COLLEGE OF ENGINEERING
(AUTONOMOUS)

GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING

(AUTONOMOUS)

MADHURAWADA, VISAKHAPATNAM-530048
AFFILIATED TO JNTU KAKINADA

MECHANICAL ENGINEERING

SYLLABI FOR B.TECH. (III, IV SEMESTERS) UNDER AUTONOMOUS STATUS FOR 2009 ADMITTED, 2010 LATERAL ENTRY BATCHES

ALL BRANCHES ARE ACCREDITED BY **NBA** OF AICTE
ACCREDITED BY **NAAC** WITH **'A'** GRADE WITH A **CGPA** OF **3.47**/4.00

Meeting of the Joint Board of Studies held on 11th April 2010

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Vision

To evolve into and sustain as a Centre of Excellence in Technological Education and Research with a holistic approach.

Mission

To produce high quality engineering graduates with the requisite theoretical and practical knowledge and social awareness to be able to contribute effectively to the progress of the society through their chosen field of endeavour.

To undertake Research & Development, and extension activities in the fields of Science and Engineering in areas of relevance for immediate application as well as for strengthening or establishing fundamental knowledge.

FOREWARD

The G.V.P. College of Engineering has started its new life as an autonomous College with great responsibility and confidence one year ago. It has become now a torch bearer for other sister institutions because of its success story in running an autonomous system for the last one year. People are inquisitive to know what has happened and how it has happened.

The functional mechanism has been explained to the faculty and students before the start. A mid-term review and an end-term review are conducted with students as well as faculty for their feed-back and corrective measures in both the semesters of first year. This helped us in eliminating some of the hitches and improving the rate of progression.

The course structure and syllabi for 1st and 2nd semesters have been reviewed for fine tuning in the second BOS meeting alongwith the syllabi for the 3rd and 4th semesters. The College expresses its thanks to all the members for their cooperation.

It must be said that the success is because of the acceptance of the main stakeholders, the students and their parents. The enthusiasm of the faculty cannot be understressed. Various learned academicians from outside, as paper setters and valuers have extended timely support through their positive response to become a part of the mechanism in the conduct of exams and bringing out the results quickly at the end of each semester. The college acknowledges their association and wishes to share its happiness with them.

Principal

AMENDMENTS TO B.TECH. REGULATIONS, REGULATIONS FOR LATERAL ENTRY STUDENTS

AMENDMENTS TO ACADEMIC REGULATIONS FOR EIGHT SEMESTER (4 YEAR) B.TECH. - 2009-10 ADMITTED BATCH

EXTERNAL EVALUATION:

If the difference between the first and second valuations is less than or equal to 15% of the maximum of the paper the better of the two valuations shall be awarded and if the difference between the first and second valuation is more than 15%, the chief examiner appointed has to discuss with the two valuers and have his own assessment of the script. The marks given by the chief examiner shall be final for award.

R.2.0 CLAUSE d (i):

EXISTING:

A student has to record a participation of minimum of 32 hours **per semester** in his/her chosen activity during the first year.

MODIFICATION:

A student has to record a participation of minimum of 32 hours in his/her chosen activity **during the first year.**

R.6.0-CLAUSE (iii):

EXISTING:

Incase of practical/drawing/project/seminar, a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each of them if he or she secures not less than 50% of marks on the aggregate in the internal evaluation and external end-examination taken together.

MODIFICATION:

Incase of practical/drawing/project/seminar, a student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each of them **if the student secures a minimum of 50% in the end examination** and not less than 50% of marks

on the aggregate in the internal evaluation and external end-examination taken together.

R.9.0 CLASS/DIVISION:

EXISTING:

70% and above	: First class with distinction.
60% and above, but less than 70%	: First class.
50%and above, but less than 60%	: Second class.
Less than 50%	**: Fail**.

A candidate shall get an aggregate of 50% overall at the end of VIII semester while fulfilling a minimum of 216 credits for the award of B.Tech. degree. The best 216 out of 224 credits shall be considered for the award of class/division.

MODIFICATION:

70% and above	: First class with distinction.
60% and above, but less than 70%	: First class.
50%and above, but less than 60%	: Second class.
40% and above, but less than 50%	**: Pass class**.
Less than 40%	**: Fail**

A candidate shall get an aggregate of 40% overall at the end of VIII semester while

Fulfilling a minimum of 216 credits for the award of B.Tech. degree. The best 216 out of 224 credits shall be considered for the award of class/division.

REGULATIONS FOR B.TECH. (LATERAL ENTRY) STUDENTS ADMITTED INTO III SEMESTER (II YEAR) (UNDER AUTONOMOUS STREAM)

RL 1.0

1.1 The selection and admission process shall be as per Government of Andhra Pradesh rules through ECET.

1.2 A student admitted to B.Tech. through lateral entry scheme joins the College in the III Semester of the respective 8-Semester program. The duration of the programme is 3 years / 6 semesters. However, if a student can not complete within 3 years, he can do so by taking more time but not more than consecutive 6 years / 12 semesters.

RL 2.0 These students are exempted from social work.

RL 3.0 The attendance requirements shall be same as those admitted into four year B.Tech programme, I- Semester (Autonomous stream).

RL 4.0 Minimum Academic Requirements :

i) A student shall be promoted to the VII Semester only after securing 56 credits in III and IV semester courses from the examinations including supplementary examinations in these subjects held till the end of VI semester of study.

ii) A student shall register and put up minimum required attendance in all the 172 credits counted from the regular course structure of VIII semester B.Tech programme and earn at least 164 credits prescribed as compulsory to be qualified for the award of B.Tech. degree. Marks out of the best 164 credits shall be considered for the award of class /division.

RL 5.0 All other regulations are same as those applicable to the students admitted into B.Tech I-Semester under Autonomous stream.

RL 6.0 Subjects are identified as exempted / mandatory / pre-requisites. A student has to attend classes in subjects prescribed as mandatory/ pre-requisites and has to earn the credits in the examinations as and when conducted. The evaluation for the above courses may be totally internal.

TRANSITORY REGULATIONS FOR STUDENTS RE-ADMITTED INTO II - YEAR OF AUTONOMOUS STREAM FROM PREVIOUS REGULATIONS

1. The student has to attend classes in the subjects declared as prerequisites before joining into II year (III or IV semester) under autonomous stream offered in the preceding summer and has to earn the credits in the examinations as and when conducted.
2. For subjects which are not prerequisites but declared as compulsory, the instruction may be taken during the following summer programmes or as and when they are offered and shall earn the credits in the examinations as and when conducted.
3. The re-admitted students have to appear and pass the I year / II Year I semester (in case of readmission into II semester) subjects by appearing for the examinations as and when conducted by JNT University Kakinada in the failed subjects.
4. **Promotion to V semester:**

   For a readmitted student to get promoted to V semester (III year) he has to earn 52 credits out of 56 credits in the I year courses from both regular and supplementary examinations, conducted by JNT University-Kakinada.
5. **Promotion to VII semester:**

   For a re-admitted student to get promoted to VII semester (IV year) the following criteria must be satisfied

   I. He shall acquire all the 56 credits of the I year courses.

   II. He shall acquire at least 104 credits from the courses up to the end of II year excluding prerequisites (Including the supplementary examinations) and secure

a pass in prerequisite courses offered during the transition from previous regulations to autonomous regulations.

6. The student seeking readmission into II year shall abide by all other relevant regulations in force under the autonomous stream in addition to the above and shall secure a pass in prerequisite and compulsory courses.

7. For the award of the degree, the student shall acquire 216 credits excluding prerequisite and compulsory subjects.

REGULATIONS FOR THE SUMMER PROGRAMME

In addition to the rules and regulations given in R 7.0 of the B.Tech regulations and syllabus book the following rules are to be followed.

1. It is desirable for a candidate to put up 100% attendance in all the subjects registered for the summer course. However 25% concession in attendance may be permitted at the discretion of the principal based on the merits of the individual case under extraneous conditions with proper evidence. No further condonation of attendance on par with the regular semester shall be permitted.
2. If a candidate is failed to satisfy the attendance requirement in a course registered during summer then he has to repeat the course in the subsequent summer programme when offered next.
3. The method of internal evaluation is same as for the regular B.Tech programme. I mid examination shall be completed by the end of IV weeks and II mid to be completed by the end of VIII weeks of the programme.
4. The earlier internal marks secured in the regular semester for the subjects registered in the summer programme are nullified and internal marks from the latest summer programme shall be final.
5. The end semester examinations for the summer programme shall be conducted on the immediately following Saturdays and / or Sundays as the need arises
6. Attendance and completion of subjects during the summer programme shall be suitably reflected in the consolidated marks memo.

SYLLABI FOR III & IV SEMESTERS

PROBABILITY AND STATISTICS

Course Code: ABM1105

L	T	P	C
4	1	0	4

Aim:

To acquire basic knowledge in concepts of probability and statistics.

Objective:

The student shall be able to apply the methods of probability distributions, perform Statistical analysis and draw inference in various engineering problems.

UNIT-I

PROBABILITY: Probability, The axioms of probability, some elementary theorems - Conditional probability – Baye's theorem. (3.3-3.7)

UNIT-II

DISCRETE RANDOM VARIABLES: Random variables , mean and variance, Chebyshev's theorem, Binomial distribution, Poisson distribution

(4.1,4.2, 4.4-4.7)

UNIT-III

CONTINUOUS RANDOM VARIABLES: Continuous Random Variable, normal distribution, Normal approximation to Binomial distribution, Uniform distribution (5.1-5.3, 5.5)

UNIT-IV

SAMPLING DISTRIBUTION OF MEANS: Population and sample, Sampling distributions of mean, Point estimation, Interval estimation (6.1-6.3, 7.1, 7.2)

UNIT-V

INFERENCES CONCERNING MEAN: Null hypothesis and tests of hypothesis, Inference concerning one mean and two means (7.3-7.5, 7.8)

UNIT-VI

INFERENCES CONCERNING VARIANCES: Sampling distribution of the variance, the estimation of Variance, Hypothesis concerning one and two variances (6.4, 8.1-8.3)

UNIT-VII

INFERENCES CONCERNING PROPORTIONS: Estimation of Proportions, Hypothesis concerning one proportion, several proportions (9.1-9.3)

UNIT-VIII

CORRELATION REGRESSION: The method of least squares , Curvilinear regression, multiple regression, correlation(excluding causation) (11.1,11.3, 11.4,11.6)

Text Book:

Miller Freund's" Probability and Statistics for Engineers" Richard A Johnson, CB Gupta, Peason education , Seventh Edition 2005.

References :

1. SC Gupta and V.K. Kapoor" Fundamentals of Mathematical Statistics" Ninth Revised Edition, Sultan Chand & Sons educational Publishers

2 Dr. B.S. Grewal " Higher Engineering mathematics" 40th Edition , Khanna Publishers.

THERMODYNAMICS

Course Code: AME1105	L	T	P	C
	4	1	0	4

Aim and Objective:

To study the basic concepts of thermodynamics and apply it to various applications and to integrate the concepts, laws and methodologies from thermodynamics for the analysis of cyclic processes.

UNIT – I

INTRODUCTION: Thermodynamic system, control volume, surrounding, boundaries, universe, types of systems, macroscopic and microscopic view points, concept of continuum, thermodynamic equilibrium, state, property, process, reversible process, irreversible process, cycle, quasi – static process, energy in state and in transition, energy types, work and heat, point and path function.

UNIT - II

ZEROTH LAW AND FIRST LAW OF THERMODYNAMICS: Concept of equality of temperature, principles of thermometry, reference points, constant volume gas thermometer, scales of temperature, ideal gas temperature scale, Joule's experiments, first law of thermodynamics, first law applied to a process - isochoric, isobaric, isothermal, adiabatic, polytropic , PMM1, first law applied to flow processes – steady flow energy equation.

UNIT – III

SECOND LAW OF THERMODYNAMICS: Limitations of the first law, thermal reservoir, heat engine, refrigerator and heat pump, parameters of performance, second law of thermodynamics, Kelvin-Planck and Clausius statements and their equivalence, reversibility and irreversibility, causes of irreversibility, types of irreversibility, conditions for reversibility, Carnot cycle, Carnot's theorem and its specialties.

UNIT – IV

ENTROPY: Clausius theorem, entropy, inequality of Clausius, entropy change in an irreversible process, principle of entropy, applications of entropy principle, entropy generation in closed and open systems, first and second laws combined, entropy and disorder.

UNIT -V

AVAILABILITY: Available energy, quality of energy, maximum work in reversible process, useful work, dead state, availability, availability in chemical reactions, Maxwell relations, TdS equations, Joule – Kelvin effect, elementary treatment of the third law of thermodynamics.

UNIT -VI

PURE SUBSTANCES: Phase transformations, triple point at critical state properties during change of phase, P-V-T surfaces, T-S and h-s diagram, dryness fraction, Clausius – Clapeyron equation, steam tables, Mollier charts, measurement of steam quality.

UNIT -VII

PERFECT GAS LAWS: Avogadro's law, Equation of state, ideal gas - characteristic and universal gas constants, various non-flow processes, heat and work transfer, changes in internal energy, throttling and free expansion processes, flow processes, deviations from perfect gas model, Van der waal's equation of state, compressibility charts, gas tables.

UNIT – VIII

MIXTURES OF PERFECT GASES: Dalton's law of partial pressures, mole fraction, volume fraction and partial pressure, Amagat's laws of additive volumes – equivalent gas constant, internal energy, enthalpy, specific heats and entropy of mixture of perfect gases

Text book:

1. Engineering Thermodynamics / PK Nag /TMH, III Edition
2. Engineering Thermodynamics: A generalized approach, Elsevier

References:

1. Thermodynamics – An Engineering Approach – Yunus Cengel & Boles /TMH
2. Engineering Thermodynamics – K. Ramakrishna / Anuradha Publishers.
3. Fundamentals of Thermodynamics – Sonntag, Borgnakke and van wylen / John Wiley & sons (ASIA) Pvt. Ltd.

MECHANICS OF SOLIDS

Course Code: AME1106

L	T	P	C
4	1	0	4

Aim and objective:

To develop the abilities for engineering student to analyse the state of stress and strain at any point in a member. This is a prerequisite course for design of machine members.

UNIT – I

SIMPLE STRESSES AND STRAINS: Elasticity and plasticity – types of stresses and strains–Hooke's law – stress – strain diagram for mild steel – working stress – factor of safety – lateral strain, Poisson's ratio and volumetric strain – elastic moduli and the relationship between them – bars of varying section – composite bars – temperature stresses, strain energy – resilience – gradual, sudden, impact and shock loadings.

UNIT – II

TORSION

TORSION OF SHAFTS: Assumptions in theory of torsion, torsion equation, polar modulus, torsion of circular solid and hollow shafts, shafts in series and parallel, combined bending and torsion, Application of torsion in helical springs - open and closed.

UNIT – III

SHEAR FORCE AND BENDING MOMENT: Definition of beam – types of beams – concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported, overhanging beams subjected to point loads, U.D.L, uniformly varying loads and combination of these loads – point of contraflexure – relation between S.F., B.M and rate of loading at a section of a beam.

UNIT – IV

FLEXURAL STRESSES: Theory of simple bending – assumptions – derivation of bending equation– determination of bending stresses – section modulus of rectangular and circular sections (Solid and Hollow), I,T sections – design of simple beam sections.

Shear Stresses in Beams: Derivation of formula – shear stress distribution across various beam sections like rectangular, circular, triangular, I, T.

UNIT –V

PRINCIPAL STRESSES: Transformation of plane stress into normal and shear stresses on inclined plane, principal planes, Mohr's circle for plane stress. Maximum shearing stress.

UNIT – VI

DEFLECTION OF BEAMS: Bending into a circular arc – slope, deflection and radius of curvature – differential equation for the elastic line of a beam – double integration and Macaulay's methods – determination of slope and deflection for cantilever and simply supported beams subjected to point loads, U.D.L, uniformly varying load. Mohr's theorems – moment area method – application to simple cases including overhanging beams.

UNIT – VII

THIN AND THICK CYLINDERS: Thin seamless cylindrical shells – derivation of formula for longitudinal and circumferential stresses – hoop, longitudinal and volumetric strains – changes in diameter, and volume of thin cylinders, thin spherical shells.

Introduction to thick cylinders – Lame's equation – cylinders subjected to inside and outside pressures.

UNIT – VIII

ANALYSIS OF PIN-JOINTED PLANE TRUSSES: Determination of Forces in members of plane, pin jointed, ideal trusses by (i) method of joints and (ii) method of sections.

Text Books:

1. Strength of Materials by Bansal, Lakshmi Publications
2. Mechanics of materials by Beer, Johnston and DeWolf, TMH

References:

1. Strength of Materials by Bhavikatti, Lakshmi Publications.
2. Strength of Materials by Rajput, S. Chand

MATERIAL SCIENCE AND METALLURGY

Course Code: AME1107

L	T	P	C
4	0	0	4

Aim and Objective :

To acquire fundamental knowledge about metals and materials used in engineering and to create the awareness in efficient problem solving, decision making and development of advanced materials in the functioning of an engineer.

UNIT-I

STRUCTURE OF METALS: Bonds in solids-metallic bond-crystal structure-BCC, FCC, HCP, unit cells, packing factor, crystallization of metals, grains and grain boundaries, effect of grain boundaries on properties of metals, crystal imperfections, determination of grain size.

UNIT-II

MECHANICAL BEHAVIOUR OF MATERIALS: Elastic deformation, plastic deformation- twinning, fracture, fatigue, creep

CONSTITUTION OF ALLOYS: Necessity of alloying, types of solid solutions, Hume Rothery rules, intermediate alloy phases and electron compounds.

UNIT-III

EQUILIBRIUM DIAGRAMS: Phase rule, Experimental method of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys. Lever rule, coring, miscibility gaps, eutectic systems. Congruent melting intermediate phases, peritectic reaction, Transformations in solid state – allotropy, eutectoid, peritectoid reactions, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams: Cu-Ni, Al-Cu, Bi-Cd.

UNIT-IV

METALLURGY OF IRON AND STEEL-I: Fe-Fe_3C equilibrium diagram, micro constituents in steels, classification of steels, structure and properties of plain carbon steels.

Heat treatment of steels- annealing, normalizing, hardening, TTT diagrams, tempering, hardenability, surface hardening methods, age hardening treatment.

UNIT-V

METALLURGY OF IRON AND STEEL-II: Effect of alloying elements on Fe-Fe_3C system, low alloy steels, stainless steels, Hadfield manganese steels, tool steels and die steels, structure and properties of white cast iron, malleable cast iron, grey cast iron and spheroidal grey cast iron.

UNIT–VI

NON-FERROUS METALS AND ALLOYS: Structure and properties of copper and its alloys, aluminum and its alloys and titanium and its alloys.

UNIT-VII

CERAMIC MATERIALS : Crystalline ceramics, glasses, cermets, abrasive materials, Nano materials-definition, properties and applications of the above.

UNIT–VIII

COMPOSITE MATERIALS: Classification of composites, particle reinforced materials, fiber reinforced materials, metal ceramic mixtures, metal-matrix composite and C-C composites. Introduction to powder metallurgy.

Text Books:

1. Introduction to physical metallurgy by Sidney H Avner, TMH
2. Materials Science and Metallurgy by Kodgire, Everest Publishing House

References:

1. Elements of materials science and Engineering by Van Vlack, Dorling Kindersley (India) Pvt. Ltd.
2. Elements of materials science by V.Raghavan, Pearson Education

BASIC ELECTRONICS

Course Code: AEC1145

L	T	P	C
4	0	0	4

Aim and Objective:
To be familiarized with basic electronics circuits.

UNIT -I

SEMI CONDUCTOR MATERIALS: Classification of materials, energy levels, intrinsic and extrinsic semiconductor, conduction in metals and semiconductors.

UNIT -II

SEMI CONDUCTOR DIODES AND APPLICATIONS: Diode under forward bias condition, diode under reverse bias condition, current-voltage characteristics of PN junction diode, Diode as a switch, , as a rectifier , Half Wave rectifier, Full Wave rectifier, rectifier with Filters.

UNIT -III

BJTs: Bipolar Junction Transistor structure , Principle of operation of npn and pnp transistor, transistor as a switch , transistor as an amplifier, Transistor (BJT) configurations CB, CE, CC, Relation between á, â and ã. Input and output characteristics of BJT.

UNIT -IV

FEEDBACK AMPLIFIERS: Concept of feedback, advantages & disadvantages of negative feedback amplifier, feedback amplifier topologies, effect of negative feedback on R_I, R_0, A_V, A_I of an amplifier.

UNIT -V

OSCILLATORS : Classification of oscillators, Barkhausen's criterion, RC phase shift oscillator, Hartley and Colpitts oscillators.

UNIT -VI

NUMBER SYSTEMS & BOOLEAN ALGEBRA : Philosophy of number systems, complement representation of negative numbers,

Binary arithmetic codes, fundamental postulates of Boolean algebra, Basic Theorems and properties, sum of products, product of sums, realization of logic gates.

UNIT -VII

INTRODUCTION TO COMBINATIONAL CIRCUITS: Design using conventional logic gates, Encoder, Decoder, MUX, De-Mux.

UNIT -VIII

MICROPROCESSORS: Introduction to 8085 microprocessor, Architecture, D/A Converters: Weighted Resistor, R-2R Ladder network, A/D Converters: successive approximation, dual slope.

Text Books:

1. Electronics Devices and Circuits – J Millman and C.C.Halkias, TMH 1998.
2. 8085 Microprocessor and Interfacing – Ramesh S. Goankar
3. Digital Design – Morris Mano, PHI, 3rd Edition, 2006.
4 Electronics Devices and Circuits, B.Visweswara Rao, K.Bhaskara Murthy, K.Raja Rajeswari, P.Chalam Raju Pantulu. Pearson Publications, 2nd Editions.
5. Electronics Devices and Circuits- Prof.G.S.N.Raju I K International Publishing House Pvt Ltd, 2006.

References:

1. Electronics Devices and Circuits, Dr.Lal Kishore, B.S.Publication.
2. Electronics Devices and Circuits, K.Satyaprasad

FLUID MECHANICS

Course Code: AME1108

L	T	P	C
4	0	0	4

Aim and objective:

To make the students familiar with the behavior of fluids at rest or in motion. To achieve a sound foundation in basic principles of mechanics of fluids with their applicability in engineering domain. This is a prerequisite course for hydraulic machinery and systems.

UNIT – I

INTRODUCTION& FLUID PROPERTIES: Density, specific weight, specific gravity, viscosity, vapour pressure, compressibility, pressure at a point, Pascal's law, pressure variation with temperature, density and altitude, hydrostatic law, total pressure and center of pressure – horizontal, vertical and inclined plane surfaces, buoyancy and floatation.

UNIT – II

FLUID KINEMATICS: Stream line, path line, streak line, stream tube, classification of flows -steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational, irrotational flows, one, two and three dimensional flows, continuity equation in three-dimensional flow, stream and velocity potential function.

UNIT – III

FLUID DYNAMICS: Surface and body forces – Euler's and Bernoulli's equation derivation, introduction to Navier- Stokes equation, momentum equation - applications, vortex – free and forced vortex with free surface.

UNIT – IV

BOUNDARY LAYER: Concepts, boundary layer along a thin flat plate, Boundary layer Equations, Von-Karman's momentum integral

equation, laminar and turbulent Boundary layers, boundary layer in transition, separation of boundary layer, control of boundary layer separation.

UNIT – V

DRAG AND LIFT: Types of drag, lift, drag on sphere and flat plate.

LAMINAR FLOW: Relation between shear and pressure gradient, steady laminar flow between parallel flat plates, steady laminar flow in circular pipes and laminar flow through inclined pipes.

UNIT – VI

FLOW THROUGH PIPES: Reynolds experiment –Darcy's equation, Chezy's formula, minor losses, pipes in series, equivalent pipe, pipes in parallel, total energy line and hydraulic gradient line, siphon, power transmission through pipes, flow through nozzle at the end of pipe.

UNIT – VII

FLOW OF COMPRESSIBLE FLUID: Introduction, thermodynamic relations, basic equations of compressible flow, velocity of sound wave in a fluid for isothermal and adiabatic process, Mach number and its applications, Mach angle, propagation of pressure waves and stagnation properties.

UNIT –VIII

SIMILITUDE: Types of similarity- geometric, kinematic and dynamic similarities, dimensionless numbers, similarity laws.

FLOW MEASUREMENT: manometers, simple manometers, differential manometers, venturimeter and orifice meter, pitot tube, flow through notches.

Text Books:

1. Fluid Mechanics, Hydraulics & Hydraulic Machines by Modi and Seth, Standard Publications, New Delhi.
2. Engineering Fluid Mechanics by K.L.Kumar, S.Chand & Co.

References:

1. Fluid Mechanics and Fluid Power Engineering by Dr. D.S. Kumar, S.K. Kataria and Sons.
2. Fluid Mechanics - John F Douglas, Pearson Education Publishers.
3. Fluid Mechanics & Hydraulic Machines - D. Ramadurgaiah, Newage Publishers

MECHANICS OF SOLIDS & METALLURGY LAB

Course Code: AME1109

L	T	P	C
0	0	3	2

Any TEN of the following experiments (Five from each Lab) are to be performed during the semester

MECHANICS OF SOLIDS LAB

Aim and objective :

To demonstrate and provide the hands-on experience in testing for mechanical properties of materials.

LIST OF EXPERIMENTS

1. Direct tension test
2. Bending test on
   a) Simply supported beam b) Cantilever beam
3. Hardness test
   a) Brinells hardness test b) Rockwell hardness test
4. Test on springs
5. Compression test on cube
6. Impact test
   a) Izod Impact Test b) Charpy Impact Test
7. Maxwell's reciprocal theorem-verification

METALLURGY LAB

Aim and objective :

To provide the hands-on experience in observing the microstructures of different types of specimens.

LIST OF EXPERIMENTS

1. Preparation and study of microstructure of pure metals
   i) Copper ii) Aluminium
2. Preparation and study of microstructure of low carbon steels

3. Preparation and study of microstructure of medium carbon steels
4. Preparation and study of microstructure of cast irons i) White ii) Grey iii) Spheroidal Graphite
5. Preparation and study of microstructure of non ferrous alloys á+â brass
6. Simple heat treatment of steels and study of the microstructure of heat treated steels
7. Hardenability by Jominy end quench test

ELECTRICAL AND ELECTRONICS LAB

Course Code: AME1110

L	T	P	C
0	0	3	2

Any TEN of the following experiments (Five from each Lab) are to be performed during the semester

Electrical Lab

Aim :

To introduce the student to the connections of various electrical equipments and their testing.

Objective :

At the end of this course the student will be able to i) understand various types of controls and measuring instruments ii) conduct performance tests on electrical machines.

LIST OF EXPERIMENTS:

Note: Five experiments are to be conducted from (Two to Seven) and First experiment is compulsory.

1. Demonstration of the following and their working (compulsory).
   (a) Fuse (b) Rheostat (c) Meters (d) Switches
2. Verification of KCL and KVL.
3. Speed control of D.C. Shunt Motor.
4. OC and SC test on a single phase transformer.
5. Brake test on 3-phase induction motor
6. Regulation of Alternator by synchronous impedance method.
7. Speed control of slip-ring induction motor.

ELECTRONICS LAB

Aim and objective:

To study the characteristics of electronic devices and circuits.

LIST OF EXPERIMENTS

1. Diode characteristics.
2. Zener Diode Characteristics
3. Half wave and full wave Rectifier.
4. Common emitter characteristics.
5. Common emitter amplifier.
6. RC Phase shift oscillator.

MACHINE DRAWING

Course Code: AME1111

L	T	P	C
2	0	3	4

Aims and Objectives:

(A) To learn about basic machine parts, conventions of machine elements.

(B) To enable students to apply the principles of basic engineering drawing in drafting simple machine components.

(C) To gain the knowledge of assembly and details of various machine parts.

Note: First angle projection to be adopted.

Machine Drawing Conventions:

Need for drawing conventions – introduction to ISI conventions

a) Conventional representation of materials, common machine elements and parts such as screws, nuts, bolts, keys, gears, webs, ribs.

b) Types of sections – selection of section planes and drawing of sections and auxiliary sectional views. Parts not usually sectioned.

I. Drawing of Machine Elements and Simple Parts

Selection of Views, additional views for the following machine elements and parts with easy drawing proportions.

a. Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.

b. Keys, cotter joint and knuckle joint.

c. Riveted joints for plates

d. Shaft coupling, spigot and socket pipe joint.

e. Journal bearing and foot step bearing.

II. Assembly Drawings:

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

a) Engine parts – stuffing box, steam engine cross head, Eccentric, Petrol Engine connecting rod, piston assembly.

b) Other machine parts - Screw jack, Machine Vice, Plummer block, Lathe tailstock.

c) Valves- Steam stop valve, spring loaded safety valve and feed check valve.

III. Computer aided drawing of components (Demonstration only)

Text Books:

1. Machine Drawing –K.L.Narayana, P.Kannaiah & K. Venkata Reddy, New Age Publishers
2. Machine Drawing – N D Bhatt, Charotar publishers

References:

1. Machine Drawing – Dhawan, S.Chand Publications
2. Machine Drawing – P.S.Gill.
3. Machine Drawing - Rajput

NUMERICAL METHODS

Course Code: ABM1108

L	T	P	C
4	1	0	4

Aim :

To acquire basic knowledge in concepts of Numerical Methods.

Objective:

The student shall be able to apply the methods of Numerical Computation in various engineering problems.

UNIT-I

SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS: Introduction to Numerical Methods, Solution of algebraic and transcendental equations-Bisection method, method of false position, Newton's method, Iteration method, Finite differences, Differences of a polynomial, Difference operators . (28.1, 28.2, 29.1, 29.2 & 29.4 of [1])

UNIT-II

INTERPOLATION: Newton's interpolation formulae, Central difference interpolation formulae, Interpolation with unequal intervals – Lagrange's formula, Newton's divided difference formula, Inverse interpolation. (29.5, 29.6, 29.8& 29.9 of [1])

UNIT-III

CURVE FITTING: Curve fitting: Introduction, Graphical method, Laws reducible to the linear law, Principles of least squares, Method of least squares, fitting of other curves, fitting of parabola (24.1 - 24.6 & 24.8 of [1])

UNIT-IV

NUMERICAL DIFFERENTIATION AND INTEGRATION: Numerical differentiation, Numerical Integration – Newton-cote's formula, Trapezoidal rule, Simpson's 1/3rd rule, Simpson's 3/8th rule, Weddle's rule. (29.10, 29.12 of [1])

UNIT-V

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS-I: Introduction, Picard's method, Taylor's series method, Euler's method, Modified Euler method (31.1 - 31.5 of [1])

UNIT-VI

NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS-II: Runge's method, Runge-Kutta method, Predictor-corrector methods: Milne's method, Adams-Bashforth method, Simultaneous first order differential equations (31.6 - 31.9 of [1])

UNIT-VII

ENGINEERING APPLICATIONS OF OPTIMIZATION-I: Introduction to Optimization, Engineering Applications of Optimization, Statement of an Optimization problems, Classification of Optimization problems. (1.1, 1.3 – 1.5 of [2])

UNIT-VIII

ENGINEERING APPLICATIONS OF OPTIMIZATION-II: Single variable optimization, Unimodal function, Exhaustive search, Dichotomous search, Fibonacci method, Golden Section method, Quadratic interpolation method, Newton method. (2.2, 5.2, 5.4, 5.5, 5.7, 5.8, 5.10, 5.12.1 of [2])

Text Books:

[1] Dr.B.S.Grewal "Higher Engineering Mathematics", 40th Edition, Khanna Publishers.

[2] Singiresu S. Rao "Engineering Optimization", Third Edition,New Age International (P) Limited, Publishers

Reference Books:

1. Numerical Methods for scientific and Engineering Computation, M.K.Jain, S.R.K.Iyengar and R.K.Jain, New age International Publishers

2. Introductory Methods of Numerical Analysis by S.S. Sastry, Prentice Hall India Pvt., Limited.

HYDRAULIC MACHINERY & SYSTEMS

Course Code: AME1112

L	T	P	C
4	0	0	4

Aim and Objective:
To make the students familiar with hydraulic machinery used in industrial and commercial applications.

UNIT – I

IMPACT OF JETS: Hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes, jet striking centrally and at tip-velocity triangles at inlet and outlet, expressions for work done and efficiency, angular momentum principle, applications to radial flow turbines, jet propulsion

UNIT – II

HYDRAULIC TURBINES: Classification of water turbines, Pelton wheel, Francis, Kaplan and Propeller turbines – work done and working proportions, draft tubes.

UNIT – III

PERFORMANCE OF TURBINES: Performance under unit head – unit quantities, performance under specific conditions – specific speed, performance characteristic curves, model testing of turbines, cavitation in turbines, governing of turbines.

UNIT – IV

RECIPROCATING PUMPS: Main components and working of a reciprocating pump, types of reciprocating pumps, power required to drive the pump, coefficient of discharge and slip indicator diagram, effect of acceleration head in suction and delivery pipes, effect of friction, maximum vacuum pressure, work saved by air vessels, rate of flow into and from air vessels.

UNIT – V

CENTRIFUGAL PUMPS – I : Component parts and working of centrifugal pump, types of centrifugal pumps, work done by the

impeller, manometric head, losses and efficiencies, effect of vane angle on manometric efficiency, effect of finite number of vanes of the impeller on head and efficiency, minimum starting speed, loss of head due to reduced or increased flow, diameters of impeller and pipes.

UNIT – VI

CENTRIFUGICAL PUMPS – II: Specific speed, model testing of pumps, multistage pumps, pumps in parallel, performance of pumps, characteristics curves, NPSH, cavitation, priming devices, pump troubles and remedies.

UNIT – VII

HYDRAULIC DEVICES: Hydraulic accumulator, hydraulic intensifier, hydraulic ram, hydraulic press, hydraulic lift, hydraulic crane, hydraulic couplings and torque converters, air lift pump.

UNIT – VIII

HYDRAULIC SYSTEMS: Gear and vane pumps, hydraulic control valves - direction control valve, pressure control valves, flow control valves, hydraulic control systems –closed loop system, open loop system.

Text Books:

1. Hydraulics and Hydraulic Machines / P.N. Modi and S.M. Seth, Standard Book House
2. Hydraulic Machines / Banga and Sharma, Khanna Publishers

References:

1. Elements of Hydraulic Machines and Fluidics / Jagdish Lal
2. Fluid mechanics and Fluid Power Engineering/ D.S.Kumar, S.K.Kataria and Sons Publications.
3. Fluid Power with Applications / Anthony Esposito, PHI

PRODUCTION TECHNOLOGY

Course Code: AME1113

L	T	P	C
4	0	0	4

Aim and Objective:

To make the students familiar and understand the details of various manufacturing processes.

UNIT-I

CASTING-I: Casting, steps involved in making a casting, advantages and applications of metal casting, patterns, pattern making, pattern materials, types of pattern, pattern allowances, mold materials.

Sand testing procedure - moisture content test, permeability test, strength test, grain fineness test.

Principles of gating system ,functions of gating system ,gating ratio ,design of gating systems, risers , types and functions of risers.

UNIT-II

CASTING-II: Solidification of casting, solidification of pure metal and alloys, short and long freezing range, special casting processes-centrifugal, investment, die casting, continuous casting, Casting defects, methods of melting- types of furnaces, crucible melting and cupola operation.

UNIT-III

JOINING PROCESSES-I: Classification of welding process, advantages and disadvantages of welding, applications of welding, safety recommendations in welding , welded joints ,gas welding , arc welding , MIG and TIG welding, Electro slag welding, plasma arc welding, gas cutting.

UNIT-IV

JOINING PROCESSES-II: Resistance welding , spot welding ,projection welding , ultrasonic welding , friction welding , thermit

welding ,electron beam welding, laser beam welding , heat affected zone, welding distortion, welding defects, soldering, brazing, adhesives.

UNIT-V

METAL FORMING-I: Hot working, cold working, strain hardening, recrystallisation, grain growth, grain structure. Rolling- hot and cold rolling, types of rolling mills and products, tube rolling, characteristics of hot rolled and cold rolled components.

UNIT-VI

METAL FORMING-II: Metal forming processes, roll forming, flexible die forming, peen forming, swaging, cold heading, thread rolling, spinning, drawing - rod drawing, wire drawing, tube drawing.

Presses and press tools - types of presses, blanking, piercing, bending, embossing, coining.

UNIT-VII

METAL FORMING –III: Forging - types of forging, smith forging, drop forging, roll forging, forging hammers, advantages and disadvantages of forging, limitations , forging defects and remedies.

Extrusion - methods of extrusion, hot and cold extrusion, forward and backward extrusion, impact extrusion, hydrostatic extrusion, tube extrusion.

UNIT-VIII

PLASTICS: Introduction to polymers, types and properties, applications of plastics, plastics moulding processes- compression moulding, transfer moulding, injection moulding, blow moulding, extrusion moulding

Text Books:

1. Production Technology Vol I, O.P. Khanna & M. Lal, Dhanpat Rai Publications
2. Manufacturing Technology, P.N. Rao, TMH

References:

1. Production Technology, R.K. Jain, Khanna Publishers
2. Welding process, Parmar
3. Principles of Metal Casting, Rosenthal, McGraw-Hill

KINEMATICS OF MACHINES

Course Code: AME1114

L	T	P	C
4	1	0	4

Aim & Objective:

The objective of this course is to expose the students to various mechanisms and motion transmission elements used in Mechanical Engineering practice and their kinematic analysis. This is a pre requisite course for Dynamics of Machines and design of machine elements.

UNIT – I

SIMPLE MECHANISMS: Link or element – types of links – Rigid, flexible and fluid links – kinematic pairs – sliding, turning, rolling, screw and spherical pairs – lower and higher pairs, Types of constrained motion – completely, incompletely and successfully constrained motion – kinematic chain - mechanism – Inversion – Types of kinematic chains – four bar or quadric cycle chain – single slider crank chain – Double slider crank chain and their inversions.

UNIT – II

VELOCITY IN MECHANISMS: Relative velocity method – velocity of point on a link- application of relative velocity method to four bar mechanism and slider crank mechanism – rubbing velocity of a joint – Instantaneous centre method –body centrode and space centrode - velocity of point on a link by Instantaneous centre method, location of Instantaneous centre - three centres in line theorem and application of the method for simple mechanisms.

UNIT – III

ACCELERATION IN MECHANISMS: Acceleration diagrams of a link - acceleration diagrams for a four bar mechanism and slider crank mechanism- Analytical expression for the determination of velocity and acceleration of the piston of a reciprocating engine- kleins construction to determine the acceleration of piston - coriolis

component of acceleration - acceleration diagram for slotted lever quick return mechanism

UNIT - IV

MECHANISM WITH LOWER PAIRS: Pantograph – straight line motion mechanisms – exact straight line motion mechanisms made of turning pairs – Peaucellier mechanism, Hart's Mechanism – exact straight line motion consisting of one sliding pair - Scott Russel's mechanism – Approximate straight line motion mechanisms - Grass hopper – Watt –Tchebicheff - Robert mechanism- steering mechanism - condition for correct steering – Davis steering gear- Ackerman's steering gear, Hooke's joint – ratio of shaft velocities – maximum and minimum speed of driven shaft – condition for equal speeds – Angular acceleration of driven shaft – Double Hooke's joint.

UNIT - V

CAMS: Classification of followers and cams – terms used in radial cams – displacement, velocity and acceleration diagrams when the follower moves with uniform velocity, uniform acceleration and retardation, simple harmonic motion – construction of cam profiles – cams with specified contours – tangent cam with roller follower – circular arc cam with flat faced follower.

UNIT – VI

BELT DRIVES: Types of belt drives, materials used for belts, slip and creep in belt drives, length of belt in open and crossed belt drives, ratio of driving tensions in flat and V belt drives – initial tension, centrifugal tension, maximum tension in belt, condition for transmission of maximum power.

UNIT – VII

TOOTHED GEARING: Classification of toothed wheels – terms used in gears - law of gearing – velocity of sliding of teeth – forms of teeth – cycloidal and involute teeth – standard proportions of gear teeth – length of arc of contact – path of contact – contact ratio- interference in involute teeth - minimum number of teeth to avoid interference. Introduction to helical and spiral gears.

UNIT – VIII

GEAR TRAINS: Simple, compound and reverted gear trains – epicyclic gear train – velocity ratio of epicyclic gear train-sun and planet wheels – torques in epicyclic gear train.

Text Books:

1. Theory of Machines, R.S. Khurmi, J.K. Gupta, S.Chand, Eurasia Publishing House (PVT)Ltd.
2. Theory of Machines and Mechanisms, S.S.Rattan, TMH Publishers

References :

1. Theory of Machines, Thomas Bevan/CBS Publishers
2. Theory of machines, R.K. Bansal, Laxmi Publications

THERMAL ENGINEERING - I

Course Code: AME1115

L	T	P	C
4	0	0	4

Aim and Objective:

To familiarize students with the thermodynamic cycles and analysis skills associated with the thermodynamic principles applied to thermal energy conversion systems like I.C. Engines and Gas turbines.

UNIT – I

Power Cycles:

Otto, Diesel, Dual Combustion cycles, Sterling cycle, Atkinson cycle, Ericcson cycle, Lenoir cycle, Brayton cycle – description and representation on P–V and T-S diagram, thermal efficiency, mean effective pressures on air standard basis – comparison of cycles.

UNIT-II

I.C. Engines:

Classification, working principles, valve and port timing diagrams, air-fuel and actual cycles, engine systems – fuel, carburetor, fuel injection system, ignition, cooling and lubrication.

UNIT – III

Combustion in S.I. Engines:

Normal Combustion and abnormal combustion, importance of flame speed and effect of engine variables, type of abnormal combustion, pre-ignition and knocking, fuel requirements and fuel rating, anti knock additives, combustion chamber – requirements, types.

UNIT -IV

Combustion in C.I. Engines:

Four stages of combustion, delay period and its importance, effect of engine variables, Diesel knock, need for air movement, suction,

compression and combustion induced turbulence, open and divided combustion chambers and nozzles used, fuel requirements and fuel rating.

UNIT –V

TESTING AND PERFORMANCE: Parameters of performance - measurement of cylinder pressure, fuel consumption, air intake, exhaust gas composition, brake power, determination of frictional losses and indicated power, performance test, heat balance sheet and chart.

UNIT – VI

COMPRESSORS: Classification – positive displacement and roto dynamic machinery, power producing and power absorbing machines, fan, blower and compressor, positive displacement and dynamic types, reciprocating and rotary types.

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

UNIT -VII

ROTARY (POSITIVE DISPLACEMENT TYPE): Roots blower, vane sealed compressor, Lysholm compressor – mechanical details and principle of working – efficiency considerations.

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

UNIT -VIII

GAS TURBINES: Classification of gas turbine, open cycle gas turbine – intercooling, reheating and regeneration - effect of variables, closed cycle gas turbine – efficiency, pressure ratio, merits and demerits of open and closed cycles.

Text Books:

1. I.C. Engines, V. Ganesan, TMH publications.
2. Thermal Engineering, R.K. Rajput, Lakshmi Publications.

References:

1. I.C. Engines, Mathur and Sharma, Dhanpath Rai and Sons.
2. Thermodynamics and Heat Engines, B. Yadav, Central Book Depot., Allahabad
3. Gas Turbines, V. Ganesan, TMH Publications

PRODUCTION TECHNOLOGY LAB

Course Code: AME1116

L	T	P	C
0	0	3	2

Aim and Objective:

To provide hands-on experience on different production processes and to demonstrate and train students in basic production trades.

Any TEN of the following experiments are to be performed during the semester

LIST OF EXPERIMENTS

I. Metal casting:

1. Pattern design and making (2 exercises)
2. Sand properties testing (2 exercises)
3. Moulding, melting and casting

II. Welding:

1. Arc welding for lap joint and butt joint (2 exercises)
2. Spot welding
3. Gas welding
4. TIG welding
5. Gas cutting

III. Mechanical working :

1. Pipe bending

IV. Processing of plastics :

1. Injection moulding
2. Blow moulding

FLUID MECHANICS AND HYDRAULIC MACHINES LAB

Course Code: AME1117

L	T	P	C
0	0	3	2

Aim and Objective :

Students should be able to verify the principles studied in theory by conducting the experiments.

Any TEN of the following experiments are to be performed during the semester

LIST OF EXPERIMENTS

1. Calibration of Venturi meter.
2. Calibration of Orifice meter.
3. Verification of Bernoulli's theorem
4. Determination of friction factor for a given pipe line.
5. Determination of minor losses in a pipeline
6. Calibration of V - Notch
7. Impact of jets on vanes.
8. Performance test on Pelton wheel.
9. Performance test on Francis turbine.
10. Performance test on single stage centrifugal pump.
11. Performance test on multi stage centrifugal pump.
12. Performance test on reciprocating pump.

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