

Faculty of Engineering & Technology
P. K. University
Shivpuri (MP)



Evaluation Scheme & Syllabus for
Department Of Automobile Engineering

B.Tech -Automobile Engineering
(Ist Year: I to II Semester)
(Effective from session 2019-20)

EVALUATION SCHEME

SEMESTER I						
		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
BT-101	Engineering Mathematics-I	30	70	NA	NA	NA
BT-102	Engineering Physics-I	30	70	25	25	150
BT-103	Engineering Chemistry	30	70	25	25	150
BT-104	Basic Electrical Engineering	30	70	25	25	150
BT-105	Computer System & Programming in C	30	70	25	25	150
SEMESTER II						
		THEORY		PRACTICAL		TOTAL
SUBJECT CODE	SUBJECT NAME	SESS.(30)	EXT.(70)	SESS.(25)	EXT.(25)	
BT-201	Engg. Maths-II	30	70	NA	NA	100
BT-202	Engineering Physics-II	30	70	25	25	150
BT-203	Elements of Mechanical Engg	30	70	25	25	150
BT-204	Professional Communication	30	70	25	25	150
BT-205	Basic Electronics	30	70	NA	NA	100

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I Year I Semester

BT -101: ENGINEERING MATHEMATICS – I

Unit - 1: Differential Calculus – I

Successive Differentiation, Leibnitz's theorem, Limit, Continuity and Differentiability of functions of several variables, Partial derivatives, Euler's theorem for homogeneous functions, Total derivatives, Change of variables, Curve tracing: Cartesian and Polar coordinates.

Unit - 2: Differential Calculus - II

Taylor's and Maclaurin's Theorem, Expansion of function of several variables, Jacobian, Approximation of errors, Extreme of functions of several variables, Lagrange's method of multipliers (Simple applications).

Unit - 3: Matrix Algebra

Types of Matrices, Inverse of a matrix by elementary transformations, Rank of a matrix (Echelon & Normal form), Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Eigen values and Eigen vectors, Cayley-Hamilton Theorem, Diagonalization, Complex and Unitary Matrices and its properties.

Unit - 4: Multiple Integrals

Double and triple integrals, Change of order of integration, Change of variables, Application of integration to lengths, Surface areas and Volumes – Cartesian and Polar coordinates. Beta and Gamma functions, Dirichlet's integral and its applications.

Unit - 5: Vector Calculus

Point function, Gradient, Divergence and Curl of a vector and their physical interpretations, Vector identities, Tangent and Normal, Directional derivatives. Line, Surface and Volume integrals, Applications of Green's, Stokes and Gauss divergence theorems (without proof).

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John-Wiley & Sons
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
3. R.K.Jain&S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.
4. Rukmanadachari, Engineering Mathematics – I, Pearson Education.

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I Year I Semester

BT-102: ENGINEERING PHYSICS-I

Unit – I: Relativistic Mechanics

Inertial & non-inertial frames, Galilean transformations, Michelson-Morley experiment, Einstein's postulates, Lorentz transformation equations, Length contraction & Time dilation, Relativistic addition of velocities; Variation of mass with velocity, Mass energy equivalence, Concept of rest mass of photon.

Unit – II: Modern Physics: Black body radiation spectrum, Weins law and Rayleigh-Jeans law, Assumption of quantum theory of radiation, Planck's law. Wave-particle duality, de-Broglie matter waves, Bohr's quantization rule, Phase and Group velocities, Davisson-Germer experiment, Heisenberg uncertainty principle and its applications, Wave function and its significance, Schrödinger's wave equation (Time dependent and time independent) – particle in one dimensional potential box, Eigen values and Eigen function.

Unit – III: Wave Optics: Interference: Coherent sources, Interference in thin films (parallel and wedge shaped film), Newton's rings and its applications..

Diffraction: Single, double and N- Slit Diffraction, Diffraction grating, Grating spectra, dispersive power, Rayleigh's criterion and resolving power of grating.

Unit – IV: Polarization and Laser

Polarization: Phenomena of double refraction, Nicol prism, Production and analysis of plane, circular and elliptical polarized light, Retardation Plate, Optical Activity, Fresnel's theory, Specific rotation.

Laser: Spontaneous and stimulated emission of radiation, population inversion, Einstein's Coefficients, Concept of 3 and 4 level Laser, Construction and working of Ruby, He-Ne lasers and laser applications.

Unit – V: Fiber Optics and Holography: Fiber Optics: Fundamental ideas about optical fiber, Propagation mechanism, Acceptance angle and cone, Numerical aperture, Single and Multi Mode Fibers, Dispersion and Attenuation.

Holography: Basic Principle of Holography, Construction and reconstruction of Image on hologram and applications of holography.

Reference Books:

1. Concepts of Modern Physics – Aurthur Beiser (Mc-Graw Hill)
2. Introduction to Special Theory of Relativity- Robert Resnick (Wielly)
3. Optics –Ajoy Ghatak (Tata McGraw Hill Education Private Ltd. New Delhi)
4. Lasers Principles, Types and Applications- K R Nambiar (New Age)

ENGINEERING PHYSICS LAB

List of Experiments

Any ten experiments, at least four from each group:

Group -A

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To study the polarization of light by simple reflection using laser.
7. Measurement of Wavelength of a laser (He-Ne) light using single slit diffraction.

Group – B

8. To determine the specific resistance of a given wire using Carey Foster's bridge.
9. To study the variation of magnetic field along the axis of current carrying - Circular coil and then
to estimate the radius of the coil.
10. To verify Stefan's Law by electrical method.
11. To calibrate the given ammeter and voltmeter by potentiometer.
12. To study the Hall effect and determine Hall coefficient, carrier density and - mobility of a given semiconductor using Hall effect set up.
13. To determine the energy band gap of a given semiconductor material.
- 14 To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
15. To draw hysteresis curve of a given sample of ferromagnetic material and from - this to determine magnetic susceptibility and permeability of the given specimen.
16. To determine the ballistic constant of a ballistic galvanometer.
17. To determine the coefficient of viscosity of a liquid.
18. Measurement of fiber attenuation and aperture of fiber.
19. High resistance by leakage method.
20. Magnetic Susceptibility of paramagnetic solution.

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I Year I Semester

BT -103: ENGINEERING CHEMISTRY

- Unit-1** Molecular orbital theory and its applications to homo-nuclear diatomic molecules. Band theory of solids. Liquid crystals and its applications. Point defects in Solids. Structure and applications of Graphite and Fullerenes. Concepts of nano-materials and its applications
- Unit-2** Polymers: Basic concepts of polymer- blends and composites. Conducting and biodegradable polymers. Preparations and applications of some industrially important polymers (Buna N, Buna S, Neoprene, Nylon 6, Nylon 6,6, Terylene). General methods of synthesis of organometallic compound (Grignard Reagent) and their applications in polymerization.
- Unit-3** Electrochemistry: Galvanic cell, electrode potential, Lead storage battery. Corrosion, causes and its prevention. Setting and hardening of cement, applications of cement. Plaster of paris. Lubricants- Classification, mechanism and applications..
- Unit-4** Hardness of water. Disadvantage of hard water. Boiler troubles, Techniques for water softening; Lime-soda, Zeolite, Ion exchange resin, Reverse osmosis. Phase Rule and its application to water system.
- Unit-5** Fuels; Classification of fuels. Analysis of Coal. Determination of Calorific values (bomb calorimeter & Dulong's method). Biogas. Elementary ideas and simple applications of UV, Visible, IR and H1NMR spectral Techniques.

Textbook

1. Chemistry for Engineers, by S. Vairam and Suba Ramesh; Wiley India

Reference Books

1. Textbook of Engineering Chemistry by Dr. Gopal Krishna Bhatt, Acme Publishers
2. Chemistry (9th ed), by Raymond Chang, Tata McGraw-Hill
3. Chemistry Concepts and Applications by Steven S. Zumdahl; Cengage Learning
4. Engineering Chemistry, Wiley India
5. Engineering Chemistry Author: Abhijit Mallick, Viva Books
6. Text Book of Engineering Chemistry by Harsh Malhotra; Sonali Publications
7. Concise Inorganic Chemistry by J.D. Lee; Wiley India
8. Organic Chemistry (6 ed) by Morrison & Boyd; Pearson Education

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I Year I Semester

BT -103: ENGINEERING CHEMISTRY

LIST OF EXPERIMENTS

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA .
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in water sample.
5. Determination of iron content in the given solution by Mohr's method.
6. pH- metric titration.
7. Viscosity of an addition polymer like polyester by viscometer.
8. Determination of iron concentration in sample of water by colorimetric method.
The method involves the use of KCN as a chelating agent and the measurements are carried out at 480nm.
9. Element detection and functional group identification in organic compounds.
10. Preparation of Bakelite and Urea formaldehyde resin.

Note: Institute can replace two experiments from the aforesaid experiments as per

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I Year I Semester

BT -104 BASIC ELECTRICAL ENGINEERING

Unit-I : Electrical Circuit Analysis:

Introduction, Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation,

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasors, phasor representation of sinusoidally varying voltage and current.

Unit-II: Steady- State Analysis of Single Phase AC Circuits:

Analysis of series and parallel RLC Circuits, Concept of Resonance in series & parallel circuits, bandwidth and quality factor; Apparent, active & reactive powers, Power factor, Concept of power factor improvement and its improvement (Simple numerical problems)

Network theorems (AC & DC with independent sources): Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem (Simple numerical problems)

Unit-III : Three Phase AC Circuits:

Three phase system-its necessity and advantages, Star and delta connections, Balanced supply and balanced load, Line and phase voltage/current relations, Three-phase power and its measurement (simple numerical problems).

Measuring Instruments: Types of instruments, Construction and working principles of PMMC and moving iron type voltmeters & ammeters, Single phase dynamometer wattmeter, Use of shunts and multipliers (Simple numerical problems on shunts and multipliers)

Unit-IV: Magnetic Circuit:

Magnetic circuit concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses, Magnetic circuit calculations (Series & Parallel).

Single Phase Transformer: Principle of operation, Construction, EMF equation, Equivalent circuit, Power losses, Efficiency (Simple numerical problems), Introduction to auto transformer.

Unit-V: Electrical Machines:

DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems)

Three Phase Induction Motor: Principle & Construction, Types, Slip-torque characteristics, Applications (Numerical problems related to slip only)

Single Phase Induction motor: Principle of operation and introduction to methods of starting, applications.

Three Phase Synchronous Machines: Principle of operation of alternator and synchronous motor and their applications.

Text Books:

1. —Basic Electrical Engineering, S N Singh; Prentice Hall International
2. —Basic Electrical Engineering, Kuldeep Sahay, New Age International Publishers
3. —Fundamentals of Electrical Engineering, B Dwivedi, A Tripathi; Wiley India
4. —Principles of Electrical Engineering, V. Del Toro,; Prentice Hall International
5. —Electrical Engineering, J. B. Gupta, Kataria and Sons

Reference Books:

- 1.—Electrical and Electronics Technology, Edward Hughes; Pearson
- 2.—Engineering Circuit Analysis, W.H. Hayt & J.E. Kimerly; McGraw Hill
- 3.—Basic Electrical Engineering, C L Wadhwa; New Age International
- 4.—Basic Electrical Engineering, T.K. Nagsarkar, M.S. Shukhija; Oxford University Press

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I Year I Semester

BT -104 ELECTRICAL ENGINEERING LABORATORIES

LIST OF EXPERIMENTS

Note: A minimum of ten experiments from the following should be performed

1. Verification of Kirchhoff's laws
2. Verification of Superposition theorem
3. Verification of Thevenin's Theorem and Maximum Power Transfer Theorem.
4. Measurement of power and power factor in a single phase ac series inductive circuit and study improvement of power factor using capacitor
5. Study of phenomenon of resonance in RLC series circuit and obtain resonant frequency.
6. Connection and measurement of power consumption of a fluorescent lamp (tube light).
7. Measurement of power in 3- phase circuit by two wattmeter method and determination of its power factor for star as well as delta connected load.
8. Determination of parameters of ac single phase series RLC circuit
9. To observe the B-H loop of a ferromagnetic material in CRO.
10. Determination of (i) Voltage ratio (ii) polarity and (iii) efficiency by load test of a single phase transformer
11. Determination of efficiency of a dc shunt motor by load test
12. To study running and speed reversal of a three phase induction motor and record speed in both directions.

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BT -105 COMPUTER SYSTEMS AND PROGRAMMING IN C

Unit1:

Basics of Computer: Introduction to digital computer, basic operations of computer, functional components of computer, Classification of computers.

Introduction to operating system: [DOS, Windows, Linux and Android] purpose, function, services and types. **Number system:** Binary, octal and hexadecimal number systems, their mutual conversions, Binary arithmetic.

Basics of programming: Approaches to Problem Solving, Concept of algorithm and flow charts, Types of computer languages:- Machine Language, Assembly Language and High Level Language, Concept of Assembler, Compiler, Loader and Linker.

Unit2:

Standard I/O in —C|, **Fundamental data types-** Character type, integer, short, long, unsigned, single and double floating point, Storage classes- automatic, register, static and external, Operators and expression using numeric and relational operators, mixed operands, type conversion, logical operators, bit operations, assignment operator, operator precedence and associativity.

Fundamentals of C programming: Structure of C program, writing and executing the first C program, Components of C language. Standard I/O in C.

Unit3:

Conditional program execution: Applying if and switch statements, nesting if and else, use of break and default with switch, program loops and iterations: use of while, do while and for loops, multiple loop variables, use of break and continue statements.

Functions: Introduction, types of functions, functions with array, passing values to functions, recursive functions.

Unit 4:

Arrays: Array notation and representation, manipulating array elements, using multi dimensional arrays. Structure, union, enumerated data types

Unit 5:

Pointers: Introduction, declaration, applications File handling, standard C preprocessors, defining and calling macros, conditional compilation, passing values to the compiler.

Reference:

1. The C programming by Kernighan Brain W. and Ritchie Dennis M., Pearson Education .
2. Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited – 2015.
3. Programming in C by Kochan Stephen G. Pearson Education – 2015.
4. Computer Concepts and Programming in C by D.S. Yadav and Rajeev Khanna, New Age International Publication.
5. Computer Concepts and Programming in C by Vikas Gupta, Wiley India Publication
6. Computer Fundamentals and Programming in C. ReemaThareja, Oxford Publication
7. Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
8. Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, Third Edition , Cengage Learning - 2007.
9. Problem Solving and Program Design in C, by Jeri R. Hanly, Elliot B. Koffman, Pearson Addison-Wesley, 2006.
10. Computer Concepts and Programming by Anami, Angadi and Manvi, PHI Publication
11. Computer Fundamental and C programming by K K Gupta, Acme Learning Publication

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I Year I Semester
BT -105 COMPUTER PROGRAMMING LAB

1. WAP that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. WAP that calculates the Simple Interest and Compound Interest. The Principal , Amount, Rate of Interest and Time are entered through the keyboard.
3. WAP to calculate the area and circumference of a circle.
4. WAP that accepts the temperature in Centigrade and converts into Fahrenheit using the formula $C/5=(F-32)/9$.
5. WAP that swaps values of two variables using a third variable.
6. WAP that checks whether the two numbers entered by the user are equal or not.
7. WAP to find the greatest of three numbers.
8. WAP that finds whether a given number is even or odd.
9. WAP that tells whether a given year is a leap year or not.
10. WAP that accepts marks of five subjects and finds percentage and prints grades according to the following criteria:
Between 90-100%----- Print _A
80-90%.....Print _B
60-80% Print _C
Below 60% ----- Print _D
11. WAP that takes two operands and one operator from the user and perform the operation and prints the result by using Switch statement.
12. WAP to print the sum of all numbers up to a given number.
13. WAP to find the factorial of a given number.
14. WAP to print sum of even and odd numbers from 1 to N numbers.
15. WAP to print the Fibonacci series.
16. WAP to check whether the entered number is prime or not.
17. WAP to find the sum of digits of the entered number.
18. WAP to find the reverse of a number.
19. WAP to print Armstrong numbers from 1 to 100.
20. WAP to convert binary number into decimal number and vice versa.
21. WAP that simply takes elements of the array from the user and finds the sum of these elements.
23. WAP to find the minimum and maximum element of the array.

24. WAP to search an element in a array using Linear Search.
25. WAP to sort the elements of the array in ascending order using Bubble Sort technique.
26. WAP to add and multiply two matrices of order nxn.
27. WAP that finds the sum of diagonal elements of a mxn matrix.
28. WAP to implement strlen (), strcat (),strcpy () using the concept of Functions.
29. Define a structure data type TRAIN_INFO. The type contain Train No.: integer type Train name: string Departure Time: aggregate type TIME Arrival Time: aggregate type TIME Start station: string End station : string The structure type Time contains two integer members: hour and minute.

Maintain a train timetable and implement the following operations:

- (i)List all the trains (sorted according to train number) that depart from a particular section.
- (ii)List all the trains that depart from a particular station at a particular time.
- (iii)List all he trains that depart from a particular station within the next one hour of a given time.
- (iv)List all the trains between a pair of start station and end station.

30. WAP to swap two elements using the concept of pointers.
31. WAP to compare the contents of two files and determine whether they are same or not.
32. WAP to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

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I Year II Semester

BT -201 ENGINEERING MATHEMATICS – II

Unit - 1: Ordinary Differential Equations

Linear differential equations of n th order with constant coefficients, Complementary function and Particular integral, Simultaneous linear differential equations, Solution of second order differential equations by changing dependent & independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).

Unit - 2: Series Solution and Special Functions

Series solution of second order ordinary differential equations with variable coefficient (Frobenius method), Bessel and Legendre equations and their series solutions, Properties of Bessel function and Legendre polynomials.

Unit - 3: Laplace Transform

Laplace transform, Existence theorem, Laplace transforms of derivatives and integrals, Initial and final value theorems, Unit step function, Dirac- delta function, Laplace transform of periodic function, Inverse Laplace transform, Convolution theorem, Application to solve simple linear and simultaneous differential equations.

Unit - 4: Fourier Series and Partial Differential Equations

Periodic functions, Dirichlet's Conditions, Fourier series of arbitrary periods, Euler's Formulae, Even and odd functions, Half range sine and cosine series, Gibbs Phenomena.

Solution of first order Lagrange's linear partial differential equations, Second order linear partial differential equations with constant coefficients.

Unit - 5: Applications of Partial Differential Equations

Classification of second order partial differential equations, Method of separation of variables for solving partial differential equations, Solution of one and two dimensional wave and heat conduction equations, Laplace equation in two dimension, Equation of transmission lines.

Text Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons.
2. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw- Hill Publishing Company Ltd.
3. R.K.Jain&S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House.

Reference Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers.
2. Peter V. O' Neil, Advanced Engineering Mathematics, Thomas (Cengage) Learning.
3. Chandrika Prasad, Advanced Mathematics for Engineers, Prasad Mudranalaya

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I Year II Semester

BT-202 ENGINEERING PHYSICS- II

Unit – I: Crystal Structures and X-ray Diffraction

Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Co-ordination number, Atomic radius and Packing factor of different cubic structures, Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Compton Effect.

Unit – II: Dielectric and Magnetic Properties of Materials

Dielectric Properties: Dielectric constant and Polarization of dielectric materials, Relation between E, D and P, Types of Polarization (Polarizability). Equation of internal fields in liquid and solid (One- Dimensional), Clausius-Mossotti equation, Frequency dependence of dielectric constant, Dielectric Losses, Important applications of dielectric material, Ferroelectricity, Piezoelectricity.

Magnetic Properties: Magnetization, Origin of magnetic moment, Dia, para and ferro magnetism, Langevin's theory for diamagnetic material, Phenomena of hysteresis and its applications.

Unit – III: Electromagnetic Theory

Equation of continuity, Maxwell's Equations (Integral and Differential Forms) and its derivations, Displacement Current, Poynting vector and Poynting theorem, EM - Wave equation and its propagation characteristics in free space, non-conducting and conducting media, energy density of electromagnetic wave, Skin depth.

Unit – IV: Band Theory of Solids

Free electron Theory, Formation of bands in Solids, Classification of solids on band theory, Density of states, Fermi-Dirac distribution, Concept of effective mass, Charge carrier density (electrons and holes), Conductivity of semiconductors, carrier concentrations Fermi energy, Position of Fermi level in intrinsic and in extrinsic semiconductors. Temperature dependence of conductivity in semiconductors.

Unit – V: Physics of some technologically important Materials

Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, London equations,

Josephson theory, persistent currents, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and Applications of Super-conductors.

Nano-Materials: Basic principle of nanoscience and technology, structure, properties and uses of Fullerene, Carbon nanotubes Single and double walled nanotubes, synthesis of nanotubes, Properties and Applications of nanotubes.

Reference books:

1. Concept of Modern Physics - by Beiser (Tata Mc-Graw Hill)
2. Solid State Physics - by C. Kittel, 7th edition (Wiley Eastern)
3. Materials Science and Engineering - by V. Raghavan (Prentice- Hall India)
4. Solid State Physics - by S.O. Pillai, 5th edition (New Age International)
5. Introduction to Electrodynamics - by David J. Griffith (PH I)
6. Engineering Physics- C. Mani Naidu(Pearson)
7. Applied Physics for Engineers- Neeraj Mehta (PHI Learning, New D

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PROFESSIONAL COMMUNICATION
LABORATORY PRACTICAL'S

Interactive and Communicative Practical with emphasis on Oral Presentation/Spoken Communication based on International Phonetic Alphabets (I.P.A)

LIST OF PRACTICAL'S

1. Group Discussion: Practical based on Accurate and Current Grammatical Patterns.
2. Conversational skills for Interviews under suitable Professional Communication Lab conditions with emphasis on Kinesics.
3. Communication Skills for Seminars/Conferences/Workshops with emphasis on Paralinguistics / Kinesics.
4. Presentation Skills of Technical Paper/Project Reports/Professional Reports based on proper Stress and Intonation Mechanics.
5. Official /Public Speaking based on Rhythmic Patterns.
6. Theme-Presentation /Key-Note Presentation based on correct argumentation methodologies.
7. Individual Speech Delivery/Conferences with skills to defend Interjections/Quizzes.
8. Argumentative Skills/Role Play Presentation with Stress and Intonation.
9. Comprehensions Skills based on Reading and Listening Practical on a model Audio-Visual Usage.

Reference Books

1. Bansal R.K.& Harrison: Phonetics in English, Orient Longman , New Delhi.
2. Sethi & Dhamija: A Course in Phonetics and Spoken English, Prentice Hall, New Delhi.
3. L.U.B. Pandey & R.P.Singh, A Manual of Practical Communication, A.I.T.B.S. Pub. India Ltd. Krishan Nagar, Delhi.
4. Joans Daniel, English Pronouncing Dictionary, Cambridge Univ. Press.

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BT -203 ELEMENTS OF MECHANICAL ENGINEERING

UNIT-I:

Force System: Force, Parallelogram Law, Lami's theorem, Principle of Transmissibility of forces. Moment of a force, Couple, Varignon's theorem, Resolution of a force into a force and a couple. Resultant of coplanar force system. Equilibrium of coplanar force system, Free body diagrams, Determination of reactions.

Concept of Centre of Gravity and Centroid and Area Moment of Inertia, Perpendicular axis theorem and Parallel axis theorem

UNIT-II:

Plane Truss: Perfect and imperfect truss, Assumptions and Analysis of Plane Truss by Method of joints and Method of section.

Beams: Types of beams, Statically Determinate Beams, Shear force and bending moment in beams, Shear force and bending moment diagrams, Relationships between load, shear and bending moment.

UNIT-III:

Simple stress and strain: Normal and shear stresses. One Dimensional Loading; members of varying cross section, bars in series. Tensile Test diagram for ductile and brittle materials, Elastic constants, Strain energy.

Bending (Flexural) Stresses: theory of pure bending, neutral surface and neutral axis, stresses in beams of different cross sections.

Engineering Materials: Importance of engineering materials, classification, mechanical properties and applications of Ferrous, Nonferrous and composite materials.

UNI-IV:

Basic Concepts and Definitions of Thermodynamics: Introduction and definition of thermodynamics, Microscopic and Macroscopic approaches, System, surrounding and universe, Concept of continuum, Thermodynamic equilibrium, Thermodynamic properties, path, process and cycle, Quasi static process, Energy and its forms, Work and heat. Thermodynamic definition of work.

Zeroth law of thermodynamics: Temperature and its measurement.

First law of thermodynamics: First law of thermodynamics, Internal energy and enthalpy. First law analysis for non-flow processes. Non-flow work Steady flow energy equation; Boilers, Condensers, Turbine, Throttling process, Pumps etc.

UNIT-V:

Second law: Thermal reservoir, Kelvin Planck statement, Heat engines, Efficiency; Clausius' statement Heat pump, refrigerator, Coefficient of Performance. Carnot cycle, Carnot theorem and its corollaries. Clausius inequality, Concept of Entropy.

Properties of pure substances: P-v, T-s and h-s diagram, dryness fraction and steam tables. Rankine Cycle.

Internal Combustion Engines: Classification of I.C. Engines and their parts, working principle and comparison between 2 Stroke and 4 stroke engine, difference between SI and CI engines. P-v and T-s diagrams of Otto and Diesel cycles, comparison of efficiency.

Books & References:

1. Engineering Mechanics: Statics by J.L Meriam, Wiley
2. Engineering Mechanics : Statics and Dynamics by R. C. Hibbler, Pearson
3. Strength of Materials by Timoshenko & Young
4. Mechanics of Solid by R. C. Hibbler, Pearson
5. Engineering Thermodynamics by P.K. Nag, McGraw Hill
6. Thermodynamics An Engineering Approach by Cengel & Boles, McGraw Hill
7. Engineering Thermodynamics by P. Chattopadhyay, OXFORD Publication
8. Internal Combustion Engine by V Ganesan, McGraw Hill Pub.
9. An Introduction to Mechanical Engineering by Wickert & Lewis, Cengage Learning
10. Engineering Mechanics By S. S. Bhavikatti, K. G. Rajashekarappa, New Age International
11. Engineering Mechanics by R K Bansal, Laxmi Publications
12. Fundamentals of Mechanical Engineering by Sawhney, PHI
13. Basic Mechanical Engineering by Pravin Kumar, Pearson

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I Year II Semester

ELEMENTS OF MECHANICAL ENGINEERING LAB

Note: Any 10 experiments (Minimum of 3 from each module) are to be conducted.

Module 1:

1. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
2. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
3. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
4. To conduct experiment on Torsion of Rod/wire.

Module 2:

1. To Study the working of 2 stroke Diesel/Petrol engine.
2. To Study and working of 4 stroke Petrol/Diesel engine.
3. To Study the model of Babcock and Wilcox and Lancashire boiler.
4. To Study various types of Mounting and Accessories of Boilers.

Module 3:

1. To verify the parallelogram, and Triangle law.
2. To verify the polygon law of force.
3. To determine the coefficient of friction on inclined surface.
4. To determine the efficiency and Mechanical Advantage of Worm & Worm-wheel.
5. To conduct experiment on Force Analysis on simple truss and Jib-crane Apparatus.
6. To conduct friction experiment on screw-jack.

Department Of Automobile Engineering
(Faculty of Engineering & Technology)
P.K. University, Shivpuri (MP)

I Year II Semester

BT -204 PROFESSIONAL COMMUNICATIONS

Unit-1 Fundamentals of Communications	Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) : Importance of technical communication; Barriers to Communication.
Unit-II Written Communication	Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial , Linear, Chronological etc.
Unit-III Business Communication	Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills.
Unit-IV Presentation Strategies and Soft Skills.	Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills.
Unit –V Value- Based	Following essays from the prescribed text book with emphasis on Mechanics of writing.

Text Readings

- (i) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior
- (ii) The Language of Literature and Science by A. Huxley
- (iii) Man and Nature by J. Bronowski
- (iv) Science and Survival by Barry Commoner
- (v) The Mother of the Sciences by A.J. Bahm.

Text Book

1. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
2. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.
3. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.

Reference Books

1. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
2. Business Correspondence and Report Writing by Prof. R.C., Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi.
3. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.

Department Of Automobile Engineering
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Year II Semester

BT -205 BASIC ELECTRONICS

Unit I PNP-N junction diode: Introduction of Semiconductor Materials Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application: Series, Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices :Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.

Unit-II Bipolar Junction Transistors and Field Effect Transistor: Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, Common Collector Configuration DC Biasing BJTs: Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration. Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (re Model). Field Effect Transistor: Construction and Characteristic of JFETs. AC analysis of CS amplifier, MOSFET (Depletion and Enhancement)Type, Transfer Characteristic,

Unit- III Operational Amplifiers : Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits, Practical Op-Amp Circuits (Inverting Amplifier, Non inverting Amplifier, Unity Gain Amplifier, Summing Amplifier, Integrator, Differentiator).

OPAMP Parameters: Input offset voltage, Output offset voltage, Input biased current, Input offset current Differential and Common-Mode Operation

Unit- IV Electronic Instrumentation and Measurements: Digital Voltmeter : Introduction, RAMP Techniques Digital Millimeters: Introduction Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage, current phase and frequency using CRO, Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope.

Unit- V Fundamentals of Communication Engineering: Elements of a Communication System, Need of Modulation, Electromagnetic spectrum and typical applications. Basics of Signal Representation and Analysis, Introduction of various analog modulation techniques, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.

Department Of Automobile Engineering
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I Year II Semester
ELEMENTS OF MECHANICAL ENGINEERING LAB

Note: Any 10 experiments (Minimum of 3 from each module) are to be conducted.

Module 1:

5. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a mild steel specimen.
6. To conduct the Impact-tests (Izod / Charpy) on Impact-testing machine to find the Impact Strength of the specimen.
7. To determine the hardness of the given specimen using Vicker/Brinell/Rockwell hardness testing machine.
8. To conduct experiment on Torsion of Rod/wire.

Module 2:

5. To Study the working of 2 stroke Diesel/Petrol engine.
6. To Study and working of 4 stroke Petrol/Diesel engine.
7. To Study the model of Babcock and Wilcox and Lancashire boiler.
8. To Study various types of Mounting and Accessories of Boilers.

Module 3:

7. To verify the parallelogram, and Triangle law.
8. To verify the polygon law of force.
9. To determine the coefficient of friction on inclined surface.
10. To determine the efficiency and Mechanical Advantage of Worm & Worm-wheel.
11. To conduct experiment on Force Analysis on simple truss and Jib-crane Apparatus.
12. To conduct friction experiment on screw-jack.

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I Year II Semester

BT -204 PROFESSIONAL COMMUNICATIONS

Unit-1 Fundamentals of Communications	Technical Communication: features: Distinction between General And Technical Communication; Language as a tool of communications; Levels of communication: Interpersonal, Organizational, Mass communication; The flow of communication: Downward, Upward, Lateral/Horizontal (Peer group) : Importance of technical communication; Barriers to Communication.
Unit-II Written Communication	Words and Phrases: Word formation, Synonyms and Antonyms; Homophones; Select vocabulary of about 500-1000 New words; correct Usage: all Parts of Speech; Modals; Concord; Articles; Infinitives; Transformation of sentences; Requisites f Sentence Construction: Paragraph Development: Techniques and Methods- Inductive, Deductive, Spatial , Linear, Chronological etc.
Unit-III Business Communication	Principles, Sales & Credit letters; Claim and Adjustment Letters; Job Application and Resumes. Reports: Types; Significance; Structure, Style & Writing of Reports. Technical Proposal; Parts; Types; Writing of Proposal; Significance; Negotiation skills.
Unit-IV Presentation Strategies and Soft Skills.	Nuances and Modes of Delivery; Body Language; Dimensions of Speech: Syllable; Accent; Pitch; Rhythm; Intonation; Paralinguistic features of voice; Interpersonal communication: Definition; Types; Team work; Attitude; Way to improve Attitude Listening Skills : Types; Methods for improving Listening Skills.
Unit –V Value- Based	Following essays from the prescribed text book with emphasis on Mechanics of writing.

Text Readings

- (vi) Humanistic and Scientific Approaches to Human Activity by Moody E. Prior
- (vii) The Language of Literature and Science by A. Huxley
- (viii) Man and Nature by J. Bronowski
- (ix) Science and Survival by Barry Commoner
- (x) The Mother of the Sciences by A.J. Bahm.

Text Book

- 4. Improve your Writing ed. V.N. Arora and Laxmi Chandra, Oxford Univ. Press, 2001, New Delhi.
- 5. Technical Communication- Principles and Practices by Meenakshi Raman & Sangeeta Sharma, Oxford Univ. Press, 2007, New Delhi.
- 6. Functional skills in Language and Literature, by R.P. Singh, Oxford Univ. Press, 2005, New Delhi.

Reference Books

- 4. Communication Skills for Engineers and Scientists, Sangeeta Sharma et.al. PHI Learning Pvt. Ltd, 2011, New Delhi.
- 5. Business Correspondence and Report Writing by Prof. R.C., Sharma & Krishna Mohan, Tata McGraw Hill & Co. Ltd. , 2001, New Delhi.
- 6. Word Power Made Easy by Norman Lewis, W.R. Goyal Pub. & Distributors, 2009, Delhi.

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I Year II Semester
BT -205 BASIC ELECTRONICS

Unit I PNP-N junction diode: Introduction of Semiconductor Materials Semiconductor Diode: Depletion layer, V-I characteristics, ideal and practical, diode resistance, capacitance, Diode Equivalent Circuits, Transition and Diffusion Capacitance, Zener Diodes breakdown mechanism (Zener and avalanche) Diode Application: Series , Parallel and Series, Parallel Diode Configuration, Half and Full Wave rectification, Clippers, Clampers, Zener diode as shunt regulator, Voltage-Multiplier Circuits Special Purpose two terminal Devices :Light-Emitting Diodes, Varactor (Varicap) Diodes, Tunnel Diodes, Liquid-Crystal Displays.

Unit-II Bipolar Junction Transistors and Field Effect Transistor: Bipolar Junction Transistor: Transistor Construction, Operation, Amplification action. Common Base, Common Emitter, And Common Collector Configuration DC Biasing BJTs: Operating Point, Fixed-Bias, Emitter Bias, Voltage-Divider Bias Configuration. Collector Feedback, Emitter-Follower Configuration. Bias Stabilization. CE, CB, CC amplifiers and AC analysis of single stage CE amplifier (re Model). Field Effect Transistor: Construction and Characteristic of JFETs. AC analysis of CS amplifier, MOSFET (Depletion and Enhancement) Type, Transfer Characteristic,

Unit- III Operational Amplifiers: Introduction and Block diagram of Op Amp, Ideal & Practical characteristics of Op Amp, Differential amplifier circuits, Practical Op-Amp Circuits (Inverting Amplifier, Non inverting Amplifier, Unity Gain Amplifier, Summing Amplifier, Integrator, and Differentiator).

OPAMP Parameters: Input offset voltage, Output offset voltage, Input biased current, Input offset current Differential and Common-Mode Operation

Unit- IV Electronic Instrumentation and Measurements: Digital Voltmeter : Introduction, RAMP Techniques Digital Millimeters: Introduction Oscilloscope: Introduction, Basic Principle, CRT , Block Diagram of Oscilloscope, Simple CRO, Measurement of voltage, current phase and frequency using CRO, Introduction of Digital Storage Oscilloscope and Comparison of DSO with Analog Oscilloscope.

Unit- V Fundamentals of Communication Engineering: Elements of a Communication System, Need of Modulation, Electromagnetic spectrum and typical applications. Basics of Signal Representation and Analysis, Introduction of various analog modulation techniques, Fundamentals of amplitude modulation, Modulation and Demodulation Techniques of AM.

Text Books:

1. Robert L. Boylestand / Louis Nashelsky "*Electronic Devices and Circuit Theory*", Latest Edition, Pearson Education.
2. H S Kalsi, -*Electronic Instrumentation*, Latest Edition, TMH Publication,.
3. George Kennedy, -*Electronic Communication Systems*, Latest Edition, TMH,

Reference Books:

1. David A. Bell, -*Electronic Devices and Circuits*", Latest Edition, Oxford University Press.
2. Jacob Millman, C.C. Halkias, StayabrataJit, -*Electronic Devices and Circuits*, Latest Edition ,TMH.
3. David A. Bell, *Electronic Instrumentation and Measurements*, Latest Edition, Oxford University Press India.

Faculty of Engineering & Technology
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Shivpuri (MP)



Evaluation Scheme & Syllabus for
Department of Automobile Engineering

B.Tech -Automobile Engineering
(IInd Year: III to IV Semester)
(Effective from session 2019-20)

EVALUATION SCHEME

B.Tech- Automobile Engineering

II Year Semester-III

SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS.	EXT.	SESS.	EXT.	
		(30)	(70)	(25)	(25)	
BTAU-301	ENGINEERING MATH'S-III	30	70	NA	NA	100
BTAU-302	FLUID MECHANICS	30	70	25	25	150
BTAU-303	MATERIALS SCIENCE	30	70	25	25	150
BTAU-304	MECHANICS OF SOLIDS	30	70	NA	NA	100
BTAU-305	THERMODYNAMICS	30	70	25	25	150
BTAU-306	ENVIRONMENT & ECOLOGY	30	70	NA	NA	100
BTAU-307	COMPUTER AIDED MACHINE DRAWING-I LAB	NA	NA	25	25	50

Semester-IV

SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS.	EXT.	SESS.	EXT.	
		(30)	(70)	(25)	(25)	
BTAU-401	NANO SCIENCE	30	70	NA	NA	100
BTAU-402	ENGINEERING MECHANICS	30	70	NA	NA	100
BTAU-403	APPLIED THERMODYNAMICS	30	70	NA	NA	100
BTAU-404	MANUFACTURING PROCESSES	30	70	25	25	150
BTAU-405	MEASUREMENT AND METROLOGY	30	70	25	25	150
BTAU-406	UNIVERSAL HUMAN VALUES	30	70	NA	NA	100
BTAU-407	MACHINE DRAWING-I I LAB	NA	NA	25	25	50

Department of Automobile Engineering
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I Year III Semester

BTAU 301: ENGINEERING MATHS-III

UNIT I

Sem. -III

Numerical Techniques – I: Zeroes of transcendental and polynomial equations, Bisection method, Regula-falsi method, Newton-Raphson method, Rate of convergence of above methods.

Interpolation: Finite differences, Newton's forward and backward interpolation. Lagrange's and Newton's divided difference formula for unequal intervals.

UNIT II

Numerical Techniques –II: Solution of system of linear equations, Matrix Decomposition methods, Jacobi method, Gauss-Seidal method.

Numerical differentiation & Integration: Trapezoidal rule, Simpson's one third and three-eighth rules, Solution of ordinary differential equations (first order, second order and simultaneous) by Euler's, Picard's and fourth-order Runge-Kutta methods.

UNIT III

Statistical Techniques: Moments, Moment generating functions, Skewness, Kurtosis, Curve fitting, Method of least squares, Fitting of straight lines, Polynomials, Exponential curves, Correlation, Linear, non-linear and multiple regression analysis, Binomial, Poisson and Normal distributions. Tests of significations: Chi-square test, t-test.

UNIT IV

Function of Complex variable: Analytic function, C-R equations, Harmonic Functions, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions, Taylor's and Laurent's series, Singularities, Zeroes and Poles, Residue theorem.

UNIT V

Integral Transforms: Fourier integral, Complex Fourier transform, Inverse Transforms, Convolution Theorems, Fourier sine and cosine transform, Applications of Fourier transform to simple one dimensional heat transfer equations, wave equations and Laplace equations, Z-Transform and its application to solve difference equation.

Text Books:

1. R.K. Jain & S.R.K. Iyenger, Advance Engineering Mathematics, Narosa Publication House..
2. Jain, Iyenger Jain, Numerical Methods for Scientific and Engineering Computation, New Age International, New Delhi
3. J.N. Kapur, Mathematical Statistics, S. Chand & company Ltd.

Department of Automobile Engineering
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II Year III Semester

BTAU 302: FLUID MECHANICS

UNIT I

Sem. -III

Fluid and continuum, Physical properties of fluids, Rheology of fluids. Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis.

UNIT II

Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential.

UNIT III

Potential Flow: source, sink, doublet and half-body. Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturimeter and bend meter, notches and weirs, momentum equation and its application to pipe bends. resistance to flow, Minor losses in pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks.

UNIT IV

Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sub-layer, separation and its control.

UNIT V

Drag and lift, drag on a sphere, a two dimensional cylinder, and an aerofoil, Magnus effect. Similarity Laws: geometric, kinematics and dynamic similarity, undistorted and distorted model studies, Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance.

BOOKS:

1. Hibbler, -Fluid Mechanics in SI Units| 1/e Pearson Education, Noida.
2. Fox & Donald, -Introduction to Fluid Mechanics| John Wiley & Sons Pvt Ltd,
3. Cengel & Cimbala, |Fluid Mechanics| TMH, New Delhi.
4. AK Jain —Fluid Mechanics| Khanna Publication.
5. Pnueli & Gutfinger, -Fluid Mechanics| Cambridge University Press
6. Modi & Seth —Hydraulics & Fluid Mechanics| Standard Publications.
7. Gupta, -Fluid Mechanics & Hydraulic Machines| Pearson Education, Noida

BTME302 - FLUID MECHANICS LAB**LIST OF PRACTICAL**

1. To verify the momentum equation using the experimental set-up on impact of jet.
2. To determine the coefficient of discharge of an orifice of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice mouth piece.
3. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynolds number.
4. To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynolds number.
5. To calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynolds number.
6. To draw a flow-net using Electrical Analogy Method.
7. To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
8. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocity profile.
9. To study the variation of friction factor, f for turbulent flow in commercial pipes.
10. To study the boundary layer velocity profile over a flat plate and to determine the boundary layer thickness.

Department of Automobile Engineering
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II Year III Semester

BTAU 303: MATERIAL SCIENCE

UNIT I

Sem. -III

Introduction: Importance of materials, historical perspective, Future aspects of engg. materials.

Crystal Structure: brief on BCC, FCC and HCP Structures, coordination number and atomic packing factors. Bravais lattices, Miller indices, crystal imperfections-point line and surface imperfections. Atomic Diffusion: Phenomenon, Ficks laws of diffusion, factors affecting diffusion.

Ferrous and non-ferrous materials: Properties, Composition and uses of Grey cast iron, malleable iron, SG iron and steel, copper alloys-brasses and bronzes, Aluminium alloys. Introduction to BIS & ASTM codes and practice on material and testing.

UNIT II

Mechanical Behaviors: Stress-strain diagram showing ductile and brittle behaviour of materials, mechanical properties in plastic range, yield strength off set yield strength, ductility, ultimate tensile strength, toughness, Plastic deformation of single crystal by slip and twinning, Hardness Tests.

Fracture Creep Fatigue: Fracture: Type I, Type II and Type III. Creep: Description of the phenomenon with examples. Three stages of creep, creep properties, stress relaxation. Fatigue: Types of fatigue loading with examples, Mechanism of fatigue, fatigue properties, fatigue testing and S-N diagram.

UNIT III

Solidification: Mechanism of solidification, Homogenous and Heterogeneous nucleation, crystal growth, cast metal structures. Phase Diagram I: Solid solutions Hume Rothery rule, substitution and interstitial solid solutions, intermediate phases, Gibbs phase rule.

Phase Diagram: Construction of equilibrium diagrams involving complete and partial solubility, lever rule. Iron carbon equilibrium diagram description of phases, solidification of steels and cast irons, invariant reactions.

UNIT IV

Heat Treating of Metals: TTT curves, continuous cooling curves, annealing and its types. Normalizing, hardening, tempering, martempering, austempering, hardenability, surface hardening methods like carburizing, cyaniding, nitriding, flame hardening and induction

hardening, age hardening of aluminium-copper alloys. Comparative study of microstructure of various Ferrous, nonferrous metals and alloys.

UNIT V

Composite materials: Definition, classification, types of matrix materials & reinforcements, fundamentals of production of FRP's and MMC's advantages and application of composites.

Ceramics: Structure types and properties and applications of ceramics. Mechanical/ Electrical behavior and processing of Ceramics.

Plastics: Various types of polymers/ plastics and its applications. Mechanical behavior and processing of plastics, Future of plastics. Introduction to Smart materials & Nano-materials and their potential applications.

Books and References:

1. Elements of Material Science & Engineering by Van Vlack, Pearson
2. Callisters Materials Science and Engineering, by William D. Callister, Jr, (Adopted by R. Balasubramaniam), Wiley India Pvt. Ltd
3. Material Science and Engineering by Smith, Hashemi and Prakash, MCGRAW HILL INDIA
4. The Science and Engineering of materials, by Askeland & Balani, Cengage Learning

BTME303: MATERIAL SCIENCE LAB

LIST OF PRACTICAL

(A). Experiments on Material Science (at least 5 of the following):

1. Preparation of a plastic mould for small metallic specimen.
2. Preparation of specimen for micro structural examination-cutting, grinding, polishing, etching.
3. Determination of grain size for a given specimen.
4. Comparative study of microstructures of different specimens of different materials (mild steel, gray C.I., brass, copper etc.)
5. Experiments on heat treatment such as annealing, normalizing, quenching, case hardening and comparison of hardness before and after heat treatment.
6. Material identification of, say, 50 common items kept in a box.
7. Experiment on Faraday's law of electrolysis.

(B) Experiments on Material Testing (at least 5 of the following):

1. Strength test of a given mild steel specimen on UTM with full details and stress versus strain plot on the machine.
2. Impact test on impact testing machine like Charpy, Izod or both.
3. Hardness test of given specimen using Rockwell and Vickers/Brinell testing machines.
4. Spring index test on spring testing machine.
5. Fatigue test on fatigue testing machine.
6. Creep test on creep testing machine.
7. Torsion test of a rod using torsion testing machine.

Department of Automobile Engineering
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II Year III Semester

BTAU 304: MECHANICS OF SOLIDS

UNIT I

Sem. -III

Compound stress and strains: Introduction, normal stress and strain, shear stress and strain, stresses on inclined sections, strain energy, impact loads and stresses, state of plane stress, principal stress and strain, maximum shear stress, Mohr's stress circle, three dimensional states of stress & strain, equilibrium equations, generalized Hook's law, theories of failure. Thermal Stress.

UNIT II

Stresses in Beams: Pure Bending, normal stresses in beams, shear stresses in beams due to transverse and axial loads, composite beams. **Deflection of Beams:** Equation of elastic curve, cantilever and simply supported beams, Macaulay's method, area moment method, fixed and continuous beams

Torsion: Torsion combined bending & torsion of solid & hollow shafts, torsion of thin walled tubes.

UNIT III

Helical and Leaf Springs: Deflection of springs by energy method, helical springs under axial load and under axial twist (respectively for circular and square cross sections) axial load and twisting moment acting simultaneously both for open and closed coiled springs, laminated springs.

Columns and Struts: Buckling and stability, slenderness ratio, combined bending and direct stress, middle third and middle quarter rules, struts with different end conditions, Euler's theory for pin ended columns, effect of end conditions on column buckling, Rankine Gordon formulae, examples of columns in mechanical equipments and machines.

UNIT IV

Thin cylinders & spheres: Introduction, difference between thin walled and thick walled pressure vessels, thin walled spheres and cylinders, hoop and axial stresses and strain, volumetric strain.

Thick cylinders:

Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, compound cylinders, stresses in rotating shaft and cylinders, stresses due to interference fits.

UNIT V

Curved Beams: Bending of beams with large initial curvature, position of neutral axis for rectangular, trapezoidal and circular cross sections, stress in crane hooks, stress in circular rings subjected to tension or compression.

Unsymmetrical Bending: Properties of beam cross-section, slope of neutral axis, stress and deflection in unsymmetrical bending, determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel section.

Books and References:

1. Strength of Material by Rattan, MCGRAW HILL INDIA
2. Mechanics of material by Gere, Cengage Learning
3. Mechanics of Materials by Beer, Jhonston, DEwolf and Mazurek, MCGRAW HILL INDIA
4. Strength of Materials by Pytel and Singer, Harper Collins
- 5 . Strength of Materials by Jindal, Pearson Education.
6. Introduction to Solid Mechanics by Shames, Pearson.

Department of Automobile Engineering
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II Year III Semester

BTAU 305: THERMODYNAMICS

UNIT I

Review of Fundamental Concepts and Definitions: Introduction- Basic Concepts: System, Control Volume, Surrounding, Boundaries, Universe, Types of Systems, Macroscopic and Microscopic viewpoints, Concept of Continuum, Thermodynamic Equilibrium, State, Property, Process, Exact & Inexact Differentials, Cycle Reversibility Quasi – static Process, Irreversible Process, Causes of Irreversibility Energy and its forms, Work and heat (sign convention), Gas laws, Ideal gas, Real gas, Law of corresponding states, Dalton's law, Amagat's law, Property of mixture of gases. **Zeroth law of thermodynamics:** Concept of Temperature and its measurement, Temperature scales.

First law of thermodynamics: Thermodynamic definition of work, Displacement work and flow work, Displacement work for various non flow processes, Joules' experiment, First law analysis for closed system (non flow processes), Internal energy and enthalpy. Limitations of first law of thermodynamics, PMM-I. Steady flow systems and their analysis, Steady flow energy equation, Boilers, Condensers, Turbine, Throttling process, Pumps etc. Analysis of unsteady processes such as filling and evacuation of vessels with and without heat transfer.

UNIT II

Second law of thermodynamics: Thermal reservoirs, Energy conversion, Heat engines, Efficiency, Reversed heat engine, Heat pump, Refrigerator, Coefficient of Performance, Kelvin Planck and Clausius statement of second law of thermodynamics, Equivalence of the two statements. Reversible and irreversible processes, Carnot cycle and Carnot engine, Carnot theorem and its corollaries, Thermodynamic Temperature Scale, PMM-II.

Entropy : Clausius inequality, Concept of Entropy, Entropy change of pure substance in different thermodynamic processes, Tds equation, Principle of entropy increase, T-S diagram, Statement of the third law of thermodynamics.

UNIT III

Availability and Irreversibility: Available and unavailable energy, Availability and Irreversibility, Second law efficiency, Helmholtz & Gibb's function.

Thermodynamic relations: Conditions for exact differentials. Maxwell relations, Clapeyron equation, Joule-Thompson coefficient and Inversion curve. Coefficient of volume expansion, Adiabatic and Isothermal compressibility.

UNIT IV

Properties of steam and Rankine cycle: Pure substance, Property of Pure Substance (steam), Triple point, Critical point, Saturation states, Sub-cooled liquid state, Superheated vapour state, Phase transformation process of water, Graphical representation of pressure, volume and temperature, P-T, P-V and P-h diagrams, T-S and H-S diagrams, use of property diagram, Steam-Tables & Mollier chart, Dryness factor and its measurement, processes involving steam in closed and open systems. Simple Rankine cycle.

Air-water vapour mixture and Psychrometry: Psychrometric terms and their definitions, Psychrometric chart, Different Psychrometric processes and their representation on Psychrometric chart.

UNIT V

Refrigeration Cycles: Reversed Carnot Cycle for gas and vapour. Refrigeration capacity, unit of refrigeration. Air Refrigeration cycles; Reversed Brayton Cycle and Bell Coleman Cycle. Vapour compression refrigeration cycle; simple saturated cycle and actual vapour compression refrigeration cycle. Analysis of cycles, effect of superheating, sub-cooling and change in evaporator and condenser pressure on performance of vapour compression refrigeration cycle. Refrigerants; their classification and desirable properties. Vapour absorption refrigeration system.

Books and References:

1. Basic and Applied Thermodynamics by PK Nag, MCGRAW HILL INDIA
2. Thermodynamics for Engineers by Kroos & Potter, Cengage Learning
3. Thermodynamics by Shavit and Gutfinger, CRC Press.
4. Thermodynamics- An Engineering Approach by Cengel, MCGRAW HILL INDIA.
5. Basic Engineering Thermodynamics, Joel, Pearson.
6. Fundamentals of Engineering Thermodynamics by Rathakrishnan, PHI.
7. Engineering Thermodynamics by Dhar, Elsevier.
8. Engineering Thermodynamics by CP Arora.

BTME305 THERMODYNAMICS LAB

LIST OF PRACTICAL

Sem. -III

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

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II Year III Semester
BTAU -306 : ENVIRONMENT & ECOLOGY

UNIT-I

Definition, Scope & Importance, Need for Public Awareness• Environment definition, Eco system - Balanced ecosystem, Human activities - Food, Shelter, Economic and social Security.

Effects of human activities on environment• Agriculture, Housing, Industry, Mining and Transportation activities, Basis of Environmental Impact Assessment. Sustainable Development.

UNIT-II

Natural Resources Water Resources• Availability and Quality aspects. Water borne diseases, Water Induced diseases, Fluoride problem in drinking water. Mineral Resources, Forest Wealth, Material Carbon, Nitrogen and Sulphur Cycles.

Energy - Different types of energy, Electromagnetic radiation. Conventional and Non-Conventional sources - Hydro Electric, Fossil Fuel based Nuclear, Solar, Biomass and Bio.gas. Hydrogen gas and alternative future source of Energy.

UNIT-III

Environmental Pollution and their effects. Water pollution, Land pollution. Noise pollution, Public Health aspects, Air Pollution, Solid waste management, e-waste management Current Environmental Issues of Importance: Population Growth, Climate Change and Global warming- Effects, Urbanization, Automobile pollution. Acid Rain Ozone Layer depletion, Animal Husbandry,

UNIT-IV

Environment-ill Protection- Role of Government, Legal aspects, initiatives by Non-, governmental organizations (NGO), Environmental Education,

Text books:

1. Environmental Studies -Benny Joseph- Tata McgrawHiU-200S
2. Environmental Studies- Dr. D.I. Manjunath, Pearson Education-2006.
3. Environmental Science & Technology- M. Anaji Reddy- BS Publication ..

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II Year III Semester

BTAU -306 COMPUTER AIDED MACHINE DRAWING-I LAB

Introduction (1 drawing sheets)

Introduction, classification of machine drawings, principles of drawing, conventional representation of machine components and materials, lines, types of lines, dimensioning types, lines and rules of dimensioning.

Orthographic Projections (3 drawing sheets)

Introduction to orthographic projection, concept of first angle and third angle projection, drawing of simple machine elements in first angle projection, missing line problems, principle of visualization of objects, sectional views, full and half sectional views, auxiliary views.

Fasteners (2 drawing sheets)

Temporary and permanent fasteners, thread nomenclature and forms, thread series, designation, representation of threads, bolted joints, locking arrangement of nuts, screws, washers, foundation bolts etc., keys, types of keys, cotter and knuckle joints.

Riveted joints (1 drawing sheet)

Introduction, rivets and riveting, types of rivets, types of riveted joints, drawing of boiler joints etc.

Assembly drawing (2 drawing sheets)

Introduction to assembly drawing, drawing assembly drawing of simple machine elements like rigid or flexible coupling, muff coupling, plummer block, footstep bearing, bracket etc.

Free hand sketching (1 drawing sheet)

Introduction, Need for free hand sketching, Free hand sketching of foundation bolts, studs, pulleys, couplings etc.

Computer aided drafting (1 drawing)

Introduction to computer aided drafting; advantages and applications of CAD, concepts of computer aided 2D drafting using any drafting software like AutoCAD, Solid Edge, Draft Sight etc., basic draw and modify commands, making 2D drawings of simple machine parts.

Books and References:

1. Fundamentals of Machine Drawing by Sadhu Singh & Shah, PHI
2. Engineering Drawing by Bhat, & Panchal, Charotar Publishing House
3. Machine Drawing with AutoCAD by Pohit and Ghosh, Pearson
4. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy, New Age
5. Machine Drawing, N. Siddeshwar, P Kannaiah, VVS Shastry, Tata McGraw Hill
6. Engineering Drawing, Pathak, Wiley
7. Textbook of Machine Drawing, K C John, PHI
8. AutoCAD 2014 for Engineers & Designers, Bhatt, WILEY
9. Engineering Graphics with AutoCAD, Bethune, PHI

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II Year IV Semester
BTAU-401: NANO SCIENCE

UNIT I

SEM-IV

Introduction: Definition of Nano-Science and Nano Technology, Applications of Nano-Technology. Quantum Theory for Nano Science: Particle in a box, Potential step: Reflection and tunneling (Quantum leak). Penetration of Barrier, Potential box (Traped particle in 3D: Nanodot). Physics of Solid State Structures: Size dependence of properties, crystal structures, face centered cubic nano particles; Tetrahedrally bounded semiconductor structures; lattice vibrations. Energy Bands: Insulators, semiconductor and conductors; Reciprocal space; Energy bands and gaps of semiconductors; effective masses; Fermi Surfaces. Localized Particles: Acceptors and deep taps; mobility; Excitons.

UNIT II

Quantum Nanostructure: Preparation of quantum wells, Wires and Dots, Size and Dimensionality effect, Fermi gas; Potential wells; Partial confinement; Single electron Tunneling, Infrared detectors; Quantum dot laser superconductivity. Properties of Individual Nano Particles: Metal nano clusters; Magic numbers; Theoretical modeling of nanoparticles; geometric structure; electronic structure; Reactivity, Fluctuations, Magnetic clusters; Bulk to nanostructure, semiconducting nano particles, Optical Properties, Photo fragmentation, Columbic Explosion. Rare Gas & Molecular clusters; Inert gas clusters; Super fluid clusters; Molecular clusters.

UNIT III

Growth Techniques of Nano materials: Litho and Non lithographic techniques, RF Plasma, Chemical methods, Thermolysis, Pulsed laser method, Self-assembly, E-beam evaporation, Chemical Vapour Deposition, Pulsed Laser Deposition.

UNIT IV

Methods of Measuring Properties: Structure: X-ray Diffraction Technique, Particle size determination, surface structure. Microscopy: Scanning Probe Microscopy (SPM), Atomic Force Microscopy (AFM), Field Ion Microscopy, Scanning Electron Microscopy, Transmission Electron Microscopy(TEM). Spectroscopy: Infra-red and Raman Spectroscopy, X-ray Spectroscopy, Magnetic resonance, Optical and Vibrational Spectroscopy, Luminescence.

UNIT V

Carbon Nano Materials: Bucky Ball and Carbon Nano- Tubes: Nano structures of carbon (fullerene), Fabrication, Structure. Electrical, Mechanical and Vibrational properties and applications. Nano Diamond, Boron Nitride Nano-tubes, Single Electron Transistors, Molecular Machine, Nano- Biometrics, Nano Robots.

Text/Reference Books:

1. CP Poole Jr, FJ Owens, -Introduction to Nanotechnology!

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II Year IV Semester

BTAU 402: ENGINEERING MECHANICS

UNIT I

Two-dimensional force systems: Basic concepts, Laws of motion, Principle of transmissibility of forces, transfer of a force to parallel position, resultant of a force system, simplest resultant of two dimensional concurrent and non-concurrent force systems, and distribution of force systems, free body diagrams, equilibrium and equations of equilibrium.

Friction: Friction force – Laws of sliding friction – equilibrium analysis of simple systems with sliding friction – wedge friction.

UNIT-II

Beam: Introduction, shear force and bending moment, different equations of equilibrium, shear force and bending moment diagram for statically determined beams.

Trusses: Introduction, simple truss and solution of simple truss, methods of F-joint and methods of sections.

UNIT-III

Centroid and moment of inertia: Centroid of plane, curve, area, volume and composite bodies, moment of inertia of plane area, parallel axis theorem, perpendicular axis theorem, principle moment of inertia, mass moment of inertia of circular ring, disc, cylinder, sphere, and cone about their axis of symmetry.

UNIT-IV

Kinematics of rigid body: Introduction, plane motion of rigid body, velocity and acceleration under translational and rotational motion, relative velocity.

Kinetics of rigid body: Introduction, force, mass and acceleration, work and energy, impulse and momentum, D'Alembert's principle and dynamic equilibrium.

UNIT-V

Simple stress and strain: Introduction, normal and shear stresses, stress-strain diagrams for ductile and brittle material, elastic constants, one-dimensional loading of members of varying cross sections, strain energy. Pure bending of beams: Introduction, simple bending theory, stress in beams of different cross sections.

Torsion: Introduction, torsion of shafts of circular cross sections, torque and twist, shear stress due to torque.

Books and References:

1. Beer, F.P and Johnston Jr. E.R., –Vector Mechanics for Engineers (In SI Units): Statics and Dynamics, 8th Edition, Tata McGraw-Hill Publishing company, New Delhi(2004).
2. Vela Murali, –Engineering Mechanics, Oxford University Press (2010).
3. A Textbook of Engineering Mechanics, R.K. Bansal, Laxmi

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II Year IV Semester

BTAU 403: APPLIED THERMODYNAMICS

UNIT I

SEM-IV

Gas power cycle: Air Standard cycles: Carnot, Otto, Diesel, Dual and Stirling cycles, P-V and T-S diagrams, description, efficiencies and mean effective pressures, Comparison of Otto, Diesel and dual cycles. **I.C. Engine:** Testing of two stroke and four stroke SI and CI engines for performance Related numerical problems, heat balance, Motoring Method, Willian's line method, swinging field dynamometer, Morse test.

UNIT II

Vapour Power cycles: Ranking cycle, effect of pressure and temperature on Rankine cycle, Reheat cycle, Regenerative cycle, Feed water heaters, Binary vapour cycle, combined cycles, Cogeneration. **Fuels and Combustion:** Combustion analysis, heating values, air requirement, Air/Fuel ratio, standard heat of reaction and effect of temperature on standard heat of reaction, heat of formation, Adiabatic flame temperature.

UNIT III

Boilers: Classifications and working of boilers, boiler mountings and accessories, Draught and its calculations, air pre heater, feed water heater, super heater. Boiler efficiency, Equivalent evaporation. Boiler trial and heat balance.

Condenser: Classification of condenser, air leakage, condenser performance parameters.

UNIT IV

Steam and Gas Nozzles: Flow through Convergent and convergent-divergent nozzles, variation of velocity, area and specific volume, Choked flow, throat area, Nozzle efficiency, Off design operation of nozzle, Shock waves stationary normal shock waves, Effect of friction on nozzle, Super saturated flow.

Steam Turbines : Classification of steam turbine, Impulse and Reaction turbines, Staging, Stage and Overall efficiency, Reheat factor, Bleeding, Velocity diagram of simple and compound multistage impulse and reaction turbines and related calculations, work done, efficiencies of reaction,.

UNIT V

Gas Turbine: Gas turbine classification, Brayton cycle, Principles of gas turbine, Gas turbine cycles with intercooling, reheat and regeneration and their combinations, Stage efficiency, Polytropic efficiency. Deviation of actual cycles from ideal cycles. **Jet Propulsion:** Introduction to the principles of jet propulsion, Turbojet and turboprop engines and their processes, Principle of rocket propulsion, Introduction to Rocket Engine.

Books and References:

1. Basic and Applied Thermodynamics by P.K. Nag, MCGRAW HILL INDIA
2. Applied thermodynamics by Onkar Singh, New Age International
3. Applied Thermodynamics for Engineering Technologists by Eastop, Pearson Education
4. Applied Thermodynamics by Venkanna And Swati, PHI

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II Year IV Semester

BTAU404: MANUFACTURING PROCESS

UNIT I

SEM-IV

Introduction: Importance of manufacturing. Economic & technological considerations in manufacturing. Classification of manufacturing processes. Materials & manufacturing processes for common items. **Metal Forming Processes:** Elastic & plastic deformation, yield criteria (Mises' and Tresca's). Hot working versus cold working. Analysis (equilibrium equation method) of Forging process for load estimation with sliding friction, sticking friction and mixed condition for slab and disc. Work required for forging, Hand, Power, Drop Forging.

UNIT II

Metal Forming Processes (continued): Analysis of Wire/strip drawing and maximum-reduction, Tube drawing, Extrusion and its application. Condition for Rolling force and power in rolling. Rolling mills & rolled-sections. Design, lubrication and defects in metal forming processes.

UNIT III

Sheet Metal working: Presses and their classification, Die & punch assembly and press work methods and processes. Cutting/Punching mechanism, Blanking vs. Piercing. Compound vs. Progressive die. Flat-face vs Inclined-face punch and Load (capacity) needed. Analysis of forming process like cup/deep drawing. Bending & spring-back.

UNIT IV

Casting (Foundry): Basic principle & survey of casting processes. Types of patterns and allowances. Types and properties of moulding sand, sand testing. Elements of mould and design considerations, Gating, Riser, Runnes, Core. Solidification of casting, Sand casting, defects & remedies and inspection. Cupola furnace. Die Casting, Centrifugal casting, Investment casting, Continuous casting, CO2 casting and Stir casting etc.

UNIT V

Unconventional Metal forming processes: Unconventional metal forming or High Energy Rate Forming (HERF) processes such as explosive forming, electromagnetic, electro-hydraulic forming. **Powder Metallurgy:** Introduction to Powder metallurgy manufacturing process. Application and, advantages. **Jigs & Fixtures:** Locating & Clamping devices & principles. Jigs and Fixtures and its applications. **Manufacturing of Plastic components:** Review of plastics, and its past, present & future uses. Injection moulding. Extrusion of plastic section. Welding of plastics. Future of plastic & its applications. Resins & Adhesives.

Books and References :

1. Manufacturing Science by Ghosh and Mallik
2. Production Engg. Science by PC Pandey
3. Manufacturing Engineering & Technology by Kalpakjian, Pearson
4. Manufacturing Technology by P.N. Rao., MCGRAW HILL INDIA
5. Manufacturing Processes by Lindberg, Pearson.
6. Manufacturing Processes foe Engineering materials by Kalpakjian, Pearson.

BTAU404: MANUFACTURING PROCESS LAB

List of Practical:

1. Design of pattern for a desired casting (containing hole).
2. Pattern making with proper allowance.
3. Making a mould (with core) and casting.
4. Sand testing methods (at least one, such as grain fineness number determination)
5. Injection moulding with plastics
6. Forging - hand forging processes
- 7 Jigs & Fixture experiment
8. Tube bending with the use of sand and on tube bending m/c.
9. Press work experiment such as blanking/piercing, washer, making etc.
10. Wire drawing/extrusion on soft material.
11. Rolling-experiment.

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II Year IV Semester

BTAU 405: MEASUREMENT AND METROLOGY

UNIT I

SEM-IV

Mechanical Measurements: Introduction to measurement and measuring instruments. General concept–Generalized measurement system and its elements-Unit sand standards-measuring instruments: sensitivity, stability, range, accuracy and precision-static and dynamic response-repeatability-systematic, Source of error, statistical analysis of error and random errors-correction, calibration. Dimensional and geometric tolerance

Sensors and Transducers: Types of sensors, types of transducers and their characteristics.

UNIT II

Time Related Measurements: Stroboscope, frequency measurement by direct comparison. Measurement of displacement **Measurement of Pressure:** Gravitational, directing acting, elastic and indirect type pressure transducers. Measurement of very low pressures (high vacuum).

Strain Measurement: Types of strain gauges and their working, strain gauge circuits, temperature compensation. Strain rosettes, calibration.

UNIT III

Flow Measurement: Hot Wire Anemometry, Laser Doppler Velocity Meter, Rotameter

Temperature Measurement: Thermometers, bimetallic thermocouples, thermistors and pyrometers. **Measurements of Force, Torque:** Different types of load cells, elastic transducers, pneumatic & hydraulic systems. Seismic instruments **Measurements of Acceleration, and Vibration:** Accelerometers vibration pickups and decibel meters, vibrometers.

UNIT IV

Coordinate measuring machine (CMM): Need, constructional features and types,

Metrology and Inspection: Standards of linear measurement, line and end standards. Interchange ability and standardization. Linear and angular measurements devices and systems

Comparators: Sigma, Johansson's Microkrator. Limit gauges classification, Taylor's Principle of Gauge Design

UNIT-V

Limits, Fits &Tolerance and Surface roughness: Introduction to Limits, Fits, Tolerances and IS standards, Limit-gauges, and surface-roughness. Measurement of geometric forms like straightness, flatness, roundness. Tool makers microscope, profile projector, autocollimator.

Interferometry: principle and use of interferometry, optical flat. Measurement of screw threads and gears. Surface texture: quantitative evaluation of surface roughness and its measurement.

Books and References:

1. Experimental Methods for Engineers by Holman, MCGRAW HILL INDIA
2. Mechanical Measurements by Beckwith, Pearson
3. Principles of Measurement Systems by Bentley, Pearson
4. Metrology of Measurements by Bewoor and Kulkarni, MCGRAW HILL INDIA
5. Measurement Systems, Application Design by Doeblein, MCGRAW HILL INDIA
6. Hume KJ, -Engineering Metrology, MacDonald and Co
7. Jain, RK, -Engineering Metrology, Khanna Publishers
8. Jain, R.K., -Mechanical Measurement, Khanna Publishers
9. Gupta SC, Engineering Metrology, Dhanpat Rai Publications

BTAU 405: MEASUREMENT AND METROLOGY LAB

List of Practical

1. Study the working of simple measuring instruments- Vernier calipers, micrometer, and tachometer.
2. Measurement of effective diameter of a screw thread using 3 wire methods.
3. Study and Measurement of angle using sine bar & slip gauges.
4. Study & angular measurement using level protector.
5. Adjustment of spark plug gap using feeler gauges.
6. Study of dial indicator & its constructional details.
7. Use of dial indicator to check a shape run use.
8. Use of dial indicator and V Block to check the circularity and plot the polar Graph.
9. Study and understanding of limits, fits & tolerances.
10. To study the displacement using LVDT
11. Study of temperature measuring equipments.
12. Experiment on measurement of flow.

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II Year IV Semester

BTAU 406: UNIVERSAL HUMAN VALUES

UNIT 1: Course Introduction - Need, Basic Guidelines, Content and Process for Value

Education 1. Understanding the need, basic guidelines, content and process for Value Education

2. Self-Exploration–what is it? - its content and process; ‘Natural Acceptance’ and Experiential Validation- as the mechanism for self-exploration

3. Continuous Happiness and Prosperity- A look at basic Human Aspirations

4. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority

5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels

UNIT 2: Understanding Harmony in the Human Being - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’

8. Understanding the needs of Self (‘I’) and ‘Body’ - Sukh and Suvidha

9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)

10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’

11. Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail

12. Programs to ensure Sanyam and Swasthya - Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 3: Understanding Harmony in the Family and Society- Harmony in HumanHuman Relationship

13. Understanding Harmony in the family – the basic unit of human interaction

14. Understanding values in human-human relationship; meaning of Nyaya and program for its fulfillment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship

15. Understanding the meaning of Vishwas; Difference between intention and competence

16. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship

17. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astitva as comprehensive Human Goals

18. Visualizing a universal harmonious order in society- Undivided Society (Akhand Samaj), Universal Order (Sarvabhaum Vyavastha)- from family to world family! - Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 4: Understanding Harmony in the Nature and Existence - Whole existence as Co-existence 19. Understanding the harmony in the Nature

20. Interconnectedness and mutual fulfillment among the four orders of nature recyclability and self-regulation in nature

21. Understanding Existence as Co-existence (Sah-astitva) of mutually interacting units in all-pervasive space

22. Holistic perception of harmony at all levels of existence - Practice Exercises and Case Studies will be taken up in Practice Sessions.

UNIT 5: Implications of the above Holistic Understanding of Harmony on Professional Ethics 23. Natural acceptance of human values

24. Definitiveness of Ethical Human Conduct

25. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

26. Competence in professional ethics:

a) Ability to utilize the professional competence for augmenting universal human order

b) Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,

c) Ability to identify and develop appropriate technologies and management patterns for above production systems.

27. Case studies of typical holistic technologies, management models and production systems

28. Strategy for transition from the present state to Universal Human Order:

a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b) At the level of society: as mutually enriching institutions and organizations

Books and References:

1. R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi, 2010, ISBN 978-8-174-46781-2

2. B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

3. PL Dhar, RR Gaur, 1990, Science and Humanism, Commonwealth Publishers.

4. Susan George, 1976, How the Other Half Dies, Penguin Press. Reprinted 1986,

5. A.N. Tripathy, 2003, Human Values, New Age International Publishers.

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II Year IV Semester
BTAU 407: MACHINE DRAWING-II LAB

Introduction: Conventional representation of machine components and materials, Conventional representation of surface finish, Roughness number symbol, Symbols of Machine elements and welded joints. Classification of Drawings: Machine drawings, Production drawing, part drawing and assembly drawing. Introduction to detail drawing and bill of materials (BOM).

Limits, Fits and Tolerances: General aspects, Nominal size and basic dimensions, Definitions, Basis of fit or limit system, Systems of specifying tolerances, Designation of holes, Shafts and fits, Commonly used holes and shafts. List of Standard Abbreviation used.

Part Modeling: Introduction to part modeling of simple machine components using any 3D software (like CATIA, PRO E, UGNX, Autodesk Inventor or SOLIDWORKS) covering all commands/ features to develop a part model (*Minimum 24 machine components need to be developed*).

Part Modeling & Assemblies of: Plummer Block Bearing, Machine Vice, Screw Jack, Engine Stuffing box, Lathe Tailstock, Feed Check Valve and Rams Bottom Safety Valve.

Books and References:

1. Textbook of Machine Drawing, K C John, PHI
2. Machine Drawing by K.R. Gopalakrishna, Subhas Stores.
3. A Textbook of Machine Drawing by PS Gill from S.K. Kataria & Sons
4. Machine Drawing-KL Narayana, P Kannaiah, KV Reddy, New Age publications
5. Engineering Graphics with AutoCAD, Bethune, PHI
6. Machine Drawing, N. Siddeshwar, P Kannaiah, VVS Shastry, Tata McGraw Hill
7. Fundamentals of Machine Drawing, Dr Sadhu Singh & P L Shah, Prantice Hall India
8. Autodesk Inventor by Examples, Sam Tikoo, Wiley.

EVALUATION SCHEME

B.Tech- Automobile Engineering

III Year Semester-V

SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS. (30)	EXT. (70)	SESS. (25)	EXT. (25)	
BTAU-501	MANAGERIAL ECONOMICS	30	70	NA	NA	100
BTAU-502	MACHINE DESIGN	30	70	25	25	150
BTAU-503	SOCIOLOGY	30	70	NA	NA	100
BTAU-504	AUTOMOTIVE ENGINES	30	70	NA	NA	100
BTAU-505	HEAT & MASS TRANSFER	30	70	25	25	150
BTAU-506	VEHICLE TRANSPORT MANAGEMENT	30	70	NA	NA	100
BTAU-507	AUTOMOTIVE COMPONENTS LAB	NA	NA	25	25	50

Semester-VI

SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS. (30)	EXT. (70)	SESS. (25)	EXT. (25)	
BTAU-601	INDUSTRIAL MANAGEMENT	30	70	NA	NA	100
BTAU-602	AUTOMOTIVE FUELS AND LUBRICANTS	30	70	25	25	150
BTAU-603	THEORY OF MACHINES	30	70	25	25	150
BTAU-604	AUTOMOTIVE CHASSIS AND SUSPENSION	30	70	NA	NA	100
BTAU-605	VEHICLE DYNAMICS	30	70	NA	NA	100
BTAU-606	CYBER SECURITY	30	70	NA	NA	100
BTAU-607	DESIGN & SIMULATION LAB	NA	NA	25	25	50

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BTAU- 501 MANAGERIAL ECONOMICS

UNIT I

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Meaning of Demand, Determinants of Demand, Shifts in demand, Law of Demand, Price Elasticity of Demand & Types, Income Elasticity, Cross price Elasticity, Determinants of Elasticity, uses and Importance of elasticity.

UNIT II

Concept of Supply: Law of Supply, Factors affecting Supply, Elasticity of supply.

Demand Forecasting: Introduction, Meaning and Forecasting, Methods or Techniques of Demand Forecasting, Criteria for Good Demand Forecasting, Demand Forecasting for a New Product;

UNIT III

Cost Analysis- Introduction, Types of Costs, Cost-Output Relationship: Cost Function, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run; Short run and long run, Break- Even Analysis; Production functions: laws of variable proportions, law of returns; Economies of scale: Internal and external.

UNIT IV

Market Structure: Market Structure Perfect Competition, Imperfect competition – Monopolistic, Oligopoly, duopoly sorbent features of price determination and various market conditions.

UNIT V

Nature and characteristics of Indian economy, concepts of LPG, elementary concepts of National Income, Inflation and Business Cycles ,Concept of N.I. and Measurement., Meaning of Inflation, Types and causes , Phases of business cycle .Investment decisions for boosting economy(National income and per capital income)

TEXT BOOKS-

1. Premvir Kapoor, Sociology and Economics for Engineers, Khanna Publishing House (Edition 2018)
2. Salvatore D, —Principles of Microeconomics, Oxford University Press.
3. Koutsoyiannis A, —Modern Microeconomic, Macmillan Education Ltd.
4. Dwivedi DN, —Principles of Microeconomics, Pearson Education.
5. Cowell, FA, —Microeconomic Principles and Analysis, Oxford University Press.

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III Year V Semester
BTAU- 502 MACHINE DESIGN

UNIT I

Introduction Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads. Design for Static Load Modes of failure, Factor of safety, Principal stresses, Stresses due to bending and torsion, Theory of failure.

UNIT II

Design for Fluctuating Loads Cyclic stresses, Fatigue and endurance limit, Stress concentration factor, Stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria. Riveted Joints Riveting methods, materials, Types of rivet heads, Types of riveted joints, Caulking and Fullering, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints, Eccentric loaded riveted joint.

UNIT III

Shafts Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads, Design for rigidity.

UNIT IV

Mechanical Springs Types, Material for helical springs, End connections for compression and tension helical springs, Stresses and deflection of helical springs of circular wire, Design of helical springs subjected to static and fatigue loading.

UNIT V

Keys and Couplings Types of keys, splines, Selection of square & flat keys, Strength of sunk key, Couplings, Design of rigid and flexible couplings. Power Screws Forms of threads, multiple threads, Efficiency of square threads, Trapezoidal threads, Stresses in screws, Design of screw jack Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements, V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria & Sons.
3. Machine Design, U C Jindal, Pearson Education.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Elements-M.F. Spott, Pearson Education
6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
8. Elements of Machine Component Design, Juvinall & Marshek, John Wiley & Sons.

BTAU- 502 MACHINE DESIGN LAB

List of practical's

1. Design & drawing of Cotter joint.
2. Design & drawing of Knuckle joint
3. Design of machine components subjected to combined steady and variable loads
4. Design of eccentrically loaded riveted joint
5. Design of boiler riveted joint
6. Design of shaft for combined constant twisting and bending loads
7. Design of shaft subjected to fluctuating loads
8. Design and drawing of flanged type rigid coupling
9. Design and drawing of flexible coupling
10. Design and drawing of helical spring
11. Design and drawing of screw jack

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BTAU-503 SOCIOLOGY

Unit-I

Industrial Sociology: Nature, Scope and Importance of Industrial Sociology. Social Relations in Industry, Social Organization in Industry- Bureaucracy, Scientific Management and Human Relations.

Unit-II

Rise and Development of Industry : Early Industrialism – Types of Productive Systems – The Manorial or Feudal system. The Guild system, The domestic or putting-out system, and the Factory system. Characteristics of the factory system. Causes and Consequences of industrialization. Obstacles to and Limitations of Industrialization.

Unit-III

Industrialization in India. Industrial Policy Resolutions – 1956.Science.Technology and Innovation Policy of India 2013.

Unit-IV

Contemporary Issues : Grievances and Grievance handling Procedure.

Industrial Disputes: causes, Strikes and Lockouts. Preventive Machinery of Industrial Disputes: Schemes of Workers Participation in Management- Works Committee, Collective Bargaining, Bi-partite & Tri-partite Agreement ,Code of Discipline, Standing Orders. Labor courts & Industrial Tribunals,

Text and References books :

1. GISBERT PASCAL, Fundamentals of Industrial sociology, Tata McGraw Hill Publishing Co., New Delhi, 1972.
2. SCHNEIDER ENGNO V., Industrial Sociology 2nd Edition, McGraw Hill Publishing Co., New Delhi, 1979.
3. MAMORIA C.B. And MAMORIA S., Dynamics of Industrial Relations in India.
4. SINHA G.P. and P.R.N. SINHA, Industrial Relations and Labor Legislations, New Delhi, Oxford and IBH Publishing Co., 1977.
5. NADKARNI, LAKSHMI, Sociology of Industrial Worker,Rawat,Jaipur,1998.
6. BHOWMICK SHARIT,Industry,Labour and Society,Orient,2012.

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III Year V Semester

BTAU- 504 AUTOMOTIVE ENGINES

Unit -I

Construction and operation: Constructional details of spark ignition (SI) and compression ignition (CI) engines. Working principles. Two stroke SI and CI engines – construction and working. Comparison of SI and CI engines and four stroke and two stroke engines. Engine classification, firing order. Otto, diesel and dual cycles.

Unit–II SI Engines: Combustion in SI engine, Flame speed, Ignition delay, abnormal combustion and its Control, combustion chamber design for SI engines, Carburetion, Mixture requirements, Carburetors and fuel injection system in SI Engine, Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark Plug, Electronic ignition, Scavenging in 2 Stroke engines, Supercharging and its effect.

Unit–III CI Engine: Combustion in CI engines, Ignition delay, Knock and its control, Combustion chamber design of CI engines. Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings, Exhaust emissions from SI engine and CI engine and its control.

Unit-IV Engine Cooling and Lubrication: Different cooling systems, Radiators and cooling fans, Engine Friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation. Different Fuels used in SI & CI Engines. Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines

Unit V Compressors: Classification, Reciprocating compressors, Single and Multi stage compressors, Intercooling, Volumetric efficiency. Rotary compressors, Classification, Centrifugal compressor, Axial compressors, Surging and stalling, Roots blower, Vaned compressor.

TEXT BOOKS:

1. Ganesan V., "Internal Combustion Engines", Tata McGraw Hill, 2007
- 1 Ramalingam K.K., -Internal Combustion Engines, Sci-Tech Publications, 2005
3. Mathur and Sharma "Fundamental Combustion Engines" Dhanpat Rai and Sons, 2002 Engineering
4. A.K. Babu, Automotive Engines, Khanna Publishing House
5. I.C Engine, by R. Yadav, Central Publishing House, Allahabad.

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**Evaluation Scheme & Syllabus for
Department Of Automobile Engineering**

B.Tech -Automobile Engineering
(IIIrd Year: V to VI Semester)
(Effective from session 2019-20)

EVALUATION SCHEME

B.Tech- Automobile Engg.

III Year Semester-V

SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS.	EXT.	SESS.	EXT.	
		(30)	(70)	(25)	(25)	
BTAU-501	MANAGERIAL ECONOMICS	30	70	NA	NA	100
BTAU-502	MACHINE DESIGN-I	30	70	25	25	150
BTAU-503	SOCIOLOGY	30	70	NA	NA	100
BTAU-504	AUTOMOTIVE ENGINES	30	70	NA	NA	100
BTAU-505	HEAT & MASS TRANSFER	30	70	25	25	150
BTAU-506	VEHICLE TRANSPORT MANAGEMENT	30	70	NA	NA	100
BTAU-507	AUTOMOTIVE COMPONENTS LAB	NA	NA	25	25	50
BTAU-508	DESIGN & SIMULATION LAB-I	NA	NA	25	25	50

Semester-VI

SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS.	EXT.	SESS.	EXT.	
		(30)	(70)	(25)	(25)	
BTAU-601	INDUSTRIAL MANAGEMENT	30	70	NA	NA	100
BTAU-602	AUTOMOTIVE FUELS AND LUBRICANTS	30	70	25	25	150
BTAU-603	THEORY OF MACHINES	30	70	25	25	150
BTAU-604	AUTOMOTIVE CHASSIS AND SUSPENSION	30	70	NA	NA	100
BTAU-605	VEHICLE DYNAMICS	30	70	NA	NA	100
BTAU-606	CYBER SECURITY	30	70	NA	NA	100
BTAU-607	DESIGN & SIMULATION LAB-II	NA	NA	25	25	50
BTAU-608	REFRIGERATION & AIR CONDITIONING LAB	NA	NA	25	25	50

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III Year V Semester

BTAU- 501 MANAGERIAL ECONOMICS

UNIT I

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of Economics, Relation between science, engineering, technology and economics; Meaning of Demand, Determinants of Demand, Shifts in demand, Law of Demand, Price Elasticity of Demand & Types, Income Elasticity, Cross price Elasticity, Determinants of Elasticity, uses and Importance of elasticity.

UNIT II

Concept of Supply: Law of Supply, Factors affecting Supply, Elasticity of supply.

Demand Forecasting: Introduction, Meaning and Forecasting, Methods or Techniques of Demand Forecasting, Criteria for Good Demand Forecasting, Demand Forecasting for a New Product;

UNIT III

Cost Analysis- Introduction, Types of Costs, Cost-Output Relationship: Cost Function, Cost-Output Relationships in the Short Run, and Cost-Output Relationships in the Long Run; Short run and long run, Break- Even Analysis; Production functions: laws of variable proportions, law of returns; Economies of scale: Internal and external.

UNIT IV

Market Structure: Market Structure Perfect Competition, Imperfect competition – Monopolistic, Oligopoly, duopoly sorbent features of price determination and various market conditions.

UNIT V

Nature and characteristics of Indian economy, concepts of LPG, elementary concepts of National Income, Inflation and Business Cycles ,Concept of N.I. and Measurement., Meaning of Inflation, Types and causes , Phases of business cycle .Investment decisions for boosting economy(National income and per capital income)

TEXT BOOKS-

1. Premvir Kapoor, Sociology and Economics for Engineers, Khanna Publishing House (Edition 2018)
2. Salvatore D, —Principles of Microeconomics, Oxford University Press.
3. Koutsoyiannis A, —Modern Microeconomic, Macmillan Education Ltd.
4. Dwivedi DN, —Principles of Microeconomics, Pearson Education.
5. Cowell, FA, —Microeconomic Principles and Analysis, Oxford University Press.

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III Year V Semester

BTAU- 502 MACHINE DESIGN-I

UNIT I

Introduction Definition, Design requirements of machine elements, Design procedure, Standards in design, Selection of preferred sizes, Indian Standards designation of carbon & alloy steels, Selection of materials for static and fatigue loads. Design for Static Load Modes of failure, Factor of safety, Principal stresses, Stresses due to bending and torsion, Theory of failure.

UNIT II

Design for Fluctuating Loads Cyclic stresses, Fatigue and endurance limit, Stress concentration factor, Stress concentration factor for various machine parts, Notch sensitivity, Design for finite and infinite life, Soderberg, Goodman & Gerber criteria. Riveted Joints Riveting methods, materials, Types of rivet heads, Types of riveted joints, Caulking and Fullering, Failure of riveted joint, Efficiency of riveted joint, Design of boiler joints, Eccentric loaded riveted joint.

UNIT III

Shafts Cause of failure in shafts, Materials for shaft, Stresses in shafts, Design of shafts subjected to twisting moment, bending moment and combined twisting and bending moments, Shafts subjected to fatigue loads, Design for rigidity.

UNIT IV

Mechanical Springs Types, Material for helical springs, End connections for compression and tension helical springs, Stresses and deflection of helical springs of circular wire, Design of helical springs subjected to static and fatigue loading.

UNIT V

Keys and Couplings Types of keys, splines, Selection of square & flat keys, Strength of sunk key, Couplings, Design of rigid and flexible couplings. Power Screws Forms of threads, multiple threads, Efficiency of square threads, Trapezoidal threads, Stresses in screws, Design of screw jack Note: Design data book is allowed in the examination

Books and References:

1. Design of Machine Elements, V.B. Bhandari, Tata McGraw Hill Co.
2. Machine Design-Sharma and Agrawal, S.K. Kataria & Sons.
3. Machine Design, U C Jindal, Pearson Education.
4. Design of Machine Elements, Sharma and Purohit, PHI.
5. Design of Machine Elements-M.F. Spott, Pearson Education
6. Machine Design-Maleev and Hartman, CBS Publishers.
7. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
8. Elements of Machine Component Design, Juvinall & Marshek, John Wiley & Sons.

BTAU- 502 List of practical's

1. Design & drawing of Cotter joint.
2. Design & drawing of Knuckle joint
3. Design of machine components subjected to combined steady and variable loads
4. Design of eccentrically loaded riveted joint
5. Design of boiler riveted joint
6. Design of shaft for combined constant twisting and bending loads
7. Design of shaft subjected to fluctuating loads
8. Design and drawing of flanged type rigid coupling
9. Design and drawing of flexible coupling
10. Design and drawing of helical spring
11. Design and drawing of screw jack

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III Year V Semester

BTAU-503 SOCIOLOGY

Unit-I

Industrial Sociology: Nature, Scope and Importance of Industrial Sociology. Social Relations in Industry, Social Organization in Industry- Bureaucracy, Scientific Management and Human Relations.

Unit-II

Rise and Development of Industry : Early Industrialism – Types of Productive Systems – The Manorial or Feudal system. The Guild system, The domestic or putting-out system, and the Factory system. Characteristics of the factory system. Causes and Consequences of industrialization. Obstacles to and Limitations of Industrialization.

Unit-III

Industrialization in India. Industrial Policy Resolutions – 1956. Science.Technology and Innovation Policy of India 2013.

Unit-IV

Contemporary Issues: Grievances and Grievance handling Procedure.

Industrial Disputes: causes, Strikes and Lockouts. Preventive Machinery of Industrial Disputes: Schemes of Workers Participation in Management- Works Committee, Collective Bargaining, Bi-partite & Tri-partite Agreement, Code of Discipline, Standing Orders. Labour courts & Industrial Tribunals,

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III Year V Semester

BTAU- 504 AUTOMOTIVE ENGINES

Unit -I

Construction and operation: Constructional details of spark ignition (SI) and compression ignition (CI) engines. Working principles. Two stroke SI and CI engines – construction and working. Comparison of SI and CI engines and four stroke and two stroke engines. Engine classification, firing order. Otto, diesel and dual cycles.

Unit-II

SI Engines: Combustion in SI engine, Flame speed, Ignition delay, abnormal combustion and its Control, combustion chamber design for SI engines, Carburetion, Mixture requirements, Carburetors and fuel injection system in SI Engine, Ignition system requirements, Magneto and battery ignition systems, ignition timing and spark Plug, Electronic ignition, Scavenging in 2 Stroke engines, Supercharging and its effect

Unit-III

CI Engine: Combustion in CI engines, Ignition delay, Knock and its control, Combustion chamber design of CI engines. Fuel injection in CI engines, Requirements, Types of injection systems, Fuel pumps, Fuel injectors, Injection timings, Exhaust emissions from SI engine and CI engine and its control

Unit-IV

Engine Cooling and Lubrication: Different cooling systems, Radiators and cooling fans, Engine Friction, Lubrication principle, Type of lubrication, Lubrication oils, Crankcase ventilation. Different Fuels used in SI & CI Engines. Testing and Performance: Performance parameters, Basic measurements, Blow by measurement, Testing of SI and CI engines

Unit V

Compressors: Classification, Reciprocating compressors, Single and Multi stage compressors, Intercooling, Volumetric efficiency. Rotary compressors, Classification, Centrifugal compressor, Axial compressors, Surging and stalling, Roots blower, Vaned compressor.

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3. Mathur and Sharma "Fundamental Combustion Engines" Dhanpat Rai and Sons, 2002 Engineering
4. A.K. Babu, Automotive Engines, Khanna Publishing House
5. I.C Engine, by R. Yadav, Central Publishing House, Allahabad

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III Year V Semester

BTAU- 505 HEAT & MASS TRANSFER

UNIT-1

Introduction to Heat Transfer: Thermodynamics and Heat Transfer. Modes of Heat Transfer: Conduction, convection and radiation. Effect of temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism.

Conduction : General differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems. Initial and boundary conditions. Steady State one-dimensional Heat conduction : Simple and Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; Concept of thermal resistance. Analogy between heat and electricity flow; Thermal contact resistance and over all heat transfer coefficient; Critical radius of insulation.

UNIT-II

Fins: Heat transfer from extended surfaces, Fins of uniform cross-sectional area; Errors of measurement of temperature in thermometer wells. Transient Conduction: Transient heat conduction; Lumped capacitance method; Time constant; Unsteady state heat conduction in one dimension only.

UNIT-III

Forced Convection: Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Approximate integral boundary layer analysis; Analogy between momentum and heat transfer in turbulent flow over a flat surface; Mixed boundary layer; Flow over a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts; Thermal entrance region, Empirical heat transfer relations; Relation between fluid friction and heat transfer; Liquid metal heat transfer.

Natural Convection : Physical mechanism of natural convection; Buoyant force; Empirical heat transfer relations for natural convection over vertical planes and cylinders, horizontal plates and cylinders, and sphere, Combined free and forced convection.

UNIT-4

Thermal Radiation : Basic radiation concepts; Radiation properties of surfaces; Black body radiation Planck's law, Wein's displacement law, Stefan Boltzmann law, Kirchoff's law; ; Gray body; Shape factor; Black-body radiation; Radiation exchange between diffuse non black bodies in an enclosure; Radiation shields; Radiation combined with conduction and convection; Absorption and emission in gaseous medium; Solar radiation; Green house effect.

UNIT-5

Heat Exchanger :Types of heat exchangers; Fouling factors; Overall heat transfer coefficient; Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method; Compact heat exchangers. **Condensation and Boiling:** Introduction to condensation phenomena; Heat transfer relations for laminar film condensation on vertical surfaces and on outside & inside

of a horizontal tube; Effect of non-condensable gases; Drop wise condensation; Heat pipes; Boiling modes, pool boiling; Hysteresis in boiling curve; Forced convection boiling.

Introduction to Mass Transfer:

Introduction; Fick's law of diffusion; Steady state equimolar counter diffusion; Steady state diffusion through a stagnant gas film.

Texts Books:

1. Fundamentals of Heat and Mass Transfer, by Incropera & DeWitt, John Wiley and Sons
2. Heat and Mass Transfer by Cengel, McGraw-Hill
3. Heat Transfer by J.P. Holman, McGraw-Hill
4. Heat and Mass Transfer by Rudramoorthy and Mayilsamy, Pearson Education
5. Heat Transfer by Ghoshdastidar, Oxford University Press
6. A text book on Heat Transfer, by Sukhatme, University Press.
7. Heat Transfer by Venkateshan, Ane Books Pvt Ltd
8. Schaum's outline of Heat Transfer by Pitts & Sisson McGraw-Hill
9. Heat and Mass Transfer by R Yadav, Central Publishing House.

BTAU- 505 HEAT & MASS TRANSFER

List of practical's

1. Conduction – Experiment on Composite plane wall
2. Conduction – Experiment on Composite cylinder wall
3. Conduction - Experiment on critical insulation thickness
4. Conduction – Experiment on Thermal Contact Resistance
5. Convection - Pool Boiling experiment
6. Convection - Experiment on heat transfer from tube-(natural convection).
7. Heat exchanger - Parallel flow experiment And Counter flow experiment
8. Convection - Heat transfer through fin-(natural convection) .
9. Convection - Heat transfer through tube/fin-(forced convection).
10. Experiment on solar collector.
11. Experiment on Stefan's Law, on radiation determination of emissivity, etc.

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III Year V Semester

BTAU-506 VEHICLE TRANSPORT MANAGEMENT

UNIT-1

Historical Back ground: Introduction, the growth of a network, trams, trolley buses, private car's subsidies The Infrastructure: Road- Approach Road. Highways National, State, District, traffic condition, relief of congestion, pedestrians, zebra lines, margins, shopping centres. Bus-stops, shelters .Bus stations. Garages layout of premises, equipment, use of machinery, conveyance of staff, facilities for passengers. Maintenance -preventive, breakdown, overhauling -major, minor.

UNIT –II

Organisation and Management: Forms of ownership, principle of transport, management – internal organisation, centralised condition, decentralised condition (Engineering, traffic and administration), staff administration: industrial relation, administration, recruitment and training, welfare, health and safety. Public relations divisions: Dissemination of information, maintaining goodwill- handling complaints, traffic advisory, committees- local contractors co-operation with the press news and articles- facilities for visitors- forms of publicity importance of quality -inter departmental liaison advertisements, signs, notice and directions general appearance of premises, specialized publicity.

UNIT-III

Prevention of accidents: Emphasis of safe driving-annual awards bonus encouragement vehicle design platform, layout, location of steps, scheduled route hazards records elimination of accident prone devices. Route planning: Source of traffic, town planning, turning paints, stopping places, shelters survey of route preliminary schedule test runs elimination of hazards factors affecting. Frequency direction of traffic flow estimated traffic possibility single verses double deck.

UNIT-IV

Timing, bus working and schedules: Time table layout uses of flat graph method of presentation preparation of vehicle and crew schedule preparation of the duty roster, co-operation with employers use of the vehicle running numbering determination of vehicle efficiency, checking efficiency of crew, duty arrangements. Fare collections systems: Principles of collection the way bill, bell punch system reduced ticket stocks wilk brew system T.I.M and straight M/C/S. The verometer lensonparason coach tickets exchanges, box system personal and common stock flat fare platform control.

UNIT-V

The fare structure: Basis of fares historical background effects of competition and control calculating average zone system straight and tapered scale elastic and inelastic demand coordination of fares concessions fares changes for workman. Anomalies double booking inter availability through booking and summation private hire charges. Operating cost and types of vehicles: Classification costs, average speed running costs supplementary costs depreciation

obsolescence, life of vehicles sinking fund factor affecting post per vehicles mile incidence of wages and overheads 100 seats miles basis, average seating capacity vehicles size and spread overs, types of vehicle economic considerations authorization of trolley, bus services, statutory procedure taxes and hire cars.

TEXTBOOKS:

1. Bus operation -L.d kitchen, iliffe& sons
2. Bus & coach operation -Rex w. fautks. butterworth version of 1987
3. Hybrid Electric Vehicles, AK Babu, Khanna Publishing House 3. A Course in International Combustion Engines, by Mathur& Sharma, DhanpatRai& Sons.
4. I.C Engine Analysis & Practice by E.F Obert.
5. I.C Engine, by V. Ganeshan, Tata McGraw Hill Publishers.
6. I.C Engine, by R. Yadav, Central Publishing House, Allahabad
7. Reciprocating and Rotary Compressors, by Chlumsky, SNTI Publications, Czechoslovakia
8. Turbines, Compressors and Fans, by S.M.Yahya, Tata McGraw Hill Pub.
9. Engineering Fundamentals of Internal Combustion Engines by W.W. Pulkrabek, Pearson Education.

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BTAU- 507 AUTOMOTIVE COMPONENTS LAB

LIST OF EXPERIMENTS (Minimum Ten Experiments are required to be conducted)

1. Dismantling and study of Multi-cylinder Petrol Engine
2. Assembling of Multi-cylinder Petrol Engine
3. Dismantling and study of Multi-cylinder Diesel Engine
4. Assembling of Multi-cylinder Diesel Engine
5. Study of petrol engine fuel system
6. Study of diesel engine fuel system
7. Study and measurement of light and heavy commercial
8. Vehicle Frame
9. Study, dismantling and assembling of front and rear
10. Axles
11. Study, dismantling and assembling of differential
12. Study, dismantling and assembling of Clutch
13. Study, dismantling and assembling of Gear Box
14. Study of steering system
15. Performance of CI and SI engine
16. Impact of Variable compression ratio on Performance

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III Year VI Semester

BTAU-508 DESIGN AND SIMULATION LAB-I

1. Design & Modeling of Cotter joint.
2. Design & Modeling of Knuckle joint
3. Design & Modeling of riveted joint applied to boiler joints.
4. Study of a FEA package and modeling stress analysis of
 - a. Bars of constant cross section area, tapered cross section area and stepped bar
 - b. Trusses,
 - c. Beams – Simply supported, cantilever, beams with UDL, beams with varying load etc
5. Mini Project: Will take up problems from real life applications and optimize using modeling and analysis software

Each student will be given a real life problem for the complete design of a subsystem/system using either manual calculation with the help of design handbook or through computer programme or through software tools. This assignment should be done in groups, which will be submitted at the end of the semester.

Text Books:

1. Design of Machine Elements, V.B. Bhandari, Tata McGraw Hill Co.
2. Design of Machine Elements, Sharma and Purohit, PHI.
3. Machine Design-R S Khurmi and J K Gupta, S Chand
4. Machine Design, Sadhu Singh, Khanna Publishing House
5. J N Reddy “An Introduction to finite element method” Tata Mc Graw Hill 3rd edition
6. S.S. Rao, “Finite Element Method In Engineering”, Pergaman Press
7. Machine Design, Sadhu Singh, Khanna Publishing House
8. P Seshu, Finite Element Analysis, PHI publications, Delhi

Design data book: Design Data Handbook for Mechanical Engineering in SI and Metric Units – by K. Mahadevan, and K. Balaveera Reddy

References:

1. Design of Machine Elements-M.F. Spott, Pearson Eductaion
2. Machine Design-Maleev and Hartman, CBS Publishers.
3. Mechanical Engineering Design, 9e – Joseph E. Shigely, McGraw Hill Education.
4. Design of Machine Elements, Gope PHI.
5. Finite Element Method with Applications in Engineering Y M Desai, Pearson Publication
6. Introduction to Finite Element Analysis by Tirupathi R.Chandrupatla & Ashok D Belegundu, Pearson Publication
7. V.Ramamurti “Finite Element Method in Machine Design”Norosa Publishing House

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III Year VI Semester

BTAU-601: INDUSTRIAL MANAGEMENT

Unit-I

Introduction: Concept, Development, application and scope of Industrial Management.

Productivity: Definition, measurement, productivity index, types of production system, Industrial Ownership.

Unit-II

Management Function: Functions of Management, Taylor's Scientific Management Theory, Fayol's Principles of Management, Social responsibilities of Management,

Introduction to Human resources management: Nature of HRM, functions and importance of HRM.

Unit-III

Work Study: Introduction, definition, objectives, steps in work study, Method study: definition, objectives, and steps of method study, Work Measurement: purpose, types of study — stop watch methods — steps — allowances — standard time calculations — work sampling, Production Planning and Control

Inventory Control: Inventory, Cost, Deterministic Models, and Introduction to supply chain management.

Unit-IV

Quality Control: Process control, SQC, Control charts, Single, Double and Sequential Sampling, Introduction to TQM.

Unit-V

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

BOOKS AND REFERENCE:

1. Statistical Quality Control by Grant and Leavarworth, McGraw Hill
2. Industrial Management By O P Khan.
3. Problems in Operations Research by- Prem Kumar Gupta & D.S. Hira, S. Chand

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III Year VI Semester

BTAU 602 AUTOMOTIVE FUELS AND LUBRICANTS

UNIT I

MANUFACTURE OF FUELS AND LUBRICANTS

Structure of petroleum refining process, classification of petroleum fuels, thermal cracking, catalytic cracking, polymerization, alkylation isomerization, blending, products of refining process. Manufacture of lubricating oil base stocks, manufacture of finished automotive lubricants.

UNIT II

PROPERTIES & TESTING OF FUELS

Thermo-chemistry of fuels, properties and testing of fuels & Lubricants, relative density, calorific value, fire point, distillation, vapor pressure, flash point, spontaneous ignition, temperature, viscosity, pour point, flammability, ignitability, diesel index. API gravity, aniline point, Viscosity index etc.

UNIT III

FUEL RATING & ADDITIVES:

Fuels for SI and CI engine, important qualities of SI and CI engine fuels, Rating of SI engine and CI engine fuels, Dopes, Gaseous fuels Additive - mechanism, requirements of an additive, petrol fuel additives and diesel fuel additives specifications of fuels, diesel knock, Cetane rating.

UNIT IV

ALTERNATE FUELS

Use of alternate fuel in engines- LPG. CNG need for alternate fuels, availability & their properties, general use of alcohols. LPG.CNG.LNG, hydrogen, ammonia, vegetable oils, biodiesel & biogas. merits & demerits of alternate fuels. Introduction to alternate energy sources like, electric vehicle, hybrid, fuel cell & solar cars.

UNIT V LUBRICANTS

Classification of lubricating oils, properties of lubricating oils, tests on lubricants. Grease classification, properties, tests. Specific requirements for automotive lubricants, oxidation, deterioration and degradation of lubricants, additives, synthetic lubricants.

THEORY OF LUBRICANTS: Engine friction - introduction, total engine friction, effect of engine variables on friction, hydrodynamic lubrication, elasto hydrodynamic lubrication, boundary lubrication, bearing lubrication, functions of the lubrication system, introduction to design of a lubricating system.

TEXT BOOKS

1. Fuels - Solids. Liquids. Gaseous by Brame. J.S.S. and King. I. G.
2. Lubrication. Raymond G. Gunther, Chipton Book Co., 1971.
3. Fuels and Fuel Technology by Francis, W, Vol. I & II
4. Elements of Fuels and Combustion, O.P. Gupta, Khanna Book Publishing Co
5. Automotive Engines, A.K. Babu, Khanna Publishing House

BTAU 602 AUTOMOTIVE FUELS AND LUBRICANTS LAB

Minimum eight experiments out of the followings:

1. Temperature dependence of viscosity of lubrication oil by Redwood Viscometer.
2. Viscosity Index of lubricating oil by Saybott Viscometer.
3. Flash and Fire points of Diesel, K-Oil, Bio Diesel.
4. Flash and Fire points of lubricants.
5. Drop point of grease and mechanical penetration in grease.
6. Calorific value of liquid fuel.
7. Calorific value of gaseous fuel
8. Study of semi-solid lubrication in various Automobile Unit & Joints
9. Study of lubrication in transmission, final drive, steering gearbox.
10. Study of analytical equipment for oil analysis.
11. To find out volatility characteristic of different fuels by ASTM distillation methods (diesel, gasoline lubricants).

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BTAU- 603 -THEORY OF MACHINES

Unit I

INTRODUCTION: DEFINITIONS: Link or element, kinematic pairs, degrees of freedom, Grubler's criterion (without derivation), Kinematic chain, Mechanism, structure, Mobility of Mechanism, Inversion, Machine Gashoff's criteria. Kinematic Chains And Inversions: Inversions of Four bar chain; Single slider crank chain and Double slider crank chain. **MECHANISMS:** Quick return motion mechanisms- Drag link mechanism, Whitworth mechanism and Crank and slotted lever Mechanism. Straight line motion mechanisms Peaucellier's mechanism and Robert's mechanism. Intermittent Motion mechanisms Geneva mechanism and Ratchet and Pawl mechanism. Toggle mechanism, Pantograph, Davis & Ackerman steering gear mechanism.

Unit II

CAMS: Types of cams, Types of followers, Displacement, Velocity and Acceleration time curves for cam profiles. Disc cam with reciprocating follower having knife-edge, roller and flat-faced follower, Disc cam with oscillating roller follower, Follower motions including SHM, Uniform velocity, uniform acceleration and retardation and Cycloidal motion.

Unit III

BALANCING OF MACHINERY: Static and Dynamic balancing, balancing of singlerotating mass in same plane and in different planes. Balancing of several rotating masses in same plane and in different planes. Balancing of reciprocating masses. Inertia effect of crank and connecting rod.

Unit - IV

SPUR GEARS: Gear terminology, law of gearing, Characteristics of involute action, Path of contact, Arc of contact, Contact ratio, Interference in involute gears, Methods of avoiding: interference, Back lash, Comparison of involute and cycloidal teeth **GEAR TRAINS:** Simple gear trains, Compound gear trains for large speed reduction, Epicyclic gear trains, Algebraic and tabular methods of finding velocity ratio of epicyclic gear trains. Tooth load and torque calculations in epicyclic gear trains.

Unit V

BELTS, ROPES AND CHAINS: Introduction, Belt and Rope drives, open and crossed belt drives, action of belt on pulleys, velocity ratio, slip, law of belting, length of belt, Ratio of friction, chains, chain length and analytical, classification of chains. **GOVERNORS:** Types of governors; force analysis of Porter and Hartnell governors. Controlling force, stability, sensitiveness, isochronisms, effort and power.

Text Books:

1. Rattan S.S, -Theory of Machines| Tata McGraw-Hill Publishing Co. Ltd., New Delhi
2. Sadhu Singh, -Theory of Machines,| Pearson Education (Singapore) Pvt. Ltd.,
3. Mechanical Vibrations – G. K. Groover, Jain Brothers, Roorkee
4. Ambekar, AG; Mechanism and Machine Theory;PHI

BTAU- 603 THEORY OF MACHINES LAB

Note: Minimum Ten experiments out of the following:

1. Study of simple linkage models/mechanisms
2. Study of inversions of four bar linkage
3. Study of inversions of single/double slider crank mechanisms
4. Experiment on Gears tooth profile, interference etc.
5. Experiment on Gear trains
6. Experiment on longitudinal vibration
7. Experiment on transverse vibration
8. Experiments on dead weight type governor
9. Experiment on spring controlled governor
10. Experiment on critical speed of shaft
11. Experiment on gyroscope
12. Experiment on static/dynamic balancing
13. Experiment on Brake
14. Experiment on clutch

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BTAU 604 AUTOMOTIVE CHASSIS AND SUSPENSION

Unit-I

Automotive chassis: Definition; chassis layout; types of chassis layout with reference to power plant location, steering position and drive on wheels; chassis components; chassis classification; Automotive frames: Construction; functions; loads acting; materials; types; frame cross sections; frame diagnosis and service; dimensions of wheel base; wheel track; chassis overhang and ground clearance.

Unit II

Front axle & steering system: Functions, construction & types of front axle; front wheel geometry; front wheel drive; steering mechanisms; steering linkages & layout; types of steering gear boxes; power & power assisted steering; electronic steering; four-wheel steering; terminology-reversible steering, under-steering, over-steering, turning radius.

Unit III

Suspension system: Need; factors influencing ride comfort; types; suspension springs-leaf spring, coil spring & torsion bar; spring materials; independent suspension; rubber suspension; pneumatic suspension; hydraulic suspension, shock absorbers-liquid & gas filled.

Unit IV

Braking systems: Introduction, principles of braking; classification; brake actuating mechanisms; **Drum brake-** theory; principle; construction; working; **Disc brake-** theory, principle, construction, working; **Parking brake-** theory, principle; construction, types; **Hydraulic system** theory, principles, master-cylinder basics, wheel-cylinder basics, tubing & hoses, valves & switches, brake fluid; **Power brake-** theory, vacuum-booster basics, hydraulic-booster basics, electro-hydraulic booster basics; **Advanced brake theories;** Exhaust brake; abs technology; factors affecting brake performance operating temperature, area of brake lining, clearance.

Unit V

Wheel: Forces acting on wheels, construction of wheel assembly, types- spoke, disc & built-up wheels; wheel balancing; wheel alignment; **Tyres:** Static & rolling properties of tyres, construction details, types of tyres- pneumatic & hydraulic; types of tyre-wear & their causes; tyre rotation.

Bearings: Functions; classification of bearings; bearing materials; automotive bearings.

Books and References:

1. Automobile engineering", Dr. Kripal Singh.
2. A.K. Babu, Automotive Mechanics, Khanna Publishing House
3. Automobile engineering" K.M. Gupta.
4. Heldt P.M., "Automotive chassis", Chilton Co., New York.
5. Giles J.G., "Steering, Suspension and tyres", Iliffe Book Co., London.

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BTAU- 605 VEHICLE DYNAMICS

UNIT-I

Definitions, Modeling and Simulation, Global and Vehicle Coordinate System, Free, Forced, Undamped and Damped Vibration, Response Analysis of Single DOF, Two DOF, Multi DOF, Magnification factor, Transmissibility, Vibration absorber, Vibration measuring instruments, Torsional vibration, Critical speed.

UNIT II

TIRES: Tire forces and moments, Tire structure, Longitudinal and Lateral force at various slip angles, rolling resistance, Tractive and cornering property of tire. Performance of tire on wet surface. Ride property of tires. Magic formulae tire model, Estimation of tire road friction. Test on Various road surfaces. Tire vibration.

UNIT III

VERTICAL DYNAMICS: Human response to vibration, Sources of Vibration. Design and analysis of Passive, Semi-active and Active suspension using Quarter car, half car and full car model. Influence of suspension stiffness, suspension damping, and tire stiffness. Control law for LQR, H-Infinite, Skyhook damping. Air suspension system and their properties.

UNIT IV

LONGITUDINAL DYNAMICS AND CONTROL: Aerodynamic forces and moments. Equation of motion. Tire forces, rolling resistance, Load distribution for three wheeler and four wheeler. Calculation of Maximum acceleration, Reaction forces for Different drives. Braking and Driving torque. Prediction of Vehicle performance. ABS, stability control, Traction control.

UNIT V

LATERAL DYNAMICS :Steady state handling characteristics. Steady state response to steering input. Testing of handling characteristics. Transient response characteristics, Direction control of vehicles. Roll center, Roll axis, Vehicle under side forces. Stability of vehicle on banked road, during turn. Effect of suspension on cornering.

TEXT BOOKS:

1. Singiresu S. Rao, "Mechanical Vibrations", 5th Edition, Prentice Hall, 2010
2. Wong. J. Y., "Theory of Ground Vehicles", 3rd Edition, Wiley-Interscience, 2001
3. Rajesh Rajamani, "Vehicle Dynamics and Control", 1st edition, Springer, 2005
4. Thomas D. Gillespie, "Fundamentals of Vehicle Dynamics", Society of Automotive Engineers Inc, 1992

REFERENCES:

1. Dean Karnopp, "Vehicle Stability", 1st edition, Marcel Dekker, 2004
2. Nakhaie Jazar. G., "Vehicle Dynamics: Theory and Application", 1st edition, Springer, 2008
3. Michael Blundell & Damian Harty, "The Multibody Systems Approach to Vehicle Dynamics", Elsevier Limited, 2004
4. Hans B Pacejka, "Tire and Vehicle Dynamics", 2nd edition, SAE International, 2005
5. A.K. Babu, Hybrid Electric Vehicles, Khanna Publishing House
6. John C. Dixon, "Tires, Suspension, and Handling", 2nd edition, Society of Automotive Engineers Inc, 1996

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UNIT-I

BTAU - 606 CYBER SECURITIES

Introduction- Introduction to Information Systems, Types of Information Systems, Development of Information Systems, Introduction to Information Security, Need for Information Security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.

UNIT-II

Application Security- Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail Viruses, Macro Viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E- Commerce- Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, Public Key Cryptography

UNIT-III

Developing Secure Information Systems- Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, CC TV and Intrusion Detection Systems, Backup Security Measures.

UNIT-IV

Security Policies- Development of Policies, WWW Policies, Email Security Policies, Policy Review Process-Corporate Policies-Sample Security Policies, Publishing and Notification Requirement of the Policies. **Evolving Technology Security** – Mobile, Cloud, Outsourcing and SCM.

UNIT-V

Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law. **Case Study** – Corporate Security

TEXT BOOKS-

1. Schou, Shoemaker, –Information Assurance for the Enterprises, Tata McGraw Hill.
2. CHANDER, HARISH,|| Cyber Laws And It Protection || ,PHI Learning Private Limited ,Delhi
3. V.K. Jain, Cryptography and Network Security, Khanna Publishing House, Delhi
4. Anshul Kaushik, Cyber Security, Khanna Publishing House

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BTAU - 607 DESIGN AND SIMULATION LAB-II

- Computer and Language: Students are required to refresh the basics of computer language such as C++ or MATLAB so that they should be able to write the computer program.
- Writing Computer programme for conventional design: Students are required to write computer program and validate it for the design of machine components done in theory subject .
- Mini Project: Based from real life applications and optimize using modelling and analysis software
- Students will take up a real life problem for design of a subsystem/system using modelling & Analysis software tools. This will be done as assignment in groups to be submitted at the end of the semester.

BTAU - 608 REFRIGERATION & AIR CONDITIONING LAB

Minimum eight experiments out of the following:

1. Experiment on refrigeration test rig and calculation of various performance parameters.
2. Study of different types of expansion devices used in refrigeration system.
3. Study of different types of evaporators used in refrigeration systems.
4. To study basic components of air-conditioning system.
5. Experiment on air-conditioning test rig & calculation of various performance parameters.
6. Experiment on air washers
7. Study of window air conditioner.
8. Study & determination of volumetric efficiency of compressor.
9. Visit of a central air conditioning plant and its detailed study.
10. Visit of cold-storage and its detailed study.
11. Experiment on Ice-plant.
12. Experiment on two stage Reciprocating compressor for determination.

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**Evaluation Scheme & Syllabus for
Department Of Automobile Engineering**

**B.Tech -Automobile Engineering
(IVrd Year: VII to VIII Semester)**
(Effective from session 2019-20)

EVALUATION SCHEME

B.Tech- Automobile Engg.

IV Year -Semester-VII

SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS. (30)	EXT. (70)	SESS. (25)	EXT. (25)	
BTAU-701	ENTREPRENEURSHIP DEVELOPMENT	30	70	NA	NA	100
BTAU-702	AUTOMOTIVE TRANSMISSION	30	70	NA	NA	100
BTAU-703	AUTOMOTIVE ELECTRICAL & ELECTRONICS SYSTEM	30	70	NA	NA	100
BTAU-704	COMPUTER AIDED DESIGN AND MANUFACTURING	30	70	25	25	150
BTAU-705	COMPUTATIONAL FLUID DYNAMICS	30	70	NA	NA	100
BTAU-706	IC ENGINE & POLLUTION CONTROL LAB	NA	NA	25	25	50
BTAU-707	MIN. PROJECT	NA	NA	25	25	50
BTAU-708	INDUSTRIAL TRAINING	NA	NA	25	25	50

Semester-VIII

SUBJECT CODE	SUBJECT NAME	THEORY		PRACTICAL		TOTAL
		SESS. (30)	EXT. (70)	SESS. (25)	EXT. (25)	
BTAU-801	NON CONVENTIONAL ENERGY RESOURCES	30	70	NA	NA	100
BTAU-802	AUTOMOTIVE POLLUTION AND CONTROL	30	70	NA	NA	100
BTAU-803	VEHICLE BODY ENGINEERING AND SAFETY	30	70	NA	NA	100
BTAU-804	SEMINAR	NA	NA	25	25	50
BTAU-805	PROJECT	NA	NA	25	25	50

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IV Year VII Semester

BTAU-701: ENTREPRENEURSHIP DEVELOPMENT

UNIT –I

Entrepreneurship- Definition. growth of small scale industries in developing countries and their positions visa-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control types. Government policy for small scale industry; stages in starting a small scale industry.

UNIT -II

Project identification- assessment of viability, formulation, evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

UNIT -III

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control, quality control, marketing, industrial relations, sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

UNIT -IV

Project Planning and control: The financial functions cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. Profit planning and programming, planning cash flow, capital expenditure and operations. Control of financial flows, control and communication.

UNIT -V

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act. Role of various national and state agencies which render assistance to small scale industries.

TEXT / REFERENCE BOOKS:

1. Forbat, John, -Entrepreneurship| New Age International.
2. Havinal, Veerbhadrappa, -Management and Entrepreneurship| New Age International
3. Joseph, L. Massod, —Essential of Management", Prentice Hall of India.

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BTAU-702: AUTOMOTIVE TRANSMISSION

UNIT-I

Transmission requirements: requirements of transmission system, general arrangement of power transmission, general arrangement of rear-engine vehicle with live axles, general arrangement of dead- axle and axles transmission; four-wheel-drive transmission.

UNIT-II

Clutches: Requirements of clutches, principle of friction clutches, types of clutches and materials used- cone, single plate, diaphragm-spring, multi-plate, centrifugal, over-running and electromagnetic clutch.

UNIT-III

Gear box: Need of gear boxes, types- sliding mesh, constant mesh and epicyclic, gear boxes; synchronizers: principle, early and later Warner synchronizer, Vauxhall synchronizer- gear materials lubrication and design of gear box;

Hydrodynamic drive: Advantages and limitations, principle of fluid coupling, constructional details, torque capacity performance characteristics, drag torque, methods of minimizing drag torque; Torque converter: performance characteristics; single, multistage and poly phase torque converters, converter-coupling- performance characteristics, coupling-blade angle and fluid flow, converter fluid.

UNIT-IV

Transmission systems-Drive line: Definition, forces & torques acting; types of drives- Hotchkiss, torque tube & radius rod drives; components- propeller shaft, slip joint, universal joints & constant velocity universal joints; front wheel drive;

Final drive: definition; types- worm- wheel, straight-bevel gear, spiral-bevel gear & hypoid-gear drives; double-reduction & twin- speed final drives;

Differential: Function, principle, construction and working; non-slip differential; differential lock; rear axle- loads acting & types; multi-axled vehicles.

UNIT-V

Automatic transmission: Chevrolet -turbo glide transmission, power glide transmission, hydraulic control system of automatic transmission;

Electric drive: advantages and limitations, principle of early and modified Ward-Leonard system, modern electric drive for buses; performance characteristics.

Text / References Books:

- 1 Heldt P.M.; Torque converters; Chilton Book Co.
- 2 Giri NK; Automobile Engineering; Khanna Publisher.
3. Newton, Steeds & Garret; Motor Vehicles; B.H. Publication.
4. Judge, A.W., Modern Transmission Systems, Chapman & Hall Ltd.
5. Check Chart; Automatic Transmission; Harper & Row Publication.

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BTAU-703: AUTOMOTIVE ELECTRICAL & ELECTRONICS SYSTEM

UNIT-I:

Batteries and accessories:

Principle and construction of lead acid battery, characteristics of battery, rating capacity and efficiency of batteries, various tests on batteries, maintenance and charging.

Lighting system: insulated and earth return system, details of head light and side light, LED lighting system, head light dazzling and preventive methods – Horn, wiper system and trifactor.

UNIT-II:

Starting system:

Condition at starting, behaviour of starter during starting, series motor and its characteristics, principle and construction of starter motor, working of different starter drive units, care and maintenances of starter motor, starter switches.

UNIT-III:

Charging system:

Generation of direct current, shunt generator characteristics, armature reaction, third brush regulation, cut-out. Voltage and current regulators, compensated voltage regulator, alternators principle and constructional aspects and bridge rectifiers, new developments.

UNIT-IV:

Fundamentals of automotive electronics:

Current trends in automotive electronic engine management system, electromagnetic interference suppression, electromagnetic compatibility, electronic dashboard instruments, onboard diagnostic system, security and warning system.

UNIT-V:

Sensors and activators:

Types of sensors: sensor for speed, throttle position, exhaust oxygen level, manifold pressure, crankshaft position, coolant temperature, exhaust temperature, air mass flow for engine application. Solenoids, stepper motors, relay.

Books & references:

1. Young A.P. & Griffiths. L. "Automotive Electrical Equipment", ELBS & New Press- 1999.
2. William B.Riddens "Understanding Automotive Electronics", 5th edition - Butter worth Heinemann Woburn, 1998.
3. Bechhold "Understanding Automotive Electronics", SAE, 1998.
4. Crouse, W.H "Automobile Electrical Equipment", McGraw-Hill Book Co., Inc., New York, 3rd edition, 1986.
5. Judge A.W "Modern Electrical Equipment of Automobiles", Chapman & Hall, London, 1992.
6. Kholi.P.L "Automotive Electrical Equipment", Tata McGraw-Hill Co., Ltd., New Delhi, 1975.
7. Robert Bosch "Automotive Hand Book", SAE (5th Edition), 2000.
8. Ganesan.V. "Internal Combustion Engines", Tata McGraw-Hill Publishing Co., New Delhi, 2003.

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BTAU-704: COMPUTATIONAL FLUID DYNAMICS

UNIT- I:

Governing Equations and Boundary Conditions:

Basics of computational fluid dynamics. Governing equations of fluid dynamics. Continuity, Momentum and Energy equations. Chemical species transport. Physical boundary conditions, Time-averaged equations for Turbulent Flow. Turbulent–Kinetic Energy Equations Mathematical behaviour of PDEs on CFD. Elliptic, Parabolic and Hyperbolic equations.

UNIT -II:

Finite Difference Method:

Derivation of finite difference equations. Simple Methods. General Methods for first and second order accuracy, solution methods for finite difference equations. Elliptic equations. Iterative solution Methods. Parabolic equations. Explicit and Implicit schemes. Example problems on elliptic and parabolic equations.

UNIT- III:

Finite Volume Method (FVM) for Diffusion:

Finite volume formulation for steady state One, Two- and Three-dimensional diffusion problems. One dimensional unsteady heat conduction through Explicit, Crank. Nicolson and fully implicit schemes.

UNIT -IV:

Finite Volume Method for Convection Diffusion:

Steady one-dimensional convection and diffusion. Central, upwind differencing schemes properties of discretization schemes. Conservativeness, Boundedness, Transportive, Hybrid, Power-law, QUICK Schemes.

UNIT- V:

Calculation Flow Field by FVM:

Representation of the pressure gradient term and continuity equation. Staggered grid. Momentum equations. Pressure and Velocity corrections; Pressure Correction equation, SIMPLE algorithm and its variants. Turbulence models, mixing length model, Two equation ($k-\epsilon$) models. High and low Reynolds number models.

Books and References:

1. An Introduction to Computational Fluid Dynamics: The Finite Volume Method, by Versteeg, Pearson, India.
2. Numerical Heat Transfer and Fluid Flow, by Patankar, Tayers & Francis.
3. Computational Heat Transfer, by Jaluriaans Torrance, CRC Press.
4. Computational Fluid Dynamics, by Anderson, Mc Graw Hill.
5. Computational Fluid Dynamics, by Chung, Cambridge University Press.
6. Computer Simulation of flow and heat transfer, by Ghoshdastidar McGraw Hill.
7. Introduction to Computational Fluid Dynamics, by Prodip Niyogi. Pearson India.
8. Computational Fluid Flow and Heat Transfer, by Muralidhar and Sundararajan, Narosa Publishing House.

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BTAU-705: COMPUTER AIDED DESIGN AND MANUFACTURING
(CAD/CAM)

UNIT-I

SEMESTER - VII

Computers in Industrial Manufacturing: Product cycle, CAD / CAM Hardware, Basic structure, CPU, Memory types, Input devices, Display devices, Hard copy devices, Storage devices.

Computer Graphics: Raster scan graphics coordinate system, Database structure for graphics modeling, Transformation of geometry, 3D transformations, Mathematics of projections, Clipping, Hidden surface removal.

UNIT II

Geometric Modeling: Requirements, geometric models, Geometric construction models, Curve representation methods, Surface representation methods, Modeling facilities desired.

Drafting and Modeling systems: Basic geometric commands, layers, Display control commands, Editing, dimensioning, Solid modeling.

UNIT III

Numerical Control: NC, NC modes, NC elements, NC machine tools, structure of CNC machine tools, Features of Machining center, turning center.

CNC Part Programming: Fundamentals, manual part programming methods, Computer Aided Part Programming.

UNIT IV

Group Tech: Part family, coding and classification, production now analysis, advantages and limitations, Computer Aided Processes Planning, Retrieval type and Generative type.

Computer aided Quality Control: Terminology in quality control, The computer in ac, Contact inspection methods, Non-contact inspection methods, optical non-contact inspection methods, non-optical, computer aided testing, integration of CAQC with CAD/CAM.

UNIT V

Computer integrated manufacturing systems: Types of Manufacturing systems, Machine tools and related equipment, material handling systems, computer control systems, and human labor in the manufacturing systems, CIMS benefits.

Books and References :

1. Automation, Production System and Computer Integrated Manufacturing, by Mikell P. Grover, Prentice Hall of India Pvt Ltd.
2. CAD/CAM – Theory and Practice, by Ibrahim Zeid, McGraw Hill
3. Computer Aided Manufacturing, by Cheng, Pearson India
4. CAD/CAM: Principles and Oerations, by P. N. Rao, McGraw Hill
5. CAD/CAM: Computer Aided Design and Manufacturing, by M. Groover, Pearson India.

BTAU-705: COMPUTER AIDED DESIGN AND MANUFACTURING

List of practical:

1. Design of machine component or other system experiment: Writing and validation of computer program.
2. Understanding and use of any 3-D Modeling Software commands.
3. Pro/E/Idea etc. Experiment: Solid modeling of a machine component
- 4 . Writing a small program for FEM for 2 spring system and validation of program or using a FEM Package
- 5 . Root findings or curve fitting experiment: Writing and validation of computer program.
6. To study the characteristic features of CNC machine
7. Part Programming (in word address format) experiment for turning operation (including Operations such as grooving and threading) and running on CNC machine
8. Part Programming (in word address format or ATP) experiment for drilling operation (point to point) and running on CNC machine
9. Part Programming (in word address format or ATP) experiment for milling operation (contouring) and running on CNC machine

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BTAU-706: I.C. ENGINE & POLLUTION CONTROL LAB

List of Experiments: (At least 8 experiments out of following in depth and details.)

1. Performance Analysis of Four stroke S.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
2. Determination of Indicated H.P. of I.C. Engine by Morse Test.
3. Performance Analysis of Four stroke C.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
4. Study & experiment on Valve mechanism.
5. Study & experiment on Gear Box.
6. Study & experiment on Differential Gear Mechanism of Rear Axle.
7. Study & experiment on Steering Mechanism.
8. Study & experiment on Automobile Braking System.
9. Study & experiment on Chassis and Suspension System.
10. Study & experiment on Ignition system of I.C. Engine.
11. Study & experiment on Fuel Supply System of S.I. Engines- Carburettor, Fuel Injection Pump and MPFI.
12. Study & experiment on Fuel Supply System of C.I. Engines- Injector & Fuel Pump.
13. Study & experiment on Air Conditioning System of an Automobile.
14. Study and testing of NO_x emission.
15. Study and testing of SO_x emission.
16. Study and testing of CO emission.
17. Experiment on Engine Tuning.
18. Experiment on Exhaust Gas Analysis of an I.C. Engine.

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BTAU- 801 : NON-CONVENTIONAL ENERGY RESOURCES

UNIT-I

SEMESTER - VIII

Solar Radiation: Extra-terrestrial and terrestrial, radiation measuring instrument, radiation measurement and predictions.

Solar thermal conversion: Basics, Flat plate collectors-liquid and air type. Theory of flat plate collectors, selective coating, advanced collectors, Concentrators: optical design of concentrators, solar water heater, solar dryers, solar stills, solar cooling and refrigeration.

Solar photovoltaic: Principle of photovoltaic conversion of solar energy; Technology for fabrication of photovoltaic devices; Applications of solar cells in PV generation systems; Organic PV cells.

UNIT-II

Wind energy characteristics and measurement: Metrology of wind speed distribution, wind speed statistics, Weibull, Rayleigh and Normal distribution, Measurement of wind data, Energy estimation of wind regimes; Wind Energy Conversion: Wind energy conversion principles; General introduction; Types and classification of WECS; Power, torque and speed characteristics; power curve of wind turbine, capacity factor, matching wind turbine with wind regimes; Application of wind energy.

UNIT-III

Production of biomass, photosynthesis-C3 & C4 plants on biomass production; Biomass resources assessment; Co₂ fixation potential of biomass; Classification of biomass; Physicochemical characteristics of biomass as fuel Biomass conversion routes: biochemical, chemical and thermo chemical Biochemical conversion of biomass to energy: anaerobic digestion, biogas production mechanism, technology, types of digesters, design of biogas plants, installation, operation and maintenance of biogas plants, biogas plant manure-utilization and manure values.

Biomass Gasification: Different types, power generation from gasification, cost benefit analysis of power generation by gasification.

UNIT-IV

Small Hydropower Systems: Overview of micro, mini and small hydro system; hydrology; Elements of turbine; Assessment of hydro power; selection and design criteria of turbines; site

selection and civil works; speed and voltage regulation; Investment issue load management and tariff collection; Distribution and marketing issues.

Ocean Energy: Ocean energy resources, ocean energy routs; Principle of ocean thermal energy conversion system, ocean thermal power plants. Principles of ocean wave energy and Tidal energy conversion.

UNIT-V

Geothermal energy: Origin of geothermal resources, type of geothermal energy deposits, site selection geothermal power plants;

Hydrogen Energy: Hydrogen as a source of energy, Hydrogen production and storage.

Fuel Cells: Types of fuel cell, fuel cell system and sub-system, Principle of working, basic thermodynamics

TEXT AND REFERENCES BOOKS:

1. Kothari, Singal & Rajan; Renewable Energy Sources and Emerging Technologies, PHI Learn
2. Khan, B H, Non Conventional Energy, TMH.
3. Sukhatme and Nayak, Solar Energy, Principles of Thermal Collection and Storage, TMH.
4. Tiwari and Ghosal, Renewable Energy Resources: basic principle & application, Narosa Publ
5. Koteswara Rao, Energy Resources, Conventional & Non-Conventional, BSP Publication.

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BTAU-802: AUTOMOTIVE POLLUTION AND CONTROL

UNIT -I

SEMESTER - VII

Introduction: History back ground, exhaust gas pollutants, Vehicle population assessment in metropolitan cities and contribution to pollution, effect on human health and environment, global warming, Greenhouse effect.

UNIT II

SI engine Combustion and Pollutant Formation: Chemistry of SI engine Combustion, HC and CO formation in Four stroke and Two stroke SI engines, NO formation in SI Engines, Effect of operating variables on emission formation.

UNIT III

CI engine Combustion and Emissions: Basic of diesel combustion, Smoke emission in diesel engines, Particulate emission in diesel engines. Colour and aldehyde emissions from diesel engines, Effect of operating variables on emission formation.

UNIT IV

Control Techniques for SI and CI: Design changes, optimization of operating factors, exhaust gas recirculation, control of evaporative emission, air injector PCV system-Exhaust treatment in SI engines-Thermal reactors- Catalytic converters, Catalysts, Use of unleaded petrol. Diesel particulate filter .

UNIT –V

Emission Measurement and standards:

Measurement of CO₂ and CO by NDIR analyzer, Measurement of Hydrocarbon emission by Flame ionization detectors, Measurement of NO_x by Chemiluminescent analyzer, Gas chromatograph, Smoke meters, Emission standards. driving cycles– USA, Euro and India. Test procedures – ECE, FTP tests. .

References

1. Mathur M. L., Internal Combustion Engines
2. Ganesan. V., Internal Combustion Engines, Tata McGraw Hill Co.
3. Obert. E.F., Internal Combustion Engines.
4. Taylor. C.F., Internal Combustion Engines, MIT Press.
5. Heywood. J.B., Internal Combustion Engine Fundamentals, McGraw Hill Book Co

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IV Year VIII Semester

BTAU- 803 : VEHICLE BODY ENGINEERING AND SAFETY

UNIT-I

SEMESTER - VIII

Materials

Structural materials: Aluminum alloy sheet, extrusion and casting, Austenitic and Ferritic stainless steels, alloy steels. Different types of composites, FRP & metal Matrix Composites. Structural timbers properties designing in GRP and high strength composites different manufacturing techniques of composites. Thermo-plastics, ABS and styrene, Load bearing plastics, semi rigid PUR foams and sandwich panel construction.

UNIT II

Ergonomics and Controls

Shaping and packaging: Product design and concepts, Aesthetics and industrial design, formal aesthetics and shape, computer aided drafting, surface development, interior ergonomics, ergonomics system design, dashboard instruments, advances in electronic display, CV legal dimension.

CV-cab ergonomics, mechanical package layout.: Body Fitting and I Controls: Driver's seat, window winding mechanism, Door lock mechanism, other interior mechanisms, driver's visibility' and tests for, visibility, minimum space, requirements and methods orim proving space in cars, electric wiring and electronic control systems, advanced body electronics, networking or body systems controls.

UNIT III

Aerodynamics and Force Analysis

Aerodynamics: Basics, aero foils, aerodynamics drag lift, pitching, yawing and rolling moments, determination of aerodynamic coefficients (wind tunnel testing), racing car aerodynamics, bluff body aerodynamics, local air flows.

Load Distribution: Types of load carrying structures -closed, integral, open, flat types. Calculation of loading cases static, asymmetric, vertical loads. Load distribution, stress analysis of structure, body shell analysis.

UNIT IV

Structural Dynamics

Noise, Vibration, Harshness: Noise and vibration basics, body structural vibrations, chassis bearing vibration, designing against fatigue, rubber as an isolator.

CV body mountings, automatic enclosures, sandwich panels, structure dynamics applied, surety under impact: Impact protection basics, design for crash worthiness, occupant and cargo restraints. Passive restraint systems, slide impact analysis, bumper system, energy absorbent foams, laws of mechanisms applied 10 safeties.

Vehicle stability: Steering geometry vehicle and a curvilinear path, and lateral stability, effects of tire factors, mass distribution and engine location on stability.

UNIT V

Types of Vehicles

Vans, trucks and buses: Types of mini coach with trailers, single and double dickers, design criteria based on passenger capacity, goods to be transported and distance to be covered, constructional details, weight and dimensions, conventional and integral type.

Text / References Books:

1. Body Engineering -Sydney F Page
2. Vehicle Body Engineering -Giles J Pawlowski
3. Automotive Chassis -P.M. Heldt. chilton& Co.
4. Handbook on Vehicle Body Design -SAE Publications

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IV Year VIII Semester

BTAU-804: SEMINAR

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IV Year VIII Semester

BTAU-805: PROJECT

Text / References Books:

1. William H Grouse and Donald L Anglin, " Automotive Air conditioning ", McGraw-Hill Inc., 1990.
2. Warren Farnell and James D.Halderman, "Automotive Heating, Ventilation, and AirConditioning systems", Classroom Manual, Pearson Prentice Hall, 2004
3. Warren Farnell and James D.Halderman, "Automotive Heating, Ventilation, and AirConditioning systems", Shop Manual, Pearson Prentice Hall, 2004
4. William H Crouse and Donald L Anglin, "Automotive Air conditioning", McGraw Hill Inc., 1990.
5. Mitchell information Services, Inc, " Mitchell Automatic Heating and Air ConditioningSystems ", Prentice Hall Ind., 1989.
6. Paul Weiser, " Automotive Air Conditioning ", Reston Publishing Co Inc., 1990.
7. MacDonald, K.L., " Automotive Air Conditioning ", Theodore Audel series, 1978.
8. Goings. L.F., Automotive Air Conditioning ", American Technical services,