T K R COLLEGE OF ENGINEERING &TECHNOLOGY

(Autonomous)

B.TECH. MECHANICAL ENGINEERING -R18

COURSE STRUCTURE& SYLLABUS

B. Tech. III Semester

Sl. No	Course Code	Course title	L	T	P	Credits
1	**BBSM3**	Probability and Statistics	**3**	**1**	**0**	**3**
2	**B33ES1**	Thermodynamics	**3**	**1**	**0**	**3**
3	**B33PC2**	Kinematics of Machinery	**3**	**1**	**0**	**3**
4	**B33PC3**	Metallurgy and Material Science	**3**	**1**	**0**	**3**
5	**B33PC4**	Mechanics of Solids	**3**	**1**	**0**	**3**
6	**B33PC5**	Metallurgy and Material Science Lab	**0**	**0**	**3**	**1.5**
7	**B33PC6**	Mechanics of Solids Lab	**0**	**0**	**3**	**1.5**
8	**B33PC7**	Kinematics and Dynamics Lab	**0**	**0**	**3**	**1.5**
Total credits						**19.5**

B. Tech. IV Semester

Sl. No	Course Code	Course title	L	T	P	Credits
1	**B34PC1**	Dynamics of Machinery	**3**	**1**	**0**	**3**
2	**B34PC2**	Fluid Mechanics and Hydraulic Machines	**3**	**1**	**0**	**3**
3	**B34ES3**	Machine Drawing	**0**	**0**	**3**	**1.5**
4	**B34PE4**	Professional Elective-I A) Manufacturing Process B)Machine Tool Design C)Computer Graphics	**3**	**1**	**0**	**3**
5	**B34OE5**	Open Elective -I A) Disaster Management B) Introduction to Mechatronics C) Non Destructive Testing methods	**3**	**1**	**0**	**3**
6	**BBSM6**	Numerical Methods	**3**	**1**	**0**	**3**
7	**B34PC7**	Fluid Mechanics and Hydraulic Machines Lab	**0**	**0**	**3**	**1.5**
8	**B34PC8**	Manufacturing Process Lab	**0**	**0**	**3**	**1.5**
Total Credits						**19.5**

T K R COLLEGE OF ENGINEERING &TECHNOLOGY

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B.TECH. MECHANICAL ENGINEERING -R18

PROBABILITY AND STATISTICS-BBSM3

B.Tech. III Semester. **L/T/P/ C**

3/1/0/3

PRE REQUISITES: Foundation course (No prerequisites).

COURSE OBJECTIVES:

1. The objective of this course is to familiarize the prospective engineers with statistical techniques
2. It aims to equip the students to deal with advanced level of mathematics and application that would be essential for their disciplines.
3. Random variables that describe randomness of an uncertainty in certain realistic situations.
4. Sampling Distributions of means- variance- Point Estimation and Interval Estimation.
5. The testing of Hypothesis.

COURSE OUTCOMES:

The students will learn:

1. The ideas of probability and random variables and various discrete and continuous probability distribution and their properties.
2. The basic ideas of statistics including correlation and regression.
3. The statistical methods of studying data sample.
4. Differentiate among many random variables involving the probability models which are quite useful for all branches of engineering.
5. To calculate Mean and Proportion and to make impotent decisions from few samples which are taken from unmanageable huge populations.

UNIT I:

Random Variables: Discrete and continuous Random variables- properties- Expectation of discrete and continuous Random variables and Variance of a sum.

UNIT II:

Probability Distributions: Binomial- poison and Normal-evaluation of statistical parameters for these three distributions and problems.

UNIT III:

Basic statistics: Correlation and regression- Rank correlation- Curve fitting by the method of least squares-fitting of straight lines- second degree parabolas- power and exponential curves.

UNIT IV:

Testing of hypothesis – I: Null and Alternative hypothesis- critical region and types of errors- Test of significance-Large sample test for single proportion- difference of proportions- single mean- difference of means.

UNIT V:

Testing of hypothesis – II: Small samples Test for single mean- difference of two means- test for ratio of variances-Chi-square test for goodness of fit and independence of attributes.

SUGGESTED TEXT/REFERENCE BOOKS

1. Erwin Kreyszig- Advanced Engineering Mathematics- 9th Edition- john Wiley & Sons- 2006.
2. N.P. Bali and Manish Goyal- A text book of Engineering Mathematics- Laxmi Publications- Reprint-2010.
3. B.S. Grewal- Higher Engineering Mathematics- Khanna Publishers- 35th Edition- 2000.
4. S.Ross- A First Course in Probability- 6th Ed.- Pearson Education in India- 2002.
5. W.Feller- An introduction to probability theory and its applications- Vol.1- 3rd edition Wiley-1968.

T K R COLLEGE OF ENGINEERING &TECHNOLOGY

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B.TECH. MECHANICAL ENGINEERING -R18

THERMODYNAMICS - B33ES1

B.Tech. III Semester **L T/P/C**

3/1/0/3

PRE-REQUISITE: Engineering Chemistry and Physics

COURSE OBJECTIVE: To understand the treatment of classical Thermodynamics and to apply the First and Second laws of Thermodynamics to engineering applications

COURSE OUTCOMES: At the end of the course, the student should be able to

1. Understand and differentiate between different thermodynamic systems and processes.
2. Understand and apply the laws of Thermodynamics to different types of systems undergoing various processes and to perform thermodynamic analysis.
3. Understand and analyze the Thermodynamic cycles and evaluate performance parameters.

Tables/Codes: Steam Tables and Mollier Chart, Refrigeration Tables

UNIT – I:

Introduction: Basic Concepts: System, Control Volume, Surrounding, Boundaries, Macroscopic and Microscopic viewpoints, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle – Reversibility – Quasi – static Process, Irreversible Process, Causes of Irreversibility – Energy in State and in Transition, Types, Displacement & Other forms of Work, Heat, Point and Path functions, Zeroth Law of Thermodynamics – Concept of Temperature – Principles of Thermometry – Reference Points – Const. Volume gas Thermometer – Scales of Temperature, Ideal Gas Scale

UNIT - II:

PMM I - Joule's Experiments – First law of Thermodynamics – Corollaries –Steady Flow Energy Equation. Limitations of the First Law –Second Law of Thermodynamics, Kelvin-Planck and Clausius Statements and their Equivalence / Corollaries, PMM of Second kind, Carnot's principle, Clausius Inequality, Entropy, Principle of Entropy Increase – Energy Equation, Availability and Irreversibility – Thermodynamic Potentials, Gibbs and Helmholtz Functions, Maxwell Relations for internal energy and enthalpy Third Law of Thermodynamics statement.

UNIT – III:

Pure Substances, p-V-T- surfaces, T-S and h-s diagrams, Mollier Charts, Phase Transformations – Triple point at critical state properties during change of phase, Dryness Fraction – Clausius – Clapeyron Equation Property tables. Mollier charts – Various Thermodynamic processes and energy Transfer – Steam Calorimetric .

Perfect Gas Laws – Equation of State, specific and Universal Gas constants – various Non- flow processes– Throttling and Free Expansion Processes – Flow processes

UNIT - IV:

Deviations from perfect Gas Model – Vader Waals Equation of State – Compressibility charts – variable specific Heats – Gas Tables, Mixtures of perfect Gases – Mole Fraction, Mass friction 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.

UNIT - V:

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

TEXT BOOKS

1. Engg. Thermodynamics – D.S.Kumar ;SK.Kataria and suns
2. Engineering Thermodynamics byR,K.Rajput ; Laxmi publishers

REFERENCE BOOKS

1. Atext book of engineering thermodynamics by VM.Domakundavar;Dhanpat Rai
2. Engineering Thermodynamics / PK Nag / Mc GrawHill
3. Thermodynamics for Engineers / Kenneth A. Kroos ; Merle C.Potter/ Cengage
4. Engineering Thermodynamics / P.Chattopadhyay/Oxford
5. Engineering Thermodynamics / Rogers /Pearson
6.Thermodynamics AnupGoel, SidduPatil, Technical publications

T K R COLLEGE OF ENGINEERING &TECHNOLOGY

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B.TECH. MECHANICAL ENGINEERING -R18

KINEMATICS OF MACHINERY - B33PC2

B.Tech. III Semester. **L/T/P/C**

3/1/0/3

PREREQUISITES: Basic principles of mechanics

COURSE OBJECTIVES: The objective is to study the relative motion, velocity, and accelerations of the various elements in a mechanism. In mechanical Engineering we come across number of mechanisms such as four bar/slider crank/double slider crank/straight line motion mechanism etc. Mechanism deals with only relative motions. Once we make a study considering for us also there it is called kinetics. The first course deals with mechanisms, their inversions straight line motion mechanisms steering mechanisms etc. Also study of cams/gears & gear trains & belts are also introduced.

COURSE OUTCOMES: The main purpose is to give an idea about the relative motions obtained in all the above type of components used in mechanical Engineering.

UNIT – I:

Mechanisms: Elements or Links – Classification – Types of kinematics pairs, constrained motion – completely, partially or successfully and incompletely constrained.

Mechanism and Machines – Mobility of Mechanisms : Grubler's criterion, classification of machines – kinematics chain – inversions of mechanism – inversions of quadric cycle chain, single and double slider crank chains, Mechanical Advantage.

UNIT – II:

Kinematics: Velocity and acceleration – Motion of link in machine – Determination of Velocity and acceleration – Graphical method – Application of relative velocity method;four bar Chain.

Plane motion of body: Instantaneous center of rotation- centrodes and axodes – Three centers in line theorem – Graphical determination of instantaneous center, determination of angular velocity of points and links by instantaneous center method.Kliens construction - Coriolis acceleration, Analysis of slider crank chain for displacement- Kieines Construction.

UNIT – III:

Straight-line motion mechanisms: Exact and approximate copied and generated types – Peaucellier - Hart - Scott Russel – Grasshopper – Watt -Tchebicheff's and Robert

Mechanism - Pantographs

Steering gears: Conditions for correct steering – Davis Steering gear, Ackerman's steering gear.

Hooke's Joint: Single and double Hooke's joint –velocity ratio – application – 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 and retardation. Maximum velocity and maximum acceleration during outward and return strokes in the above three cases.

UNIT – V:

Higher pair: Friction wheels and toothed gears – types – law of gearing, condition for constant velocity ratio for transmission of motion – velocity of sliding

Forms of teeth, phenomena of interferences – Methods of interference.Condition for minimum number of teeth to avoid interference – expressions for arc of contact and path of contact of Pinion & Gear and Pinion & Rack Arrangements.

Gear Trains: Introduction – Types – Simple – compound and reverted gear trains –Epicyclic gear train. Methods of finding train value or velocity ratio of Epicyclic gear trains. Selection of gear box - Differential gear for an automobile.

TEXT BOOKS

1) Theory of machines – R.K.Bansal; Laxmi Publishers

2) Theory of Machines .R.S.Kurmi, J.K.Guptha- Chand Publications

REFERENCE BOOKS

1) Kinematics of Machinery:AnupGoel ; Technical Publications

2) Theory of Machines and Mechanisms/JOSEPH E. SHIGLEY/ Oxford

3) Theory of Machines / Sadhu Singh / Pearson.

4) Theory of Machines – V.P.Singh – Dhanpath Rai

5) Kinematics and Dynamics of machinery – R.L.Norton – TMH

6) Theory of Machines / S.S.Rattan / Mc GrawHill Publishers

7) Theory of mechanisms and machines- Ghosh. A. and Malik A.K. – East west Publishers

8) Theory of mechanisms and machines – Jagadish Lal- Metropolyton Books

9) Theory of Machines / Thomas Bevan /CBS

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B.TECH. MECHANICAL ENGINEERING -R18

METALLURGY AND MATERIAL SCIENCE - B33PC3

B.Tech. III Semester. **L/T/P/C**

3/1/0/3

PREREQUISITES: Physics and Chemistry

COURSE OBJECTIVES: Builds on the Material Science and concerned with selection of engineering materials. Basic Principles of material science is introduced

COURSE OUTCOMES:

1) Principles ofPhysicalscience and Chemistry are applied to understand materials and their properties.

2) Understand the feasibility, sustainability in using the different materials in construction, fabrication and errection.

3) To understand the relationship and properties of different alloy metals.

4) Understand Ceramics, refractories, Nano- materials and their practical applications.

UNIT – I:

Structure of Metals: Crystallography, Packing Efficiency, Grains and Grain Boundaries. Effect of grain size on the properties.Determination of grain size by different methods**.** **Constitution of Alloys:** Necessity of alloying, Types of solid solutions, Hume - Rothery rules.

UNIT – II:

Phase Diagrams: Construction and interpretation of phase diagrams, Phase rule. Lever rule.Binary phase Diagrams, Isomorphous, Eutectic and Eutectoid transformations with examples.

UNIT –III:

Engineering Materials –I Steels: Iron-Carbon Phase Diagram and Heat Treatment: Study of Fe-Fe3C phase diagram. Construction of TTT diagrams. Annealing, Normalizing, Hardening, and Tempering of steels, Alloy steels.

UNIT – IV:

Engineering Materials –II: Cast Irons: Structure and properties of White Cast iron, Malleable Cast iron, Grey cast iron. **Engineering Materials-III: Non-ferrous Metals and Alloys:** Structure and properties of copper and its alloys, Aluminum and its alloys, Al-Cu phase diagram.**Principles of Poweder metallurgy.**

UNIT – V:

Engineering Materials –IV: Ceramics, Polymers and Composites: Crystalline ceramics, glasses, cermets: structure, properties and applications. Classification, properties, and applications of composites. Classification, Properties, and applications of Polymers. **Introduction of Nano Materials.**

TEXT BOOKS

1) Elements of Material science / V. Rahghavan

2) Material Science and Metallurgy/ Kodgire

REFERENCE BOOKS

1. Introduction to Physical Metallurgy / Sidney H. Avner.- TMH
2. Materials Science and engineering / William and callister.
3. Engineering Material and Metallurgy – Er Amandeep Singh Wadhva
4. Materials Science for Engineering Students- Traugott Fischer 2009 Edition.
5. Mechanics of Composite materials – Robert M.Jones- Taylor and Francis- USA
6. ASM hand book – Volume -1
7. Material Science- S.L.Kulakarni and AmithKakani – New age
8. Essentials of Materials Science and engineering / Donald R. Askeland /Thomson

T K R COLLEGE OF ENGINEERING &TECHNOLOGY

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B.TECH. MECHANICAL ENGINEERING -R18

MECHANICS OF SOLIDS - B33PC4

B.Tech. III Semester. **L T/P/C**

3/1/0/3

COURSE OBJECTIVES: The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest. Fundamentals of applying equilibrium, compatibility, and force-deformation relationships to structural elements are emphasized. The students are introduced to advanced concepts of flexibility and stiffness method of structural analysis. The course builds on the fundamental concepts of engineering mechanics course.

This course will advance the students' development of the following broad capabilities:

1. Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviors due to different types of loading will be discussed.
2. Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
3. Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
4. Students will understand how to calculate normal and shear stresses

COURSE OUTCOMES:

1. Analyze the behavior of the solid bodies subjected to various types of loading;
2. Apply knowledge of materials and structural elements to the analysis of simple structures;
3. Undertake problem identification, formulation and solution using a range of analytical methods;
4. Analyze and interpret laboratory data relating to behaviorof structures and the materialsthey are made of, and undertake associated laboratory work individually and inteams.
5. Expectation and capacity to undertake lifelong learning

UNIT - I:

Simple Stresses & Strains:– Types of stresses & strains–Hooke's law– stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio

&volumetric strain – Elastic moduli & the relationship between them – Bars of varying section – composite bars – Temperature stresses. Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT - II:

Shear Force and Bending Moment : Types of beams – Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simplysupported and overhanging beams subjected to point loads, u.d.l., uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT - III:

Flexural Stresses: Theory of simple bending – Assumptions – Derivation of bending equation – Determination bending stresses – section modulus of regular sections.

Shear Stresses: Derivation of formula – Shear stress distribution across various beams sections.

UNIT - IV:

Principal Stresses and Strains: Introduction – Stresses on an inclined section of a bar under axial loading – compound stresses – Normal and tangential stresses on an inclined plane for biaxial stresses – Two perpendicular normal stresses accompanied by a state of simple shear– Mohr's circle of stresses – Principal stresses and strains – Analytical and graphical solutions. Theories of Failure.

UNIT-V:

Torsion of Circular Shafts: Theory of pure torsion – Derivation of Torsion equations– Torsional moment of resistance – Polar section modulus –Combined bending and torsion and end thrust.

Thin Cylinders: Thin seamless cylindrical shells– Derivation of formula for longitudinal andcircumferential stresses – hoop, longitudinal and volumetric strains – changes in dia, and volume of thin cylinders– Thin spherical shells.

TEXT BOOKS

1) Strength of materials – 17 th edition – Ramamrutham – Dhanpath Rai

2) Strength of materials – Bhavkati SS – Vikas publications.

REFERENCE BOOKS

1) Strength of materials – R.S. Kurmiand Gupta

2) Strength of Materials by R.K.Bansal – Laxmi Publications

3) Strength of Materials -By Jindal, UmeshPublications.

4) Analysis of structures by Vaziraniand Ratwani.

5) Mechanics of Structures Vol –I by H. J. Shah and S. B. Junnarkar, Charotar Publishing House Pvt.Ltd.

6) Strength of Materials by D.S Prakash Rao, Universities Press Pvt. Ltd.

7) Strength of Materials by S. S. Rattan, Tata McGraw Hill Education Pvt. Ltd.

8) Fundamentals of Solid Mechanics by M. L. Gambhir, PHI Learning Pvt. Ltd

Strength of Materials by R.K Rajput, S. Chand & Company Ltd.

9) Solid Mechanics, byPopov

10) Strength of Materials – Ryder. G.H.; Macmillan Long Man Pub.

11) Strength of Materials – W.A. Nash, TMH

12) Strength of Materials by R.K Rajput, S. Chand & Company Ltd

T K R COLLEGE OF ENGINEERING &TECHNOLOGY

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B.TECH. MECHANICAL ENGINEERING -R18

METALLURGY AND MATERIAL SCIENCE LAB-B33PC5

B.Tech. IIISemester. **L/T/P/C**

0/0/3/1.5

COURSE OBJECTIVE: The purpose of this course is to make the students learn the concepts of Metallurgy and Material Science role in all manufacturing processes which convert raw materials into useful products adapted to human needs.

COURSE OUTCOMES: The Primary focus of the Metallurgy and Material science program is to provide undergraduates with a fundamental knowledge based associated materials properties, and their selection and application. Upon graduation, students would have acquired and developed the necessary background and skills for successful careers in the materials-related industries. Furthermore, after completing the program, the student should be well prepared for management positions in industry or continued education toward a graduate degree.

LIST OF EXPERIMENTS:

1. Preparation and study of crystal models for simple cubic, body centred cubic, face centred cubic and hexagonal close packed structures.
2. Preparation and study of the Microstructure of pure metals like Iron, Cu and Al.
3. Grain size measurement by different methods.
4. Preparation and study of the Microstructure of Mild steels, low carbon steels, high – C steels.
5. Study of the Microstructures of Cast Irons.
6. Study of Microstructures of different alloy steels.
7. Study of the Microstructures of Non-Ferrous alloys.
8. Study of the Microstructures of Heat treated steels.
9. Hardenability of steels by Jominy End Quench Test.
10. To find out the hardness of various heat treated and untreated plain carbon steels.

T K R COLLEGE OF ENGINEERING &TECHNOLOGY

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B.TECH. MECHANICAL ENGINEERING -R18
MECHANICS OF SOLIDS LAB -B33PC6

B.Tech. II YearISem. **L/T/P/ C**

0/0/3/1.5

COURSE OBJECTIVES:

The students will advance the students' development of the following broad capabilities:

1. Students will be able to understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviors due to different types of loading will be discussed.
2. Students will be able to understand and know how to calculate stresses and deformation of a bar due to an axial loading under uniform and non-uniform conditions.
3. Students will understand how to develop shear-moment diagrams of a beam and find the maximum moment/shear and their locations
4. Students will understand how to calculate normal and shear stresses on any cross-section of a beam. Different cross-sections (including I-beam) will be discussed and applied Continuous Assessment Test 10 marks Mid Semester Test 15 marks End

COURSE OUTCOMES:

1. Analyze the behavior of the solid bodies subjected to various types of loading.
2. Apply knowledge of materials and structural elements to the analysis of simple structures.
3. Undertake problem identification, formulation and solution using a range of analytical methods
4. Analyze and interpret laboratory data relating to behaviorof structures and the materialsthey are made of, and undertake associated laboratory work individually and inteams.
5. Expectation and capacity to undertake lifelong learning.

Any 10 experiments from the following

1. Direct tensiontest
2. Bending test on Simple supported beam
3. Bending test on Cantilever beam
4. Torsiontest
5. Brinell hardnesstest

6. Rockwell hardnesstest
7. Test onsprings
8. Compression test oncube
9. Izod Impacttest
10..Charpy Impact test
11. Punch shear test.

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B.TECH. MECHANICAL ENGINEERING -R18

KINEMATICS AND DYNAMICS LAB - B33PC7

B.Tech. III Semester. **L/T/P/C**

0/0/3/1.5

PRE-REQUISITES:

Prerequisites for the graduate-level course are Kinematics, Dynamics, differential equations, motion simulation, displacement, velocity, acceleration, force, torque, power, Newton's motion laws, vibration, Gyroscopic Effect, Cams, Bearings.

COURSE OBJECTIVES:

The objective of the lab is to understand the kinematics and dynamics of mechanical elements such as linkages, gears, cams and learn to design such elements to accomplish desired motions ortasks.

Course Outcomes: Upon successful completion of this lab, students should be able to:

1. Understand types ofmotion
2. Analyze forces and torques of components inlinkages
3. Understand static and dynamic balance
4. Understand forward and inverse kinematics of open-loop mechanisms

EXPERIMENTS: (A Minimum of 10 experiments are to be conducted)

1.To determine the state of balance of machines for primary and secondary forces

2.To determine the frequency of torsional vibration of a given rod

3.Determine the effect of varying mass on the centre of sleeve in porter and proell governor

4.Find the motion of the follower if the given profile of the cam

5.The balance masses statically and dynamically for single rotating mass systems

6.Determine the critical speed of a given shaft for different n-conditions

7.For a simple pendulum determine time period and its natural frequency

8.For a compound pendulum determine time period and its natural frequency

9.Determine the effect of gyroscope for different motions

10 Determine time period, amplitude and frequency of undamped free longitudinal vibrationof single degree spring mass systems.

11. Determine the pressure distribution of lubricating oil at various load and speed of a Journalbearing.

12. Determine time period, amplitude and frequency ofdamped free longitudinal vibrationof single degree spring mass systems

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B.TECH. MECHANICAL ENGINEERING -R18

GENDER SENSITIZATION LAB - B33MC8

B.Tech. IIISemester. **L/T/P/C**

0/0/3/0

COURSE OBJECTIVES:

- To develop students' sensibility with regard to issues of genderin contemporary India.
- To provide a critical perspective on the socialization of men and women.
- To introduce students to information about some key biological aspects of genders.
- To expose the students to debates on the politics and economics of work.
- To help students reflect critically on gender violence.
- To expose students to more egalitarian interactions between men and women.

COURSE OUTCOMES:

- Students will have developed a better understanding of important issues related to gender in contemporaryIndia.
- Students will be sensitized to basic dimensions of the biological, sociological, psychological and legal aspects of gender. This will be achieved through discussion of materials derived from research, facts, everyday life, literature and film.
- Students will attain a finer grasp of how gender discriminationworks inour society andhow to counter it.
- Students will acquire insight into the gendered division of labour and its relation to politics andeconomics.
- Men and women students and professionals will be better equipped to work and live together asequals.
- Students will develop a sense of appreciation of women in all walks of life.
- Through providing accounts of studies and movements as well as the new laws that provide protection and relief to women, the textbook will empower students to understand and respond to gender v i o l e n c e .

UNIT-I:

UNDERSTANDING GENDER

Gender: Why Should We Study It? (*Towards a World of Equals*: Unit -1)

Socialization: Making Women, Making Men (*Towards a World of Equals*: Unit -2) Introduction. Preparing for Womanhood.Growing up Male.First lessons in Caste.Different Masculinities.

UNIT-II:

GENDER ANDBIOLOGY

Missing Women: Sex Selection and Its Consequences (*Towards a World of Equals*: Unit -4) Declining Sex Ratio. Demographic Consequences.

Gender Spectrum: Beyond the Binary (*Towards a World of Equals*: Unit -10)

Two or Many? Struggles with Discrimination.

UNIT-III:

GENDER ANDLABOUR

Housework: the Invisible Labour (*Towards a World of Equals*: Unit -3)

"My Mother doesn't Work." "Share the Load."

Women's Work: Its Politics and Economics (*Towards a World of Equals*: Unit -7)

Fact and Fiction.Unrecognized and Unaccounted work. Additional Reading: Wages and Conditions of Work.

UNIT-IV:

ISSUES OF VIOLENCE

Sexual Harassment: Say No! (*Towards a World of Equals*: Unit -6)

Sexual Harassment, not Eve-teasing- Coping with Everyday Harassment- Further Reading: "*Chupulu".*

Domestic Violence: Speaking Out (*Towards a World of Equals*: Unit -8)

Is Home a Safe Place? -When Women Unite [Film]. Rebuilding Lives. Additional Reading: New Forums for Justice.

Thinking about Sexual Violence (*Towards a World of Equals*: Unit -11)

Blaming the Victim-"I Fought for my Life…." - Additional Reading: The Caste Face of Violence.

UNIT-V:

GENDER: CO - EXISTENCE

Just Relationships: Being Together as Equals (*Towards a World of Equals*: Unit -12)

Mary Kom and Onler. Love and Acid just do not Mix. Love Letters. Mothers and Fathers. Additional Reading: Rosa Parks-The Brave Heart.

TEXTBOOK

1. All the five Units in the Textbook**, "*Towards a World of Equals: A Bilingual Textbook on Gender"*** written by A. Suneetha, Uma Bhrugubanda, DuggiralaVasanta, Rama Melkote, Vasudha Nagaraj, Asma Rasheed, GoguShyamala, Deepa Sreenivas and Susie Tharu and published by **Telugu Akademi, Hyderabad**,Telangana State in the year **2015**.

REFERENCE BOOKS

1. Menon, Nivedita. Seeing like a Feminist. New Delhi: Zubaan-Penguin Books, 2012
2. Abdulali Sohaila. "*I Fought For My Life…and Won*."Available online at: http://www.thealternative.in/lifestyle/i-fought-for-my-lifeand-won-sohaila-abdulal/
3. www.worldofequals.org.in

T K R COLLEGE OF ENGINEERING &TECHNOLOGY

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B.TECH. MECHANICAL ENGINEERING -R18

DYNAMICS OF MACHINERY - B34PC1

B.Tech. IV Semester **L/T/P/C**

3/1/0/3

PRE-REQUISITE: Kinematics of machines

COURSE OBJECTIVES: The objective is to introduce some of the components mainly used in IC Engines and make analysis of various forces involved. Subjects deals with topics like inertia forces in slider crank mechanism; IC Engine components & the analysis like governors is introduced. It also deals with balancing of rotating & reciprocating parts. Studies are made about balancing of multi cylinder engines, Radial engines etc. study of primary & secondary forces are considered while balancing. Finally they are introduced to the topic of vibrations. The study deals with linear, longitudinal, & torsional vibrations. The idea is to introduce the concept of natural frequency and the importance of resonance and critical speeds.

COURSE OUTCOME: the study of KOM& DOM are necessary to have an idea while designing the various machine members like shafts, bearings, gears, belts & chains and various I.C. Engine Components & Machine tool parts.

UNIT – I:

Precession: Gyroscopes – effect of precession – motion on the stability of moving vehicles such as motorcycle – motorcar – aeroplanesand ships.

Dynamic Force Analysis: Dynamic Force Analysis– D'Alembert's principle, Dynamic Analysis of 4-link mechanism, Slider Crank Mechanism.

UNIT – II:

Turning Moment Diagram And Flywheels: Engine Force Analysis – Piston Effort, Crank Effort, etc., Inertia Force in Reciprocating Engine – Graphical Method - Turning moment diagram –fluctuation of energy – flywheels and their design - crank effort and torque diagrams.

UNIT – III:

Friction: pivots and collars – uniform pressure, uniform wear. Clutches – Types – Single plate, multi-plate and cone clutches.

Brakes And Dynamometers: Types of brakes: Simple block brake, band and block brake-

internal expanding shoe brake-effect of braking of a vehicle. Dynamometers – absorption and transmission types. General description and methods of operation.

UNIT – IV:

Governors: Types of governors - Watt, Porter and Proell governors. Spring loaded governors – Hartnell and Hartung with auxiliary springs. Sensitiveness, isochronisms and hunting **–** stability – effort and power of the governors.

Balancing: Balancing of rotating masses- Primary, Secondary, and balancing of reciprocating masses.Analytical and graphical methods. Unbalanced forces and couples.

UNIT – V:

Vibrations: Free Vibration of mass attached to vertical spring – Transverse loads – vibrations of beams with concentrated loads. Dunkerly's method – Raleigh's method.Whirling of shafts – critical speed – torsional vibrations – one, two and three rotor systems.

TEXT BOOKS

1) Theory of Machines – V.P.Singh – Dhanpat Rai
2) Theory of Machines – Thomas Bevan.
3) Theory of machines – R.K.Bansal – Laxmi publications

REFERENCE BOOKS

1. Theory of Machines and Mechanisms/Joseph E. Shigley / Oxford
2. Theory of Machines / Rao,J.S / New Age
3. Theory of Machines /S.S.Rattan / Mc GrawHill.
4. Theory of Machines /Sadhu Singh/ Pearson
5. Kinematics and Dynamics- of Macinery- RL Norton – TMH
6. Theory of mechanisms and machines, Ghosh A and Malik A,K

T K R COLLEGE OF ENGINEERING &TECHNOLOGY

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B.TECH. MECHANICAL ENGINEERING -R18

FLUID MECHANICS ANDHYDRAULIC MACHINES - B34PC2

B.Tech.IV Semester **L/T/P/C**

3/1/0/3

COURSE OBJECTIVES: The objectives of the course are to enable the student;

1. To understand the basic principles of fluid mechanics
2. To identify various types offlows
3. To understand boundary layer concepts and flow through pipes
4. To evaluate the performance of hydraulic turbines
5. To understand the functioning and characteristic curves of pumps

COURSE OUTCOMES:

1. Able to explain the effect of fluid properties on a flow system.
2. Able to identify type of fluid flow patterns and describe continuity equation.
3. To analyze a variety of practical fluid flow and measuring devices and utilize fluid Mechanics principles in design.
4. To select and analyze an appropriate turbine with reference to given situation in powerplants.
5. To estimate performance parameters of a given Centrifugal and Reciprocating pump.
6. Able to demonstrate boundary layer concepts.

UNIT - I:

Fluid statics: Dimensions and units: physical properties of fluids- specific gravity, viscosity, and surface tension - vapour pressure and their influence on fluid motion- atmospheric, gauge and vacuum pressures – measurement of pressure- Piezometer, U-tube and differential manometers.

UNIT - II:

Fluid kinematics: Stream line, path line and streak lines and stream tube, classification of flows-steady and unsteady, uniform & non uniform, laminar & turbulent, rotational &irrotational flows-equation of continuity for one dimensional flow and three dimensional flows.

Fluid dynamics: Surface and bodyforces –Euler's and Bernoulli's equations for flow along a stream line.

UNIT - III:

Boundary Layer Concepts: Definition, thicknesses, characteristics along thin plate, laminar

and turbulent boundary layers (No derivation) boundary layer in transition, separation of boundary layer, submerged objects – drag and lift.

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 - IV:

Basics of turbo machinery : Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes.

Hydraulic Turbines : Classification of turbines, Heads and efficiencies, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions.

Performance of hydraulic turbines: Geometric similarity, Unit and specific quantities.

UNIT - V:

Centrifugal pumps: Classification, working, work done – barometric head- losses and efficiencies specific speed- performance characteristic curves, NPSH.

Reciprocating pumps: Working, Difference between Reciprocating and Centrifugal pumps.

TEXT BOOKS

1) Hydraulics, fluid mechanics and Hydraulic machinery MODI and SETH.- Standard publications

2) Fluid Mechanics and Hydraulic Machines by R.K.Rajput Chand publications

3) Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria&Sons.

REFERENCE BOOKS

1) Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.

2) Hydraulic Machines by Banga& Sharma, Khanna Publishers.

3) Fluid mechanics – Yunus A Cenegal , John Climbale – TMH

4) Fluid mechanics and Hydraulic machines – R.K.Bansal- Laxmi publications

5) Fluid Mechanics and HydraulicMachinary by Jagadish Lal

6) Fluid mechanics – John F.Dauglas- Pearson

7) Fluid mechanics – Frank M.White- TMH

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B.TECH. MECHANICAL ENGINEERING -R18

MACHINE DRAWING - B34ES3

B.Tech. IV Semester **L/T/P/C**

3/0/0/1.5

PRE-REQUISITES: Engineering graphics

COURSE OBJECTIVES:

1. To familiarize with the standard conventions for different materials and machine parts in working drawings.
2. To make part drawings including sectional views for various machine elements.
3. To prepare assembly drawings given the details of part drawings.

COURSE OUTCOMES:

1. Preparation of engineering and working drawings with dimensions and bill of material during design and development. Developing assembly drawings using part drawings of machinecomponents.
2. Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.
3. Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.
4. Methods of dimensioning, general rules for sizes and placement of dimensions for holes, centers, curved and tapered features.
5. Title boxes, their size, location and details - common abbreviations and their liberal usage
6. Types of Drawings – working drawings for machine parts.

Drawing of Machine Elements and simple parts

Selection of Views, additional views for the following machine elements and parts with every drawingproportion.

1. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.
2. Keys, cottered joints and knucklejoint.
3. Rivetted joints forplates
4. Shaft coupling, spigot and socket pipe joint.
5. Journal, pivot and collar and foot step bearings.

Assembly Drawings:

Drawings of assembled views for the part drawings of the following using conventions and easy drawing proportions.

1. Steam engine parts – stuffing boxes, cross heads, Eccentrics.

2. Machine tool parts: Tail stock, Tool Post, Machine Vices.
3. Other machine parts - Screws jacks, Petrol engine connecting rod, Plummer block

NOTE: First angle projection to be adopted. The student should be able to provide working drawings of actual parts.

TEXT BOOKS

1) Machine drawing- N.Siddeswar, P.Kannaih and VVS Sastry - TMH
2) Machine Drawing by / Bhattacharyya / Oxford
3) Machine Drawing with Auto CAD /GouthamPohit, Goutam Ghosh / Pearson

REFERENCE BOOKS

1. Machine Drawing / Ajeet Singh / Mc GrawHill
2. Machine Drawing / N.D. Bhat / Charotar

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B.TECH. MECHANICAL ENGINEERING -R18

MANUFACTURING PROCESS - B34PE4A

B.Tech. IV Semester **L/T/P/C**

3/1/0/3

PRE-REQUISITES: Basic Mechanical Engineering, Engineering Graphics

COURSE OBJECTIVES:

- To teach the process-level dependence of manufacturing systems through tolerances
- To expose the students to a variety of manufacturing processes including their typical use andcapabilities.
- To teach the important effects that manufacturing processes may have on the material properties of the processed part with a focus on the most common processes.
- To teach the thermal and mechanical aspects, such as force, stress, strain, and temperature, of the most common processes.
- To provide a technical understanding of common processes to aid in appropriate process selection for the material and required tolerances
- To provide a technical understanding of common processes to aid in appropriate material selection for a predetermined process.

COURSE OUTCOMES: Understand the idea for selecting materials for patterns. Types and allowances of patterns used in casting and analyze the components of moulds. Design core, core print and gating system in metal casting processes Understand arc, gas, solid state and resistance welding processes. Develop process-maps for metal forming processes using plasticity principles. Identify the effect of process variables to manufacture defect free products.

UNIT – I:

Casting: Steps involved in making a casting – Advantage of casting and its applications; Patterns - Pattern making, Types, Materials used for patterns, pattern allowances and their construction; Properties of moulding sands. Methods of Melting - Crucible melting – Defects in castings; Casting processes – Types – Sand moulding, Centrifugal casting, die-casting, Investment casting, shell moulding; Principles of Gating – gating systems and its design. Solidification of casting – Solidification of pure metal – Nucleation and grain growth, casting design considerations

UNIT – II:

Welding: Classification – solid state welding, fusion welding and welded joints; Gas welding - Types, oxy-fuel gas cutting – standard time and cost calculations. Arc welding, forge welding, submerged arc welding, Resistance welding, Thermit welding.

UNIT – III:

Inert Gas Welding _ TIG Welding, MIG welding, Friction welding, induction welding, explosive welding, Laser Welding; Soldering and Brazing; Heat affected zone in welding. Welding defects – causes and remedies; destructive and non- destructive testing of welds.

UNIT – IV:

Hot working, cold working, strain hardening, Rolling fundamentals – theory of rolling, types of Rolling mills and products. Forces in rolling and power requirements Stamping, forming and other cold working processes. Blanking and piercing – Bending and forming – Drawing and its types – wire drawing and Tube drawing – coining – Hot and cold spinning.Types of presses and press tools. Forces and power requirement in the above operations.

UNIT – V:

Extrusion of Metals: Basic extrusion process and its characteristics. Hot extrusion and cold extrusion - Forward extrusion and backward extrusion – Impact extrusion – Extruding equipment – Tube extrusion and pipe making, Hydrostatic extrusion. Forces in extrusion **Forging Processes:** Forging operations and principles – types of Forging methods, Forging tools– forging defects – swaging, Forces in forging operations.

TEXT BOOKS:

1) Manufacturing Science – Ghosh and Malik- TMH
2) Production Technology –R.K.Jain – Khanna Publishers
3) Manufacturing Technology / P.N. Rao Vol.1 &2 /Mc GrawHill

REFERENCE BOOKS:

1) A course in work shop technology – Volime 2- S .Raghu vamsiDhanpat Rai
2) Metal Casting / T.V RamanaRao / New Age
3) Production Technology / G. ThirupathiReddy / Scitech
4) Manufacturing Engineering & Technology / SeropeKalpakjian / Steven R. Schmid / Pearson

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B.TECH. MECHANICAL ENGINEERING -R18

MACHINE TOOL DESIGN -B34PE4B

B.Tech. IV Semester. **L/T/P/ C**

3/1/0/ 3

PRE REQUISITES: Manufacturing process, Tool Materials, Drive units& mechanisms.

COURSE OBJECTIVE:

1. To develop a solution oriented approach by in depth knowledge of Machine Tool Design.
2. To address the underlying concepts, methods and application of Machine Tool Design.
3. To know various interdisciplinary materials machining and Designing

COURSE OUTCOMES:

1. The student can identify different areas of Machine Tool Design.
2. Can find the applications of all the areas in day to day life.
3. Student's gets and basic conceptual knowledge on automation

UNIT- I:

Introduction-Calculation Data (Forces, Velocities and Power Requirements during metal cutting): Turning: Cutting force, Cutting Speed and Feed Rate. Drilling: Cutting forces, Cutting Speed and Feed Rate. Milling: Chip Section, Cutting force, Milling with Cutter Heads. Grinding: Grinding Forces, Cutting Speed, Feed Rate, and Depth Setting. Planning, Shaping and Broaching. General Requirements of the Machine Tool: Accuracy of Shape, Dimensional accuracy and surface finish of the components produced. High Productivity.High Technical and Economic Efficiency.

UNIT- II:

Design Principles: Stiffness and Rigidity of the Separate Constructional Elements and their Combined behavior Under Load, Static Rigidity, Dynamic Rigidity, Natural frequencies, Damping, Mode of Vibration.. Standardization of Spindle Speeds and Feed Rates: Layout of Speed Change Gears. Saw Diagrams for Arithmetic Progression, Geometric Progression, Harmonic Progression and Logarithmic Progression of spindle speeds for Mechanical Stepped Drives for Machine Tools. Establishment of Gear Ratios, Layout of the Intermediate Reduction

Gears, Calculation of Transmission Ratios, Pulley Diameter, Gear Wheel Diameters and Number of Teeth. Ray Diagram. Speed Diagram.

UNIT- III:

Electrical, Mechanical and Hydraulic Drives for the Operational Movements: Electric Drive and Control Equipment. Mechanical and Hydraulic Drives. Drives for Producing Rotational Movements, Stepped Drives, Step less Drives. Drives for Producing Rectilinear Movements. Backlash Eliminator in the Feed Drive Nut. Automatic Control: Principles and Constructional Elements. Automatic Driving of the Cutting Movements, Feed Movements, and Return Movements.Automatic control of movements for Starting, Stopping and Reversing. Automatic Clamping and Unclamping the work piece.

UNIT- IV:

Automatic Selection of Required Speeds, Automatic Setting of Tools.Automatic Measurement of Machined Shape and Surfaces.Transport of Components from One Machine to the Next.Applications (Examples of Automatic Machines). Control for Moving Slides into Defined, Fixed Positions. Control of Feed Movements in Producing Profiles or Surface by Continuous Path Control. 7. Design of Constructional Elements: Machine Tool Structures, Structural Elements Design for Centre Lathe, Drilling Machine, Knee Type Milling Machine, Planning Machine, Boring Machine, and Grinding Machines.

UNIT- V:

Design of Slide Ways: Design of Slide ways for Tables, Saddles and Cross-slides. Antifriction Bearings for slide ways.Hydrostatically Lubricated Slide ways. 9. Design of Spindles and Spindle Bearings: Design of Spindles for Strength and Stiffness. Design of Spindles for Balancing.General Layout and Design of the Driving Elements and the Spindle Bearings.Selection and General Layout of Ball and Roller Bearings for Supporting Spindles. 10. Design of Secondary Drives for Machine Tools: Design of Cutting Drives, Feed Drives and Setting Drives.

TEXT BOOKS

1. Design Principles of Metal-Cutting Machine Tools by F. Koenigsberger
2. Machine Tool Design by N. K. Mehta. McGraw Hill Publishing.
3. Machine tool design by Sen and Bhattacharya, CBS Publications

REFERENCE BOOKS

1. Machine Tool Design by Acherkan, Mir publishing.

2. Machine Tool Design by S.K, Basu, Oxford and IBH Publishing

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B.TECH. MECHANICAL ENGINEERING -R18

COMPUTER GRAPHICS - B34PE4C

B.Tech. IV Semester. **L/T/P/C**

3/1/0/3

COURSE OBJECTIVES:

- To make students understand about fundamentals of Graphics to enable them to design animated scenes for virtual object creations.
- To make the student present the content graphically.

COURSE OUTCOMES:

- Students can animate scenes entertainment.
- Will be able work in computer aided design for content presentation..
- Better analogy data with pictorial representation.

UNIT – I:

Introduction: Application areas of Computer Graphics, overview of graphics systems, video-display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices Output primitives: Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood fill algorithms.

UNIT – II:

2-D Geometrical transforms: Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems. 2-D Viewing: The viewing pipeline, viewing coordinate reference frame, window to viewport coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm.

UNIT – III:

3-D Object representation: Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-spline curves, Bezier and B-spline surfaces, sweep representations, octrees BSP Trees, 3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations, 3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping.

UNIT – IV:

Visible surface detection methods: Classification, back-face detection, depth-buffer, scanline, depth sorting, BSP-tree methods, area sub-division and octree methods Illumination Models and Surface rendering Methods: Basic illumination models, polygon rendering methods

UNIT- V:

Computer animation: Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications

TEXT BOOKS

1. Computer Graphics C version, Donald Hearn and M. Pauline Baker, Pearson education.
2. Computer Graphics Second edition Zhigandxiang, Roy Plastock, Schaum's outlines, Tata Mc Graw hill edition.

REFERENCE BOOKS

1. Computer Graphics Principles & practice, second edition in C, Foley, Van Dam, Feiner and Hughes, Pearson Education.
2. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
3. Principles of Interactive Computer Graphics, Neuman and Sproul, TMH.
4. Principles of Computer Graphics, Shalini, Govil-Pai, Springer.
5. Computer Graphics, Steven Harrington, TMH
6. Computer Graphics, F. S. Hill, S. M. Kelley, PHI.
7. Computer Graphics, P. Shirley, Steve Marschner& Others, Cengage Learning.
8. Computer Graphics & Animation, M. C. Trivedi, Jaico Publishing House.
9. An Integrated Introduction to Computer Graphics and Geometric Modelling, R. Goldman, CRC Press, Taylor&Francis Group.

T K R COLLEGE OF ENGINEERING &TECHNOLOGY

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B.TECH. MECHANICAL ENGINEERING -R18

NUMERICAL METHODS - BBSM6

B.Tech.IV Semester **L/T/P/C**

3/1/0/ 3

COURSE OBJECTIVES:

1. The objective of this course is to familiarize the prospective engineers with techniques in numerical methods.
2. It aims to equip the students to deal with advanced level of mathematics and application that would be essential for their disciplines
3. The topics of those deals with methods to find roots of an equation.
4. The topics of integration that deals using numerical techniques.
5. The topics deals with the solution of PDE using numerical methods.

COURSE OUTCOMES:

1. Find the root of an equation using numerical methods.
2. Finding integral values using numerical techniques.
3. To find the numerical solution of PDE.
4. learn the methods of interpolation
5. Solve the problems using numerical differentiation

UNIT I:

Solution of Algebraic and transcendental equations, Bisection method- Newton-Raphson method and Regula-falsi method.

UNIT II:

Interpolation and Integration, Finite differences- interpolation using Newton's forward and back ward difference formulae. Central difference interpolation- Gauss' forward and backward formulae.Interpolation with unequal intervals newton's divided difference and Lagrange's formulae.

UNIT III:

Numerical Differentiation & Integration-Numerical Differentiation -Numerical Integration- Trapezoidal rule and Simpson's 1/3 and 3/8 rules.

UNIT IV:

Numerical solutions of Ordinary Differential Equations - Ordinary differential equations- Taylor's series- Euler and modified Euler's methods. Runge-Kuttamethod of fourth order for solving first and second order equations.

UNIT V:

Numerical Solutions of Partial Differential Equations - Partial differential equations finite difference solution two dimensional Laplace equation and poison equation- implicit and explicit methods for one dimensional heat equation (bender-Schmidt and crank-Nicholson methods) finite difference explicit method for wave equation

REFERENCE BOOKS

1. Erwinkreyszig- Advanced Engineering Mathematics- 9th Edition- John Wiley & Sons- 2006.
2. VeerarajanT.- Engineering Mathematics for first year-tataMcGraw-Hill- New delhi- 2008.
3. S.S.Sastry introductory methods of numerical analysis- PHI-4th edition 2005
4. N.P. Bali and Manish Goyal- A text book of engineering Mathematics-Laxmi Publications- Reprint- 2008.
5. B.S.Grewal- Higher Engineering Mathematics- Khanna Publishers- 36th Edition- 2010

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B.TECH. MECHANICAL ENGINEERING -R18

FLUID MECHANICS AND HYDRAULIC MACHINES LAB - B34PC7

B.Tech. IV Semester **L/T/P/C**

0/0/3/ 1.5

COURSE OBJECTIVES:

1. To understand the basic principles of fluid mechanics.
2. To identify various types of flows.
3. To understand boundary layer concepts and flowthrough pipes.
4. To evaluate the performance of hydraulic turbines.
5. To understand the functioning and characteristic curves of pumps.

COURSE OUTCOMES:

1. Able to explain the effect of fluid properties on a flow system.
2. Able to identify type of fluid flow patterns and describe continuity equation.
3. To analyze a variety of practical fluid flow and measuring devices and utilize fluid mechanics principles indesign.
4. To select and analyze an appropriate turbine with reference to given situation in powerplants.
5. To estimate performance parameters of a given Centrifugal and Reciprocating pump.
6. Able to demonstrate boundary layer concepts

List of Experiments:

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturimeter.

9. Calibration of Orificemeter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Verification of Bernoulli's Theorems

Note: Any 10 of the above 12 experiments are to be conducted.

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B.TECH. MECHANICAL ENGINEERING -R18

MANUFACTURING PROCESS LAB - B34PC8

B.Tech. IV Semester **L/T/P/C**

0/0/3/1.5

PRE-REQUISITES: Manufacturing Technology

COURSE OBJECTIVES:

1. Know about the basic Physical, Chemical Properties of materials
2. Explain why some material(s) are better to be used in a product for given design requirements
3. Learn the basic operation of various manufacturing processes
4. Learn how various products are made using traditional, non-traditional, or Electronics manufacturingprocesses
5. Design simple process plans for parts and products
6. Understand how process conditions are set for optimization of production
7. Learn how CNC machines work
8. Write and execute CNC machining programs to cut parts on a milling machine
9. Measure a given manufactured part to evaluate its size, tolerances and surface finish
10. Design and fabricate a simpleproduct

COURSE OUTCOMES: Understanding the properties of moulding sands and pattern making. Fabricate joints using gas welding and arc welding. Evaluate the quality of welded joints. Basic idea of press working tools and performs moulding studies on plastics.

Minimum of 12 Exercises need to be performed

I. Metal CastingLab:

1. Pattern Design and making - for one casting drawing.
2. Sand properties testing - Exercise -for strengths, and permeability – 1
3. Moulding Melting and Casting - 1 Exercise

II. WeldingLab:

1. ARC Welding Lap & Butt Joint - 2 Exercises
2. Spot Welding - 1Exercise
3. TIG Welding - 1Exercise
4. Plasma welding and Brazing - 2 Exercises

(Water PlasmaDevice)

III. Mechanical PressWorking:

1. Blanking & Piercing operation and study of simple, compound and progressive press tool.
2. Hydraulic Press: Deep drawing and extrusion operation.
3. Bending and otheroperations

IV. Processing Of Plastics:

1. InjectionMoulding
2. BlowMoulding

REFERENCE BOOK

1. Dictionary of Mechanical Engineering – G.H.F. Nayler, Jaico Publishing House.

T K R COLLEGE OF ENGINEERING &TECHNOLOGY

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B.TECH. MECHANICAL ENGINEERING -R18

DISASTER MANAGEMENT - B34OE5A

B.Tech. IV Semester **L/T/P/C**

3/1/0/3

COURSE OBJECTIVES: The subject provide different disasters, tools and methods for disaster management

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

1. Understanding Disasters, man-made Hazards and Vulnerabilities Understanding disaster management mechanism
2. Understanding capacity building concepts and planning of disaster managements.

UNIT - I:

Understanding Disaster: Concept of Disaster - Different approaches- Concept of Risk -Levels of Disasters - Disaster Phenomena and Events (Global, national and regional) **Hazards and Vulnerabilities:** Natural and man-made hazards; disaster risk - Vulnerabilities to flood and earthquake hazards

UNIT - II:

Disaster Management Mechanism: Concepts of risk management and crisis managements - Disaster Management Cycle - Response and Recovery - Development, Prevention, Mitigation and Preparedness - Planning for Relief

UNIT - III:

Capacity Building: Capacity Building: Concept - Structural and Nonstructural MeasuresCapacity Assessment; Strengthening Capacity for Reducing Risk - Counter-Disaster Resources - Legislative Support at the state and national levels

UNIT - IV:

Coping with Disaster: Coping Strategies; alternative adjustment processes – Changing Concepts of disaster management - Industrial Safety Plan; Safety norms and survival kits - Mass media and disaster management

UNIT - V:

Planning for disaster management: Strategies for disaster management planning - Steps for formulating a disaster risk reduction plan - Disaster management Act and Policy in India - Organizational structure for disaster management in India.

TEXT BOOKS

1. Manual on Disaster Management, National Disaster Management, Agency Govt of India.
2. Disaster Management by Mrinalini Pandey Wiley 2014.
3. Disaster Science and Management by T. Bhattacharya, McGraw Hill Education (India) Pvt Ltd Wiley 2015

REFERENCE BOOKS

1. Earth and Atmospheric Disasters Management, N. Pandharinath, CK Rajan, BS Publications 2009.
2. National Disaster Management Plan, Ministry of Home affairs, Government of India (http://www.ndma.gov.in/images/policyplan/dmplan/draftndmp.pdf)

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B.TECH. MECHANICAL ENGINEERING -R18

INTRODUCTION TO MECHATRONICS - B34OE5B

B.Tech. IV Semester **L/T/P/C**

3/1/0/ 3

PRE-REQUISITES: Basic Electronics Engineering

COURSE OBJECTIVES:

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

COURSE OUTCOMES: At the end of the course, the student will be able to, Model, analyze andcontrol engineering systems. Identify sensors, transducers and actuators to monitor and control the behavior of a process or product. Develop PLC programs for a given task. Evaluate the performance of mechatronic systems.

UNIT – I:

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

Signal Conditioning : Introduction –Digital I/O , Analog input – ADC ,resolution, Filtering Noise using passive components – Registors, capacitors - Digital Signal Processing – Low pass , high pass , notch filtering

UNIT – II:

Precision Mechanical Systems : Modern CNC Machines – Design aspects in machinestructures, guideways, feed drives, spindle and spindle bearings, measuring systems, control software and operator interface, gauging and tool monitoring.

Electronic Interface Subsystems :TTL, CMOS interfacing - Sensor interfacing – Actuatorinterfacing – solenoids , motors Isolation schemes- opto coupling, buffer IC's.

UNIT – III:

Electromechanical Drives : Relays and Solenoids - Stepper Motors - DC brushed motors –DC brushless motors - DC servo motors - 4-quadrant servo drives , Variable Frequency Drives, Vector Drives - Drive System load calculation.

Microcontrollers Overview : 8051 Microcontroller , microprocessor structure – DigitalInterfacing - Analog Interfacing - Digital to Analog Convertors - Analog to Digital Convertors -.

UNIT – IV:

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

UNIT – V:

Programmable Motion Controllers : Introduction - System Transfer Function – Laplacetransform and its application in analysing differential equation of a control system - Feedback Devices : Position , Velocity Sensors - Optical Incremental encoders - Proximity Sensors : Inductive , Capacitive , Infrared - Continuous and discrete processes - Control System Performance & tuning - Digital Controllers - P , PI , PID Control - Control modes – Position , Velocity and Torque - Velocity Profiles – Trapezoidal- S. Curve.

TEXT BOOKS

1. Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering/ W Bolton/ Pearson.
2. Introduction to Mechatronics / Appukuttan /Oxford

REFERENCE BOOKS

1. Mechatronics Principles concepts & Applications / N.P.Mahalik/ Mc Graw Hill
2. Designing Intelligent Machines. Open University, London.

T K R COLLEGE OF ENGINEERING &TECHNOLOGY

(Autonomous)

B.TECH. MECHANICAL ENGINEERING -R18

NON DESTRUCTIVE TESTING METHODS - B34OE5C

B.Tech. IV Semester **L/T/P/C**

3/1/0/3

PREREQUISITE: Metrology.

COURSE OBJECTIVES: This course has the basic idea of the properties of steal and ferrous metals. The objectives aim to:

1. Identify the basic methods of testing.
2. Understand the concept of non-destructive testing.
3. Describe the various types of NDT tests carried out on components.
4. Describe ultrasonic method of testing the materials.
5. Analyze the different types of test carried out on components and surfaces.
6. Understand the properties of materials suitable for NDT test.
7. Understand the radiography uses in engineering.

COURSE OUTCOMES: At the end of the course the students are able to:

1. Identify the requirements of testing criteria as per material composition.
2. Understand the theory of non-destructive testing methods is used.
3. Determine the type of requirement of non-destructive test.
4. Distinguish between the various NDT test as Ultrasonic and Eddy current methods.
5. Understand the properties of radiation used in engineering.
6. Describe the various types of non-destructive test used to determine the surface cracks.

UNIT – I:

Overview of NDT - NDT Versus Mechanical testing, Overview of the Non DestructiveTesting Methods for the detection of manufacturing defects as well as material characterization. Relative merits and limitations, various physical characteristics of materials and their applications in NDT, Visual inspection.

UNIT – II:

Surface NDE Methods: Liquid Penetrant Testing – Principles, types and properties of liquid penetrants, developers, advantages and limitations of various methods. Magnetic Particle Testing-Theory of magnetism, inspection materials Magnetization methods, Interpretation and evaluation of test indications, Principles and methods of demagnetization, Residual magnetism.

UNIT - III:

Thermography and Eddy Current Testing - Principles, Contact and non contact inspection methods, Techniques for applying liquid crystals, Advantages and limitation – infrared radiation and infrared detectors, Instrumentations and methods, applications. Eddy Current Testing-Generation of eddy currents, Properties of eddy currents, Eddy current sensing elements, Probes, Instrumentation, Types of arrangement, Applications, advantages, Limitations, Interpretation/Evaluation.

UNIT - IV:

Ultrasonic Testing and Acoustic Emission - Ultrasonic Testing-Principle, Transducers,transmission and pulse-echo method, straight beam and angle beam, instrumentation, data representation, A/Scan, B-scan, C-scan. Phased Array Ultrasound, Time of Flight Diffraction. Acoustic Emission Technique IV Principle, AE parameters, Applications

UNIT - V:

Radiography - Principle, interaction of X-Ray with matter, imaging, film and film lesstechniques, types and use of filters and screens, geometric factors, Inverse square, law, characteristics of films – graininess, density, speed, contrast, characteristic curves, Penetrameters, Exposure charts, Radiographic equivalence. Fluoroscopy- Xero-Radiography, Computed Radiography, Computed Tomography

TEXT BOOKS

1. Baldev Raj, T. Jayakumar, M. Thavasimuthu, Practical Non-Destructive Testing¡¨, Narosa Publishing House, 2009.
2. Ravi Prakash, Non-Destructive Testing Techniques¨, 1st revised edition, New Age International Publishers, 2010

REFERENCE BOOKS

1. ASM Metals Handbook, ¨Non-Destructive Evaluation and Quality Control¨, American Society of Metals, Metals Park, Ohio, USA, 200, Volume-17.
2. Paul E Mix, “Introduction to Non-destructive testing: a training guide”, Wiley, 2nd Edition New Jersey, 2005
3. Charles, J. Hellier, Handbook of Non-destructive evaluation”, McGraw Hill, New York 2001.