स्वामी रामानंद तीर्थ मराठवाडा विद्यापीठ
नांदेड– ४३१६०६ (महाराष्ट्र)
SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY
NANDED-431606, MAHARASHTRA STATE, INDIA.
Established on 17th September 1994 - Recognized by the UGC U/s 2(f) and 12(B), NAAC Re-accredited with 'A' Grade

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परिपत्रक

सर्व संबधितांना या परिपत्रकान्वये कळविण्यात येते की, प्रस्तूत विद्यापीठाच्या विज्ञान व तंत्रज्ञान विद्याशाखेंतर्गत अभियांत्रिकी अभ्यासक्रमांतील सोबत जोडल्याप्रमाणे B.E. Mechanical Engineering (Auto) Second Year अभ्यासक्रम शैक्षणिक वर्ष २०१८—१९ पासुन लागु करण्याकरिता मा. कुलगुरूनी विद्या परीषदेच्या वतिने मान्यता प्रदान केली आहे.

तरी उपरोक्त प्रमाणे ही बाब सर्व संबंधितांच्या निदर्शनास आणून द्यावी.

''ज्ञानतीर्थ'' परिसर)(
विष्णुपूरी, नांदेड.)(
जा.क्र.शैक्षणिक/०१/Engg/२०१८—१९/८३८)(स्वा/—
दिनांक : ०८/०८/२०१६)(उपकुलसचिव
)(शैक्षणिक (अभ्यासमंडळ) विभाग

प्रत माहिती व पुढील कार्यवाहीस्तव :

१) प्राचार्य, संलग्नित अभियांत्रिकी महाविद्यालये, प्रस्तुत विद्यापीठ.
२) संचालक, परीक्षा व मुल्यमापन मंडळ, प्रस्तुत विद्यापीठ.
३) कुलसचिव, (निवडणूक व सभा कक्ष) यांचे कार्यालय, प्रस्तुत विद्यापीठ.
४) उपकुलसचिव, पदव्युत्तर विभाग व पात्रता विभाग, प्रस्तुत विद्यापीठ.
५) सिस्टीम एक्सपर्ट, प्रस्तुत विद्यापीठ. (सदरील परिपत्रक विद्यापीठाच्या संकेतस्थळावर प्रसारित करावे.)

Teaching Scheme - Second Year Mechanical(Auto) Engineering

SEMESTER – III **(Academic Year 2018-19)**

			Teaching Scheme				Marking Scheme					Theory Total
Sr. No	Sub Code	Subject	L	P	T	CR	PR	OR	TW	MSE	ESE	
1	BSC 301	Physics II (Optics & Waves)	3	2		4	25 @		25	30	70	100
2	BSC 302	Mathematics III	3		1	4				30	70	100
3	PCCME303	Thermodynamics	3	2		4		25 #		30	70	100
4	ESC 304	Basic Electronics Engg.	3	2		4	25 @		25	30	70	100
5	ESC 305	Engineering Mechanics	3	2		4	25 @		25	30	70	100
6	BSC 306	Biology	2	2		3			25	15	35	50
7	HSMC307	Effective Technical Communication	2			2		25 @				
8	ESC 308	Seminar I		2		0		25 @				
Total			19	12	1	25	75	75	100	165	385	550
GRAND TOTAL												**800**

TH – Theory , PR – Practical, TU – Tutorial , CR – Credit , OR – Oral , TW – Term work, MSE – Minor Semester Examination, ESE – End Semester Examination.

Teaching Scheme - Second Year Mechanical (Auto) Engineering

SEMESTER – IV **(Academic Year 2018-19)**

			Teaching Scheme				Marking Scheme					Theory Total
Sr.N	**Sub Code**	**Subject**	**L**	**P**	**T**	**CR**	**PR**	**OR**	**TW**	**MSE**	**ESE**	
1	PCC ME 401	Automobile Engineering	3	2		4			25	30	70	100
2	PCC ME 402	Fluid Mechanics & Machinery	3	2		4	25 @		25	30	70	100
3	PCC ME 403	Strength of Materials	3	2		4	25 @		25	30	70	100
4	PCC ME 404	Mechanical Engineering Drawing	2	4		4	50 @		25	30	70	100
5	PCC ME 405	Material Science & Manufacturing	3		1	4				30	70	100
6	HSME 406	Professional Practice, Law and Ethics.(Non Credit)	1	2		1			25			
7	MC 407	Environmental Science (Mandatory Course) ï Non Credit	1						25			
8	HSME408	Management (Organizational Behavior) ï Non Credit	3							15	35	50
	Total		17	08	1	22	100		1150	165	385	550
	Semester Total											**800**

TH – Theory , PR – Practical, TU – Tutorial , CR – Credit , OR – Oral , TW – Term work, MSE – Minor Semester Examination, ESE – End Semester Examination.

Industrial Training of 4 Weeks after Forth semester Examination and will be evaluated in Fifth Semester.

B.E. Mechanical (Auto) Engineering
Second Year
Third & Fourth Semester

(Academic Year 2018-19)

Course Name : Second Year Mechanical (Auto)Engineering

Semester : Third

Subject Title : Physics II

Subject Code : BSC 301

Detailed contents :

Module 1: Simple harmonic motion, damped and forced simple harmonic oscillator (7 lectures)

Mechanical and electrical simple harmonic oscillators, complex number notation and phasor representation of simple harmonic motion, damped harmonic oscillator ï heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators, electrical and mechanical impedance, steady state motion of forced damped harmonic oscillator, power absorbed by oscillator.

Module 2: Non-dispersive transverse and longitudinal waves in one dimension and introduction to dispersion (7 lectures)

Transverse wave on a string, the wave equation on a string, Harmonic waves, reflection and transmission of waves at a boundary, impedance matching, standing waves and their Eigen frequencies, longitudinal waves and the wave equation for them, acoustics waves and speed of sound, standing sound waves. Waves with dispersion, water waves, superposition of waves and Fourier method, wave groups and group velocity.

Module 3: The propagation of light and geometric optics (10 lectures)

Fermatôs principle of stationary time and its applications e.g. in explaining mirage effect, laws of reflection and refraction, Light as an electromagnetic wave and Fresnel equations, reflectance and transmittance, Brewsterôs angle, total internal reflection, and evanescent wave. Mirrors and lenses and optical instruments based on them, transfer formula and the matrix method.

Module 4: Wave optics (6 lectures)

Huygensô principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Youngôs double slit experiment, Newtonôs rings, Michelson interferometer, Mach-Zehnder interferometer. Farunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power

Module 5: Lasers (8)

Einsteinôs theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO), solid-state lasers(ruby, Neodymium), dye lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine.

Reference Books

(i) Ian G. Main, Oscillations and waves in physics

(ii) H.J. Pain, The physics of vibrations and waves

(iii)E. Hecht, Optics ADDISON WESLEY Publishing Company Incorporated, 2016

(iv)A. Ghatak, Optics McGraw-Hill Education, 23-Mar-2009

Practicalôs

1. To determine the refractive index of material of prism by using spectrometer.
2. To determine the disperser power of prismby using spectrometer.
3. To determine the speed and propagation of light wave in glass by using spectrometer.
4. To study the polarization of light and to find Brewster angle for a given glass.
5. To determine the wavelength of sodium ï D line by diffraction grating.
6. To determine the diameter of given wire using interference patterns produced due to wedge shaped film.
7. To determine the radius of curvature of Plano-convex lens by using Newtonôs ring apparatus.
8. To determine the wavelength of given monochromatic light source by using Newtonôs apparatus.
9. Determine the refractive index of given liquid by using Newtonôs ring apparatus.
10. To determine the concentration of sugar in given sugar solution by using Polari meter.
11. To measure the modulus of rigidity of a torsional pendulum by dynamic meth0d.
12. To determine the velocity of sound by using CRO.
13. To study normal mode of oscillations of coupled pendulums and to measure the normal mode frequencies.
14. To determine the acceleration due to gravity (g) by small oscillations of a bar pendulum.

15. To determine the angle of minimum deviation for a given prism by plotting the graph between angle of incidence and angle deviation.
16. To determine the wavelength of sodium light by Fresnelôs bi prism experiment.
17. To find the resolving power of telescope.
18. To find the velocity of ultrasonic waves in non-conducting medium by pezo-electric method.
19. To determine the dispersive power and resolving power of plane diffraction grating.
20. To determine the frequency of AC supply by Sonometer method.
21. To determine the frequency of electrically driven tuning fork by Meldeôs is experiment.

Course Name : Second Year Mechanical (Auto) Engineering

Semester : Third

Subject Title : Mathematics III

Subject Code : BSC 302

Objectives:

(1) To introduce the solution methodologies for second order Partial Differential Equations with applications in engineering

(2) To provide an overview of probability and statistics to engineers

Contents:

Module 1 Definition of Partial Differential Equations, First order partial differential equations, solutions of first order linear PDEs; Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method. Second-order linear equations and their classification, Initial and boundary conditions, D'Alembert's solution of the wave equation; Duhamel's principle for one dimensional wave equation. Heat diffusion and vibration problems, Separation of variables method to simple problems in Cartesian coordinates. The Laplacian in plane, cylindrical and spherical polar coordinates, solutions with Bessel functions and Legendre functions. One dimensional diffusion equation and its solution by separation of variables.**(14 hours)**

Module 2 Probability spaces, conditional probability, independence; Discrete random variables, Independent random variables, the multinomial distribution, Poisson approximation to the binomial distribution, infinite sequences of Bernoulli trials, sums of independent random variables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality. Continuous random varibales and their properties, distribution functions and densities, normal, exponential and gamma densities.Bivariate distributions and their properties, distribution of sums and quotients, conditionaldensities, Bayes' rule.**(12 hours)**

Module 3 Basic Statistics, Measures of Central tendency: Moments, skewness and Kurtosis Probability distributions: Binomial, Poisson and Normal evaluation of statistical parameters for these three distributions, Correlation and regression ï Rank correlation. Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, Tests for single mean, difference of means, and difference of standard deviations. Test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.**(12 hours)**

Course Outcomes:

Upon completion of this course, students will be able to solve field problems in engineering involving PDEs. They can also formulate and solve problems involving random variables and apply statistical methods for analysing experimental data.

References:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9thEdition, John Wiley & Sons,2006.

2. N.P. Bali and Manish Goyal, A Reference Book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.

3. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).

4. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.

Course Name : Second Year Mechanical (Auto)Engineering

Semester : Third

Subject Title : Thermodynamics

Subject Code : PCC AE 303

Objectives:

- To learn about work and heat interactions, and balance of energy between system and its surroundings
- To learn about application of I law to 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 1. Fundamentals - System & Control volume; Property, State & 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. **(5)**

Module 2 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 Cyclic & Non-cyclic processes; Concept of total energy E ; Demonstration that E is a property; Various modes of energy, Internal energy and Enthalpy. **(5)**

Definition of Pure substance, Ideal Gases and ideal gas mixtures, Real gases and real gas mixtures, Compressibility charts- Properties of two phase systems - Const. temperature and Const. pressure heating of water; Definitions of saturated states; P-v-T surface; Use of steam tables and R134a tables; Saturation tables; Superheated tables; Identification of states & determination of properties, Mollierôs chart. **(8)**

Module 3 First Law for Flow Processes - Derivation of general energy equation for a control volume; Steady state steady flow processes including throttling; Examples of steady flow devices; Unsteady processes; examples of steady and unsteady I law applications for system and control volume. **(5)**

Second law - Definitions of direct and reverse heat engines; Definitions of thermal efficiency and COP; Kelvin-Planck and Clausius statements; Definition of reversible process; Internal and external irreversibility; Carnot cycle; Absolute temperature scale. **(5)**

Module 4 Clausius inequality; Definition of entropy 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 coordinates; Definition of Isentropic efficiency for compressors, turbines and nozzles- Irreversibility and Availability, Availability function for systems and Control volumes undergoing different processes, Lost work. Second law analysis for a control volume. Exergy balance equation and Exergy analysis.**(8)**

Module 5 Thermodynamic cycles - Basic Rankine cycle; Basic Brayton cycle; Basic vapor compression cycle and comparison with Carnot cycle. **(4)**

Total Hours (40 lectures + 12 tutorials)

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 students 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.

List of Practical's:-

1. To Know about your Thermal Engineering Lab.
2. Jouleôs experiment to validate first law of thermodynamics.
3. Determination of Cp and Cv for Ideal gas.
4. Performance estimation of Air standard cycle using standard simulation softwareôs (MATLAB, VC++ etc.).
5. Study of Barrel Calorimeter to Determine dryness fraction of steam.
6. Study of Separating Calorimeter to Determine dryness fraction of steam.
7. Study of Throttling Calorimeter to Determine dryness fraction of steam.
8. Study of combined Separating and Throttling Calorimeter to Determine dryness fraction of steam.

9. Performance estimation of VCC using any professional software (Cool Pack etc.)

Reference 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. Moran, 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.

Course Name : Second Year Mechanical (Auto)Engineering

Semester : Third

Subject Title : Basic Electronics Engineering

Subject Code : ESC304

Objectives:

To provide an overview of electronic device components to Mechanical engineering students

Contents

Module 1 Semiconductor Devices and Applications: Introduction to P-N junction Diode and V-I characteristics, Half wave and Full-wave rectifiers, capacitor filter. Zener diode and itscharacteristics, Zener diode as voltage regulator. Regulated power supply IC based on 78XXand 79XX series, Introduction to BJT, its input-output and transfer characteristics, BJT as asingle stage CE amplifier, frequency response and bandwidth.

Module 2 Operational amplifier and its applications: Introduction to operational amplifiers, Op-amp input modes and parameters, Op-amp in open loop configuration, op-amp with negative feedback, study of practical op-amp IC 741, inverting and non-inverting amplifier applications: summing and difference amplifier, Moduley gain buffer, comparator, integrator and differentiator.

Module 3 Timing Circuits and Oscillators: RC-timing circuits, IC 555 and its applications as astable and mono-stable multi-vibrators, positive feedback, Barkhausen's criteria for oscillation, R-C phase shift and Wein bridge oscillator.

Module 4 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.

Module 4 Electronic Communication Systems: The elements of communication system, IEEE frequency spectrum, Transmission media: wired and wireless, need of modulation, AM and FM modulation schemes, Mobile communication systems: cellular concept and block diagram of GSM system.

Reference Books:

1. Floyd ,ò Electronic Devicesò Pearson Education 9

2. R.P. Jain , ñ Modern Digital Electronicsò , Tata Mc Graw Hill, 3th edition, 2012.

Edition, 2007.

3. Frenzel, ñCommunication Electronics: Principles and Applicationsò, Tata Mc Graw Hill, 3rdEdition, 2001

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand the principles of semiconductor devices and their applications.

2. Design an application using Operational amplifier.

3. Understand the working of timing circuits and oscillators.

4. Understand logic gates, flip flop as a building block of digital systems.

5. Learn the basics of Electronic communication system.

List of Practical's

1. Verify performance of PN Junction
2. Verify performance of Zener diode
3. Test the performance of BJT in CB configuration
4. Test the performance of BJT in CF configuration
5. Verify performance of Zener diode as voltage regulator
6. To build and test regulated power supply using IC 78XX series
7. To build and test regulated power supply using 79 XX series
8. Determine the OP Amp parameters input offset voltage and output offset voltage
9. Determine the gain of inverting and non inverting amplifier using OP Amp and compare it with theoretical gian
10. Verify the operation of adder and subtractor using OP Amp IC 741
11. Assembly Astable multivibrator circuit using IC 741 plot the output waveform
12. Assemble monostable multivibrator
13. Plot the frequency response of single stage CF amplifier
14. Test and verify oscillation frequency at RC phase shift oscillator
15. Verify the truth table of basic logic gates
16. Realize adder and subtractor
17. Verify the Operation of multiplexer IC 74151 and DE multiplex IC 74155
18. Observe and draw the wave forms of AM modulation & demodulation
19. Observe the waveforms of FM modulations and demodulation

Course Name : Second Year Mechanical (Auto)Engineering

Semester : Third

Subject Title : Engineering Mechanics

Subject Code : ESC305

Objective The objective of this Course is to provide an introductory treatment of *EngineeringMechanics* to all the students of engineering, with a view to prepare a good foundation fortaking up advanced courses in the area in the subsequent semesters. A working knowledge ofstatics with emphasis on force equilibrium and free body diagrams. Provides anunderstanding of the kinds of stress and deformation and how to determine them in a widerange of simple, practical structural problems, and an understanding of the mechanicalbehavior of materials under various load conditions. Lab should be taken concurrently

What Will I Learn?

a)Confidently tackle equilibrium equations, moments and inertia problems

b)Master calculator/computing basic skills to use to advantage in solving mechanics problems.

c)Gain a firm foundation in Engineering Mechanics for furthering the career in Engineering

Proposed Syllabus

Module 1*: Introduction to Engineering Mechanics covering,* Force Systems Basic concepts, Particle equilibrium in 2-D & 3-D; Rigid Body equilibrium; System of Forces, CoplanarConcurrent Forces, Components in Space ï Resultant- Moment of Forces and its Application;Couples and Resultant of Force System, Equilibrium of System of Forces, Free bodydiagrams, Equations of Equilibrium of Coplanar Systems and Spatial Systems; StaticIndeterminacy

Module 2*: Friction covering,* Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction; Motion of Bodies, wedge friction, screw jack & differential screw jack;

Module 3*: Basic Structural Analysis covering,* Equilibrium in three dimensions; Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members; Beams & types of beams; Frames & Machines;

Module 4*: Centroid and Centre of Gravity covering,* Centroid of simple figures from first principle, centroid of composite sections; Centre of Gravity and its implications; Area moment of inertia- Definition, Moment of inertia of plane sections from first principles,

Theorems of moment of inertia, Moment of inertia of standard sections and composite sections; Mass moment inertia of circular plate, Cylinder, Cone, Sphere, Hook.

Module 5*: Virtual Work and Energy Method-* Virtual displacements, principle of virtual work for particle and ideal system of rigid bodies, degrees of freedom. Active force diagram, systems with friction, mechanical efficiency. Conservative forces and potential energy (elastic and gravitational), energy equation for equilibrium. Applications of energy method for equilibrium. Stability of equilibrium.

Module 6*: Review of particle dynamics-* Rectilinear motion; Plane curvilinear motion (rectangular, path, and polar coordinates). 3-D curvilinear motion; Relative and constrained motion; Newtonôs 2nd law (rectangular, path, and polar coordinates). Work-kinetic energy, power, potential energy.Impulse-momentum (linear, angular); Impact (Direct and oblique).

Module 7:*Introduction to Kinetics of Rigid Bodies covering,* Basic terms, general principles in dynamics; Types of motion, Instantaneous centre of rotation in plane motion and simpleproblems; DôAlembertôs principle and its applications in plane motion and connected bodies;Work energy principle and its application in plane motion of connected bodies; Kinetics ofrigid body rotation;

Module 8:*Mechanical Vibrations covering,* Basic terminology, free and forced vibrations, resonance and its effects; Degree of freedom; Derivation for frequency and amplitude of freevibrations without damping and single degree of freedom system, simple problems, types ofpendulum, use of simple, compound and torsion pendulums;

Tutorials*from the above modules covering*, To find the various forces and angles including resultants in various parts of wall crane, roof truss, pipes, etc.; To verify the line of polygon on various forces; To find coefficient of friction between various materials on inclined plan; Free body diagrams various systems including block-pulley; To verify the principle of moment in the disc apparatus; Helical block; To draw a load efficiency curve for a screw jack

Text/Reference Books:

1.Irving H. Shames (2006), Engineering Mechanics, 4th Edition, Prentice Hall

2.F. P. Beer and E. R. Johnston (2011), Vector Mechanics for Engineers, Vol I - Statics, Vol II, ï Dynamics, 9th Ed, Tata McGraw Hill

3.R. C. Hibbler (2006), Engineering Mechanics: Principles of Statics and Dynamics, Pearson Press.

4.Andy Ruina and Rudra Pratap (2011), Introduction to Statics and Dynamics, Oxford University Press

5.Shanes and Rao (2006), Engineering Mechanics, Pearson Education,

6.Hibler and Gupta (2010),Engineering Mechanics (Statics, Dynamics) by Pearson Education

7.Reddy Vijaykumar K. and K. Suresh Kumar(2010), Singerôs Engineering Mechanics

8.Bansal R.K.(2010), A Reference Bood of Engineering Mechanics, Laxmi Publications

9.Khurmi R.S. (2010), Engineering Mechanics, S. Chand & Co.

10.Tayal A.K. (2010), Engineering Mechanics, Umesh Publications

Upon successful completion of the course, student should be able to:

➢Use scalar and vector analytical techniques for analyzing forces in statically determinate structures

➢Apply fundamental concepts of kinematics and kinetics of particles to the analysis of simple, practical problems

➢Apply basic knowledge of maths and physics to solve real-world problems

➢Understand measurement error, and propagation of error in processed data

➢Understand basic kinematics concepts ï displacement, velocity and acceleration (and their angular counterparts);

➢Understand basic dynamics concepts ï force, momentum, work and energy;

➢Understand and be able to apply Newtonôs laws of motion;

➢Understand and be able to apply other basic dynamics concepts - the Work-Energy principle, Impulse-Momentum principle and the coefficient of restitution;

➢Extend all of concepts of linear kinetics to systems in general plane motion (applying

Euler's Equation and considering energy of a system in general plane motion, and the work of couples and moments of forces)

➢Learn to solve dynamics problems. Appraise given information and determine which concepts apply, and choose an appropriate solution strategy; and

➢Attain an introduction to basic machine parts such as pulleys and mass-spring systems.

20. List of Practical's

21. Term work shall consist of record of laboratory/ practical work as listed below

22. 1. Verification of law of polygon of force/parallelogram of forces

23. 2. Determination of coefficient of friction by inclined plane apparatus

24. 3. To find the coefficient of friction between Belt and pulley friction

25. 4. To find the moment of inertia of fly wheel
26. Study of machines for calculation of MA, VR, Efficiency and Law of Machine for
27. 5. Single purchase crab
28. 6. Worm and worm wheel
29. 7. Screw Jack
30. 8. Different axle
31. 9. Wheel of differential pulley block
32. 10 Assignments on Analytical solution of at least four problems on each unit based on above syllabus

Course Name : Second Year Mechanical (Auto)Engineering

Semester : Third

Subject Title : Biology

Subject Code : BSC306

Module 1. *(2 hours)- Introduction*

Mention the most exciting aspect of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18thCentury that lead to major discoveries. Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

Module 2. *(3 hours)- Classification*

Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discuss classification based on (a) cellularity- Unicellular or multicellular (b)ultrastructure- prokaryotes or eucaryotes. (c) energy and Carbon utilization ï Auto trophs,hetero trophs, litho tropes (d) Ammonia excretion ï aminotelic, uricoteliec, ureotelic (e)Habitata- acquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life. A given organism can come under different category based on classification. Model organisms for the study of biology come from different groups. E.coli, S.cerevisiae, D. Melanogaster,C. elegance, A. Thaliana, M. musculus

Module 3. *(4 hours)-Genetics*

Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanics of cell division nor the phases but how genetic material passes from parent to offspring. Concepts of recessiveness and dominance. Concept of mapping of phenotype to genes. Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

Module 4. *(4 hours)-Biomolecules*

Molecules of life. In this context discuss monomeric Modules and polymeric structures. Discuss about sugars, starch and cellulose. Amino acids and proteins. Nucleotides and DNA/RNA. Two carbon Modules and lipids.

Module 5. *(4 Hours). Enzymes*

Enzyme classification. Mechanism of enzyme action. Discuss at least two examples. Enzyme kinetics and kinetic parameters. Why should we know these parameters to understand biology? RNA catalysis.

Module 6. *(4 hours)- Information Transfer*

DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes. Concept of genetic code. Universality and degeneracy of genetic code. Define gene in terms of complementation and recombination.

Module 7. *(5 hours). Macromolecular analysis*

Hierarch in protein structure. Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

Module 8. *(4 hours)- Metabolism*

Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions. Concept of K and its relation to standard free energy. Spontaneity. ATP as an energy currency. This should include the breakdown of glucose to COv (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energyvcharge

Module 9. *(3 hours)- Microbiology*

Concept of single celled organisms. Concept of species and strains. Identification and classification of microorganisms. Microscopy. Ecological aspects of single celled organisms. Sterilization and media compositions. Growth kinetics.

Reference Books:

1)Biology: A global approach: Campbell, N. A. ; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd

2)Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons

3)Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company

4)Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher

5)Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers

Course Outcomes

After studying the course, the student will be able to:

- Describe how biological observations of 18 th Century that lead to majordiscoveries.
- Convey that classification *per se* is not what biology is all about but highlight the underlying criteria, such as morphological, biochemical and ecological
- Highlight the concepts of recessiveness and dominance during the passage of genetic material from parent to offspring
- Convey that all forms of life have the same building blocks and yet the manifestations are as diverse as one can imagine
- Classify enzymes and distinguish between different mechanisms of enzyme action.
- Identify DNA as a genetic material in the molecular basis of information transfer.
- Analyse biological processes at the reduction level
- Apply thermodynamic principles to biological systems.
- Identify and classify microorganisms.

Course Name : Second Year Mechanical (Auto)Engineering
Semester : Third
Subject Title : Effective Technical Communication
Subject Code : HCMC 307

Content Details :

Module 1: Information Design and Development- Different kinds of technical documents, Information development life cycle, Organization structures, factors affecting information and document design, Strategies for organization, Information design and writing for print and for online media.

Module 2: Technical Writing, Grammar and Editing- Technical writing process, forms of discourse, Writing drafts and revising, Collaborative writing, creating indexes, technical writing style and language. Basics of grammar, study of advanced grammar, editing strategies to achieve appropriate technical style. Introduction to advanced technical communication, Usability, Hunan factors, Managing technical communication projects, time estimation,

Single sourcing, Localization.

Module 3: Self Development and Assessment- Self assessment, Awareness, Perception and Attitudes, Values and belief, Personal goal setting, career planning, Self-esteem. Managing Time; Personal memory, Rapid reading, Taking notes; Complex problem solving; Creativity

Module 4: Communication and Technical Writing- Public speaking, Group discussion, Oral; presentation, Interviews, Graphic presentation, Presentation aids, Personality Development. Writing reports, project proposals, brochures, newsletters, technical articles, manuals, official notes, business letters, memos, progress reports, minutes of meetings, event report.

Module 5: Ethics- Business ethics, Etiquettes in social and office settings, Email etiquettes, Telephone Etiquettes, Engineering ethics, Managing time, Role and responsibility of engineer, Work culture in jobs, Personal memory, Rapid reading, Taking notes, Complex problem solving, Creativity.

Text/Reference Books:

1.David F. Beer and David McMurrey, Guide to writing as an Engineer, John Willey. New York, 2004

2.Diane Hacker, Pocket Style Manual, Bedford Publication, New York, 2003. (ISBN 0312406843)

3.Shiv Khera, You Can Win, Macmillan Books, New York, 2003.

4.Raman Sharma, Technical Communications, Oxford Publication, London, 2004.

5.Dale Jungk, Applied Writing for Technicians, McGraw Hill, New York, 2004. (ISBN: 07828357-4)

6.Sharma, R. and Mohan, K. Business Correspondence and Report Writing, TMH New Delhi 2002.

7.Xebec, Presentation Book, TMH New Delhi, 2000. (ISBN 0402213)

Course Name : Second Year Mechanical (Auto)Engineering
Semester : Third
Subject Title : Seminar I
Subject Code : HCMC 308

This seminar is based on the recent advances in Basic Science. Student has to write a paper in IEEE format on any recent topic pertaining to Basic science by referring different journals. Student has to prepare PPT of the same and present before students and faculties.

Mechanical (Auto) Engineering

Forth Semester

Curriculum Details

Course Name : Second Year Mechanical (Auto)Engineering
Semester : Fourth
Subject Title : Automobile Engineering
Subject Code : PCC AE 401

Objectives:

- To understand the construction and working principle of various parts of an automobile. Also to understand recent trend in automobile

Contents:

Module 1. Introduction

Heat engines; Internal and external combustion engines; Classification of I.C. Engines; Cycle of operations in four strokes and two-stroke IC engines and their comparative study; Scavenging and scavenging blowers, Air standard cycles and Fuel air cycles, Variable specific heat and its effects, Dissociation and other losses, Actual cycles, Deviation of actual engine cycle from ideal cycle .**(9)**

Module 2. Spark Ignition Engines

A. Carburators and fuel injection system in S I Engines : Theory of carburetion, Simple carburetor, Essential parts of modern carburetor, Types of carburators, Types of fuel injection systems in S I engines, Continuous injection system, Timed injection system, Electronic Fuel-Injection systems (EFIs), Advantages and disadvantages of SI engine fuel injection system

B. Ignition Systems : Spark Plug and its requirements, Battery, Magneto, Electronic ignition systems

C. Combustion : Combustion phenomenon in SI Engines, Ignition delay, Flame propagation, Pressure-Crank angle diagram, Abnormal combustion, Auto ignition, Detonation and Knocking, Factors affecting combustion and detonation, Types of combustion chambers.**(9)**

Module 3. Compression Ignition Engines

A. **Fuel Injection Systems :**Types i.e. Air injection systems, Airless/solid injection systems, Common rail, individual pump, distributor and Module injector etc, Injection pumps, Fuel injector, Types of nozzle, Electronically controlled Module fuel injection system, C I Engine Governors: necessity and characteristics

B. **Combustion :**Combustion phenomenon in C I engines, Stages of combustion, Delay period, Knocking, Pressure-Crank angle diagram, Factors affecting combustion and knocking, Types of combustion chambers **(8)**

Module 4. Engine lubrication : Types of lubricants and their properties, SAE rating of lubricants, Types of lubrication systems

Engine Cooling: Necessity of engine cooling, disadvantages of overcooling, Cooling systems and their comparison: Air cooling, Liquid cooling

Supercharging/Turbo-charging: Objectives, Effects on power output and engine efficiency, Methods, Types, Limits **(5)**

Module 5. Engine Testing and Performance: Measurement of BP, IP, Fuel Consumption, Air flow, BMEP, Performance characteristic of SI and CI Engines, Effect of load and Speed on mechanical, indicated thermal, break thermal and volumetric efficiencies, Heat balance sheet

Exhaust Emissions : Exhaust gas analysis and methods, necessity, constituents, Air pollution due to engine exhaust, Pollution control devices and EURO, BHARAT standards

Fuels :SI and CI engine fuels, Rating of fuels, Non conventional fuels: CNG, LPG, Bio-fuels, Hydrogen, Alcohol etc**(5)**

Module 6. Alternative Potential Engines: Stratified charge engine, Wankel engine, Free-piston engine, Stirling engine, VCR engine, Dual fuel engines, Multi fuel engines ,Modern Trends in I C Engines **(4)**

Total number of hours (40 lecture hours + 12 tutorials)

Course Outcome : -

Upon completion of this course, students will understand the function of each automobilecomponent and also have a clear idea about the overall vehicle performance.

List of Practical's:-

1. Morse Test on petrol engine.
2. Speed Test on petrol or/and diesel engine.
3. Load Test on diesel engine (engines).
4. Heat Balance test on diesel or petrol engines.
5. Experimental determination of Air fuel ratio.

6. Exhaust Gas/Smoke analysis of S.I./ C.I. engines

7. Effect of Supercharging on Performance Characteristics of an engine

Reference Books

1. Internal Combustion Engines, Willard W.Pulkrabek, Pearson Education.

2. Internal Combustion Engines, ShyamAgrawal, New Age International

3. Internal Combustion Engine, Mathur and Sharma

4. Internal Combustion Engines, Mohanty, Standard Book House

5. Internal Combustion Engine, Gills and Smith

6. Internal Combustion Engines Fundamentals, John B. Heywood

7. Internal Combustion Engines, Gupta H N, 2nd ed, PHI

8. Internal Combustion Engine, V Ganesan - *TataMcGraw Hill*

9. Internal Combustion Engines, Richard Stone - *Palgrave Publication*

10. Internal Combustion Engine, S.L. Beohar

11. Internal Combustion Engine, P.M Heldt.

12. Internal Combustion Engines, V.L. Maleeve

13. Internal Combustion Engine, E.F. Oberi.

14. Internal Combustion Engine, Domkundwar

Course Name : Second Year Mechanical (Auto)Engineering

Semester : Forth

Subject Title : Fluid Mechanics and Machinery

Subject Code : PCC ME 402

Objectives:

- To learn about the application of mass and momentum conservation laws for fluid flows
- To understand the importance of dimensional analysis
- To obtain the velocity and pressure variations in various types of simple flows
- To analyze the flow in water pumps and turbines.

Contents :

Module 1 Definition of fluid, Newtonôs law of viscosity, Modules and dimensions-Properties of fluids, mass density, specific volume, specific gravity, viscosity, compressibility and surface tension, Control volume- application of continuity equation and momentum equation, Incompressible flow, Bernoulliôs equation and its applications.**(9)**

Module 2 Exact flow solutions in channels and ducts, Couette and Poisuielle flow, laminar flow through circular conduits and circular annuli- concept of boundary layer ï measures of boundary layer thickness ï Darcy Weisbach equation, friction factor, Moodyôs diagram. **(9)**

Module3 Need for dimensional analysis ï methods of dimension analysis ï Similitude ï types of similitude Dimensionless parameters ï application of dimensionless parameters ï Model analysis. **(6)**

Module 4 Eulerôs equation ï theory of Rotodynamic machines ï various efficiencies ï velocity components at entry and exit of the rotor, velocity triangles ï Centrifugal pumps, working principle, work done by the impeller, performance curves ï Cavitation in pumps-Reciprocating pump ï working principle. **(8)**

Module 5 Classification of water turbines, heads and efficiencies, velocity triangles- Axial, radial and mixed flow turbines- Pelton wheel, Francis turbine and Kaplan turbines, working principles ï draft tube- Specific speed, Module quantities, performance curves for turbines ï governing of turbines. **(8)**

Course Outcomes:

- Upon completion of this course, students will be able to mathematically analyze simple flow situations

They will be able to evaluate the performance of pumps and turbines.**List of Practicals:**

1. Determine Pressure & Discharge (Q) through pipes, channels
2. Determine the absolute pressures and gage pressures
3. Determine pressure changes using manometers
4. Determine forces on submerged plane, center of pressure
5. Determine buoyancy for a body completely or partially submerged in a fluid.
6. Verify Bernoulliôs theorem.
7. Determine Cd,Cc&Cv for orifice
8. Determine discharge by using Venturimeter
9. Calculate discharge by using Orifice meter
10. Calculate velocity & discharge by using Pitot tube
11. Determine the Reynold's number for laminar and turbulent flow.
12. Determinemajor frictional losses for circular pipes
13. Determine the energy loss through various types pipes of minor losses
14. Determine the coefficient of resistance for various types of minor losses
15. Determine net positive suction head
16. Calculate the efficiency of pelton wheel turbine
17. Determine the efficiency of centrifugal pump
18. Determine the efficiency of reciprocating pump

Course Name : Second Year Mechanical (Auto)Engineering

Semester : Forth

Subject Title : Strength of Material

Subject Code : PCC ME 403

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. Simple Stress and Strain: Concept of stress and strain (linear, lateral, shear & volumetric), Hookes Law, Elastic constants & their relationship, Stresses of varying section in step, circular and rectangular,Temperature stresses.

Principal Stresses and Strains: Normal & shear stress on any oblique plane & concept of principal plane, principal planes by analytical methods & graphical method.

Strain Energy: Strain energy due to axial loads, impact loads.

Bending Stresses: Theory of simple bending, Concept and assumptions, Derivation of flexure formula, Bending stresses distribution diagram, Different IS steel section, Flitched beams, Design of a section.

Shear Stress in Beams: Concept and derivation of shear stress distribution formula, Shear stress distribution diagram for symmetrical and unsymmetrical section.

Module 2. Combined direct and bending stresses: Introduction, stress distribution for an eccentric loaded rectangular section, the middle third rule, core or kernel section, circular solid and hollow section,structural section.

Moudle 3. Torsion of Circular Shaft: Theory of torsion of shaft of circular cross section, Assumptions, Derivation of torsion formulae, Stress in shaft of hollow, solid, composite circular cross section subjected to twisting moments, Stresses due to combined torsion, bending and axial force on shaft, Flanged coupling.

Module 4. Thin & Thick Pressure Vessels: *Thin pressure vessels*: Stress, Strain and deformation in thin walled seamless cylindrical and spherical vessels. *Thick pressure vessels*: Lameôs theory, Stresses in thick cylindrical shell and compound cylinder, Initial difference of radii at the junction of compound tube, Stresses in thick spherical shell.

Module 5. Deflection of Beams: Concept of deflection, Slope and deflection by double integration method(Macauleyôs method). Slope and deflection for simply supported, cantilever and statically determinate beam.

Module 6 Axially Loaded Columns: Concept of critical load and buckling, Derivation of Eulerôs formula for buckling load with various end conditions, limitations of Eulerôs formula, Rankine buckling load, Safe load on column.

(Total: 40 lectures + 12 tutorials)

Course Outcomes:

- After completing this course, the students should be able to recognize various types loads 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 result due to the elastic stresses developed within the materials for simple types of loading

List of Practices :

- 01 Study and demonstration of Universal Testing Machine & its attachments.
- 02 Study & demonstration of Extensometer.
- 03 Tension Test on mild steel, Aluminum & compression test on cast iron on Universal
- Testing Machine.
- 04 Direct Shear Test of mild steel on Universal Testing Machine.
- 05 BrinellHardness Test on Mild Steel.
- 06 Rockwell hardness Test on Hardened Steel.
- 07 Izod&Charpy - Impact tests of a standard specimen.
- 08 Torsion Test on Mild steel bar.
- 09 a) Assignments: Problems on shear force & bending moment diagrams to be drawn
- on graph paper.

Reference 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.

3. Ferdinand P. Been, Russel Johnson Jr and John J. Dewole, Mechanics of Materials, Tata McGrawHill Publishing Co. Ltd., New Delhi 2005.

Course Name : Second Year Mechanical (Auto)Engineering
Semester : Forth
Subject Title : Mechanical Engineering Drawing
Subject Code : PCC ME 404

Detailed Content :

Module 1 .Introduction to Machine Drawing (8 Hours)

Dimensioning Techniques, Representation of standard components such as Screw Threads, Screw fasteners, keys, couplings, bearings, pulleys, brackets, gears, locking arrangements, Rivets and riveted joints, Welding symbols. **Pipe Joints**: Expansion joints, stuffing box and glands, piping layouts, conventional representation of pipe fittings, valves, joints, etc.

I S Conventions: Need and Types,Nuts,Bolts,Gears, Springs,Washers,Knurling,array of holes, Ratchet & Pawl.

Module 2 Solid Geometry (16 Hours)

Intersection of surfaces and Interpenetration of Solids.

Introduction: Introduction, interpenetration of prism with prism, prism with cylinder, prism with cone, prism with pyramids. (Prisms and Pyramids limited up to rectangular), cylinder with cylinder, Cone with cylinder.

Section Of Solids: Projection of solids in simple positions or having their axes inclined to one of the reference planes and cut by a section plane inclined to one of the reference planes, true shape of section.

Auxiliary Projection: Projection on auxiliary vertical and horizontal plane, Auxiliary projection of simple machine components.

Module 3 : Limits, Fits & Dimensional Tolerances (8 Hours)

Terminology, Necessity of Limit system, Unilateral and Bilateral Tolerances, Relation between Tolerances and Manufacturing Processes, Methods of indicating tolerances on drawings, IT grades, Systems of fits, Types fits, Selection of fits, Selection of tolerances based on fits.

Surface Finish: Surface Texture, Surface Roughness Number, Roughness Symbols and Range of Roughness obtainable with different manufacturing processes.

Module 4 :Assembly and Detail Drawing (16 Hours)

Drawings assembled views for the part drawings offollowing assemblies. Importance of BOM,Preparation of BOM.

Engine parts: stuffing box, cross heads,Eccentrics,Petrol Engine connecting rod, piston assembly etc. Machine parts: Screws jacks, Machine Vices , Plummer block, Tool Post, Tailstock etc. Valves: Steam stop valve, spring loaded safety valve, feed check valve and air cock.

Course Outcome

1. Students will be able toé
2.
3. 1. Visualize and prepare detail drawing of a given object.
4. 2. Read and interpret the drawing.
5. 3. Draw details and assembly of different mechanical systems.
6. 4. Convert detailed drawing into assembly drawing using modelling software.
7. 5. Convert assembly drawing into detailed drawing using modelling software.
8. 6. Prepare detailed drawing of any given physical object/machine element with actual measurements

Term work:

9. Sheet on convention and machine drawing of various machine components.
10. Sheet on Solid geometry

    One problem on projection solid, one problem on section of solid, one problem on auxillary view.
11. Sheet on limit,fit, geometrical tolerance And surface finishing.
12. Sheet on assembly drawing by taking actual measurements and entering limits, fits, tolerances, surface finish symbols, geometrical requirements etc.
5. Sheet on details drawing from given assembly.
6. Sheet on assembly to details and details to assembly by using any (CAD) solid modelling software.

Reference Books:

1. Elementary Engineering Drawing N D Bhatt Charotar Publication House
2. Machine Drawing-By N.D. Bhatt.
3. Machine Drawing by Sidheswar, N., Kanniah, P. and Sastry, V.V.S., Tata McGraw Hill.

4. Machine Drawing by K.I. Narayana, P. Kannaiah, K.Venkata Reddy, New Edge Publication.

5. R.K. Dhavan, Machine Drawing., S. Chand and Company.
6. IS Code: SP 46 ï 1988, Standard Drawing Practices for Engineering Institutes.
7. Auto CAD &Autolisp Manuals by AutoDesk Corp., USA.
8. Faculty of Mechanical Engineering, ñDesign Dataò, PSG College of Tech,
9 N.D.Junnarkar Machine Drawing 1 st print Pearson Education.

Course Name : Second Year Mechanical (Auto) Engineering

Semester : Forth

Subject Title : Material Science & Manufacturing Process

Subject Code : PCC AE 405

Objectives:

- Understanding of the correlation between the internal structure of materials, their mechanical properties and various methods to quantify their mechanical integrity and failure criteria.
- To provide a detailed interpretation of equilibrium phase diagrams
- Learning about different phases and heat treatment methods to tailor the properties of Fe-C alloys.
- To understand various manufacturing process to produce the required product.
- To understand test & check for quality assurance during or after the manufacturing & planning the production process prior to manufacturing.

Contents:

Module 1 Crystal Structure: Module cells, Metallic crystal structures, Ceramics. Imperfection in solids: Point, line, interfacial and volume defects; dislocation strengthening mechanisms and slip systems, critically resolved shear stress. **(6)**

Module 2 Alloys, substitutional and interstitial solid solutions- Phase diagrams: Interpretation of binary phase diagrams and microstructure development; eutectic, peritectic, peritectoid and monotectic reactions. Iron Iron-carbide phase diagram and microstrctural aspects of ledeburite, austenite, ferrite and cementite, cast iron.**(6)**

Module 3 Heat treatment of Steel: Annealing, tempering, normalising and spheroidising, isothermal transformation diagrams for Fe-C alloys and microstructure development. Continuous cooling curves and interpretation of final microstructures and properties-austempering, martempering, case hardening, carburizing, nitriding, cyaniding, carbo-nitriding, flame and induction hardening, vacuum and plasma hardening **(6)**

Module 4 Conventional Manufacturing processes: Casting and moulding: Metal casting processes and equipment, Heat transfer and solidification, shrinkage, riser design, casting defects and residual stresses. **(5)**

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.**(4)**

Module 5Metal 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,

Module 6Introduction to CNC machining.(6) Additive manufacturing: Rapid prototyping and rapid tooling**(3)** Joining/fastening processes: Physics of welding, brazing and soldering; design considerations in welding, Solid and liquid state joining processes; Adhesive bonding. **(4)**

(Total: 40 lectures + 12 tutorials)

Course Outcomes:

1. Student will be able to identify crystal structures for various materials and understand the defects in such structures

2. Understand how to tailor material properties of ferrous and non-ferrous alloys

3.How to quantify mechanical integrity and failure in materials

List Of Practical's

1. To study Merchantôs circle analysis for calculation of power.

2. To study different machine tools and working principle.

3. One job on drilling machine including all major operations.

4. One job on milling machine including all major operations.

5. One job on broaching machine including all major operations.

6. Study of basics of CNC machining.

7. To study a part programming codes.

8. To study APT language used in CNC programming.

9. One job on CNC milling including all major operations.

10. One industrial visit to industry having CNC set up.

Reference Books:

1. W. D. Callister, 2006, ñMaterials Science and Engineering-An Introductionò, 6th Edition, Wiley India.

2. Kenneth G. Budinski and Michael K. Budinski, ñEngineering Materialsò, Prentice Hall of India Private Limited, 4th Indian Reprint, 2002.

3. V. Raghavan, ñMaterial Science and Engineeringô, Prentice Hall of India Private Limited, 1999.

4. U. C. Jindal, ñEngineering Materials and Metallurgyò, Pearson, 201

Course Name **: Second Year Mechanical (Auto) Engineering**

Semester **:**Forth

Subject Title **:** Professional Practice, Law and Ethics

Subject Code **:** HSME 406

The course is designed to address the following:

- To make the students understand the types of roles they are expected to play in the society as practitioners of the civil engineering profession
- To develop some ideas of the legal and practical aspects of their profession

Modules:

Module 1 A- Professional Practice ï Respective roles of various stakeholders: Government (constituting regulatory bodies and standardization organizations, prescribing norms to ensure safety of the citizens); Standardization Bodies (ex. BIS, IRC)(formulating standards of practice); professional bodies (ex. Institution of Engineers(India), Indian Roads Congress, IIA/ COA, ECI, Local Bodies/ Planning Authorities) (certifying professionals and offering platforms for interaction); Clients/ owners (role governed by contracts); Developers (role governed by regulations such as RERA); Consultants (role governed by bodies such as CEAI); Contractors (role governed by contracts and regulatory Acts and Standards); Manufacturers/ Vendors/ Service agencies (role governed by contracts and regulatory Acts and Standards)

Module 1 B- Professional Ethics ï Definition of Ethics, Professional Ethics, Business Ethics, Corporate Ethics, Engineering Ethics, Personal Ethics; Code of Ethics as defined in the website of Institution of Engineers (India); Profession, Professionalism, Professional Responsibility, Professional Ethics; Conflict of Interest, Gift Vs Bribery, Environmental breaches, Negligence, Deficiencies in state-of-the-art; Vigil Mechanism, Whistle blowing, protected disclosures.

Module 2:*General Principles of Contracts Management: Indian Contract Act, 1972 and amendments* covering General principles of contracting; Contract Formation & Law; Privacy of contract; Various types of contract and their features; Valid & Voidable Contracts; Prime and sub-contracts; Joint Ventures & Consortium; Complex contract terminology; Tenders, Request For Proposals, Bids & Proposals; Bid Evaluation; Contract Conditions &Specifications; Critical /ñRed Flagò conditions; Contract award & Notice To Proceed;

Variations & Changes in Contracts; Differing site conditions; Cost escalation; Delays, Suspensions & Terminations; Time extensions & Force Majeure; Delay Analysis; Liquidated damages & Penalties; Insurance & Taxation; Performance and Excusable Non-performance; Contract documentation; Contract Notices; Wrong practices in contracting (Bid shopping, Bid fixing, Cartels); Reverse auction; Case Studies; Build-Own-Operate & variations; Public-Private Partnerships; International Commercial Terms;

Module 3 :*Arbitration, Conciliation and ADR (Alternative Dispute Resolution) system:* Arbitration ï meaning, scope and types ï distinction between laws of 1940 and 1996; UNCITRAL model law ï Arbitration and expert determination; Extent of judicial intervention; International commercial arbitration; Arbitration agreements ï essential and kinds, validity, reference and interim measures by court; Arbitration tribunal ï appointment, challenge, jurisdiction of arbitral tribunal, powers, grounds of challenge, procedure and court assistance; Award including Form and content, Grounds for setting aside an award, Enforcement, Appeal and Revision; Enforcement of foreign awards ï New York and Geneva Convention Awards; Distinction between conciliation, negotiation, mediation and arbitration, confidentiality, resort to judicial proceedings, costs; Dispute Resolution Boards; Lok Adalats

Module 4 :*Engagement of Labour and Labour& other construction-related Laws:* Role of Labour in Civil Engineering; Methods of engaging labour- on rolls, labour sub-contract, piece rate work; Industrial Disputes Act, 1947; Collective bargaining; Industrial Employment (Standing Orders) Act, 1946; Workmenôs Compensation Act, 1923; Building & Other Construction Workers (regulation of employment and conditions of service) Act (1996) and Rules (1998); RERA Act 2017, NBC 2017

Module 5 : *Law relating to Intellectual property:* Introduction ï meaning of intellectual property, main forms of IP, Copyright, Trademarks, Patents and Designs, Secrets; Law relating to Copyright in India including Historical evolution of Copy Rights Act, 1957, Meaning of copyright ï computer programs, Ownership of copyrights and assignment, Criteria of infringement, Piracy in Internet ï Remedies and procedures in India; Law relating to Patents under Patents Act, 1970 including Concept and historical perspective of patents law in India, Patentable inventions with special reference to biotechnology products, Patent protection for computer programs, Process of obtaining patent ï application, examination, opposition and sealing of patents, Patent cooperation treaty and grounds for opposition,

Rights and obligations of patentee, Duration of patents ï law and policy considerations, Infringement and related remedies;

Text/Reference Books:

1.B.S. Patil, Legal Aspects of Building and Engineering Contracts, 1974.

2.The National Building Code, BIS, 2017

3.RERA Act, 2017

4.MeenaRao (2006), Fundamental concepts in Law of Contract, 3rd Edn. Professional Offset

5.NeelimaChandiramani (2000), The Law of Contract: An Outline, 2nd Edn. AvinashPublications Mumbai

6.Avtarsingh (2002), Law of Contract, Eastern Book Co.

7.Dutt (1994), Indian Contract Act, Eastern Law House

8.Anson W.R. (1979), Law of Contract, Oxford University Press

9.Kwatra G.K. (2005), The Arbitration & Conciliation of Law in India with case law on UNCITRAL Model Law on Arbitration, Indian Council of Arbitration

10.Wadhera (2004), Intellectual Property Rights, Universal Law Publishing Co.

11.T. Ramappa (2010), Intellectual Property Rights Law in India, Asia Law House

12.Bare text (2005), Right to Information Act

13.O.P. Malhotra, Law of Industrial Disputes, N.M. Tripathi Publishers

14.K.M. Desai(1946), The Industrial Employment (Standing Orders) Act

15.Rustamji R.F., Introduction to the Law of Industrial Disputes, Asia Publishing House

Course Name : Second Year Mechanical (Auto) Engineering

Semester : Forth

Subject Title : Environmental Science

Subject Code : MC 407

Detail Content

Module 1: Nature of Environmental Studies

Specific Objectives: ¬ Define the terms related to Environmental Studies ¬ State importance of awareness about environment in general public

Contents:• Definition, Scope and Importance of the environmental studies • Importance of the studies irrespective of course • Need for creating public awareness about environmental issues

Module 2: Natural Resources and Associated Problems

Specific Objectives: ¬ Define natural resources and identify problems associated with them ¬ Identify uses and their overexploitation ¬ Identify alternate resources and their importance for environment

Contents: 2.1 Renewable and Non renewable resources • Definition • Associated problems 2.2 Forest Resources • General description of forest resources • Functions and benefits of forest resources • Effects on environment due to deforestation, Timber extraction, Building of dams, waterways etc. 2.3 Water Resources • Hydrosphere: Different sources of water • Use and overexploitation of surface and ground water • Effect of floods, draught, dams etc. on water resources and commModuley 2.4 Mineral Resources: • Categories of mineral resources • Basics of mining activities • Mine safety • Effect of mining on environment 2.5 Food Resources: • Food for all • Effects of modern agriculture • World food problem

Module 3. Ecosystems

Contents• Concept of Ecosystem • Structure and functions of ecosystem • Energy flow in ecosystem • Major ecosystems in the world

Module 4. Biodiversity and Its Conservation

Contents• Definition of Biodiversity • Levels of biodiversity • Value of biodiversity • Threats to biodiversity • Conservation of biodiversity

Topic 5. Environmental Pollution

Contents • Definition • Air pollution: Definition, Classification, sources, effects, prevention • Water Pollution: Definition, Classification, sources, effects, prevention • Soil Pollution:

Definition, sources, effects, prevention • Noise Pollution: Definition, sources, effects, prevention 03 08

Module 5. Social Issues and Environment

Contents• Concept of development, sustainable development • Water conservation, Watershed management, Rain water harvesting: Definition, Methods and Benefits • Climate Change, Global warming, Acid rain, Ozone Layer Depletion, Nuclear Accidents and Holocaust: Basic concepts and their effect on climate • Concept of Carbon Credits and its advantages 03 10

Module 6.Environmental Protection

ContentsEnvironmental Protection Brief description of the following acts and their provisions: • Environmental Protection Act • Air (Prevention and Control of Pollution) Act • Water (Prevention and Control of Pollution) Act • Wildlife Protection Act • Forest Conservation Act Population Growth: Aspects, importance and effect on environment • Human Health and Human Rights

References :

01 AninditaBasak Environmental Studies Pearson Education

02 R. Rajgopalan Environmental Studies from Crises to Cure Oxford University Press

03 Dr. R. J. Ranjit Daniels, Dr. JagdishKrishnaswamy Environmental Studies Wiley India

Course Name : Second Year Mechanical (Auto) Engineering

Semester : Forth

Subject Title : Management (Organization Behavior)

Subject Code : HSME 408

Detail Content :

Module 1 - Introduction:

Managing and managers, management- science, theory and practice, functions of management, evolution of management theory, contributions of Taylor, Fayol and others.

Planning: The nature and purpose of planning, objectives, strategies, policies and planning premises, decision making.

Organizing: The nature and purpose of organizing, departmenation, Line/ staff authority and decentralization, effective organizing and organizational culture.

Module 2

Staffing: Human resource management and selection, orientation, apprentice training and Apprentice Act (1961), performance appraisal and career strategy, job evolution and merit rating, incentive schemes.

Leading: Managing and human factor, motivation, leadership, morale, team building, and communication.

Controlling: The system and process of controlling control techniques, overall and preventive control.

Module 3 Leadership & Motivation

Leadership- Styles & type Motivation ï Definition , Intrinsic & Extrinsic Moslowôs theory of Motivation and its significance

Module 4Safety Management

Causes of AccidentsSafety Procedures Introduction, Objectives & feature of Industrial Legislationsuch as

- ÅFactory Act
- ÅESI Act,
- ÅWorkman Compensation Act,
- ÅIndustrial Dispute Act.
- ÅIndustrial Dispute Act.

Module 5 Financial Management (No Numerical)

Financial Management- Objectives &Functions , Capital Generation & Management ,Types of capitalsSources of finance Budgets and Accounts Types of Budgets Production Budget (including Variance Report)Labour BudgetIntroduction to Profit & Loss Account (Only concept) Balance sheet etc.

Module 6 Materials Management

Inventory Management (No Numericals) Meaning & Objectives ,ABC Analysis, Economic Order Quantity: Introduction & Graphical Representation Purchase Procedure Objectives of PurchasingFunctions of Purchasing Department Steps inPurchasing

References Books :

1.Riggs, J.L., Production Systems: Planning, Analysis and Control, John Wiley & Sons, New York, International Edition, 4th Edition, 1987.

2.Amrine, H.T., Ritchey, J.A., Moodie, C.L. and Kmec, J.F. Manufacturing Organization and Management, 6thEd., Pearson Education, 2004.

3.International Labour Organization (ILO), Introduction to Work Study, International LabourOffice, Geneva, 3rd Ed., 1987.