamental knowledge of statistics and probability
2. Use control charts to analyze for improving the process quality.
3. Describe different sampling plans
4. Acquire basic knowledge of total quality management
5. Understand the concepts of reliability and maintainability

Prerequisites:
Industrial Engineering and Management

UNIT I
Quality value and engineering – quality systems
Quality engineering in product design and production process – system design –parameter design – tolerance design, Quality costs – quality improvement.

UNIT II
Statistical Process control
X, R, p, c charts, other types of control charts, process capability, process capability analysis, process capability index.
Acceptance sampling by variables and attributes, design of sampling plans, single, double, sequential and continuous sampling plans, design of various sampling plan.

UNIT III
Loss function, tolerance design –
N type, L type, S type; determination of tolerance for these types. Online quality control– variable characteristics attribute characteristics, parameter design.

UNIT IV

Quality function deployment –

House of quality, QFD matrix, and total quality management concepts. Quality information systems, quality circles, introduction to ISO 9000 standards.

Reliability– Evaluation of design by tests - Hazard Models, Linear, Raleigh, Weibull. Failure Data Analysis, reliability prediction based on weibull distribution, Reliability improvement.

UNIT V

Complex system-

Reliability, reliability of series, parallel, standby systems, reliability prediction and system effectiveness.

Maintainability-

Availability, economics of reliability engineering, replacement of items, maintenance costing and budgeting, reliability testing.

Learning Resources

Text Books:

1. Statistical Process Control, by Eugene Grant, Richard Leavenworth, McGraw Hill.
2. Quality Engineering in Production Systems, by G Taguchi , McGraw Hill, 1989.
3. Optimization &Variation Reduction in Quality, byW.A. Taylor,Tata McGraw Hill, 1991.

Reference Books:

1. Jurans Quality Planning and Analysis, by Frank. M.Gryna Jr. McGrawHill
2. Taguchi Techniques for Quality Engineering, (2^{nd}Edition) by Philipposs, McGraw Hill, 1996,.
3. Reliability Engineering, (3^{rd}Edition), by LS Srinath, Affiliated East West Pvt Ltd, 1991.
4. Reliability Engineering, by E.Bala Guruswamy, Tata McGraw Hill, 1994.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - II SEMESTER

FLEXIBLE MANUFACTURING SYSTEMS & GROUP TECHNOLOGY

Course Code: ME8T2D **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Demonstrate the components and need of FMS in modern manufacturing
- Get the knowledge of applying FMS in industries
- Classify the partsac cording coding system
- Get the skill of odeling and design for critical systems

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Describe the Structure of FMS and types of workstations.
2. Analyze the various levels of FMS, planning and control.
3. Explain the concepts of material handling, storage and automated inspection systems.
4. Describe part families, different types of coding system sin Group technology (GT)
5. Identify applications of GT in different complex systems

Prerequisites:
CAD/CAM

UNIT I
INTRODUCTION
Manufacturing Automation, Need of flexibility, Concept of flexibility, Definition and types of FMS, Architecture of FMS, Work piece flow in FMS, Performance measures of FMS.
WORK STATION:CNC Machines, Machine Centers, Inspection Stations

UNIT II
COMPUTER CONTROL SYSTEM OFFMS:
Functions of Computer, Control system architecture, Factory level, Cell level control systems, Equipment control systems, Factory communications, Local area networks, Data files and system reports.
FMS PLANNING: short term planning problems, loading models in FMS, Production planning model for an FMS, FMS control, FMS planning and control.

UNIT III
AUTOMATED MATERIAL HANDLING STORAGE SYSTEMS:
Function of MHS, Types of Material handling equipment, Conveyor systems, AGVs, Industrial Robots. Characteristics of Storage Systems Automated storage and retrieval systems; work in process storage, inter facing and ling and storage with manufacturing.

AUTOMATED INSPECTION SYSTEMS:
In-process gauging, Coordinate measuring Machines–principle, construction, types of structure and their applications; Probes – various shapes, sizes and applications, operation and programming of CMMs

UNIT IV
GROUP TECHNOLOGY:
Introduction, part families, need of G.T. Part families, Methods for developing part families
BASIC TYPE OF CODES:
Hierarchical codes, Attri but ecode, Hybrid code, selecting acoding system, Developing acoding system in an industry, examples of coding systems, MICLASS,OPITZ,CODE systems.

UNIT V
FACILITY DESIGN USING GT:
Introduction, economic modelling in GT environment–production planning cost model, Economics of GT, Application of GT for design retrieval, CAPP, and FMS.

Learning Resources

Text Books:

1. Automation & Production Systems and Computer Integrated Manufacturing, by M.P.Groover, Prentice Hall,2007

Reference Books:

1. Performance Modeling of Automated Manufacturing Systems, by N. Viswanadham, Y.Narahari,Prentice Hall,1992.
2. CAD/CAM Handbook, byEric Teichloz ,McGraw-Hill,1985.
3. Computer Integrated Design and Manufacturing, Bedworth Henderson,, McGraw- Hill,1991.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - II SEMESTER
GAS DYNAMICS AND JET PROPULSION

Course Code: ME8T3A **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Define basic concept and importance of gas dynamics
- Interpret the flow pattern in flow and nonflow systems
- Identify the thrust equation and its usage in jet aircraft and rocket propulsion in an efficient way

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Explain basic concepts of gas dynamics and describe the basic fundamental equations of one dimensional flow of compressible fluid and isentropic flow of an ideal gas.
2. Analyze the steady one-dimensional is entropic flow, frictional flow and isothermal flow and express the concepts of steady one dimensional flow with heat transfer.
3. Discuss the effect of heat transfer on flow parameters.
4. Describe the jet propulsion engines
5. Describe the basic concepts of rocket propulsion

Pre-Requisite

Basic thermodynamics, Heat transfer.

UNIT I

INTRODUCTION TO GASDYNAMICS:

Control volume and system approaches acoustic waves and sonic velocity- Mach number-classification of fluid flow based on Mach number-Mach cone-compressibility factor -General features of one dimensional flow of a compressible fluid -continuity and momentum equations for a control volume.

ISENTROPIC FLOW OF AN IDEAL GAS

Basic equation-stagnation enthalpy, temperature, pressure and density-stagnation, acoustic speed-critical speed of sound dimensionless velocity-governing equations for isentropic flow of a perfect gas -critical flow area.

UNIT II

STEADY ONE DIMENSIONAL ISENTROPICFLOW:

nozzles -area change effect on flow parameters-chocking- convergent nozzle– performance of a nozzle under decreasing back pressure-Delavel nozzle-optimum area ratio, -effect of back pressure –nozzle discharge coefficients -nozzle efficiencies.

SIMPLE FRICTIONAL FLOW:

Governing equations for Adiabatic flow with friction in a constant area duct-fannoline limiting conditions-effect of wall friction flow properties in an Isothermal flow with

friction in a constant area duct governing equations- limiting conditions, numerical problems.

UNIT III

STEADY ONE DIMENSIONAL FLOW WITH HEAT TRANSFER:

Governing equations- Rayleigh line entropy change caused by heat transfer -conditions of maximum enthalpy and entropy.

EFFECT OF HEAT TRANSFER ON FLOW PARAMETERS:

Intersection of Fanno and Rayleigh lines. Shock waves in perfect gas-properties of flow across a normal shock-governing equations – Rankine Hugoniat equations- Prandtl's velocity relationship- converging diverging nozzle flow with shock thickness–shock strength.

UNIT IV

JET PROPULSION

Aircraft propulsion: types of jet engines – thrust equation, Effect of pressure, velocity and temperature changes of air entering compressors, thrust augmentation methods, Performance of turbo propeller engines, ramjet and pulsejet, scramjet engines.

UNIT V

ROCKET PROPULSION

Rocket engines, Basic theory of equations- thrust equation- effective jet velocity – specific impulse-rocket engine performance-solid and liquid propelant rockets- comparison of various propulsion systems.

Learning Resources

Text Books:

1. Modern Compressible flow- Anderson, by J.D-McGraw Hill-2003.
2. Gas Turbine Theory, by H. Cohen, G.E.C. Rogers and Saravanamutto-Longman Group Ltd.-1980.
3. Fundamentals of Compressible Flow, by S.M. Yahya-New Age International (P) Limited-1996.
4. Principles of Jet Propulsion and Gas Turbines, by N.J. Zucrow-John Wiley, New York,-1970.

Reference Books:

1.Compressible fluid flow, by A. H. Shapiro-The Ronald Press, New York-2002
2. Fundamentals of compressible flow with aircraft and rocket propulsion, by S. M.Yahya-New Age International (P) Ltd.-2007
3. Elements of gas dynamics, by Liepman & Roshko-Wiley, NewYork-1957
4. Aircraft & Missile propulsion, by Zucrow-Wiley,New York-1958
5. Gas dynamics, by M.J. Zucrow & Joe D.Holfman-Krieger Pub. Co.-1985

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - II Semester
AUTOMOBILE ENGINEERING

Course Code: ME8T3B **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- List the basic types of automobiles and their classification
- Recognize the importance of fuel system, cooling system, ignition system and emission control techniques from automobiles
- Interpret construction, working and functions of electrical, transmission, steering, suspension, braking systems.

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Explain basic concepts of Automobile Engineering, types of engines and components of automobiles.
2. Describe the functions of fuel, cooling and ignition systems.
3. Describe the concepts of transmission and suspension systems
4. Illustrate steering and braking systems of an automobile
5. Discuss the concept of electrical system, emissions from automobiles and alternative energy resources

Pre-Requisite: IC Engines and gas turbines, Heat transfer

UNIT I
INTRODUCTION

Components of four wheeler automobile – chassis and body – power unit –power transmission – rear wheel drive, front wheel drive, 4 wheel drive – types of automobile engines, engine construction, turbo charging and super charging – engine lubrication, splash and pressure lubrication systems, oil filters, oil pumps – crank case ventilation –engine service, reboring, decarburization, Nit riding of crank shaft.

UNIT II
FUEL SYSTEM

S.I. Engine: Fuel supply systems, Mechanical and electrical fuel pump – filters–carburetor – types – air filters – petrol injection. **C.I. Engines:** Requirements of diesel injection systems, types of injection systems, fuel pump, nozzle, spray formation, injection timing, testing of fuel pumps.

COOLING SYSTEM:

Cooling Requirements, Air Cooling, Liquid Cooling, Thermosyphon and Forced Circulation System – Radiators – Types – Cooling Fan - water pump, thermostat, evaporating cooling – pressure sealed cooling – antifreeze solutions.

IGNITION SYSTEM: Function of an ignition system, battery ignition system, constructional features of storage, battery, auto transformer, contact breaker points,

condenser and spark plug – Magneto coil ignition system, electronic ignition system using contact breaker, electronic ignition using contact triggers – spark advance and retard mechanism.

UNIT III

TRANSMISSION SYSTEM:

Clutches, principle, types, cone clutch, single plate clutch, multi plate clutch, magnetic and centrifugal clutches, fluid fly wheel – gear boxes, types, sliding mesh, construct mesh, synchro mesh gear boxes, epicyclic gear box, over drive torque converter. Propeller shaft – Hotch – Kiss drive, Torque tube drive, universal joint, differential rear axles – types – wheels and tyres.

SUSPENSION SYSTEM:

Objects of suspension systems – rigid axle suspension system, torsion bar, shock absorber, Independent suspension system.

UNIT IV

STEERING SYSTEM:

Steering geometry – camber, castor, king pin rake, combined angle toein, center point steering. Types of steering mechanism – Ackerman steering mechanism, Davis steering mechanism, steering gears – types, steering linkages.

BRAKING SYSTEM: Mechanical brake system, Hydraulic brake system, Master cylinder, wheel cylinder tandem master cylinder Requirement of brake fluid, Pneumatic and vacuum brakes.

UNIT V

ELECTRICAL SYSTEM:

Charging circuit, generator, current – voltage regulator – starting system, bendix drive mechanism solenoid switch, lighting systems, Horn, wiper, fuel gauge – oil pressure gauge, engine temperature indicator etc.

EMISSION FROM AUTOMOBILES:

Pollution standards National and international – Pollution Control– Techniques – Multipoint fuel injection for SI Engines. Common rail diesel injection Energy alternatives – Solar, Photo-voltaic, hydrogen, Biomass, alcohols, LPG,CNG, liquid Fuels and gaseous fuels, electrical-their merits and demerits.

Learning Resources

Text Books:

1. Automotive Mechanics-Vol.1 & Vol.2, by Kirpal sing, Standard Publishers, New Delhi 2008.
2. Automobile Engineering, (3rd edition), by William crouse, TMH Distributors, New Delhi.

Reference Books:

1. Automobile Engineering Theory and Servicing, by James D. Halderman and Chase D. Mitchell, Pearson education inc, 2001.
2. Automobile Engineering, by Newton steeds & Garrett Automotive Mechanics Heitner, Butterworth International, London.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - II Semester
NANO TECHNOLOGY

Course Code: ME8T3C **Credits: 3**
Lecture: 3periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Study the material property changes that changes with size, scale and dimensions
- Recognize the characterization techniques of nano materials
- Demonstrate manufacturing methods of nano particles and powders
- Acquire the knowledge effectiveness of nano scale dimensions
- Study all the basic sciences that are the foundation to Nano Technology
- Illustrate the applications of Nano technology in different fields

COURSE OUTCOMES:
Upon completion of this course the student will be able to:

1. Recognize the importance of nano materials.
2. Demonstrate material property dependence on size, scale and dimension.
3. Characterize nano materials by electron microscopy, scanning probes and X Ray Diffraction
4. List the applications and manufacturing methods of nano particles, powders
5. Identify different applications of nano materials

Prerequisites: Physics, Chemistry, Material Science.

UNIT I
INTRODUCTION TO NANO MATERILAS:
Basics of Quantum Mechanics, Harmonic oscillator, magnetic Phenomena, band structure in solids, Mossbauer and Spectroscopy, optical phenomena bonding in solids, Anisotropy.
Application of Silicon carbide, nano materials preparation, Sintering of SiC, X-ray Diffraction data, electron microscopy sintering of nano particles, Nano particles of Alumina and Zirconia Nano materials preparation, Characterization

UNIT II
MECHANICAL PROPERTIES:
Strength of nano crystalline SiC, Preparation for strength measurements, Mechanical properties, Magnetic properties,
ELECTRICAL PROPERTIES:
Switching glasses with nano particles, Electronic conduction with nano particles Optical properties: Optical properties, special properties and the colored glasses.

UNIT III
SYNTHESIS OF NANO MATERIALS: Process of synthesis of nano powders, Electro deposition
CHARACTERIZATION OF NANO MATERIALS: Electron microscopic, scanning probe microscopic, optical microscopic for nano science and technology, X-ray diffraction.

UNIT IV

NANO BIOLOGY : Interaction between bimolecular and nano particle surface, Different types of inorganic materials used for the synthesis of hybrid nano-bio assemblies, Application of nano in biology, nano probes for Analytical Applications-A new Methodology in medical diagnostics and Biotechnology, Current status of nano Biotechnology, Future perspectives of Nano biology, Nano sensors.

UNIT V

NANO MEDICINES : Developing of Nano medicines Nano systems in use, Protocols for nano drug Administration, Nanotechnology in Diagnostics applications, materials for used in Diagnostics and Therapeutic applications, Molecular Nano mechanics, Molecular devices, Nano tribology, studying tribology at nano scale, Nano tribology applications.

Learning Resources

Text Books:

1. A. K. Bandyopadhyay, "Nano Materials", New Age International, 2007.
2. T.Pradeep, "Nano: The Essentials, Understanding Nanoscience and Nanotechnology", TMH publications, 2007.

Reference Books:

1. Nanotechnology–A gentle Introduction to the next big idea by Mark Ratner and Daniel Ratner,Prentice Hall Professional, 2003.
2. Introduction to Nanotechnology–Charles P Poole Jr, Frank J Owens, Wiley Interscience– JohnWiley & sons.
3. Nanotechnology for Dummies–Richard Booker, Earl Boysen, Wiley Publishing Inc

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - II Semester

EXPERIMENTAL STRESS ANALYSIS

Course Code: ME8T3D **Credits: 3**
Lecture: 3 periods/week **Internal assessment: 30 marks**
Tutorial: 1 period/week **Semester end examination: 70 marks**

COURSE OBJECTIVES:

- Recognize the various techniques available to measure the stress and Strains using different sources.
- Realize the working of recording instruments and data logging methods
- Distinguish the principles of photo elasticity in two dimensional stress analyses

COURSE OUTCOMES:

Upon completion of this course the student will be able to:

1. Understand the overall concepts of stress/strain analysis by experimental means.
2. Familiar with the theory and practice of common experimental stress analysis Methods including moire methods, photo elasticity
3. Acquire the knowledge on Brittle and bi-refrigent coatings and working of strain gauges.

Prerequisites: Strength of materials

UNIT I
STRAIN MEASUREMENT METHODS:
Various types of strain gauges, Electrical Resistance strain gauges, Gage Sensitivity and Gage Factor Semiconductor strain gauges, Temperature compensation, strain gauge circuits
ANALYSIS OF STRAIN GAGE DATA: Three Element Rectangular Rosette, Delta Rosette, strain gauge rosette.

UNIT II
RECORDING INSTRUMENTS:
Introduction, static recording and data logging, dynamic recording at very low Frequencies, dynamic recording at intermediate frequencies, dynamic recording at high Frequencies, dynamic recording at very high frequencies.

UNIT III
BRITTLE COATINGS and BIREFRINGENT COATINGS:
Brittle Coatings: Introduction, coating stresses, failure theories, brittle coating crack patterns, crack detection, ceramic based brittle coatings, resin based brittle coatings, test procedures for brittle coatings analysis, calibration procedures, analysis of brittle coating data.
Birefringent Coatings:
Introduction, Coating stresses and strains, coating sensitivity, coating materials, application of coatings, effects of coating thickness, Fringe-order determinations in coatings, stress separation method Undercoating.

UNIT IV
MOIRE METHODS:
Introduction, mechanism of formation of Moire fringes, the geometrical approach to Moire-Fringe analysis, displacement field approach to Moire-Fringe analysis, out of plane displacement measurements, out of plane slope measurements, sharpening and multiplication of Moire-Fringes, experimental procedure and techniques.

UNIT V
PHOTO ELASTICITY:–
Introduction Polariscope – Plane and circularly polarized light, Bright and dark field setups, Isochromatic Fringe Patterns, Isoclinic Fringe Patterns, CompensationTechniques, Calibration Methods, Separation Methods, Shear Difference Method, Materials for Two-Dimensional Photo elasticity

Learning Resources

Text Books:
1. Experimental stress analysis, (Third Edition) by James Dally and Riley, Mc Graw-Hill International, New Delhi.1978.
2. Experimental stress analysis, (6^{th} edition) by Dr. Sadhu Singh, KhannaPublishers, New Delhi, 1996.

Reference Books:
1. A treatise on Mathematical theory of Elasticity, by Augustus Edward Hough Love, University Press, fourth edition, 1906.
2. Experimental stress analysis principles and methods, by G.S. Holister, Cambridge university press, 1967.
3. Theory of Elasticity, (Third Edition), S.Timoshenke and JN. Goodier McGraw-Hill, New York ,1970.

E-learning resources:

1. http://nptel.ac.in/courses.php
2. http://jntuk-coeerd.in/

IV B.TECH - II SEMESTER
MECHATRONICS LAB

Course Code: ME8L1 **Credits: 2**
Lecture: - **Internal assessment: 25 Marks**
Lab Practice: 3 Periods/week **Semester end examination: 50 Marks**

Note: 12 experiments must be conducted

COURSE OUTCOMES:

1. Identify the pneumatic, hydraulic and electro-pneumatic components used in automation.
2. Demonstrate the features of various simulation software.
3. Design and execute the pneumatic, hydraulic and electronic circuits for various mechanical applications
4. Apply the knowledge of MATLAB software to write simple programs

List of Experiments:

1. operation of a single and double acting cylinder
2. Sequencing of cylinders
3. **Logic gates using LSM controller package**

a) NOT
b) AND
c) OR
d) NAND
e) XOR
f) Latching
g) Cascade timers
h) Single acting cylinder
i) Double acting cylinder
j) Sequencing of cylinders

4. Sensor Technology Package-using PLC

a) Through Beam Optical Sensor
b) Capacitive sensor
c) Inductive sensor
d) Retro-reflective optical sensor
e) Diffused optical sensor
f) Reed switches

5. Simulation software / (Automation Studio)

a) Robot simulator
b) H-simulator
c) P-simulator
d) PLC simulator

6. MATLAB Programming

a. Sample programmers on MATLAB

IV B.TECH -II Semester
Project Work

Course Code: ME8L2 **Credits: 9**
Lecture: - **Internal assessment: 100 Marks**
Lab : 9 Periods/week **Semester end examination: 200 Marks**

COURSE OBJECTIVES:

- To make the students to understand the advances in mechanical engineering
- To implement the knowledge, technology, innovative ideas to solve issues in current domain.
- To develop the team work and improve student's communication skills

COURSE OUTCOMES:

- Know the recent trends in technologies and engineering.
- Implement the innovative ideas in the field of technologies.
- Solve the industrial problems by using theoretical knowledge.
- Develop the computational methods for simplifying the engineering problems.
- Get the knowledge in design, analysis and testing of engineering prototype models.
- Use techniques skills and modern engineering tools.

Our Other Institutions :

1. Parvathaneni Brahmayya Siddhartha College of Arts & Science
2. Parvathaneni Brahmayya Siddhartha Junior College of Arts & Science
3. Veeramachaneni Paddayya Siddhartha Public School
4. Velagapudi Ramakrishna Siddhartha Engineering College
5. Sri Durga Malleswara Siddhartha Mahila Kalasala
6. Sri Durga Malleswara Siddhartha Junior Mahila Kalasala
7. Y.V. Rao Siddhartha College of Education
8. Sri Velagapudi Durgamba Siddhartha Law College
9. K.C.P. Siddhartha Adarsh Residential Public School
10. K. V. Sadasiva Rao Siddhartha College of Pharmaceutical Sciences
11. A.G. & S.G. Siddhartha Arts & Science College
12. A.G. & S.G. Siddhartha Arts & Science Junior College
13. Siddhartha Institute of Hotel Management & Catering Technology
14. Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research Foundation
15. Siddhartha School of Nursing
16. Drs. Sudha & Nageswara Rao Siddhartha Institute of Dental Sciences
17. Dr. C. Sobhanadri Siddhartha College of Nursing