Jharkhand University of Technology Jharkhand, Ranchi

Proposed Syllabus for B.Tech 3rd Semester

Mechanical Engineering

&
Production Engineering

Mechanical Engineering

3rd semester course structure

Sl. No.	Course Code	Subject	L	T	P	Credit
01	ME301	Thermodynamics	3	1	0	3
02	ME302	Fluid Mechanics	3	1	0	3
03	ME303	Strength Of Materials	3	1	0	3
04	MT301	Materials Engineering	3	1	0	3
05	BSC301	Mathematics-III	3	1	0	4
06	BSC302	Environmental Science	2	0	0	0
01	ME301P	Thermodynamics Lab	0	0	3	1
02	ME302P	Fluid Mechanics Lab	0	0	3	1
03	ME303P	Strength Of Materials Lab	0	0	3	1
04	EX301	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1
05	HS301	Communication Skill Lab	0	0	2	1
		Total credit				21

Production Engineering

3rd semester course structure

Sl. No.	Course Code	Subject	L	T	P	Credit
01	ME301	Thermodynamics	3	1	0	3
02	ME302	Fluid Mechanics	3	1	0	3
03	ME303	Strength Of Material	3	1	0	3
04	MT301	Materials Engineering	3	1	0	3
05	BSC301	Mathematics-III	3	1	0	4
06	BSC302	Environmental Science	2	0	0	0
01	ME302P	Fluid Mechanics Lab	0	0	3	1
02	ME303P	Strength Of Material Lab	0	0	3	1
03	MT301P	Materials Engineering Lab	0	0	3	1
04	EX301	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1
05	HS301	Communication Skill Lab	0	0	2	1
Total credit						**21**

Mathematics III

(COMMON FOR ALL BRANCH)

Course code –BSC- 301

L	T	P	CR.
3	1	0	4

Module I

Laplace Transformation: Laplace Transformation and its applications, Inverse Laplace Transformation, Convolution Theorem, Solution of ODE by Laplace Transformation.

Module II

Fourier Transform: Complex form of Fourier series, Fourier Transformation and inverse Fourier Transformation, sine, cosine Transformation, Inverse Transformations -simple illustration.

Module III

Z-Transform: Inverse Z-Transform- Properties – Initial and final value theorems-convolution theorem- Difference equations, Solution of Difference equations using Z-Transformation.

Module IV

Partial Differential Equations: Solution of Wave equation, Heat equation, Laplace's equation by the method of separation of variables and its applications. Solution of PDE by Laplace Transformation.

Module V

Numerical Method: Finite difference, Symbolic relations, Interpolation and Extrapolation, Newton – Gregory forward and backward formula, Gauss forward and backward formula, Lagrange's formula , Inverse Interpolation by Lagrange's formula , Numerical Differentiation and **N**umerical Integration : Trapezoidal rule , Simpson's $1/3^{rd}$ rule , Simpson's $3/8^{th}$ rule ,Weddle quadrature formula.

Text Books

- Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
- Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi,2010.
- B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition.

Reference Books

- R. J. Beerends ,H. G. Ter Morsche ,J. C. Van Den Berg, E. M. Van De Vrie, Fourier and Laplace Transforms, Cambridge University Press.
- Sastry S.S, Introductory Methods of Numerical Analysis, PHI.

THERMODYNAMICS

(ME , PROD)
Course code -ME 301

Objectives:

- To learn about work and heat interactions, and balance of energy between system and its surroundings.
- To learn about application of I law of various energy conversion devices.
- To evaluate the changes in properties of substances in various processes.
- To understand the difference between high grade and low grade energies and II law limitations on energy conversion.

Contents:

Module -I

Fundaments- system and control volume; property; state and process; Exact & inexact differentials; Work-thermodynamic definition of work; examples; displacement work; path dependence of displacement work and illustrations for simple processes; electrical, magnetic, gravitational, spring and shaft work. **(5hrs)**

Module – II

Temperature , definition of thermal equilibrium and zeroth law; Temperature scales; various thermometers-definition of heat; examples of heat/work interaction in systems-first law for cycle & non-cyclic processes; concept of total energy E; Demonstration that E is a property; Various modes of energy; internal energy and enthalpy**.(5hrs)**

Module – III

Definition of pure substance, ideal gases and ideal gas mixture, real gases and real gas mixtures, compressibility charts-Properties of tow phase system-const. temperature and const. pressure heating of water; Definitions of standard states; P-V-T surface; use of steam tables and R134a tables; saturation tables; superheated tables; identification of states and determination of properties, Mollier's chart.(8hrs)

Module – IV

First law of flow processes-Derivation of general energy equation for a control volume; Steady state flow processes including throttling; Examples of steady flow devices; unsteady processes; Examples of steady and unsteady I law applications

for system and control volume. **(5hrs)**

Module -V

Second law- Definitions of direct and reverse heat engines; Definitions of thermal efficiency and COP; Kelvin-plank and Clausius statements; Definition of reversible process; internal and external irreversibility; Carnot cycle; Absolute Temperature Scale. **(5hrs)**

Module-VI

Clausius inequality; Definition of energy S; Demonstration that entropy S is a property; Evaluation of S for solids, liquids, ideal gases and ideal gas mixtures undergoing various processes; Determination of S from steam tables-Principle of increase of entropy; Illustration of processes in T-S co-ordinates; Definition of Isentropic efficiency for compressors, turbines and nozzles- Irreversibility and availability, availability function for systems and control volume undergoing different processes, Lost work. Second law analysis for a control volume. Energy balance equation and Energy analysis. **(8hrs)**

Module -VII

Thermodynamic cycles- Basic Rankine cycle; Basic Brayton cycle; Basic vapour compression cycle and comparison with Carton cycle. **(4hrs)**

Course Outcomes:

1. After completing this course, the students will be able to apply energy balance to systems and control volumes, in situations involving heat and work interactions.
2. Students can evaluate changes in thermodynamic properties of substances.
3. The student will be able to evaluate the performance of energy conversion devices.
4. The students will be able to differentiate between high grade and low grade energies.

Text Books:

1. Sonntag R.E., Borgnakke C. and Van wylen G. J., 2003- 6th edition, *Fundamentals of thermodynamics*, John Wiley and sons.
2. Jones, J.B. and Duggan R.E., 1996, *Engineering Thermodynamics*, Prentice-Hall of India.

3. Morgan, M.J and Shapiro, H.N., 1999, *Fundamentals of Engineering Thermodynamics*, John Wiley and Sons.
4. Nag P.K.,1995, *Engineering Thermodynamics*, Tata McGraw-Hill Publishing Co. Ltd.

FLUID MECHANICS

Course Code-ME302

Module I

Fluids and Their Properties: Introduction of fluid, fluid classifications, hypothesis of continuum, Shear stress in a moving fluid, molecular structure of material, fluid density, viscosity, causes of viscosity in gases and liquids, surface tension, capillary effect, vapor pressure, cavitation, compressibility and the bulk modulus

Module II

Pressures and Head: Types of Pressure, Pascal's law of pressure at a point, variation of pressure vertically in a fluid under gravity, equality of pressure at the same level in a static fluid, general equation for the variation of pressure due to gravity from a point to point in a static fluid, pressure and head, the hydrostatic paradox, pressure measurements using Elastic Pressure Transducers, Force Balance Pressure gauge, Electrical Pressure Transducers

Module III

Static Forces on Surface and Buoyancy: Fluid static, action of fluid pressure on surface, resultant force and center of pressure on a plane surface under uniform pressure, resultant force and center of pressure on a plane surface immersed in a liquid, pressure diagrams, forces on a curved surface due to hydrostatic pressure, buoyancy, equilibrium of floating bodies, stability of a submerged body, stability of floating bodies, determination of the metacentric height, etermination of the position of the metacentre relative to the center of buoyancy

Module IV

The Energy Equation and its Application: Momentum and fluid flow, Momentum equation for 2-D and 3-D flow along a stream line, momentum correction factor, Euler's equation of motion along a stream line, Mechanical energy of a flowing fluid – Bernoulli's theorem, kinetic energy correction factor, pitot tube, determination of volumetric flow rate via pitot tube, changes of pressure in tapering pipe, principle of venturimeter, pipe orifices, theory of small orifices discharging to atmosphere, theory of large orifices, Rotameter, elementary theory of notches and weirs, flow in a curved path

Module V

Dimensional Analysis And Similarities: Dimension reasoning, dimensional homogeneity, dimensional analysis using Rayleigh's method, Buckingham π-theorem, significance of dimensionless, use of dimensionless numbers in experimental investigation, geometric similarity, dynamic similarity, Kinematic similarity, model testing-Model laws, Undistorted and Distorted models.

Module VI

Viscous Flow: Reynolds number and Reynolds experiment, flow of viscous fluid through circular pipe- Hagen Poiseuille formula, Flow of viscous fluid between two parallel fixed plates, power absorbed in viscous flow through - journal, foot step and collar bearing , movement of piston in dash pot, methods of measurement of viscosity Turbulent Flow: Expression for coefficient of friction -Darchy Weishbach Equation, Moody diagram resistance of smooth and rough pipes shear stress and velocity distribution in turbulent flow through pipes.

Module VII

Flow through pipes: Major energy losses, Minor energy losses, Hydraulic gradient and total energy lines, Pipes in series and parallel, Equivalent pipes, Siphon, power transmission through pipe, Flow through nozzle at end of pipe, Water hammer in pipes

Compressible Flow: Basic equations for one dimensional compression, Pressure wave propagation, sound velocity in fluid, Mach number, Stagnation properties

Reference Books:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, S.K.Kataria & Sons
2. Fluid Mechanics and Hydraulic Machines by R.K. Bansal, Laxmi Publications
3. Fluid Mechanics and Hydraulic Machines by R.K. Rajput, S.Chand & Co.
4. Fluid Mechanics by Frank .M. White, McGraw Hill Publishing Company Ltd.
5. Fundamentals of Fluid Mechanics by Munson, Wiley India Pvt. Ltd
6. Fluid Mechanics by A. K. Mohanty, PHI Learning Pvt. Ltd.
7. Laboratory Manual Hydraulics and Hydraulic Machines by R V Raikar

Course Outcome: After learning the course the students should be able to: Understand the basic concept of fluid mechanics.

- Understand statics, dynamics and various approaches to fluid mechanics.
- Understand fundamentals of flow through pipes
- Understand basics of compressible flow
- Correlate fundamentals of fluid mechanics with various mechanical systems

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STRENGTH OF MATERIALS

(ME , PROD,CE)

Course code -ME 303

Objectives:

- To understand the nature of stresses developed in simple geometries such as bars, cantilevers, beams,shafts cylinders and spheres for various types of simple loads.
- To calculate the elastic deformation occurring in various simple geometries for different types of loading.

Contents:

Module-1

Deformation in solids-Hooks law, stress and strain-tension, compression and shear stresses –elastic constants and their relations-volumetric, linear and shear strains-principal stresses and principal planes-mohr's circle**(8hrs)**

Module-II

Beams and types transverse loading on beams-shear force and bending moment diagrams-Types of beam supports, simply supported and over hanging beams, cantilevers. Theory of bending of beam, bending stresses distribution and neutral axis, shear stress distribution, point and distributed loads**.(8hrs)**

Module-III

Moment of inertia about the axis and polar moment of inertia, deflection of beam using double integration method, computation of slopes and deflection in beams, Maxwell's reciprocal theorem**.(8hrs)**

Module-IV

Torsion, stresses and deformation in circular and hollow shafts,stepped shafts, deflection of shafts fixed at both ends, stresses and deflection of helical spring**.(8hrs)**

Module -V

Axial and hoop stresses in cylinders subjected to internal pressure, deformation of thick and thin cylinders, deformation in spherical shells subjected to internal pressure**.(8hrs)**

Course Outcomes:

- After completing this course, the students should able to recoginize various type of load applied on machine components of simple geometry and understand the nature of internal stresses that will develop within the components.
- The students will be able to evaluate the strains and deformation that will results due to the elastic stresses develop within the material for simple type of loading.

Test Books:

1. Egor P. Popov,Engineering Mechanics of solids,Prentice Hall of india,New Delhi,2001.
2. R.Subramanian, Strength of Materials,Oxford University Press,2007.

Ferdinand P.Been, Russel Johnson Jr and Jhon J.Dewole, Mechanism of materials, Tata McGrawHill Publication Co. Ltd., New Delhi 2005.

MATERIAL ENGINEERING

(ME , PROD)

Course code -MT 301

Course Objectives:

To increasing demand of the available materials, coupled with new applications and requirements has brought about many changes in the style of their uses.

To develop the basic knowledge of metals, polymers composites and ceramics other than conventional metals and alloys to apply them to advance engineering applications.

Module - I

Introduction – Crystalline and Non crystalline solids, Classification of Engineering materials and their selections, Bonding in solids: Ionic, Covalent and Metallic bonding. (5hrs)

Module – II

Crystal Structure- Space lattices, Bravais lattices, Crystal system, Unit Cell, Metallic crystal structures : SC, BCC, FCC, HCP structures, Miller notations of planes and directions, Imperfections in crystal: Point defects, Line surface defects. Dislocations: Edge and Screw dislocation, Burgers vectors. (12 hrs)

Module – III

Metallic Materials – Metals and alloys, ferrous materials- introduction to Iron carbon Diagram, steel and their Heat treatment , Properties and applications. Different types of heat treatment processes. Non-ferrous alloys:- Copper based alloys. Al based alloys, other important non ferrous alloys, properties and applications. (10hrs)

Module – IV

Polymers- Basic concepts of Polymers Science, polymer classifications. Crystallinity of polymers, Copolymers, Thermoplastic and Thermosetting polymers, Elastomers, Properties and Applications. (5hrs)

Module – V

Ceramics- Basic concepts of ceramics science, traditional and new ceramics. Oxide and Non-Oxide ceramics, Ceramics for high temperature applications. Glass, applications of ceramics, and glass. (5hrs)

Module -VI

Composite materials- Definition, general characteristics. Particles reinforced and fiber reinforced composite materials, MMC, CMC, PMC, properties and

applications. (5hrs)

Text Books:

1. Elements of Material Science by Van Vlack
2. Material Science by O.P. Khanna
3. Material Science and Engineering by V. Raghavan
4. Material Science by R. K.Sharma and R.S. Sedha

Reference Books:

1. Material Science and Engineering by Wiliam D. Callister

Course Outcomes:

At the end of this course, the students would be able to :

- Select different materials other than conventional metals and alloys for specific engineering applications.
- To solve the materials problems associated with the weight reduction through the appropriate choice of metals, polymers, ceramics and composites.
- Selection criterion for polymers and composites for various engineering applications.

ENVIRONMENTAL SCIENCE

Course code –BSC 302

L T P CR.

2 0 0 0

(COMMON FOR ALL BRANCH)

Module-1

Concept and scope of Environment science, components of environment, environmental segment and their importance. **(2 Hrs)**

Module-II

Ecology: Ecosystem and its characteristics features, structure and function of forest ecosystem, grassland ecosystem, desert ecosystem and aquatic ecosystem, ecological balance and consequences of imbalance. **(4 Hrs)**

Module-III

Atmosphere: Atmospheric composition, energy balance, climate, weather, depletion of ozone layer, green house effect, acid rain, particles, ions and radicals in the atmosphere, chemical and photochemical reactions in the atmosphere.

Module-IV

(4 Hrs)

Air pollution and control: Air pollutants, sources and effect of air pollutants, primary and secondary pollutants, photochemical smog, fly ash, inorganic and organic particulate matter. Air quality standards, sampling, monitoring and control measures for pollutants. **(4 Hrs)**

Module-V

Water pollution and control: Aquatic environment, water pollution, sources and their effect, lake and ground water pollution, eutrophication, water quality standard and water pollution control measures, waste water treatment.

Module-VI (4 Hrs)

Land pollution; Lithosphere, composition of soil, acid base and ion exchange reactions in soil, soil erosion, landslides, desertification, pollutants (municipal, industrial, commercial, agricultural , hazardous solid wastes), origin and effects, collection and disposal of solid wastes, recovery and conversion methods.

(5 Hrs)

Module-VII

Noise pollution; Noise classification and its sources, effects and measurement, noise pollution hazards, standards and noise pollution control. **(2 Hrs)**

Books and References:

1. Master, G.M Introduction to environment engineering and science, Pearson Education.
2. Nebel, B.J., Environment science, Prentice Hall Inc.
3. Odum, E.P. Ecology: The link between the natural and social sciences. IBH Publishing Company Delhi
4. De, A.K. Environmental Chemistry, Merrut.
5. Sharma B.K Envrionmental Chemistry, Krishna Prakashan Media Merrut.
6. Kaushik, A and Kaushik, C.P. Perspectives in Environmental studies, New Age International Publication.
7. Menon, S.E. Environmental Chemistry.

MATERIALS ENGINEERING LAB

MT301P

List of experiments

1. To study the Metallurgical Microscope.
2. To study the lattice structure of various types of unit cells, observe the mille indices for

various planes & directions in unit cells.
3. To study the microstructure of cast iron, cold work forged, rolled condition.
4. To study the microstructure of mild steel.
5. To study the microstructure of brass solder underancaed.
6. To verify Hall effect.
7. To verify the fracture, characteristics of ductile & brittle materials.
8. To determine the chemical composition of a few common alloys.

9. To determine the percentage of carbon & sulphur contents in a alloy with Fe as main constituent.
10. Estimation of percentage carbon composition of mild steel.

FLUID MECHANICS LAB

Course Code-ME302P

1. To determine the coefficient of impact for vanes.

2. To determine coefficient of discharge of an orifice meter.

3. To determine the coefficient of discharge of Notch (V and Rectangular types).

4. To determine the friction factor for the pipes.

5. To determine the coefficient of discharge of venturi meter.

6. To determine the coefficient of discharge, contraction & velocity of an orifice.

7. To verify the Bernoulli's Theorem.

8. To find critical Reynolds number for a pipe flow.

9. To determine the meta-centric height of a floating body.

10. To determine the minor losses due to sudden enlargement, sudden contraction and bends.

11. To show the velocity and pressure variation with radius in a forced vertex flow.
12.Verification of momentum theory by impact of Jet
13 .To study the performance characteristics of a Pelton Turbine
14.Determine the operating characteristic of a reaction turbine
15. Determine the operating characteristic of a reciprocating pump
16.Verification of momentum theory by impact of Jet

Strength of Material Lab

ME303P

Name of the Experiment

1.Tensile test: To prepare the tensile test upon the given specimen (Mild Steel)
2.Compression test: To determine the compressive strength of the given specimen
3.Torsion test: To perform the Torsion test on the given specimen.
4.Impact test: To determine the Impact toughness of the given material
5.Brinell hardness test: To determine the hardness of the given specimen
6.Vicker,s Hardness test : To determine the hardness of the given specimen
7.Rockwell Hardness test: To determine the hardness of the given specimen.
8.To determine the shear strength of a mild steel specimen by Double Shear Test
9.To determine the modulus of rigidity of a solid circular rod by conducting Torsion Test.
10.To obtain tensile strength, modulus of elasticity, percentage elongation and percentage reduction in area. of cross-section.

COMMUNICATION SKILL LAB

Course code HS301

This lab paper involves interactive practice sessions in Language Lab along with some class lectures to enable the students to be confident enough in language and professional sphere of life.

Module I: Listening Comprehension

To comprehend spoken material in standard Indian English/ British English & American English

- Current situation in India regarding English
- American English Vs. British English

Module II: Phonetics & Phonology

- Introduction to Phonetics & Phonology
- Organs of Speech/ Speech Mechanism
- Pronunciation, Intonation**,** Stress and Rhythm, Syllable division
- Consonants/Vowels/Diphthongs Classification

Module III: Common Everyday Situations: Conversations and Dialogues

Module IV: Communication at Workplace

Module V: Telephonic Conversation

- Introduction
- Listening/Speaking
- Telephonic Skills Required

- Problems of Telephonic Conversation
- Intensive Listening

Module VI: Interviews

- The Interview Process
- Purpose/Planning/Two-way Interaction/Informality
- Pre-interview Preparation Techniques
- Projecting a Positive Image
- Answering strategies

Module VII: Formal Presentations

- Introduction
- Nature/Importance of Presentation
- Planning
- Objective with central idea, main ideas, role of supporting materials
- Handling Stage Fright

Module VIII: Forms of Technical Communication: Technical Report: Definition & importance; Thesis/Project writing: structure & importance; synopsis writing: Methods; Technical research Paper writing: Methods & style; Seminar & Conference paper writing; Expert Technical Lecture: Theme clarity; Analysis & Findings; C.V./Resume writing; Technical Proposal: Types, Structure & Draft.

Module IX: Technical Presentation: Strategies & Techniques Presentation: Forms; interpersonal Communication; Class room presentation; style; method; Individual conferencing: essentials: Public Speaking: method; Techniques: Clarity of substance; emotion; Humour; Modes of Presentation; Overcoming Stage Fear; Audience Analysis & retention of audience interest; Methods of Presentation: Interpersonal; Impersonal; Audience Participation: Quizzes & Interjections.

Module X: Technical Communication Skills: Interview skills; Group Discussion: Objective & Method; Seminar/Conferences Presentation skills: Focus; Content; Style; Argumentation skills: Devices: Analysis; Cohesion & Emphasis; Critical thinking; Nuances: Exposition narration & Description; effective business communication competence: Grammatical; Discourse competence: combination of expression & conclusion; Socio-linguistic competence: Strategic competence: Solution of communication problems with verbal and non verbal means.

Jharkhand University of Technology Jharkhand, Ranchi

Proposed Syllabus for B.Tech 4th Semester

Mechanical Engineering

&
Production Engineering

Mechanical Engineering

4th semester course structure

Sl. No.	Course code.	Subject	L	T	P	Credits
01	ME401	Theory Of Machines	3	1	0	3
02	ME402	Fluid Machines	3	1	0	3
03	ME403	Applied Thermodynamics	3	1	0	3
04	PE401	Manufacturing Process-I	3	1	0	3
05	EC404	Electronics & Instrumentation Engg.	3	1	0	3
06	EN401/ IT402	Engineering Economics / Cyber Security	2	0	0	0
01	ME401P	Theory Of Machines Lab	0	0	3	1
02	ME403P	Applied Thermodynamics Lab	0	0	3	1
03	PE401P	Manufacturing Process-I Lab	0	0	3	1
04	EX401	Extra Activities (NSO/NSS/NCC/Yoga/ Creative Arts/Mini Project)	0	0	2	1
05	IN401	Internship/ Tour & Training/Industrial Training	0	0	0	2
Total credits						**21**

Production Engineering

4th semester course structure

Sl. No.	Course code.	Subject	L	T	P	Credit
01	PE401	Manufacturing Process-I	3	1	0	3
02	PE402	Industrial Management & Plant Engineering	3	1	0	3
03	PE403	Heat Transfer	3	1	0	3
04	ME401	Theory Of Machines	3	1	0	3
05	EC404	Electronics & Instrumentation Engg.	3	1	0	3
06	EN401/ IT402	Engineering Economics / Cyber Security	2	0	0	0
01	PE401P	Manufacturing Process – I Lab	0	0	3	1
02	ME401P	Theory Of Machines Lab	0	0	3	1
03	EC404P	Instrumentation Lab	0	0	3	1
04	EX401	Extra Activities (NSO/NSS/NCC/Yoga / Creative Arts/Mini Project)	0	0	2	1
05	IN401	Internship/ Tour & Training/Industrial Training	0	0	0	2
Total credit						**21**

THEORY OF MACHINE

(ME , PROD)

Course code -ME 402

Objective:

- To understand the kinematics and rigid-body dynamics of kinematically driven machine components
- To understand the motion of linked mechanism in terms of the displacement, velocity and acceleration at any point in a rigid link
- To understand the kinematics of gear trains

Contents:

Module -1

Classification of mechanisms- Basic kinematic concepts and definition – Degree of freedom, mobility-Grashof 's law , Kinematic inversions of four bar chain and slider crank chains-Limit proportions-Mechanical advantage-Transmission angle – Description of some common mechanisms-Quick return mechanism, Straight line generators-Universal Joint- Rocker mechanism**(8hrs)**

Module-II

Displacement, velocity and acceleration analysis of simple mechanisms, graphical velocity analysis using instantaneous centers, velocity and acceleration analysis using loop closure equation-kinematics analysis of simple mechanisms-slider crank mechanism dynamics-Coincident points- Coriolis component of acceleration – introduction to linkage synthesis-three position graphical synthesis for motion and path generation**(8hrs)**

Module-III

Classification of cams and followers –Terminology and definitions –Displacement diagrams –Uniform velocity, parabolic, simple harmonic and cycloidal motions-derivatives of follower motion-specified counter cams-circular and tangents cams – pressure angle and undercutting, sizing of cams, graphical and analytical disc cam profile synthesis for roller and flat face followers**(8hrs)**

Module – IV

Involute and cycloidal gear profiles, gear parameters, fundamental law of gearing and conjugate action, spur gear contact ratio and interference/undercutting –helical, bevel, worm, rack & pinion gears, epicyclic and regular gear train kinematics**(8hrs)**

Module – V

Surface contacts-sliding and rolling friction- friction drives- bearings and lubrication-friction clutches-belt and rope drives-friction in brakes**(8hrs)**

Course outcomes:

- After completing this course, the students can design various types of linkage mechanism for obtaining specific motion and analyze them for optimal functioning.

Text Book:

1.Thomas Bevan,Theory of machines,3rd edition, CBS Publishers &Distributors,2005.
2.Cleghorn W.L.,Mechanisms of Machines,Oxford University Press,2005.
3.Robert L. Norton, Kinematics and Dynamics of machinery,Tata McGrawHill,2009.
4.Ghosh A. And Mallick A.K, Theory of Mechanism and Machines, Affiliated East-West Pvt.Ltd,New Delhi,1988.

APPLIED THERMODYNAMICS

Course Code-ME 402

Objectives:

1) To learn about of 1st law for reacting systems and heating value of fuels.
2) To learn about gas and vapor cycles and their first law and second law efficiencies.
3) To understand about the properties of dry and wet air and the principles of psychometry.
4) To learn about gas dynamics of air flow and steam through nozzles.
5) To learn the about reciprocating compressors with and without intercooling
6) To analyze the performance of steam turbines.

Module-1

Introduction to solid, liquid and gaseous fuels- Stoichiometry, exhaust gas analysis- First law analysis of combustion reactions- Heat calculations using enthalpy tables- Adiabatic flame temperature- Chemical equilibrium and equilibrium composition calculations using free energy.

(8Hrs)

Module -II

Vapor power cycles Rankine cycle with superheat, reheat and regeneration, energy analysis Super- critical and ultra super-critical Rankine cycle- Gas power cycles, Air standard Otto, Diesel and Dual cycles- Air standard Brayton cycle, effect of reheat, regeneration and intercooling – Combined gas and vapor power cycles- vapor compression refrigeration cycles, refrigerants and their properties(12hrs)

Module-III

properties of dry and wet air, use of pschyrometric chart, processes involving heating/cooling and humidification/ dehumidification, dew point(4hrs)

Module-IV

Basics of compressible flow. Stagnation properties, Isentropic flow of a perfect gas through a nozzle, chocked flow, subsonic and supersonic flows- normal shocks-use of ideal gas tables for isentropic flow and normal shock flow- Flow of steam and refrigerant through nozzle, super saturation-compressible flow in diffusers, efficiency of nozzle and diffuser. (8hrs)

Module-V

Reciprocating compressors, staging of reciprocating compressors, optimal stage pressure ratio, effect of intercooling, minimum work for multistage reciprocating compressors. (5hrs)

Module-VI

Analysis of steam turbines, velocity and pressure compounding of steam turbine. (3hrs)

Outcomes:

1. After completing this course the students will get a good understanding of various practical power cycles and heat pump cycles.
2. They will be able to analyze energy conversion in various thermal devices such as combustors, air coolers, nozzles, diffusers, steam turbines and reciprocating compressors.
3. They will be able to understand phenomena occurring in high speed compressible flows.

MANUFACTURING PROCESSES I

Course Code-PE 401

Objectives:

To motivate and challenge students to understand and develop an appreciation of the processes in correlation with material properties which change the shape, size and form of the raw materials into the desirable product by conventional or unconventional manufacturing methods.

Module-I

Conventional Manufacturing Processes:

Casting and moulding: Metal casting processes and equipment, Heat transfer and solidification, shrinkage, riser design, casting defects and residual stresses. (5hrs)

Module-II

Introduction to bulk and sheet metal forming, plastic deformation and yield criteria;

fundamentals of hot and cold working processes; load estimation for bulk forming (forging, rolling, extrusion, drawing) and sheet forming (shearing, deep drawing, bending) principles of powder metallurgy.

Metal Cutting: Single and multi-point cutting; Orthogonal cutting, various force components: Chip formation, Tool wear and tool life. Surface finish and integrity, Machinability, Cutting tool materials, cutting fluids coating; Turning, Drilling, Milling and finishing processes, Introduction to CNC machining (8hrs)

Module-III

Additive manufacturing: Rapid prototyping and rapid tooling (3hrs)

Module-IV

Joining/ fastening processes: Physics of welding, brazing and soldering; design considerations in welding. Solid and liquid state joining processes; Adhesive bonding (3hrs)

Module-V

Unconventional Machining Processes:

Abrasive Jet Machining, Water Jet Machining Abrasive Water Jet Machining, Ultrasonic Machining principles and process parameters (5hrs)

Module-VI

Electrical Discharge Machining principle and processes parameters, MRR, surface finish tool wear, dielectric, power and control circuits, wire EDM; Electro-chemical machining (ECM), etchant & maskant, process parameters, MRR and surface finish.(8hrs)

Module-VII

Laser Beam Machining (LBM), Plasma Arc Machining (PAM) and Electron Beam Machining (3hrs)

Books and References:

1. Kalpakjian and Schmid, Manufacturing processes for engineering materials (5th Edition)-Pearson India, 2014.
2. Mikell P. Groover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems.
3. Manufacturing Technology by P.N. Rao., MCGRAW HILL INDIA.
4. Materials and Manufacturing by Paul Degarmo.
5. Manufacturing Processes by Kaushish, PHI.
6. Principles of Foundry Technology, Jain, MCGRAW HILL INDIA
7. Production Technology by RK Jain.
8. Degarmo, Black &Kohser, Materials and Processes in Manufacturing.

Course Outcomes:

Upon completion of this course, students will be able to understand the different conventional and unconventional manufacturing methods employed for making different products Objectives:

ELECTRONICS AND INSTRUMENTATION ENGINEERING

Course code – EC404

(For Civil , Mech. and Production Engineering).

Module 1: Basic Electronic Components

Active and Passive Components, Types of resistors and Colour coding, Capacitors, Inductors applications of Resistor, Capacitor and Inductor, Relay, LDR, Basic Integrated Circuits (IC 7805, 7809, 7812, 555 etc.).Measuring Instruments like CRO, Power supply, Multi-meters etc.

Module II: Semiconductors, Diode and Transistors:

Difference between Insulators, Semiconductors and Conductors, Mobility and Conductivity, Intrinsic and Extrinsic Semiconductors, Fermi Level, Energy band, P-N Junction Diode, construction, working, characteristics and diode equation Application of Diode, Rectifier: Half Wave, Full Wave and Bridge Rectifier, Zener Diode and its Applications, Varactor Diode, Schottky Diode, Regulated Power Supply using Zener Diode and Regulated ICs, LED, Photodetector, Construction, Working, Modes and Configuration of BJT, Input and Output Characteristics of all Configurations, Comparison of all Configuration & Modes, BJT as a Switch and as an Amplifier. JFET Construction, working and characteristics. MOSFET Construction, working and Characteristics, Types of MOSFET,.

ModuleIII: Digital Electronics Fundamentals:

Difference between analog and digital signals, Boolean algebra, Basic and Universal Gates, Symbols, Truth tables, logic expressions, Logic simplification using K- map, Logic ICs, half and full adder/subtractor, multiplexers, demultiplexers, flip-flops, shift registers, counters, Block diagram of microprocessor/microcontroller and their applications.

ModuleIV: Electronic Instruments:

Measurement of Temperature, RTD, Thermistors, LVDT, Strain Gauge, Piezoelectric Transducers, Digital Shaft Encoders, Tachometer, Hall effect sensors. Sensors and Transducers for physical parameters: temperature, pressure, torque, flow. Speed and Position Sensors. Electronic Display Device, Digital Voltmeters, Digital Energy meter, CRO, measurement of voltage and frequency, Lissajous Patterns, Plotting B-H curve of a magnetic material, Wave Analyzers, Harmonic Distortion Analyzer. Digital Energy Meter. Measurements of R, L and C.Digital Multi-meter, True RMS meters, Clamp-on meters, Meggers.Digital Storage Oscilloscope.

ModuleV: Electronic Communication Systems:

The elements of communication system, IEEE frequency spectrum and Transmission media: wired and wireless, need of modulation, AM and FM modulation schemes, Mobile communication systems: cellular concept and block diagram of GSM system, Ultrasonic wave & its application in distance measurement.

Text Books

1. Basic Electronics and Linear Circuits by N. N. Bhargava, D. C. Kulshreshtha and S. C. Gupta,

TMH Publications.
2. Op-Amps and Linear Integrated Circuits by Ramakant A. Gayakwad, PHI Publications.
3. Electronic Devices and Circuits by Godse and Bakshi Technical, Vol-1 Technical Publication Pune.
4. Floyd ," Electronic Devices" Pearson Education 9th edition, 2012.
5. R.P. Jain , "Modern Digital Electronics", Tata Mc Graw Hill, 3rd Edition, 2007.
6. Frenzel, "Communication Electronics: Principles and Applications", Tata Mc Graw Hill, 3rd Edition, 2001

Reference Books

1. Integrated Devices & Circuits by Millman & Halkias, TMH Publications.
2. Electronics Devices and Circuit Theory by R. Boylestad & L. Nashelsky, Pearson Publication
3. Electronic Communication System by G. Kennedy, TMH Publications.
4. Basic Electronics by Sanjeev Kumar & Vandana Sachdeva, Paragaon International Publication

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HEAT TRANSFER

Course code – PE403

Module I

Fundamental: Modes of heat transfer, effect of temperature on thermal conductivity of different solids, liquids and gases, derivation of generalized equation in Cartesian, cylindrical and spherical coordinates and its reduction to specific cases, General laws of heat transfer

Module II

Conduction: Fourier's law, One dimensional steady state conduction, heat conduction through plane and composite walls, cylinders and spheres, electrical analogy, critical radius of insulation for cylinder and sphere, overall heat transfer coefficient.
Transient heat conduction- lumped heat capacity analysis, time constant, transient heat conduction in solids with finite conduction and convective resistances Heat transfer from extended surface: Types of fin, heat flow through rectangular fin, infinitely long fin, fin insulated at the tip and fin losing heat at the tip, efficiency and effectiveness of fin, Biot number, Estimation of error in temperature measurement in a thermometer well

Module III

Convection: Newton's law of cooling, Dimensional analysis applied to forced and free convection, dimensionless numbers and their physical significance, empirical correlations for free and forced convection Continuity, momentum and energy equations, thermal and hydrodynamic boundary layer, Blasius solution for laminar boundary layer, General solution of Von-Karman integral momentum equation

Module IV

Radiation: Absorptivity, reflectivity and transmissivity, black, white and grey body, emissive power and emissivity, laws of radiation – Planck, Stefan-Boltzmann, Wein's displacement, Kirchhoff's law, intensity of radiation and solid angle, Lambert's cosine law Radiation heat exchange between black bodies, shape factor, heat exchange between non-black bodies- infinite

parallel planes and infinite long concentric cylinders, radiation shield, heat exchange between two grey surfaces, electrical analogy

Module V

Heat exchanger: Classification, heat exchanger analysis, LMTD for parallel and counter flow exchanger, condenser and evaporator, overall heat transfer coefficient, fouling factor, correction factors for multi pass arrangement, effectiveness and number of transfer unit for parallel and counter flow heat exchanger, introduction of heat pipe and compact heat exchanger Two-phase heat transfer: Boiling of liquids, Pool boiling curve, different types of pool boiling, condensation of vapor. Film wise & drop wise condensation.

Reference Books:

1. Heat & Mass Transfer by P.K. Nag, McGraw Hill
2. Heat and Mass Transfer: Fundamentals and Application by Yunus Cengel, McGraw Hill
3. Fundamental of Heat and Mass Transfer by Incropera and Dewitt, Wiley Publication
4. Heat Transfer by Mills and Ganesan, Pearson Education
5. Heat Transfer by J P Holman , McGraw Hill
6. Heat and Mass Transfer by R K Rajput, S.Chand Publication
7. Heat Transfer: Principles and Applications by Dutta, Binay K, PHI Publication

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INDUSTRIAL MANAGEMENT & PLANT ENGINEERING

Course code – PE402

Module I

Introduction: Concept and scope of Industrial Management. Productivity: Definition, measurement, productivity index, types of production system, Industrial Ownership.

Module II

Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Social responsibilities of Management, Introduction to Human resources management: Nature of HRM, functions and importance of HRM.

Module III

Work Study: Introduction, definition, objectives, steps in work study, Method study: definition, objectives, steps of method study, Work Measurement: purpose, types of study — stop watch methods — steps — allowances — standard time calculations — work sampling, Production Planning and Control Inventory Control: Inventory, Cost, Models of inventory control: EOQ, ABC, VED

Module IV

Quality Control: statistical quality control, Control charts for variables and attributes, Acceptance Sampling- Single sampling- Double sampling plans, Introduction to TQM.

Module V

Project Management: Project network analysis, CPM, PERT and Project crashing and resource Leveling

References:

1. Engineering Management (Industrial Engineering & Management)/ S.C. Sharma & T.R.

Banga, Khanna Book Publishing Co. (P) Ltd., Delhi (ISBN: 978-93-86173-072)
2. Industrial Engineering and Management/ P. Khanna, Dhanpatrai publications Ltd.
3. Production & Operation Management /PaneerSelvam /PHI.
4. Industrial Engineering Management/NVS Raju/Cengage Learning.
5. Industrial Engineering Management I RaviShankar/ Galgotia.

CYBER SECURITY

Course code –IT 402

Module I: Introduction to Cybercrime : Introduction, Cybercrime, and Information Security, Who are Cybercriminals, Classifications of Cybercrimes, and Cybercrime: The legal Perspectives and Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes.

Module II: Cyber Offenses: How Criminals Plan Them: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector, Cloud Computing.

Module III: Cybercrime : Mobile and Wireless Devices: Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies an Measures in Mobile Computing Era, Laptops.

Module – IV: Tools and Methods Used in Cybercrime : Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

Module V: Cyber Security : Organizational Implications Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

TEXT BOOK:

- Cyber Security: Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Nina Godbole and Sunil Belapure, Wiley INDIA.

REFERENCE BOOK:

- Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.

- Introduction to Cyber Security , Chwan-Hwa(john) Wu,J.David Irwin.CRC Press T&F Group

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ENGINEERING ECONOMICS

Course code –EN 401

COURSE OUTLINE:

The basic purpose of this course is to provide a sound understanding of concepts and principles of engineering economy and to develop proficiency with methods for making rational decisions regarding problems likely to be encountered in professional practice.

Module -1

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Nature of Economic problem, Production possibility curve, Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility – its practical application and importance.

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, practical importance & applications of the concept of elasticity of demand.

Module -II

Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

Various concepts of cost – Fixed cost, variable cost, average cost, marginal cost, money cost, real cost, opportunity cost. Shape of average cost, marginal cost, total cost, Cost curves.

Module III

Meaning of Market, Types of Market – Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

Pricing Policies- Entry Deterring policies, Predatory Pricing, Peak load Pricing. Product Life cycle

Firm as an organisation- Objective of the Firm, Type of the Firm, Vertical and Horizontal Integration, Diversification, Mergers and Takeovers.

Module -IV

Nature and characteristics of Indian economy (brief and elementary introduction), Privatization – meaning, merits and demerits. Globalisation of Indian economy – merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement, Business cycle, Inflation

RECOMMENDED BOOKS:-

1. R.Paneer Seelvan: Engineering Economics, PHI
2. Managerial Economics, D.N.Dwivedi, Vikash Publication
3. Managerial Economics, H.L. Ahuja, S. Chand and Co. Ltd.
4. Managerial Economics, Suma Damodaran, Oxford.
5. R.molrishnd Ro T.V S 'Theory of firms : Economics and Managerial Aspects'. Affiliated East West Press Pvt Ltd New Delhi
6. Managerial Economics, H. Craig Petersen &W. Cris Lewis, Pearson Education.

APPLIED THERMODYNAMICS LAB

Course Code-ME 402P

List of Experiments: (At least 8 of the following)

1. Study of Fire Tube boiler.
2. Study of Water Tube boiler.
3. Study and working of Two stroke petrol Engine.
4. Study and working of Four stroke petrol Engine.
5. Determination of Indicated H.P. of I.C. Engine by Morse Test.
6. Prepare the heat balance sheet for Diesel Engine test rig.
7. Prepare the heat balance sheet for Petrol Engine test rig.
8. Study and working of two stroke Diesel Engine.
9. Study and working of four stroke Diesel Engine.
10. Study of Velocity compounded steam turbine.
11. Study of Pressure compounded steam turbine.
12. Study of Impulse & Reaction turbine.
13. Study of steam Engine model.
14. Study of Gas Turbine Model.

S. No.	Name of the Experiment
1	To study the construction and operation of a Cochran boiler

2	To study the construction and operation of a Babcock boiler
3	To study the construction and operation of a Lancashire boiler
4	To study the construction and operation of a vertical water tube boiler
5	To study about 2-Stroke petrol Engine
6	To study about 4-Stroke petrol Engine
7	To study about CI Engine(Diesel Engine)
8	Study of simple and compound Steam Engine
9	To determine the volumetric and isothermal efficiency
10	To determine the static efficiency and total efficiency

THEORY OF MACHINE LAB

ME402P

Name of the Experiment

1. To draw velocity diagram of four bar mechanism
2.To draw velocity diagram of slider crank mechanism.
3.To draw acceleration diagram of four bar mechanism
4.To draw acceleration diagram of slider crank mechanism
5.To study Different types of Cam profile
6.To draw displacement diagram, velocity diagram & acceleration diagram of cam follower
7.To draw a cam profile
8.To study Different types of Gears
9.To draw Involute gear profile.
10.To draw Cycloidal gear profile

MANUFACTURING PROCESS LAB

Course Code-PE401P

List of Experiments: (At least 8 of the following along-with study of the machines/processes)
1. Shear-angle determination (using formula) with tube cutting (for orthogonal) on lathe machine.
2. Bolt (thread) making on Lathe machine.
3. Tool grinding (to provide tool angles) on tool-grinder machine.
4. Gear cutting on Milling machine.

5. Machining a block on shaper machine.
6. Finishing of a surface on surface-grinding machine.
7. Drilling holes on drilling machine and study of twist-drill
8. Study of different types of tools and its angles & materials.
9. Experiment on tool wear and tool life.
10. Experiment on jigs/Fixtures and its uses.
11. Gas welding experiment.
12. Arc welding experiment.
13. Resistance welding experiment.
14. Soldering & Brazing experiment.
15. Study and understanding of limits, fits & tolerances.
16. Study of temperature measuring equipment's.
17. Measurement using Strain gauge.
18. Experiment on dynamometers.
19. To study the displacement using LVDT.

Course Outcomes: Upon completion of this course, students will be able to understand the different conventional and unconventional manufacturing methods employed for making different products.