ACHARYA NAGARJUNA UNIVERSITY
NAGARJUNA NAGAR – 522 510

Scheme of Instruction and Examination and detailed Syllabi

of

4-Year B.Tech Degree Course (All Branches)
(Semester System)

w.e.f. 2007-2008

ACHARYA NAGARJUNA UNIVERSITY: NAGARJUNA NAGAR

REVISED REGULATIONS FOR FOUR – YEAR B.TECH. DEGREE COURSE

(SEMESTER SYSTEM)

(Effective for the batch of students admitted into first year B.Tech. from the academic year 2007-2008).

1.0.   MINIMUM QUALIFICATIONS FOR ADMISSION:

A candidate seeking admission into First Year of B.Tech. Degree Course should have passed

either Intermediate examination conducted by the Board of Intermediate Education, Andhra

Pradesh with Mathematics, Physics, and Chemistry as optional subjects (or any equivalent

examination recognized by the Acharya Nagarjuna University) or Diploma in Engineering in the

relevant branch conducted by the State Board of Technical Education & Training of Andhra

Pradesh (or equivalent Diploma recognized by Acharya Nagarjuna University).

The selection is based on the rank secured by the candidate at the EAMCET / ECET (FDH) examination conducted by A.P. State Council of Higher Education.

The candidate shall also satisfy any other eligibility requirements stipulated by the University and / or the Government of Andhra Pradesh from time to time.

2.0.   BRANCHES OF STUDY:

2.1.   The B.Tech. Course is offered in the following branches of study at one or more of the affiliated colleges:

1   Biotechnology
2   Chemical Engineering
3   Civil Engineering
4   Computer Science & Engineering
5   Electrical & Electronics Engineering
6   Electronics & Communication Engineering
7   Electronics & Instrumentation Engineering
8   Information Technology
9   Mechanical Engineering

2.2   The first year of study is common to all branches of Engineering except for Chemical Engineering and Biotechnology.

3.0. DURATION OF THE COURSE AND MEDIUM OF INSTRUCTION:

The duration of the Course is four academic years consisting of two semesters in each academic year where as annual pattern is followed for first year. The medium of instruction and examination is English.

4.0. MINIMUM INSTRUCTION DAYS:

The first year shall consist of a minimum number of 180 instruction days and each semester of 2nd, 3rd and 4th years shall consist of 90 days of instruction excluding the days allotted for tests, examinations and preparation holidays.

5.0 EVALUATION:

5.1. The performance of the students in each year or semester shall be evaluated subject wise

5.2. The distribution of marks between sessional work (based on internal assessment) and University Examination will be as follows:

Nature of the subject	Sessional Marks	University Exam. Marks
Theory subjects	30	70
Design and / or Drawing	30	70
Practicals	25	50
Project work	50	100 (Viva voce)

5.2.1. In the First Year, there shall be three Mid Term Examinations and three Assignment Tests in theory subjects, conducted at approximate equal intervals in the academic year. Assignment questions shall be given at least one week in advance and the students shall answer the question(s) specified by the concerned teacher just before the commencement of the Assignment Test. A maximum of 18 Sessional marks (75% approx) shall be awarded based on the best two performances out of the three Mid Term Exams and a maximum of 7 (25% approx) marks for the best two Assignment Tests out of the three Assignment Tests conducted.

For Drawing subject (Engineering Graphics), 7 marks shall be awarded based on day-to-day class work and the remaining 18 marks based on the best two performances in the three Mid Term Exams. No separate Assignment Tests will be held for this subject.

The remaining 5 marks out of the 30 marks earmarked for the internal sessional marks are allotted for attendance in the respective theory and drawing subjects in a graded manner as indicated in 7.1 (a) from I year to IV year.

In each of the Semesters of 2nd, 3rd and 4th years, there shall be two Mid Term examinations and two Assignment Tests in every theory subject. The Sessional marks for the midterm examinations shall be awarded giving a weightage of 14 marks out of 18 marks (75% approx) to that midterm examination in which the student scores more marks and the remaining 4 marks (25% approx.) for other midterm examination in which the student scores less marks. Similarly a weightage of 5 marks (75% approx) out of 7 marks earmarked for assignment tests shall be given for the assignment in which the student scores more marks and remaining 2 marks (25% approx) shall be given for the assignment test in which the student scores less marks.

For Drawing subjects, there shall be only two Mid Term examinations in each semester with no Assignment Tests. In the case of such subjects a maximum of seven marks shall be given for day-to-day class work and the remaining maximum 18 marks shall be awarded to the Mid Term examinations taking into account the performance of both the Mid Term examinations giving

weightage of 14 marks for the Mid Term Examination in which the student scores more marks and the remaining 4 marks for the other midterm examination. A weightage of 5 marks will be given in the total sessional marks of 30 for attendance in all theory and drawing subjects as indicated in 7.1(a).

5.2.2. The evaluation for Laboratory class work contists of weightage of 15 marks for day to day laboratory work including record work and 10 marks for internal laboratory examination including Viva-voce examination.

In the case of Project work, the sessional marks shall be awarded based on the weekly progress and based on the performance in a minimum of two Seminars and the Project Report submitted at the end of the semester. The allotment of sessional marks for Seminars and for day-to-day class work shall be 25 and 25.

<u>NOTE</u> : A student who is absent for any Assignment / Mid Term Exam, for any reason whatsoever, shall be deemed to have scored zero marks in that Test / Exam and no make-up test / Exam shall be conducted.

5.2.3. A student who could not secure a minimum of 50% aggregate sessional marks is not eligible to appear for the year-end / semester-end University examination and shall have to repeat that year/ semester.

6.0.   LABORATORY / PRACTICAL CLASSES:

In any year/semester, a minimum of 90 percent experiments / exercises specified in the syllabi for laboratory course shall be conducted by the students, who shall complete these in all respects and get the Record certified by the concerned Head of the Department for the student to be eligible to face the University Examination in that Practical subject.

7.0.   ATTENDANCE REGULATIONS:

7.1. Regular course of study means a minimum average attendance of 75% in all the subjects computed by totaling the number of hours / periods of lectures, design and / or drawing, practicals and project work as the case may be, held in every subject as the denominator and the total number of hours / periods actually attended by the student in all the subjects, as the numerator.

7.1(a). A Weightage in sessional marks upto a maximum of 5 marks out of 30 marks in each theory subject shall be given for those students who put in a minimum of 75% attendance in the respective theory in a graded manner as indicated below:

Attendance of 75% and above but less than 80%   - 1 mark

Attendance of 80% and above but less than 85%   - 2 marks

Attendance of 85% and above but less than 90%   - 3 marks

Attendance of 90% and above   - 5 marks

7.2. Condonation of shortage in attendance may be recommended on genuine medical grounds, up to a maximum of 10% provided the student puts in at least 65% attendance as calculated in *7.1* above and provided the principal is satisfied with the genuineness of the reasons and the conduct of the student.

7.3. A student who could not satisfy the minimum attendance requirements, as given above, in any year / semester, is not eligible to appear for the year end or semester end examinations and shall have to repeat that year/semester.

8.0   DETENTION:

A student, who fails to satisfy either the minimum attendance requirements as stipulated in *Clause-7*, or the requirement of minimum aggregate sessional marks as stipulated in *Clause 5*,

shall be detained. Such a student shall have to repeat the same year / semester as the case may be subsequently and satisfy the above requirements afresh to become eligible to appear for the year-end / semester-end University examination.

9.0.   UNIVERSITY EXAMINATION:

9.1.   For each theory, design and/or drawing subject, there shall be a comprehensive University Examination of three hours duration at the end of First year / each Semester of 2nd, 3rd and 4th years, except where stated otherwise in the detailed Scheme of Instruction.

Question paper setting shall be entrusted to external examiners from the panels approved by the respective Boards of Studies.

9.2.   For each Practical subject, the University examination shall be conducted by one internal and one external examiner appointed by the Principal of the concerned college and the University respectively, the duration being that approved in the detailed Schemes of Instruction & Examination.

9.3.1   Viva-voce Examination in Project Work shall be conducted by one internal examiner and one external examiner to be appointed by the University.

10.0   CONDITIONS FOR PASS:

A candidate shall be declared to have passed the University Examination in individual subjects if he / she secures a minimum of 40% marks in theory and drawing subjects, and 50% marks in Practical subjects (including Project Viva-voce).

11.0   CONDITIONS FOR PROMOTION

11.1. A student shall be eligible for promotion to II B.Tech. Course if he / she satisfies the minimum requirements of attendance and sessional marks as stipulated in Clauses 5 and 7, irrespective of the number of backlog subjects in I B.Tech.

11.2.   A student shall be eligible for promotion to III B.Tech. Course if he / she has passed all but three subjects of I B.Tech., (including practical subject) in addition to satisfying the minimum requirements of attendance and sessional marks stipulated in *Clauses 5 and 7* in II B.Tech.

11.3.   A student shall be eligible for promotion to IV B.Tech. Course if he/she has passed all but three subjects of II B.Tech. and all but one subject of I B.Tech.in addition to satisfying the minimum requirements of attendance and sessional marks stipulated in *Clauses 5 and 7* in III B.Tech.

12.0 ELIGIBILITY FOR AWARD OF B.TECH. DEGREE

The B.Tech. Degree shall be conferred on a candidate who has satisfied the following requirements.

12.1.   The candidate must have, after admission to B.Tech. Degree Course of the University pursued the course of study for not less than four academic years in any one of the affiliated Engineering Colleges.

12.2.   The candidate must have satisfied the conditions for pass in all the subjects of all the years as stipulated in *clause 10.*

12.3.   **Maximum Time Limit for completion of B.Tech Degree**

A Maximum time limit of 8 (eight) years for Four Year B.Tech is prescribed for a candidate to complete B.Tech Degree beyond which the candidate shall not be permitted to appear for the B.Tech Degree examinations.

13.0 AWARD OF CLASS

A candidate who becomes eligible for the award of B.Tech. Degree as stipulated in *Clause 12* shall be placed in one of the following Classes.

First Class With Distinction   : 70% aggregate* or more.

First Class   : 60% aggregate or more but less than 70%.

Second Class   : 50% aggregate or more but less than 60%

Pass Class   : All other candidates eligible for the award of the Degree.

"Aggregate," for this purpose, shall mean aggregate of the marks obtained in the University Examinations and Sessional marks put together in all the four years.

14.0. IMPROVEMENT OF CLASS

14.1. A candidate, after becoming eligible for the award of the Degree, may reappear for the University Examination in any of the theory subjects as and when conducted, for the purpose of improving the aggregate and the class. But this reappearance shall be within a period of two academic years after becoming eligible for the award of the Degree.

However, this facility shall not be availed of by a candidate who has taken the Original Degree Certificate. Candidates shall not be permitted to reappear either for Sessional Examination or for University Examinations in Practical subjects (including Project Viva-voce) for the purpose of improvement.

14.2. The Sessional marks and the University Examination marks shall be shown separately on the Marks Sheet.

14.3. A single Marks Statement shall be issued to the candidate after incorporating the marks secured in subsequent improvements.

14.4. A consolidated Marks Statement shall be issued to the candidate indicating the aggregate percentage of marks of all the four years along with the Provisional Certificate.

15.0. AWARD OF RANK
The rank shall be awarded based on the following:

15.1. Ranks shall be awarded in each branch of study for the top ten percent of the students appearing for the Regular University Examinations or the top ten students whichever is lower.

15.2. Only such candidates who pass the Final year examination at the end of the fourth academic year after admission as regular final year students along with the others in their batch and become eligible for the award of the Degree shall be eligible for the award of rank. The University Rank will be awarded only to those candidates who complete their agree within four academic years.

15.3. For the purpose of awarding rank in each branch, the aggregate of marks - University Examination and Sessional marks put together - in all the four years, secured at the first attempt only shall be considered.

15.3. Award of prizes, scholarships, or any other Honors shall be based on the rank secured by a candidate, consistent with the desire of the Donor, wherever applicable.

16.0. SUPPLEMENTARY EXAMINATIONS

In addition to the Regular University Examinations held at the end of each academic year / each semester, Supplementary University Examinations will be conducted during the academic year. Such of the candidates taking the Regular / Supplementary University examinations as Supplementary candidates may have to take more than one University Examination per day.

17.0. TRANSITORY REGULATIONS

17.1.   Candidates who studied the four-year B.Tech. Degree Course under New Regulations (NR) / Revised Regulations (RR) but who got detained in any year for want of attendance / minimum aggregate sessional marks may join the appropriate year / semester in the Semester system applicable for the batch and be governed by the Regulations of that batch from then on.

17.2.   University Examinations according to NR / RR shall be conducted in subjects of each year five times after the conduct of the last set of regular examinations under those Regulations.

17.3.   Candidates who have gone through the entire course of four academic years and have satisfied the attendance and minimum aggregate sessional marks in each year under NR / RR, but who are yet to pass some subjects even after the five chances stated in *Clause 17.2*, shall appear for the equivalent subjects in the Semester system, specified by the University / Board of Studies concerned.

18.0. AMENDMENTS TO REGULATIONS

The University may, from time to time, revise, amend, or change the Regulations, Schemes of Examinations, and / or Syllabi.

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ᴀCHARYA NAGARJUNA UNIVERSITY : NAGARJUNA NAGAR

SCHEME OF EXAMINATION AND INSTRUCTION FOR 1/4 B.TECH.
w.e.f 2007-2008 (Semester System)

I/IV B.TECH (ALL BRANCHES) - ANNUAL PATTERN (For I B.Tech. only)
(except Chemical Engg. and Biotechnology)

Code No	Subject	Periods per week		Maximum Marks		Total Marks
		L/T	D/P	Sessional	University	
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 101	Mathematics – I	3	-	30	70	100
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 102	Mathematics – II	3	-	30	70	100
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 103	Physics	3	-	30	70	100
CE/CSE/ECE/EEE/EI/IT/ME - 104	Chemistry	3	-	30	70	100
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 105	Technical English Communication Skills	3	-	30	70	100
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 106	Computer Programming	3	-	30	70	100
CE/CSE/ECE/EEE/EI/IT/ME - 107	Engineering Mechanics	3+1	-	30	70	100
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 108	Engineering Graphics**	2+4	-	30	70	100
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 151	Physics Lab	-	3	25	50	75
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 152	Chemistry Lab*	-	3/2	25	50	75
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 153	Workshop Practice*	-	3/2	25	50	75
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 154	Computer Programming Lab	-	3	25	50	75
	TOTAL	**23+5**	**9**	**340**	**760**	**1100**

*   Common slot

** Two different question papers will be set for the University Examination. One question paper for CE, ME, EEE, Ch.E and BT branches and the University Examination will be conducted from 9.00 A.M. to 12.00 Noon. The second question paper will be set for ECE, EI, CSE & IT branches and the University exam will be conducted from 2 P.M. to 5 PM.

ACHARYA NAGARJUNA UNIVERSITY : NAGARJUNA NAGAR

SCHEME OF EXAMINATION AND INSTRUCTION FOR 1/4 B.TECH.
w.e.f 2007-2008 (Semester System)

I/IV B.TECH (Biotechnology) - ANNUAL PATTERN (For I B.Tech. only)

Code No	Subject	Periods per week		Maximum Marks		Total Marks
		L/T	D/P	Sessional	University	
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 101	Mathematics – I	3	-	30	70	100
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 102	Mathematics – II	3	-	30	70	100
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 103	Physics	3	-	30	70	100
BT/Ch.E - 104	Inorganic & Physical Chemistry	4	-	30	70	100
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 105	Technical English Communication Skills	3	-	30	70	100
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 106	Computer Programming	3	-	30	70	100
BT - 107	Cell Biology	3	-	30	70	100
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 108	Engineering Graphics**	2+4	-	30	70	100
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 151	Physics Lab	-	3	25	50	75
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 152	Chemistry Lab*	-	3*	25	50	75
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 153	Workshop Practice*	-	3*	25	50	75
BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 154	Computer Programming Lab	-	3	25	50	75
	TOTAL	24+4	9	340	760	1100

*   Common slot.

**   Two different question papers will be set for the University Examination. One question paper for CE, ME, EEE, Ch.E and BT branches and the University Examination will be conducted from 9.00 A.M. to 12.00 Noon. The second question paper will be set for ECE, EI, CSE & IT branches and the University exam will be conducted from 2 P.M. to 5 PM.

ACHARYA NAGARJUNA UNIVERSITY : NAGARJUNA NAGAR

SCHEME OF EXAMINATION AND INSTRUCTION FOR 1/4 B.TECH.
w.e.f 2007-2008 (Semester System)

I/IV B.TECH (Chemical Engineering) - ANNUAL PATTERN (For I B.Tech. only)

Code No	Subject	Periods per week		Maximum Marks		Total Marks
		L/T	D/P	Sessional	University	
BT/CE/Ch.E/CSE/ECE /EEE/EI/IT/ME - 101	Mathematics – I	3	-	30	70	100
BT/CE/Ch.E/CSE/ECE /EEE/EI/IT/ME - 102	Mathematics – II	3	-	30	70	100
BT/CE/Ch.E/CSE/ECE /EEE/EI/IT/ME - 103	Physics	3	-	30	70	100
BT/Ch.E - 104	Inorganic & Physical Chemistry	4	-	30	70	100
BT/CE/Ch.E/CSE/ECE /EEE/EI/IT/ME - 105	Technical English Communication Skills	3	-	30	70	100
BT/CE/Ch.E/CSE/ECE /EEE/EI/IT/ME - 106	Computer Programming	3	-	30	70	100
Ch.E - 107	Introduction to Chemical Engineering	3	-	30	70	100
BT/CE/Ch.E/CSE/ECE /EEE/EI/IT/ME - 108	Engineering Graphics **	2+4	-	30	70	100
BT/CE/Ch.E/CSE/ECE /EEE/EI/IT/ME - 151	Physics Lab	-	3	25	50	75
BT/CE/Ch.E/CSE/ECE /EEE/EI/IT/ME - 152	Chemistry Lab*	-	3/2	25	50	75
BT/CE/Ch.E/CSE/ECE /EEE/EI/IT/ME - 153	Workshop Practice*	-	3/2	25	50	75
BT/CE/Ch.E/CSE/ECE /EEE/EI/IT/ME - 154	Computer Programming Lab	-	3	25	50	75
	TOTAL	24+4	9	340	760	1100

*   Common slot.

**   Two different question papers will be set for the University Examination. One question paper for CE, ME, EEE, Ch.E and BT branches and the University Examination will be conducted from 9.00 A.M. to 12.00 Noon. The second question paper will be set for ECE, EI, CSE & IT branches and the University exam will be conducted from 2 P.M. to 5 PM.

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BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 101: MATHEMATICS - I

(Common to all Branches)

Lectures: 3 Periods/ week   *Sessional Marks: 30*

University Exam. Marks : 70   *University Exam. : 3 hrs*

UNIT-I

Ordinary differential equations-Introduction, Linear and Bernoulli's equations, Exact equations, equations reducible to exact equations, Orthogonal trajectories, Linear Differential equations: Definition, Theorem, Operator D, Rules for finding the complementary function,   Inverse operator, Rules for finding the particular integral, Working procedure to solve the equation, Newton's law of cooling, Heat flow, Rate of Decay of Radio-Active Materials.

Unit-II

Linear dependence of solutions, Method of variation of parameters, Equations reducible to linear equations, Cauchy's homogeneous linear equation, Legendre's linear equation Simultaneous linear equations with constant coefficients, Statistics: Method of least squares, Correlation, co-efficient of correlation (direct method only), lines of regression.

Unit-III

Laplace Transforms : Introduction, Transforms of elementary functions, Properties of Laplace Transforms, existence conditions, Transforms of derivatives, Integrals, multiplication by t^n, division by t, Evaluation of integrals by Laplace Transforms, Inverse transforms, convolution theorem, Application to Differential equations with constant coefficients, transforms of unit step function, unit impulse function, periodic function. Convolution Theorem, Application to ordinary differential equations

Unit-IV

  Introduction and Euler's formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, Change of interval, Even and Odd functions, Half range series Typical wave forms and Parseval's formulae, Complex form of the Fourier series Practical harmonic analysis

Text Books: 1). Higher Engineering Mathematics by B.S. Grewal, Khanna publishers,
                          39th edition.

Reference Books: 1]. Advanced Engineering Mathematics by kreyszig.

                          2]. A textbook of Engineering Mathematics by N.P. Bali

BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME – 102: MATHEMATICS - II
(Common to all Branches)

Lectures: 3 Periods / week   *Sessional Marks: 30*
University Exam. Marks : 70   *University Exam. : 3 hrs*

UNIT-I
Matrices:

Rank of a matrix, vectors, Elementary transformations,   Solution of linear system of equations, Consistency of linear system of equations, System of linear homogeneous equations, Linear transformations, Characteristic equations, Properties of eigen values, Cayley- Hamilton theorem (without proof), Reduction to diagonal form reduction of Quadratic forms to canonical form, Nature of a quadratic form, Complex matrices.

UNIT-II

Differential Calculus:

Rolle's Theorem(without proof), Lagrange's Mean value theorem (without proof), Taylor's theorem (without proof), Maclaurin's series, Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

UNIT-III

Multiple Integrals and Vector Calculus:

Double integrals, Change of order of integration , Double integrals in polar coordinates, Area enclosed by plane curves, Evaluation of triple integrals, Volume of solids, Change of variables.
Vector Calculus:
Scalar and vector point functions, Del applied to scalar point functions. Gradient

UNIT-IV

Vector Calculus:

Del applied to vector point functions, Physical interpretation of divergence, Del applied twice to point functions, Del applied to products of point functions, Integration of vectors, Line integral, Surfaces, Green's theorem in the plane (without proof),   Stoke' s theorem (without proof) , Volume integral, Gauss divergence Theorem (without proof), Cylindrical Coordinates, Spherical polar coordinates.

Text Books: [1] Higher Engineering Mathematics by B.S.Grewal Khanna publishers,39thedition.

Reference Books: 1] A textbook of Engineering Mathematics by N.P. Bali
            2] Advanced Engineering Mathematics by Erwin Keyszing John willy and sons.
            3] Differential Calculus by Shanti Nayaran

BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 103: *PHYSICS*
(Common to all Branches)

Lectures: 3 Periods / week   *Sessional Marks: 30*
University Exam. Marks : 70   *University Exam. :   3 hrs*

UNIT – 1 Ultrasonics & Optics :

Ultrasonics- Production of Ultrasonics by Magnetostriction & Piezoelectric oscillator methods, Detection of Ultrasonics by Kundt's tube and acoustic grating method, applications of Ultrasonics in engineering & medicine. Lissajous' figures for time periods with Ratios 1:1 and 1:2, applications of Lissajous' figures.

Optics: Superposition principle, Stokes principle (Phase change on reflection) -Interference in thin films due to reflected light(cosine law) -Michelson's interferometer principle, construction, working and applications (Determination of wave length of monochromatic source & for resolution of two closely lying wavelengths).

Diffraction: Fraunhoffer diffraction due to a single slit, Plane diffraction grating, resolving power of a grating using Rayleigh's criterion. *Polarization*: double refraction, Nicol prism, quarter wave plate, Production and detection of circular and elliptical polarizations (qualitative), Optical activity, Electro-optic and Magneto-optic effects (Kerr & Faraday effects) .

UNIT –II *Electicity & Electromagnetism:*

Gauss's law in electricity (statement and proof) and its applications: Coulomb's law from Gauss law, line of charge, non-conducting infinite sheet, Charged non-conducting sphere.

Circulating charges and Cyclotron principle& working, Hall effect, Biot-Savart's law- B for a long wire and circular loop, Faraday's law of induction- Lenz's law- induced electric fields ,Gauss' law for magnetism ,Inductance, Energy storage in a magnetic field, Electromagnetic oscillations(quantitative),Displacement current, Maxwell's equations (Qualitative treatment),Electromagnetic waves equation and velocity, A.C. Circuit containing series LCR circuit (Resonance condition).

UNIT –III

Modern Physics

Planck's theory of black body radiation, Dual nature of light, Compton effect, Matter waves - de Broglie's concept of matter waves - Davisson and Germer experiment - Heisenberg's uncertainty principle and applications(non existence of electron in nucleus, finite width of spectral lines). One dimensional time independent Schrodinger's wave equation - Physical significance of wave function - Particle in a box(one dimension)- Radio Isotopes-applications in medicine and industry, Qualitative treatment (without derivation) of Fermi -Dirac distribution function and Fermi-energy level concept in semiconductors.

UNIT – IV

 Advanced Physics

Lasers: -Spontaneous emission -stimulated emission – Population inversion – Solid State (Ruby) laser – Gas   (He-Ne) laser – Semiconductor(Ga-As) laser – Applications of lasers. Holography Principle, Recording , reproduction and applications.

Optical fibers : Structure of optical fiber, types of optical fibers, Numerical aperture – fiber optics in communication and its advantages

Super conductivity: First experiment, critical parameters(T_C,H_C,I_C) Meissner effect, types of superconductors, Applications of Superconductors.

Optoelectronic devices: Qualitative treatments of -- Photo diode, LED , LCD and Solar cell and its applications.

Nano Technology (Basic concepts only) and its applications.

Text Books

1. Physics Part I and II – Halliday and Resinick.
2. Engineering physics – Gaur & Gupta

Reference Books

1   Physics for engineers – M.R.Srinivasan.
2   Engineering physics – M.Arumugam.
3   Modern Engineering Physics - A.S Vasudeva

CE/CSE/ECE/EEE/EI/IT/ME – 104 : CHEMISTRY
(Common to all branches except Chemical Engineering and Bio-Tech)

Lectures: 3 Periods/ week   *Sessional Marks: 30*
University Exam. Marks : 70   *University Exam. : 3 hrs*

UNIT-I

WATER TECHNOLOGY**: Drinking Water quality parameter, WHO guidelines, Hardness units and determination by EDTA method, water treatment for drinking purpose, sedimentation, coagulation, filtration, various methods of chlorination, breakpoint chlorination.** Water treatment for industrial purpose**: Boiler troubles, scales, sludges, caustic embrittlement and boiler corrosion- causes and prevention, Lime Soda process, softening by ion exchange process (related problems), Desalination of brakish water by electro dialysis and reverse osmosis.**

COMPOSITES: Classification and Properties of composite materials, Mechanism of reinforcement in composites.

UNIT-II

POLYMERS:

Monomer functionality, degree of polymerization, classification of polymerization- addition, condensation and co polymerization, mechanism of free radical polymerization.

Classification of plastics- Thermoplastic and thermosetting resins, chemistry of synthesis of bekalite, urea formaldehyde and polyesters. Compounding of plastics. Conducting polymers, polytiophene, mechanism of conduction, examples and applications, polymers as optical fibers- Application of polymers in biomedical devices and electronics.

Natural Rubber- drawbacks of natural rubber- vulcanisation.

Synthetic rubbers- Buna-S and Buna-N and polyurethane rubber

Materials used in information Technology: Liquid crystals, cellulose acetate, ZnO, CdS, Silicon, Germanium

UNIT-III

Phase Rule: Statement and explanation of the terms involved, one component water system, condensed phase rule- construction of phase diagram by thermal analysis, simple eutectic system (Pb-Ag system only).

Electrochemical Energy Systems: Types of electrochemical energy systems, electrochemistry of primary batteries (Weston Cadmium Standard cell), Secondary cells(Lead Acid cell, Ni-Cd cell), Lithium batteries and their advantages.

Fuels**: Classification of fuels, calorific value- determination. Coal- Ranking and analysis, carbonization of coal, coal-tar products, metallurgical coke, classification of petroleum- fractional distillations, cracking, reforming, composition and uses of petrol- diesel, coal gas, natural gas, producer gas, LPG- Bio gas.**

UNIT-IV

Corrosion and its control: Introduction, electrochemical theory of corrosion, corrosion due to dissimilar metals, galvanic series, corrosion due to differential aeration cells, Types of corrosion: Pitting, Stress corrosion, cracking and microbiological corrosion, Factors affecting corrosion: oxidizers, pH, over voltage and temperature.

Protection methods: Cathodic protection, (Impressed current and sacrificial anode) anodic protection, corrosion inhibitors- types and mechanism of inhibition, metallic coatings by electroplating.

Lubricants:
Role of lubricants in reducing wear and friction, Mechanism and types of lubrication. Classification, properties and selection of lubricants, Additives

Text Books recommended:

1. Engineering Chemistry, P.C. Jain, Dhanpat Rai and Sons, New Delhi
2. A Text Book of Engineering Chemistry, S.S. Dara, 10th Edition, S.Chand and Co.
3. Essentials of Physical Chemistry, B.S.Bahl and G.D. Tuli
4. Principles of Polymer Science, P.Bahadur and N.V. Sastry, Narora Publishing House

BT/Ch.E – 104 : INORGANIC & PHYSICAL CHEMISTRY
(Only for Biotechnology and Chemical Engineering branches)

Lectures: 4 Periods/ week   *Sessional Marks: 30*
University Exam. Marks : 70   *University Exam. :   3 hrs*

PART – A: INORGANIC CHEMISTRY

UNIT- I
Mole concept, oxidation numbers, balancing of equations, stoichiometry (Mass-mass, Mass volume, Volume – Volume); Chemical bonding- ionic and covalent bonding; Molecular orbital and valence bond approaches for diatomic molecules; VSEPR theory; Hybridization and shapes of molecules; Resonance, dipole moment, structure parameters such as bond length, angle & energy; Hydrogen bonding, Vander waal's interactions; Ionic solids, Ionic radii, lattice energy (Born-Haber cycle); Metal- ligand bonding and importance;

Planck's Quantum theory, Wave particle duality, Uncertainty principle, Quantum mechanical model of hydrogen atom, Periodic Table and properties- Ionization energy, Electron negativity, Atomic size; Coordination complexes- nomenclature, crystal field theory, color, geometry and magnetic properties.

UNIT- II
Chemistry of representative s and p- block elements- electronic configuration, general properties and oxidation states; Oxides, Halides and Hydrides of Alkali, Alkaline earth metals, Boron- Aluminium, Carbon- Silicon, Nitrogen- Phosphorus, Sulphur;

d block elements- electronic configuration, general characteristics and oxidation states;

Inner transition elements- General discussion, Oxidation states and Lanthanide contractions.

PART –B: PHYSICAL CHEMISTRY

UNIT- III
Thermodynamics- First law, Reverisble and Inrreversible processes, internal energy, enthalpy, Kirchoff's equation, heat of Reaction, Hess's law, heat of formation; Second law, entropy, free energy and work function. Gibb's-helmholtz equation, Clausius-Clapeyron equation, free energy change and equilibrium constant, Trouton's rule, Third law of thermodynamics.

Phase and Chemical Equilibria : Phase rule, phase diagram of water, two component systems with a simple eutectic-Pb,Ag system, Construction of phase diagram by thermal analysis.

Colligative properties : Raoult's law, elevation of boiling point, depression of freezing point, osmotic pressure (no thermodynamic derivations) elementary treatment of vapour pressure ; Chemical Equilibria : Reversible reactions, law of mass action, Lechatelier principle, Effect of temperature on equilibrium-van't

Hoff equation; Ionic Equilibria : Solubility, solubility product, common ion effect; Hydrolysis of salts, pH, buffer and their application in chemical analysis, equilibrium constants (K_c, K_p, K_x) for homogeneous reactions.

UNIT- IV

Galvanic cells : Thermodynamics of galvanic cells, half cell potentials, e.m.f. of cells, Nernst equation, Commercial applications of galvanic cells;

Electrolytes : Conductance, effect of concentration, Kohlrausch law.

Kinetics of chemical reactions : Rate constant, order of reaction, molecularity, activation energy; Zero, First and Second order kinetics and elementary enzyme reactions.

Catalysis : Characteristics of catalyst, promoter, negative catalyst, catalytic poison, heterogeneous catalysis, intermediate compound formation theory, activated complex theory, acid, base and enzyme catalysis.

Text Books:
1. **A new concise Inorganic chemistry, III edition** - J.D.Lee, ELBS and Van Nostrand Reinhold Co. Ltd.; London.
2. **Physical Chemistry – III Edition** - P.W.Atkins, Oxford University Press.
3. **University General Chemistry** - C.N.R.Rao, MacMillan India.
4. **Elements of Physical Chemistry** – II edition - Samuel Glastone and David Lewsis; MacMillan & Co., London.
5. **Principles of Chemistry** - Paul Ander & Anthony J.Sonnessa, Collier-MacMillan Ltd., London.

BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME: - 105
TECHNICAL ENGLISH COMMUNICATION SKILLS

Lectures	: 3 periods/week	Sessional Marks	: 30
University Exam	: 3 hours	University Examination Marks	: 70

Course objectives: The areas of technical communication assay to make learners linguistically aware and communicatively competent. Special attention has been paid to the contemporary tests on language and industrial needs keeping in mind the current societal demands.

UNIT-I

General Communication Skills: This area exposes the learners to some standard varieties of linguistic communication.

1. Guided composition
    a) Paragraph writing
    b) Essay writing
    c) Confusable words
2. Reading comprehension
3. Letter writing

UNIT-II

Technical Communication Skills: This area falls under English for specific purposes (ESP) which trains the learners in basic technical communication.

1. Report writing
2. Corporate information
3. Technical words

UNIT-III

Vocabulary and Basic Language Skills: This unit offers the learners some basic aspects of language like vocabulary, structure and usage which are common to many contemporary tests.

1. Basic word list – A list of 500 words.
2. Idioms and phrases and their use.
3. Correction of sentences.
4. Analogies
5. One word substitutes
6. Antonyms & Synonyms

Textbooks:

1. Developing Language Skills: 1. (Foundation Books)
2. Objective English for Competitive Examinations (Third edition)
                                        - Hari Mohan Prasad
                                          Uma Rani Sinha
                                          (Tata McGraw Hill)

REFERENCE BOOKS

1. Effective Technical Communication
            - M.Ashraf Rizvi (Tata McGraw Hill)
2. English for Engineers
            Prepared by Regional Institute of English,
            South India, Bangalore (Foundation Books)
3. Cambridge Preparation Guide for TOEFL.
4. Dictionary of Technical Terms
            F.S.Cripsin (Oxford IBH)
5. Cambridge Advanced Learner's Dictionary
6. Cambridge Idioms Dictionary
7. Basic Correspondence & Report writing
            -Sharma (Tata McGraw Hill)
08. Business Correspondence and Report Writing
            - R.C.Sharma
              Krishna Mohan
              (Tata McGraw Hill)
09. Dictionary of Misspelled and Easily Confused Words
            -David Downing
              Deborah K.Williams
              (Tata McGraw Hill)

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Scope & extent: Scope rules, Storage Classes, Multi-file compilation.

Pointers: Pointers Arithmetic, Character array of pointers, Dynamic memory allocation, array of Pointer, Pointer to arrays.

Programming Exercises for Unit - III:

Recursive Functions: factorial, GCD(Greatest Common Divisior),Fibonacci; To evaluate the pointer arithmetic expressions; An interactive program to perform Pointers & Functions - Insertion sort, Bubble sort, Linear search Binary search, Computation of Statistical parameters of a given list of numbers, Counting the number of characters, words and lines in a given text, Table of values of f (x,y) varying x and y; Using Storage Classes to implement the multifile compilation; implement the string operations using Dynamic memory allocation functions;

UNIT – IV

Structures: Structures, Array of structures, structures within structures, Pointer to structures, self referential structures, Unions.

Files: File Handling functions, File error handling functions, Command-line arguments.

Programming Exercises for Unit - IV:

Operations on complex numbers, operations on rational number (p/q form), Matrix operations with size of the matrix as a structure; Frequency count of keywords in an input program, Sorting a list of birth records on name and date of birth using File handling functions, Student marks processing, Library records processing - sorting on name, author, Copy one file to another.

Text Book:

1. Programming with C (Schaum's Outlines) by Byron Gottfried, Tata Mcgraw-Hill.

Reference Books:

The C programming language by Kernighan B W and Ritchie O M,Prentice Hall.

Programming with C by K R Venugopal & Sudeep R Prasad, TMH.

'C' Programming by K.Balaguruswamy,BPB

C Complete Reference ,Herbert Sheildt,TMH

BT – 107 - CELL BIOLOGY
(Only for Biotechnology Branch)

Lectures: 3 Periods / week   *Sessional Marks: 30*
University Exam. Marks : 70   *University Exam. :   3 hrs*

UNIT-I

CELL STRUCTURE, ORGANELLES AND THEIR FUNCTIONS
Molecule – organelle – cell – organism, Oparin & Haldane's theory, Miller and Urey's experimental evidence for chemical evolution. Cell structure organization in Bacteria, Yeast, higher plants and animal cells. Comparison of Prokaryotic and Eukaryotic cells. Organization, structure and functions of cell wall, plasma membrane, lysosomes, Ribosomes, Golgi complex, Peroxisomes, Glyoxysomes, Mitochondria, Plastids, Endoplasmic Reticulum, Vacuoles, Centrioles, Cytoskeleton – composition, structure & functions of Microtubules, Microfilaments and Intermediate filaments.

UNIT-II
NUCLEUS & CHROMOSOMES
Nucleus, its ultra structure, Nuclear envelope, Nucleoplasm, Nucleolus, Chromatin fibers**;** Fine Structure of Chromosome, Structure of Nucleosome and Packing of DNA; Types of Chromatin – Euchromatin & Heterochromatin; Role of Histone & Non-Histone proteins in structural organization of Chromosomes; Giant chromosomes - Polytene & Lamp-brush chromosomes.

UNIT-III
CELL DIVISION AND CELL CYCLE
Cell Cycle – Phases; Cell Division – Karyokinesis and Cytokinesis; Mitosis: General events of Interphase, Karyokinesis - Prophase, Metaphase, Anaphase and Telophase. Cytokinesis; significance of Mitosis; Meiosis and Reproductive cycle, Kinds of Meiosis, process of Meiosis, Heterotypic and Homotypic Meiotic division, significance of Meiosis.

Cell cycle: Bacterial cell cycle- Reproduction; Eukaryotic cell cycle - different phases, Check points; molecular basis of cell cycle regulation - Cyclin dependent kinases (CDKs) and Cyclins; CDK- Cyclin activity- Progress through cell cycle; Apoptosis – Cascade of reactions.

UNIT- IV
 BIOENERGETICS
Outlines of thermodynamic principles, Chemical equilibria, free energy, enthalpy, free energy changes in biological transformations. High-energy compounds, energy change – Oxidation/Reduction reactions; Organization of electron carriers and enzymes in mitochondria. Classes of electron transferring enzymes; Inhibitors of electron transport, Oxidative phosphorylation, mitochondria transport systems, microsomal   electron   transport,   photorespiration,   Cyclic   and   non-cyclic photophosphorylations(photochemical events associated with Pigment Systems I and II).

Text Books :
1. **The World of the Cell:** Becker, Klein smith, Hardin
2. **Biochemistry:** Lubert Stryer 4th Edition
3. **Cell and Molecular Biology** – De Robertis, 8th Edition

4. Cell Biology – S.C.Rastogi.
References :
1. Molecular Cell Biology - Darnell J, Lodish H, Baltimore D, W H Freeman, 1990
2. Cell Biology- Kimball T.W., Wisley Publishers, 1989
3. Principles of Biochemistry – Lehninger, Nelson and Cox
4. Text Book of Biochemistry – Thomas M. Devlin, 5ᵗʰ Edition

Ch.E107- INTRODUCTION TO CHEMICAL ENGINEERING
(Only for Chemical Engineering Branch)

Lectures: 3 Periods I week   *Sessional Marks: 30*
University Exam. Marks : 70   *University Exam. :   3 hrs*

UNIT – I:

Definition of chemical engineering – basic concepts in chemical engineering- unit operations – basic laws, useful mathematical methods – units and dimensions.

Flow of fluids: Nature of Fluid, viscosity, flow field, flow of fluid past a solid surface, conservation of mass and energy, Friction loses in laminar flow through a circular tube: Hagen-Poiseuille equation, Friction losses in turbulent flow: Fanning equation

UNIT – II:

 Heat Transfer: Fundamental concepts of Conduction, convection, and radiation.

Heat transfer equipment: double pipe, shell and tube heat exchangers and evaporators (description with diagrams)

UNIT – III:

Mass Transfer: diffusion-diffusion in different phases, role of concentration difference in diffusion, resistance to diffusion, diffusion in liquids. Inter-phase mass transfer-mass transfer coefficients, relation between mass transfer coefficients and overall mass transfer coefficients. Distillation-flash distillation, differential distillation, steam distillation, fractional distillation-McCabe-Thiele method. Mass Transfer Equipment (Description with diagrams)

UNIT – IV:

Chemical kinetics –introduction, thermodynamics of reactions – determination of the rate equation – effect of temperature on reaction rate – reactors (description with diagrams)

TEXT BOOK:
1.   Introduction to Chemical Engineering by S.K.Ghosal, S.K.Sanyal & S.Datta; Tata-McGraw-Hill.

REFERENCE BOOK:
1.   Introduction to Chemical Engineering by Walter L. Badger & Julius T. Banchero; Tata-McGraw-Hill.

CE/CSE/ECE/EEE/EI/IT/ME – 107 **ENGINEERING MECHANICS**
(Common to all branches except Chemical Engg. & Biotechnology branches)

Lectures: 3 Periods / week   *Sessional Marks: 30*

Tutorial: 1 Period/Week   *University Exam. Marks : 70*   *University Exam. :   3 hrs*

UNIT – I
CONCURRENT FORCES IN A PLANE:
Principles of statics – composition and resolution of forces – equilibrium of concurrent forces in a plane – method of projections – Method of moments.
PARALLEL FORCES IN A PLANE:
Couple – general case of parallel forces in a plane – center of parallel forces and centre of gravity – Centroids of composite plane figures and curves.

UNIT – II
GENERAL CASE OF FORCES IN A PLANE:
Composition of forces in a plane – Equilibrium of forces in a plane – Plane trusses: methods of joints.

FRICTION: Static, kinetic, and limiting friction – angle of friction: Applications of static friction.
PRINCIPLE OF VIRTUAL WORK: Equilibrium of Ideal systems

UNIT – III

RECTILINEAR TRANSLATION:
Kinematics of rectilinear motion – principles of dynamics – differential equation of rectilinear motion – motion of a particle acted upon by a constant force – D'Alemberts principle – momentum and impulse – work and energy – ideal systems: conservation of energy – direct central impact

MOMENTS OF INERTIA OF PLANE FIGURES:
Moment of inertia of a plane figure with respect to an axis in its plane – Moment of Inertia with respect to an axis perpendicular to the plane of the figure – Parallel axis theorem.

UNIT – IV

CURVILINEAR TRANSLATION:
Kinematics of curvilinear motion – Differential equations of curvilinear motion – D'Alembert's principle in curvilinear motion – Work and Energy.

MOMENTS OF INERTIA OF MATERIAL BODIES:
Moment of inertia of a rigid body – Moment of inertia of a lamina – Moments of inertia of three – dimensional bodies.

ROTATION OF A RIGID BODY ABOUT A FIXED AXIS:
Kinematics of rotation – Equation of motion for a rigid body rotating about a fixed axis

TEXT BOOKS:
1. Engineering mechanics by S. Timoshenko and D. H. Young – Mc Graw-Hill International edition (For concepts and symbolic problems)

2. engineering mechanics statics and dynamics by A. K. Tayal – Umesh publication, Delhi (For numerical problems using S.I. system of units)

REFERENCE BOOKS:

1. Vector mechanics for engineers statics and dynamics by Beer and Johnston, Tata Mc Graw-Hill publishing company, New Delhi

2. Engineering mechanics statics and dynamics by J. L. Meriam and L. Kraige

BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME -108
ENGINEERING GRAPHICS
(Common to all branches)

Lectures   : 2+4 Periods / week   Sessional Marks   : 30
University Exam.   :   3 hrs.   *University Exam. Marks   : 70*

NOTE : 1) Unit VI not to be included in the university theory examination. This unit is only for internal assessment

2) University Examination Question paper consists of FIVE questions, TWO questions from each unit with internal choice.

(To be taught & examined in First angle projection)

<u>**UNIT I**</u>

  GENERAL: Use of Drawing instruments, Lettering .-Single stroke letters, Dimensioning- Representation of various type lines. Geometrical Constructions. Representative fraction.

(3+9)

CURVES : Curves used in Engineering practice - conic sections - general construction methods for ellipse, parabola and hyperbola. cycloidal curves - cycloid, epicycloid and hypocycloid; involute of circle and Archemedian spiral.

(9+15)

 <u>**UNIT II**</u>

METHOD OF PROJECTIONS: Principles of projection - First angle and third angle projection of points. Projection of straight lines. Traces of lines.   (6+12)

PROJECTIONS OF PLANES : Projections of planes, projections on auxiliary planes.   (4+8)

<u>**UNIT III**</u>

PROJECTIONS OF SOLIDS : Projections of Cubes, Prisms, Pyramids, Cylinders and Cones with varying positions.

(4+8)

SECTIONS OF SOLIDS: Sections of Cubes, Prisms, Pyramids, cylinders and Cones.true shapes of sections. (Limited to the Section Planes perpendicular to one of the
Principal Planes).

(6+12)

UNIT IV

DEVELOPMENT OF SURFACES: Lateral development of cut sections of Cubes,Prisms,Pyramids,Cylinders and Cones.

(4+8)

ISOMETRIC PROJECTIONS : Isometric Projection and conversion of Orthographic Projections into isometric views. (Treatment is limited to simple objects only).

(4+8)

UNIT V

ORTHOGRAPHIC PROJECTIONS: Conversion of pictorial views into Orthographic views. (Treatment is limited to simple castings).

(6+12)

UNIT VI

(Demonstration only)

COMPUTER AIDED DRAFTING(Using any standard package): Setting up a drawing: starting , main menu (New, Open, Save, Save As etc.), Opening screen, error correction on screen, units, co-ordinate system, limits, grid, snap, ortho.

Tool bars: Draw tool bar, object snap tool bar, modify tool bar, dimension tool Bar

PRACTICE OF 2D DRAWINGS: Exercises of Orthographic views for simple solids using all commands in various tool bars.   (4+8)

TEXT BOOK:

1. Engineering Drawing by N.D. Bhatt & V.M. Panchal. (Charotar Publishing House, Anand).
2. AutoCAD 14 for Engineering Drawing Made Easy(Features AutoCAD 200) by P.Nageswara Rao

REFERENCE BOOK:

1. Engineering Drawing by Prof.K.L.Narayana & Prof. R.K.Kannaiah.
2. Engineering Graphics with AutoCAD 2002 by James D. Bethune

BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - 151 : <u>PHYSICS LAB</u>
(Common to all Branches)

Lectures   : 3 Periods / week   Sessional Marks   : 25
University Exam.   :   3 hrs.   *University Exam. Marks   : 50*

1. **Compound Pendulum** - Measurement of g-value.

2. **Sonometer** - Determination of unknown frequency of tuning fork and verification of laws of transverse vibrations of a stretched string

3. **C.R.O** - Measurement of voltage, frequency and phase difference of an A.C. signal.

4. **Torsional Pendulum** - Determination of Rigidity modulus/damping coefficient.

5. **Newton's Rings** - Measurement of wavelength/Radius of curvature.

6. **Dispersive Power** - Determination of Dispersive power of prism.

7. **Diffraction Grating -** Determination of wavelength.

8. **Air Wedge** - Measurement of thickness of given wire.

9. **Field along the axis of a current carrying circular coil.** - Variation of intensity of magnetic field along the axis of circular coil.

10. **L.C.R** - Resonance Characteristics.

11. **Sensitive Galvanometer** - Figure of Merit.

12. **Hall Effect** - Measurement of Hall potential and Carrier concentration

13. **Carey Foster's bridge** - Measurement of temperature coefficient of resistance.

14. **Platinum resistance thermometer** - Measurement of room temperature.

15. **GM Counter** - Characteristics.

16. **Photo Tube** - Characteristics of photo tube/determination of planks constant.

17. Determination of **band gap of semiconductors**.

18. Optical Measurements with **laser**.

19. **Solar Cell** - Characteristics and Fill Factor determinations.

20. **Fiber Optics** - Numerical Aperture Calculations.

BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME - **152** : CHEMISTRY LABORATORY

(Common to all Branches)

Lectures   : 3 Periods / alternate week   Sessional Marks   : 25

University Exam.   :   3 hrs.   *University Exam. Marks   : 50*

LIST OF EXPERIMENTS

Note: Minimum of twelve experiments have to be conducted out of the list of experiments given below.

1. Estimation of total alkalinity of water sample
    a.   Standardization of HCl solution b. Estimation of alkalinity

2. Determination of purity of washing soda

3. Estimation of Chlorides in water sample:
    a.   Standardization of $AgNO_3$ solution b. Estimation of Chlorides

4. Determination of Total Hardness of water sample:
    a.   Standardization of EDTA solution b. Determination of Total Hardness

5. Estimation of Mohr's salt-permanganometry
    a.   Standardization of $KMnO_4$ solution b. Estimation of Mohr's salt

6. Estimation of Mohr's salt –Dichrometry
    a.   Standardization of $K_2Cr_2O_7$ solution b. Estimation of Mohr's salt

7. Analysis of soil sample:
    a. Estimation of Ca and Mg   b. Estimation of Organic matter

8. Determination of available chlorine in bleaching powder-Iodometry
    a.   Standardization of Hypo solution b. Determination of Available chlorine

9. Determination of Iodine in Iodized salt

10. Determination of Iron (Ferrous and Ferric) in an iron ore by Permanganometry

11. Determination of Zn using Potassium ferrocyanide

12. Preparation of Phenol-formaldehyde resign

13. Conductometric titration of an acid vs. base

14. pH metric tritrations of an acid vs base

Demonstration Experiments:

15. Potentiometric titrations: Ferrous vs Dichromate

16. Spectrophotometry: Estimation of Mn/Fe

BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME – 153 : <u>WORKSHOP PRACTICE</u>
(Common to all branches)

Lectures   :   2 Periods / week   Sessional Marks   : 25
University Exam.   :   3 hrs.   *University Exam. Marks   : 50*

1. Carpentry

To make the following jobs with hand tools

   a)   Lap joint
   b)   Lap Tee joint
   c)   Dove tail joint
   d)   Mortise & Tenon joint
   e)   Gross-Lap joint

2. Welding *using electric arc welding process / gas welding.*

The following joints to be welded.

   a)   Lap joint
   b)   Tee joint
   c)   Edge joint
   d)   Butt joint
   e)   Corner joint

3. Sheet metal operations with hand tools.

   a)   Saw edge
   b)   wired edge
   c)   lap seam
   d)   grooved seam
   f) funnel

4. House wiring

   a) To control one lamp by aspt switch
   b) To control two lamps by aspt switch
   c)   To assemble a fluorescent lamp fitting
   d)   Stair case wiring
   f)   Go down wiring

BT/CE/Ch.E/CSE/ECE/EEE/EI/IT/ME – 154 :
COMPUTER PROGRAMMING LAB
(Common to all Branches)

Lectures   : 3 Periods / week   Sessional Marks   : 25
University Exam.   : 3 hrs.   *University Exam. Marks   : 50*

List of programs (to be recorded)
1. A program for electricity bill taking different categories of users, different slabs in each category. (Using nested if else statement).

Domestic level Consumption As follows:	
Consumption Units	**Rate of Charges(Rs.)**
0 - 200	0.50 per unit
201 - 400	100 plus 0.65 per unit
401 - 600	230 plus 0.80 per unit
601 and above	390 plus 1.00 per unit
Street level Consumption As follows:	
Consumption Units	**Rate of Charges(Rs.)**
0 - 50	0.50 per unit
100 – 200	50 plus 0.6 per unit
201 - 300	100 plus 0.70 per unit
301 and above	200 plus 1.00 per unit

2. Write a C program to evaluate the fllowing(using loops):

   a. $1 + x^2/2! + x^4 / 4!+$ upto ten terms

   b. $x + x^3/3! + x^5/5!+$ upto 7 digit accuracy

   c. $1+x+x^2/2! +x^3/3!+$………upto n terms

   d. Sum of $1 + 2+ 3 +$………………..$+n$

3. A menu driven program to check the number is:
      i) Prime or not
      ii) Perfect or Abundant or deficient
      iii) Armstrong or not
      iv) Strong or not
      v) Fibonacci or not

4. A menu driven program to display statistical parameters (using one –dimensional array)
      i) Mean ii) Mode iii) Median iv) Variance v) Standard deviation

5.   A menu driven program with options (**using one -Dimensional array)**
     (i)   To insert an element into array
     (ii)   To delete an element
     (iii)   To print elements
     (iv)   To print elements in reverse order
     (v)   To remove duplicates
6. A menu driven program with options (using two dimensional array)
     (i)   To compute A+B
     (ii)   To compute A x B
     (iii)   To find transpose of matrix A
     (iv)   To Check A=B
     Where A and B are matrices. Conditions related to size to be tested

7.   A menu driven program with options (using Two-dimensional Character arrays)
   (i) To insert a student name
   (ii) To delete a name
   (iii)   To sort names in alphabetical order
   (iv) To print list of names
   (v) To print names having maximum length, min. length

8. A menu driven program (using pointers)
         a. Linear search b. Binary search   c. Fibonacci search

9. A menu driven program with options (**using Dynamic memory allocation**)
      a. Bubble sort   b. Insertion sort c. Selection sort

10. A menu driven program with options (**using Character array of pointers**)
   (i) To insert a student name
   (ii) To delete a name
   (iii)   To sort names in alphabetical order
   (iv)   To print list of names
   (v)   To print names having maximum length, min. length

11. Write a program to perform the following operations on Rational numbers (**using
      Structures & pointers):**
         i)   Read a Rational number
         ii)   Addition of two Rational numbers
         iii)   Subtraction of two Rational numbers
         iv)   Multiplication of two Rational numbers
         v)   Division of two Rational numbers
         vi)   Display a Rational number

12. A Bookshop maintains the inventory of books that are being sold at the shop. The   list includes details such as author, title, price,publisher and stock position.   Whenever   a customer wants a book the sales person inputs the title and the author and the system searches the list and displays whether it is available or not. If it is not an appropriate message is displayed, if it is then the system displays the book details and request for the number of copies are required ,if the requested copies are available the total cost of the requested copies is displayed otherwise the message "required copies not in stock" is displayed. **Write a program for the above in structures with suitable functions.**

13. Create a student data file (roll no., name, date of birth, rank) and code a program with   options (**use pointers & structures**)
   (i) Listing names, dob sorted on names
   (ii) Listing names, dob sorted on dob
   (iii) Listing names, dob sorted on names, dob

14. a) Write a C program To copy the one file contents to the another file (**using
         commandline arguments)**

   b) Write a C Program to count the frequencies of words in a given file.

SCHEME OF INSTRUCTION AND EXAMINATION
With Effect from 2007 – 2008 (Semester System)
II / IV B.TECH. (Mech) :: FIRST SEMESTER

Sl. No	Code No & Subject	Scheme of Instruction Periods per week		Scheme of Examination			
		Theory + Tutorial / Drawing	Pract icals	Duration of Univ. Exam. (Hrs.)	Sessiona l Marks	Univ. Marks	Total
1.	ME 211 Engineering Mathematics- III	4	--	3	30	70	100
2	ME 212 Mechanics of Materials - I	4+1	--	3	30	70	100
3	ME 213 Kinematics of Machines	4+1	--	3	30	70	100
4	ME 214 Fluid Mechanics	4	--	3	30	70	100
5	ME 215 Basic Thermodynamics	4+1	--	3	30	70	100
6	ME 216 Electrical Technology	4	--	3	30	70	100
7	ME 217 Machine Drawing	3	--	3	30	70	100
8	ME 251 S.M. & F.M. Lab	--	3	3	25	50	75
9	ME252 Electrical Technology Lab	--	3	3	25	50	75
	TOTAL	30	6	--	260	590	850

SCHEME OF INSTRUCTION AND EXAMINATION
With Effect from 2007 – 2008 (Semester System)
II / IV B.TECH. (Mech) :: SECOND SEMESTER

Sl. No.	Code No & Subject	Scheme of Instruction Periods per week		Scheme of Examination			
		Theory + Tutorial	Pract icals	Duration of Univ. Exam. (Hrs.)	Sessio- nal Marks	Univ. Marks	Total
1.	ME 221 Engineering Mathematics - IV	4	--	3	30	70	100
2	ME 222 Environmental Studies	4	--	3	30	70	100
3	ME 223 Probability And Statistics And Optimization Techniques	4	--	3	30	70	100
4	ME 224 Mechanics of Materials - II	4+1	--	3	30	70	100
5	ME 225 Applied Thermodynamics	4+1	--	3	30	70	100
6	ME 226 Casting, Forming and Welding Technology	4	--	3	30	70	100
7	ME227 Material Science & Metallurgy	4	--	3	30	70	100
8	ME 261 Computer Aided Drafting	--	3	3	25	50	75
9	ME 262 Workshop Practice		3	3	25	50	75
	TOTAL	30	6	--	260	590	850

SCHEME OF INSTRUCTION AND EXAMINATION
With Effect from 2007 – 2008 (Semester System)

III / IV B.TECH. (Mech) :: FIRST SEMESTER

Sl. No.	Code No & Subject	Scheme of Instruction Periods per week		Scheme of Examination			
		Theory + Tutorial	Prac- ticals	Duration of Univ. Exam. (Hrs.)	Sessio- nal Marks	Univ.M arks	Total
1.	ME 311 Operations Research	4+1	--	3	30	70	100
2	ME 312 Design of Machine Elements	4+1	--	3	30	70	100
3	ME 313 Machine Dynamics	4+1	--	3	30	70	100
4	ME 314 Basic Electronics & Micro Processors	4	--	3	30	70	100
5	ME 315 I.C. Engines and Gas Turbines	4	--	3	30	70	100
6	ME 316 Metal Cutting & Machine Tools	4	--	3	30	70	100
7	ME 351 Computer Application in Mechanical Engineering Lab	--	3	3	25	50	75
8	ME 352 Machine shop Practice	--	3	3	25	50	75
9	ME353 Basic Electronics & Microprocessor Lab	--	3	3	25	50	75
	TOTAL	27	9	--	255	570	825

SCHEME OF INSTRUCTION AND EXAMINATION
With Effect from 2007 – 2008 (Semester System)
III / IV B.TECH. (Mech) :: SECOND SEMESTER

Sl. No.	Code No & Subject	Scheme of Instruction Periods per week		Scheme of Examination			
		Theory + Tutorial	Prac-ticals	Duration of Univ. Exam. (Hrs.)	Sessio-nal Marks	Univ. Marks	Total
1.	ME 321 Operations Management	4	--	3	30	70	100
2	ME 322 Design of Transmission Elements	4+1	--	3	30	70	100
3	ME 323 Hydraulic Machines	4	--	3	30	70	100
4	ME 324 Engineering Metrology & Mechanical Measurements	4	--	3	30	70	100
5	ME 325 Heat Transfer	4+1	--	3	30	70	100
6	ME 326 Manufacturing Engineering	4	--	3	30	70	100
7	ME 361 CAD -I Lab. (Modelling)	--	3	3	25	50	75
8	ME 362 Thermal Engineering Lab. – I	--	3	3	25	50	75
9	ME363 English Language & Communication Skills Lab	--	3	--	25	50	75
	TOTAL	26	9	--	255	570	825

SCHEME OF INSTRUCTION AND EXAMINATION
With Effect from 2007 – 2008 (Semester System)
IV / IV B.TECH. (Mech) :: FIRST SEMESTER

Sl. No.	Code No & Subject	Scheme of Instruction Periods per week		Scheme of Examination			
		Theory + Tutorial	Prac-ticals	Duration of Univ. Exam. (Hrs.)	Sessio-nal Marks	Univ. Marks	Total
1.	ME 411 Professional Ethics & Human Values	4	--	3	30	70	100
2	ME 412 Advanced Machine Design	4+1	--	3	30	70	100
3	ME 413 Finite Element Analysis	4	--	3	30	70	100
4	ME 414 Automation & Computer Aided Manufacturing	4	--	3	30	70	100
5	ME 415 Industrial Engineering & Management	4	--	3	30	70	100
6	ME 416 Elective – I	4	--	3	30	70	100
7	ME 451 CAD Lab-II (Analysis)	--	3	3	25	50	75
8	ME 452 Thermal Engineering Lab.-II	--	3	3	25	50	75
9	ME453 Term Paper	--	3	--	25	--	25
	TOTAL	25	9	--	255	520	775

ELECTIVE – I :

ME 416 / 1	: Automobile Engineering	ME 416 / 2	: Fluid Power & Control Systems
ME 416 / 3	: Optimization Techniques	ME 416 / 4	: Refrigeration & Air Conditioning
ME 416 / 5	: Computer Graphics	ME 416 / 6	: Industrial Tribology

SCHEME OF INSTRUCTION AND EXAMINATION
With Effect from 2007 – 2008 (Semester System)
IV / IV B.TECH. (Mech) :: SECOND SEMESTER

Sl. No.	Code No & Subject	Scheme of Instruction Periods per week		Scheme of Examination			
		Theory + Tutorial	Prac-ticals	Duration of Univ. Exam. (Hrs.)	Sessio-nal Marks	Univ. Marks	Total
1.	ME 421 Mechatronics	4	--	3	30	70	100
2	ME 422 Computer Aided Design	4	--	3	30	70	100
3	ME 423 Energy Resources Utilization	4	--	3	30	70	100
4	ME 424 Robotics	4	--	3	30	70	100
5	ME 425 Elective – II	4	--	3	30	70	100
6	ME461 CAM Lab	-	3	3	25	50	75
7	ME 462 Design & Metrology Lab.	--	3	3	25	50	75
8	ME 463 Project Work - II	--	6	3	50	100	150
	TOTAL	20	12	--	250	550	800

ELECTIVE – II :

ME 425 / 1	: Advanced Concepts in Mechanical Engineering
ME 425 / 2	: Flexible Manufacturing Systems & Group Technology
ME 425 / 3	: Enterprise Resource Planning (ERP)
ME 425 / 4	: Computational Fluid Dynamics
ME 425 / 5	: Computer Integrated Manufacturing
ME 425 / 6	: Nano Technology

ME 211 ENGINEERING MATHEMATICS –III

(CE/CHE/CS/EC/EEE/EI/IT/ME …211)

II Year B.Tech. (Mech) First Semester
Lectures   : 4 Periods / week   Sessional Marks   : 30
University Exam.   :   3 hrs.   University Exam. Marks : 70

UNIT-I
Partial Differential Equations :
Introduction, Formation of Partial Differential Equations, Solutions of a Partial Differential Equation, Equations solvable by direct Integration, Linear Equations of the first Order, Non-Linear Equations of the first Order, Charpit's Method, Homogeneous Linear Equations with Constant Coefficients, Rules for finding the Complementary Function, Rules for finding the Particular Integral, Non-Homogeneous Linear Equations.

UNIT-II
Beta Gamma Functions , Error Function.
Integral Transforms:
Introduction, Definition, Fourier Integrals-Fourier sine and cosine integrals, Complex form of the Fourier Integral, Fourier Transforms, Properties of Fourier Transforms, Finite Fourier sine and cosine transforms, Convolution theorem(without proof), Parseval's Identity for Fourier Transforms(without proof), Fourier Transforms of the derivatives of a function.

UNIT-III
Solution of Algebraic and Transcendental Equations : Introduction, Newton- Raphson Method, Solutions of Simultaneous Linear Equations: Direct Methods of Solution- Crout's triangularisation method (LU – decomposition method), Iterative Methods of Solution - Gauss-Seidel Iteration Method.
Finite Differences and Difference Equations: Introduction, Finite Difference operators, Symbolic relations, Differences of a polynomial, Newton's forward and backward difference interpolation Formulae, Central Difference Interpolation Formulae-Gauss's Forward and Stirling's formulae, Interpolation with Unequal-Intervals-Lagrange's Interpolation , inverse interpolation. Difference Equations: Introduction, Formation, Linear difference equations - Rules for Finding the Complementary Function, Rules for Finding the Particular Integral.

UNIT-IV
Numerical Differentiation: Finding First and Second order Differentials using Newton's formulae , Numerical Integration : Trapezoidal rule , Simpson's one-third rule, Numerical Solution of Ordinary and Partial Differential Equations - Euler's Method, Picard's Method, Runge- Kutta Method of fourth order (for first order equations , Simultaneous equations) Classification of Partial Differential Equation of second order, Solutions of Laplace's and Poisson's Equations by iteration methods.

Text Book : [1] Higher Engineering Mathematics by B.S.Grewal
                Khanna publishers,39th edition.

Reference Books:

[2] A textbook of Engineering Mathematics by N.P. Bali

[3] Advanced Engineering Mathematics by Erwin Kreyszig John willy
    and sons.

ME 212   MECHANICS OF MATERIALS- I
II Year B.Tech.   (Mech) First Semester

Lectures   :   4 +1 Periods / week   Sessional Marks   : 30
University Exam.   :   3 hrs.   University Exam. Marks   : 70

UNIT   I
TENSION, COMPRESSION AND SHEAR : Introduction, Normal Stress and Strain, Stress- Strain Diagrams, Elasticity and Plasticity, Linear Elasticity and Hooke's Law, Shear Stress and Strain, Allowable Stresses and Loads.   (8)

AXIALLY LOADED MEMBERS: Introduction, Deflections of Axially loaded Members, Displacement diagrams.
                                                                                                                (7)

UNIT   II
STATICALLY INDETERMINATE AXIALLY LOADED MEMBERS: Statically indeterminate structures(Flexibility method and Stiffness method).
                                                                                                                (7)
Temperature and Pre-strain effects, Strain energy of axially loaded members subjected to static load, Dynamic loading
                                                                                                  (8)

UNIT   III
TORSION : Introduction, Torsion of Circular Bars, Pure Shear, Relationship between Moduli of Elasticity E and G, Transmission of power by circular shafts, Strain Energy in pure Shear and uniform Torsion for Statically determinate Members.

                                                                                                                (7)

SHEAR FORCE AND BENDING MOMENT : Types of Beams, Shear Force and Bending Moment, Relationships between Load, Shear Force and Bending Moment, Shear Force and Bending Moment Diagrams.
                                                                                                  (8)

UNIT   IV
STRESSES IN BEAMS : Introduction, Normal Strains in Beams, Normal Stresses in Beams Strain Energy, Shear Stresses in Rectangular Beams, Shear Stresses in Webs of Beams with flanges.

                                                                                                  (8)

ANALYSIS OF STRESS AND STRAIN: Plane Stress, Principal Stresses and Maximum Shear Stress, Mohr's Circle for Plane Stress, Hooke's Law for Plane Stress, Unit Volume change, Strain Energy Density. Plane Strain, Mohr's Circle for Plane Strain.
                                                                                                  (7)

TEXT BOOKS :
1. Mechanics of Materials by Gere and Timoshenko, C B S Publishers

2. Mechanics of Solids by Singh, Pearson Education.
REFERENCE :
1. Strength of materials by Sadhu Singh, Khanna Publishers

ME 213   KINEMATICS OF MACHINES
II Year B.Tech. (Mech) First Semester

Lectures / Tutorials   : 4+1 Periods / week   Sessional Marks   : 30

University Exam.   : 3 hrs.   University Exam. Marks   : 70

UNIT I

INTRODUCTION : Mechanisms and machines, Rigid and resistant bodies, Link, Kinematic pair, Degrees of Freedom, Classifications of Kinematic pairs, kinematic-chain, Linkage, Mechanism, and structure, Classification of mechanisms, Equivalent Mechanisms, Four - Link (bar) Mechanism, Inversions of Slider - Crank Chain, Double – Slider Chain.

(7)

VELOCITY ANALYSIS: Introduction, Absolute and Relative Motion, Vectors, Addition and subtraction of Vectors, Motion of a Link, Four Link Mechanism, Angular Velocity of Links, Velocity of Rubbing, Slider - Crank Mechanism, Crank and Slotted Lever Mechanism.

(8)

UNIT   II

Instantaneous centre, Notation, Number of I - Centres, Kennedy's theorem, Locating I - Centres, Angular velocity by I - Centre Method.   (5)

ACCELERATION ANALYSIS : Acceleration, Four-Link Mechanism, Angular acceleration of Links, Acceleration of Intermediate and offset points, slider-Crank Mechanism, Coriolis acceleration component, Crank and slotted lever Mechanism.

(10)

UNIT   III

KINEMATIC SYNTHESIS: Stages of synthesis-Concepts of type, Number and dimensional synthesis - Tasks of dimensional synthesis, Concepts of function generation, Rigid body guidance and path generation, Freudenstein equation for function generation using three precision points.

(7)

CAMS : Introduction, Types of cams, Types of Followers, Definitions, Graphical synthesis of cam profile. (Knife Edge, Roller and Flat faced Followers).

(8)

UNIT   IV

GEARS : Introduction, Classification gear terminology, Law of Gearing, Velocity of Sliding, Forms of Teeth, Cycloidal Profile Teeth, Involute Profile Teeth, Path of contact, Arc of contact, Number of pairs of Teeth in contact, Interference in Involute Gears, Minimum number of Teeth, Interference between Rack and Pinion, Undercutting, Comparison of Cycloidal and Involute tooth forms.

(8)

GEAR TRAINS: Introduction, simple Gear Train, Compound Gear Train, Reverted Gear train, Planetary or Epicyclic Gear Train, Analysis of Epicyclic Gear Train, Torques in Epicyclic Trains. Tabular and Algebraic Methods.

(7)

TEXT BOOKS:
1.   Theory of Machines of by S.S.Rattan. TMH.
2.   Theory of Mechanisms and Machines by C.S.Sharma, Kamlesh Purohit, PHI

REFERENCE BOOK:
1. Theory of Mechanisms and Machines by Ghosh and Mallik
2. Mechanism and Machine Theory by J.E. Shigley

ME 214 FLUID MECHANICS
II Year B.Tech. (Mech) First Semester

Lectures / Tutorials	*: 4 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks*	*: 70*

UNIT I
INTRODUCTION: Definition of fluid, Properties of a fluid – density, specific weight, specific gravity, viscosity, compressibility, surface tension, capillarity, vapor pressure, Classification of fluids.
(6)

FLUID STATICS: Pressure, variation of pressure in fluid, measurement of pressure – simple and differential manometers, pressure head, Pascal's law, Total pressure and center of pressure on plane surfaces, Buoyancy and Metacentric height.

(9)

UNIT II
FLUID KINEMATICS: Velocity and acceleration of fluid particle, type of fluid flow, Description of flow pattern, Rotation and irrotational flow, velocity potential, stream function, flownet, continuity equation in Cartesian coordinates.

(7)

FLUID DYNAMICS: Introduction, Euler's equation of motion, Bernoulli's equation, Pitot tube, venturimeter, orifice meter, orifice- various coefficients of an orifice.

(8)

UNIT III
IMPULSE MOMENTUM EQUATION: Impulse momentum Principle, Equation and Application-Force on pipe bend.

(3)

FLOW THROUGH PIPES: Types, Reynolds experiment, laws of fluid friction, Darcy-Wiesbach equation, minor losses, hydraulic gradient, Total energy lines, pipes in series and parallel, transmission of power through a pipe, water hammer, Laminar flow through a circular pipe, Hagen-Poiseulle law, emptying of tanks with uniform cross section.

(12)

UNIT IV
BOUNDARY LAYER CONCEPTS: introduction, boundary layer thickness, displacement thickness, momentum thickness, energy thickness, boundary layer growth on a flat plate, separation of boundary layer.

(6)

INTRODUCTION TO COMPRESSIBLE FLUID FLOW: Equation of state, Gas laws, Equation of Continuity, Equation of motion and Equation of Energy, compressible flow regimes, Mach number, Mach cone, Shock waves, Stagnation point.

(9)

TEXT BOOKS:
1. Hydraulics and fluid mechanics -P.N. Modi & S.M.Seth, Standard Book House, New Delhi.
2. Fluid Mechanics and Fluid machines – Agarwal, TMH.
REFERENCE BOOKS:
1. Fluid Mechanics and hydraulic machines-R.K.Bansal
2. Fluid mechanics and fluid power engineering - D.S.Kumar, SK Kataria & Sons, New Delhi.
3. Fluid mechanics including Hydraulic machines - A.K.Jain.
4. Fluid Mechanics-K.L.Kumar

ME 215   BASIC THERMODYNAMICS
II Year B.Tech. (Mech) ---First Semester

Lectures / Tutorials   :   4+1 Periods / week   Sessional Marks   : 30
University Exam.   :   3 hrs.   University Exam. Marks   : 70

UNIT   I
FUNDAMENTAL CONCEPTS AND DEFINITIONS: Introduction, Macroscopic and microscopic points of view, Thermodynamic system and control volume, Perfect gases, properties and state of a substance, Thermodynamic equilibrium and Quasi-static Process, thermodynamic path, reversible and irreversible processes, factors that render a process irreversible, cycle, Zeroth law of thermodynamics, concept of temperature.
                                                                (8)

WORK AND HEAT: Definitions and units, Work done at the moving boundary of a system, work done in various non-flow processes, comparison of heat and work.
                                                                (7)

UNIT   II
 FIRST LAW OF THERMODYNAMICS FOR NON-FLOW SYSTEMS: First law for a system undergoing a cycle and for a change in state of system, internal energy and enthalpy, constant volume and constant pressure specific heats and their relation to internal energy and enthalpy of ideal gases.
                                                                (7)
FIRST LAWOF THERMODYNAMICS FOR FLOW SYSTEMS*:* Control mass and control volume, first law of thermodynamics for a control volume, Steady flow energy equation and its application to engineering equipment.
                                                                (8)

UNIT   III
SECOND LAW OF THERMODYNAMICS: Limitations of first law, PMM of first kind**,** Heat engines and Refrigerators, Statements of Second law, PMM of second kind, Carnot cycle and Carnot theorems, Thermodynamic temperature scale.
                                                                (6)

ENTROPY: Inequality of Classius, Entropy change in reversible process, T-ds relations*,* Entropy change of a system during an irreversible process, Principle of increase of entropy, Applications, Entropy change of an ideal gas, Availability, Maximum work.
                                                                (9)

UNIT IV
GAS POWER CYCLES: Air standard Carnot cycle, Otto cycle, Diesel cycle, Dual Combustion cycle and Brayton cycle, Air standard efficiency and MEP.
                                                                (7)
PURE SUBSTANCE: Definition**,** process of steam generation, P-v, T-s and h-s diagrams, properties of saturated and superheated steam, Use of Steam Tables, Mollier chart.
                            (8)
TEXT BOOKS:
1. Engineering Thermodynamics- P.K.Nag, TMH, New Delhi.
2. Thermal Science and Engineering- D.S.kumar, S.K.Kataria publ, New Delhi.
3. Thermodynamics—Rajput, Laxmi Publ, New Delhi.

REFERENCE BOOKS:
1. Fundamentals of Engineering Thermodynamics-Rathakrishnan-PHI, New Delhi.
2. Thermodynamics -- J.P.Holman, MGH, New York.
3. Engineering Thermodynamics—Cengel & Boles, TMH
Note: Use of Steam Tables is permitted in University Examinations.

ME 216   ELECTRICAL TECHNOLOGY
II Year B.Tech. (Mech) First Semester

Lectures   : 4 Periods / week   Sessional Marks : 30
University Exam.   : 3 hrs.   *University Exam. Marks : 70*

UNIT   I

DC and AC circuits: Kirchoffs laws, simple circuits -Alternating current - waveforms - RMS - Average values-simple R-L-C- circuits. Power factor, 3-phase Balanced circuits.

(7)

D.C. Machines - Constructional features - Methods of excitation-Load characteristics of shunt, series, compound generators-Torque development in motor-Torque equation.

(8)

UNIT   II

Load and speed control Characteristics of shunt, Series and compound motors-losses and efficiency of motors and generators-principle of starters-3 point starter only.

(7)

Transformers : E.M.F. equation-equivalent circuit - regulation - losses and efficiency - open circuit and short-circuit tests.

(8)

UNIT   III

Induction machines : Constructional features-Principle of operation- concept of rotating magnetic field, torque-slip characteristics - Principle of starters, Fundamentals of single-phase induction motors and their starting.

(8)

Synchronous machines : Principle - constructional features E.M.F. equation-applications of synchronous motors.

(7)

UNIT IV
Measuring Instruments : Principles and operation of moving - coil and moving-iron instruments-Dynamometer-type wattmeter.
Utilization: Principles of resistance and induction heating - principles of electrical traction-speed time characteristics.

TEXT BOOKS :
1. Electrical Technology by B.L. Theraja, (S. Chand & Co.)
2. A course in Electrical Power by Soni, Gupta Bhatnagar.

REFERENCE BOOKS :
1. Electrical Technology by H. Cotton (Sir Issac Pittman & Sons Ltd., London).
2. Utilization of Electrical Energy by Openshaw & Taylor
3. Electrical Machinery by P.S. Bimbra
4. Electrical Technology by B. Hughes (ELBS)

ME 217 MACHINE DRAWING
II Year B.Tech. (Mech) First Semester

Lectures / Tutorials   : 3 Periods / week   Sessional Marks   : 30
University Exam.   : 3 hrs.   University Exam. Marks : 70

1. **Sectional views :** Introduction, full & half section

(9)

2. **Screwed fasteners :** Screw thread nomenclature – types & classification of screw threads – Square & hexagonal headed bolted joints.

(6)

3. **Keys, Cotters and Pin joints** : Saddle & sunk keys – cotter joint with sleeve – knuckle joint

(6)

4. **Shaft couplings :**   Universal coupling & protected flanged coupling

(6)

5. **Assembly Drawings** : Stuffing box – screw jack – eccentric

(9)

Text book :

1.   Machine Drawing by K.L.Narayana, P.Kannaiah & K.Venkata Reddy,

Reference book :

1. Machine Drawing by K.R.Gopala Krishnan

ME251   S.M. & F.M. LABORATORY
II/IV B.Tech (Mech.) :: First Semester

Practicals   : *3 Periods / week*   *Sessional Marks   : 25*

University Exam.   : 3 hrs.   *University Exam. Marks : 50*

Any TWELVE experiments should be done

FLUID MECHANICS LAB:

1. Orifice / mouthpiece - Determination of coefficient of discharge
2. Venturimeter / Orifice meter - Determination of coefficient of discharge
3. Pipe friction - Determination of friction factor and size of roughness   of a given pipe.
4. Single - stage centrifugal pump - To draw the operating characteristics of the pump and to determine the designed discharge and designed head from it.
5. Single - acting reciprocating pump - To draw the operating characteristic curves at constant speed and determination of efficiency.
6. Gear pump - To draw the operating characteristic curves and determination of overall efficiency
7. Pelton turbine - To draw the performance characteristic curves and determination of overall efficiency
8. Francis / Kaplan turbine - To draw the performance characteristic curves and determination of overall efficiency.
9. Windtunnel a) Determination of pressure distribution on car/truck/ airfoil models - b)Lift and drag measurement - c) Pitot tube - Velocity distribution and calibration.   d) Boundary - Layer profile.

STRENGTH OF MATERIALS LAB:

1. Load vs Deflection - Determination of Young's modulus on cantilever beam and propped cantilever beam.
2. Load vs deflection on simply supported and overhanging beams. Determination of Young's modulus of the beam material
3. (a) Rockwell Hardness test - Determination of Hardness Number for different metal specimens such as mildsteel, cast iron, Brass, Aluminum (b) Brinnell's Hardness Test,
4. Impact Test - (a) Charpy and (b) lzod: Determination of impact strength of mild steel and cast iron specimens
5. Torsion test - Determination of Modulus of Rigidity of the material.
6. Double shear Test - Determination of shear strength of mild steel / Torsteel specimens.
7. Tension Test on UTM - Determination of mechanical properties of mild steel and cast iron specimens.
8. Tests on helical spring - Determination of stiffness of Helical springs.

ME252 ELECTRICAL TECHNOLOGY LABORATORY
II/IV B.Tech (Mech.) :: First Semester

Practicals   : 3 periods / week   *Sessional Marks   : 25*
University Exam   : 3 hrs   *University Exam Marks : 50*

(Any Ten Experiments)

1. Verification of Kirchoff's laws

2. Determination of Parameters of coke coil

3. O.C.C. of a D.C.Shunt generator

4. Load Test on DC shant generator

5. Measurement of low and medium resistance of a D.C. machine

6. Load test on D.C. shunt motor

7. Swinburn's test

8. Speed control of a D.C. shunt motor

9. Equivalent circuit of a single phase transformer using sc and oc test .

10. Load test on 1 – phase transformer.

11. Regulation of alternative synchronous impedance method.

12. Load test on 3 phase squirrel cage induction motor

13. Predetermination of efficiency and regulator of 1 – phase transform.

14. Measurement of power by using two-watt meters in 3 phase load

ME221 ENGINEERING MATHEMATICS – IV
II Year B.Tech. (Mech)   Second Semester

Lectures / Tutorials   :   4 Periods / week   Sessional Marks   : 30
University Exam.   :   3 hrs.   University Exam. Marks : 70

UNIT-I

ONE DIMENSIONAL WAVE EQUATION AND HEAT EQUATION: Derivation of one dimensional wave equation-Transverse Vibration of finite elastic string with fixed ends-Boundary value and initial value problems- Fourier series Solution. Derivation of one dimensional heat equation-Steady and unsteady states-Boundary value and initial value problems- Fourier series solution.

TWO DIMENSIONAL HEAT EQUATION : Two dimensional heat equation- Steady state heat flow in two dimensions- Laplace equation in Cartesian and polar coordinates (including annulus). Fourier series solution.

(15)

UNIT-II
CALCULUS OF COMPLEX FUNCTIONS :
Introduction - continuity, Cauchy-Riemann equations, Analytic Functions, Harmonic Functions, orthogonal system, Line integrals in complex plane, Cauchy integral theorem, Existence of indefinite integral, Cauchy's integral formula.

(15)

UNIT-III

Derivatives of Analytic function, Laurent series, Singularities and zeroes, Residue theorem, Evaluation of Real integrals, Further types of real integrals.

(15)

UNIT-IV

CONFORMAL MAPPING :
Conformal Mapping, Linear fractional transformations, special linear fractional transformations, Mapping by other functions, Electrostatic fields, use of conformal mapping, Heat problems, fluid flow, Poisson's integral formula.

(15)

TEXT BOOKS:

1.   Higher Engineering Mathematics by B.S. Grewal, Khanna publishers, 39th edition.
2.   Advanced Engineering Mathematics by Erwin Kreyszig, 8th edition, John willy 2000.

REFERENCE BOOKS:

1.   Engineering Mathematics by M.K. Venkataraman
2.   Engineering Mathematics by P. Kandaswamy, etal.

ME 222 ENVIRONMENTAL STUDIES
(Common for all branches)
II Year B.Tech. (Mech) Second Semester

Lectures: 4 Periods/week   *Sessional Marks: 30*
University Exam: 3 hours.   University Exam Marks: 70

UNIT I

Introduction: *Definition, Scope and Importance*
Ecosystems*: Introduction, types, characteristic features, structure and functions of Ecosystems- Forest, Grassland, Desert, Aquatic (lakes, rivers and estuaries)*
Natural Resources:
Land resources - Land as a resource, Common property resources, land degradation, soil erosion and desertification and Effects of modern agriculture, fertilizer- pesticide problems
Forest Resources- Use and over-exploitation, Mining and dams; their effects on forests and tribal people.
Water Resources - Use and over-utilization of surface and ground water, floods and drought, Water logging and salinity, Dams – benefits and costs, Conflicts over water.
Energy resources: Energy needs, Renewable and non-renewable energy sources, Use of alternate energy sources.
                                                                                                    (15)

UNIT II
Biodiversity and its Conservation: Value of biodiversity- consumptive and productive use, social, ethical, aesthetic and option values. Bio-geographical classification of India-India as a mega-diversity habitat. Threats to bio-diversity – Hot spots, habitat loss, poaching of wildlife, loss of species, seeds, etc. Conservation of biodiversity - In-situ and Ex-situ conservation
Environmental Pollution: Causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Solid waste management, composting and vermiculture, Urban and industrial wastes, recycling and re-use.
                                                                                                    (15)

UNIT III
Sustainability: Theory and practice, Equitable use of resources for sustainable life styles.
Rain water harvesting, cloud seeding and watershed management, Water scarcity and ground water depletion
Controversies on major dams- Resettlement and rehabilitation of people, problems and concerns. Nature of thermal pollution and nuclear hazards, Global warming, Acid rain, Ozone depletion. Green revolution. Population growth and environment.
Environmental Impact Assessment.
                                                                                                    (15)

UNIT IV
Environmental acts: Water (Prevention and Control of pollution) act, Air (Prevention and Control of pollution) act, Environmental protection act, Wild life protection act, Forest Conservation act.
International Conventions: Stockholm Conference 1972 and Earth Summit 1992
Case Studies: Chipko movement, Narmada Bachao Andolan, Silent Valley Project, Madhura Refinery and Taj Mahal, Chernobyl Nuclear Diaster, Tehri Dam, Ralegaon Siddhi (Anne Hazare), Florosis and Bhopal Tragedy.   (15)
Field work:Visit to a local area to document environmental assets – river/ forest/ grassland / hill /mountain. Study of local environment-common plants, insects, birds. Study of simple ecosystems – pond, river, hill, slopes etc.Visits to industries, water treatment plants, effluent treatment plants

TEXT BOOK

1) Benny Joseph, Environmental Studies**,** The Tata McGraw-Hill Publishing Company Limited, New Delhi.

REFERENCE BOOKS
1)   Text book of environmental studies, Erach Bharucha, UGC.
2)   Environmental Studies by Anubha Kaushik and C. P. Kaushik.
3)   A basic course in environmental studies by S. Deswal and A. Deswal, Dhanapath Rai & Co.
4)   Essentials of environmental studies, Kurian Joseph and R.Nagendram, Pearson Education Pt Ltd, Delhi.
5)   Environmental studies, R.Rajagopalan, Oxford university press.
6)   Environmental Pollution Control Engineering, C. S. Rao, Wiley Eastern Ltd., New Age International Ltd.,
7)   Introduction to Environmental Science, Anjaneyulu Y, B S Publications
8)   Principles of Environmental Studies, Manoharachary C and Jayarama Reddy P, B S Publications

ME 223 PROBABILITY & STATISTICS AND OPTIMIZATION TECHNIQUES.
III Year B.Tech. (Mech) Second Semester

Lectures / Tutorials :   4 Periods / week   *Sessional Marks   : 30*
University Exam.   : 3 hrs.   *University Exam. Marks : 70*
UNIT-I

Probability Distributions
Random Variables, The Binomial Distribution, The Hypergeometric Distribution, The Mean and the Variance of a Probability Distribution, Chebyshev's Theorem, The Poisson approximation to the Binomial Distribution,
Probability Densities: Continuous Random Variables, The Normal Distribution, The Normal Approximation to the Binomial Distribution.

(15)

UNIT-II

Other Probability Densities, Uniform Distribution, The Log-Normal Distribution, The Gamma Distribution, The Beta Distribution, The Weibull Distribution, Joint Distributions- Discrete and Continuous
Sampling Distribution: Populations and Samples, The Sampling distribution of the Mean(σ known), The Sampling distribution of the Mean (σ unknown), The Sampling Distribution of the Variance.

(15)

UNIT-III

Inferences Concerning Means:
Point Estimation, Interval Estimation, Test of Hypotheses, Null Hypotheses and Tests of Hypotheses, Hypotheses Concerning one Mean, The Relation Between Tests and Confidence Intervals, Operating Characteristic Curves, Inferences Concerning two Means.
Inferences concerning variances: The estimation of variances, Hypothesis concerning one and two variances.
Curve Fitting**:** The method of least squares, curvilinear regression, multiple regression.

UNIT-IV

Optimization Techniques
Introduction, Historical Development, Engineering Applications of Optimization, Statement of an Optimization Problem, Single Variable Optimization, Multivariable Optimization with no Constraints, Multivariable Optimization with Equality Constraints, Solution by Direct Substitution, Solution by the method of Constrained Variation, Solution by the Method of Lagrange Multipliers, Multivariable Optimization with Inequality Constraints

<u>**TEXT BOOKS**</u>**:** [1] Miller& Freund's Probability and Statistics for Engineers by
                    Richard A. Johnson, 6th Edition Pearson Education Asia, 2002
                   [2] Optimization Theory and Applications by S. S. Rao, 2nd Edition,
                    1984, Wiley Eastern Limited.

<u>**REFERENCE BOOKS**</u>: [1] : R.E Walpole, R.H. Myers& S.L. Myers, Probability &
                       Statistics for Engineers and Scientists, 6th Edition, PHI.
                      [2] : Schaum's Outline of Probability & Statistics Murray R
                       Spiegel, John J.Schiller, R. Alu Srinivasan 2nd Edition, Tata
                       McGraw Hill

ME 224 MECHANICS OF MATERIALS- II
II Year B.Tech. (Mech) Second Semester

Lectures   : 4 +1 Periods / week   Sessional Marks   : 30
University Exam.   :   3 hrs.   University Exam. Marks : 70

UNIT I
DEFLECTIONS OF BEAMS : Introduction, Differential Equations of the Deflection Curve, Deflections by Integration of the Bending Moment Equation, Deflections by integration of the Shear Force and Load equations.   Introduction to Moment Area Method, Macaulay's Method

(9)

COLUMNS : Buckling and Stability, Columns with Pinned ends, Columns with other support conditions, Limitations of Euler's Formula, Rankine's Formula, Columns with eccentric Axial Loads, Secant formula.

(6)

UNIT II
STATICALLY INDETERMINATE BEAMS : Statically indeterminate Beams, Analysis by the differential equations of the Deflection curve, Moment Area Method.

(8)

CONTINUOUS BEAMS : Clapeyron's theorem of three moments, Beams with constant and varying moments of inertia.

(7)

UNIT III
PRESSURE VESSELS: Thin Spherical and Cylindrical Pressure Vessels [Biaxial Stresses], Thick Cylinders: Lame's theory, Radial Deflection, Compound Cylinders.

(7)

CURVED BEAMS : Stresses in Beams of small and large initial curvature, The Winkler-Bach theory, Stresses in Crane Hook and C-Clamp with Rectangular, Circular and Trapezoidal cross-sections.

(8)

UNIT IV

SHEAR CENTRE : Bending Axis and Shear Centre, Position of Shear Centre, Shear flow,   Shear Centre of Channel section, Angle section, T- section and   I- section.

(6)

CENTRIFUGAL STRESSES : Introduction, Rotating Ring, Rotating Disc, Rotating Disc of uniform strength.

(9)

TEXT BOOK :
1. Mechanics of Materials by Gere and Timoshenko,CBSPublishers& Distributors.
2. Mechanics of Solids by Singh, Pearson Education.

REFERENCE:
1. Strength of materials by Sadhu Singh, Khanna Publishers
2. Advanced Solid Mechanics by L.S. Srinath

ME 225 APPLIED THERMODYNAMICS
II Year B.Tech. (Mech) Second Semester

Lectures   : 4+1 Periods / week   Sessional Marks   : 30
University Exam.   : 3 hrs.   University Exam. Marks : 70

UNIT   I

VAPOR POWER CYCLES: Rankine cycle, Effect of pressure and temperature on the Rankine cycle, reheat cycle, regenerative cycle.

(9)

STEAM BOILERS: Function, classification, working of Babcock and Wilcox boiler, Mountings & Accessories.

(6)

UNIT   II

STEAM NOZZLES: Types of nozzles, isentropic flow through nozzles, Effect of friction, Nozzle efficiency, Critical pressure ratio and maximum discharge, calculation of throat and exit areas using Mollier diagram.

(8)

STEAM CONDENSERS: Jet and Surface condensers, condenser vacuum and vacuum efficiency, Condenser efficiency, Thermodynamic analysis, Air pumps, Capacity of air extraction pump.

(7)

UNIT   III

STEAM TURBINES: Types of steam turbines, Impulse turbines, pressure and velocity compounding, velocity diagrams, work output, power, blade efficiency and stage efficiency, Reaction turbines, velocity diagrams, degree of reaction, work output, power, blade efficiency and stage efficiency, Governing of turbines, Overall efficiency and reheat factor.

(15)

UNIT IV

REFRIGERATION: Need for Refrigeration, Definitions, Methods of refrigeration, Working of Refrigerator & Heat pump, Bell - Coleman cycle, Refrigerating effect, COP , vapor compression refrigeration system, influence of various parameters on cycle performance, Vapor absorption refrigeration cycle.

(8)

PSYCHROMETRY AND AIR CONDITIONING: -Introduction, Psychrometric properties, Psychrometric chart, Psychrometric processes, Types of Air conditioning systems.

(7)

TEXTBOOKS:

1. Treatise on Heat Engineering-V.P.Vasandani and D.S.Kumar, Metropolitan Book co, New Delhi.
2. Thermal Engineering ---Rajput, Laxmi Publ, New Delhi.
3. Thermal Science and Engineering- D.S.kumar, S.K.kataria Publ, New Delhi.

REFERENCE BOOKS:

1. Engineering Thermodynamics----Cengel and Boles, TMH.
2. Refrigeration and Air Conditioning -- C.P. Arora, TMH.
3. Engineering Thermodynamics—Achuthan, PHI, New Delhi.

Note: Use of Steam Tables and Refrigeration and Air-Conditioning Tables is permitted in University Examinations.

ME226   CASTING, FORMING AND WELDING TECHNOLOGY

II Year B.Tech. (Mech) Second Semester

Lectures	*: 4 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks*	*: 70*

UNIT I

METAL CASTING: Introduction, advantages of Casting method, pattern:types, materials and allowances. Sand moulding procedure, Moulding materials and equipment. Preparation, control and testing of moulding sands.Cores, Cupola: Description, operation and zones.

(15)

UNIT II

GATING DESIGN: Design Considerations
SPECIAL CASTING METHODS: Permanent Mould Casting, Die Casting, Centrifugal casting, Investment casting, shell moulding, CO_2 process and continuous casting. Fettling of castings, casting defects : causes, remedies and testing.

(15)

UNIT III

WELDING: Gas and arc welding - Principles of oxy-acetylene welding, oxyacetylene flame cutting, MMAW(Manual metal arc welding), TIG, MIG, submerged arc welding. Resistance welding principles - Butt welding, Spot welding, Seam welding. Thermit Welding, Electroslag welding. Laser beam welding. Brazing & Soldering, welding defects - causes and remedies.

(15)

UNIT IV

METAL WORKING PROCESSES: Introduction, Hot and Cold working of metals. Rolling, Forging, Extrusion, Tube making, Swaging, Spinning, Coining, Embossing and Wire drawing.

(6)

SHEET METAL WORKING OPERATIONS: Introduction, Types of Sheet metal working operations, Blanking and Punching operations, Clearance and shear as applied to Punching/Blanking operations, Simple related problems, High energy rate forming of metals, Bending, deepdrawing, load estimation using homogeneous deformation methods.

(9)

TEXT BOOKS:
1. Manufacturing Technology-Vol- I by PN Rao,TMH
2. Workshop Technology Vol.1 by S.K.Hazra Chowdary. Khanna Publishers
3. A course in Work shop technology, Vol-I by B.S.Raghuvanshi, Dhanpatrai & sons.
REFERENCE BOOKS:
1. Welding Technology by Little, TMH
2. Principles of Metal Casting by Heine, Loper, Rosenthal, TMH.
3. Manufacturing Engineering & Technology, Kalpakjain, Pearson Education / PHI

ME227   MATERIAL SCIENCE & METALLURGY
II Year B.Tech. (Mech)   Second Semester

Lectures	*: 4 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks*	*: 70*

UNIT   I

CRYSTALLOGRAPHY: Classification of crystals – Bravi's lattices – Miller Indices – Packing factor in cubic systems – coordination number – crystal imperfections – crystal deformation – Slip and Twinning.

(8)

PHASE DIAGRAMS: Binary phase diagrams – Phase rule – one component system, two component system, isomorphous, eutectic, eutectoid, peritectic and peritectoid systems, concept of Ternary diagrams.

(8)

UNIT   II

HEAT TREATMENT OF STEELS: Iron–Iron carbide equilibrium diagram, TTT diagrams for eutectoid, hypo and hyper eutectoid steels, martensite and bainitic transformation.

(8)

HEAT TREATMENT: Annealing, normalizing, hardening, tempering, surface hardening, age hardening, austempering, martempering and hardenability concept and experimental determination.

(8)

UNIT   III

STRENGTHENING MECHANISMS: Strain hardening, solid solution strengthening, grain refinement, dispersion strengthening.

(6)

COMPOSITE MATERIALS:
Properties and applications of Particulate-reinforced composites, fibre reinforced composites, Laminar composites and metal matrix composites.

(7)

UNIT – IV
POWDER METALLURGY: Powder metallurgy process, preparation of powders, characteristics of metal powders, mixing, compacting, sintering, Applications of Powder Metallurgy.
Forming and shaping of plastics – Extrusion and Injection moulding.

(8)

FERROUS AND NON FERROUS MATERIALS: Composition, properties and application of ferrous and non ferrous metals and their alloys. Brief study of cast iron, steels, copper, aluminum,
Nano materials – Introduction and Applications

(7)

TEXT BOOKS:
1. Introduction to Physical Metallurgy - Avner, McGrawHill
2. Material Science and Metallurgy   - V. Raghavan, Pearson Education / PHI.
3. Material Science and Metallurgy - R.B.Choudary - Khanna Pub.

REFERENCE BOOK:
1. Material Science and Metallurgy -   Dr.V.D.Kodgire, Everest Publishers
2. Nano materials – J.Dutta & H.Hofman
3. Manufacturing Engineering & Technology – Kalpak Jain & Schmid, Pearson / PHI

Acharya Nagarjuna University   Mechanical Engineering Syllabus

ME261   COMPUTER AIDED DRAFTING
(Using Computer packages)
II/IV B.Tech (Mech.) :: Second Semester

Practicals   : 3 periods / week   Sessional   Marks   : 25
University Exam   : 3 hrs   University Exam Marks   : 50

1. Introduction, Basic drawing, modify, editing & dimensioning commands, layers, AutoCAD – screen menus .

2. Sectional views of castings

3. Assembly drawings

    a. Pipe vice ; b. Lathe tail stock ; c. Swivel bearing

4. Part drawings

    a. Single tool post ; b. Petrol engine connecting rod ; c. Angular – plummer block

Reference books :

1. AutoCAD 14 for Engineering drawing made easy by P.Nageswara Rao, TMH,

2. An Introduction to AutoCAD 2000 by A.Yarwood, Longman Publishers.

3. Machine Drawing by K.L.Narayana, P.Kannaiah, and K.Venkata Reddy, Wiley Eastern Limited, New Age International.

ME 262   WORKSHOP PRACTICE

II Year B.Tech. (Mech) Second Semester

Practicals   : 3 Periods / week   Sessional Marks   : 25
University Exam.   : 3 hrs.   University Exam. Marks : 50

PATTERN MAKING : Solid pattern , Split pattern .

MOULDING : Stepped cone pulley, Hand wheel, Bush.

FITTING : Six Standard Exercises

TURNING: Plain, Step and Taper turning, Right-hand and Left-hand threads, Eccentric turning, Knurling and contour turning.

ME 311 OPERATIONS RESEARCH
III Year B.Tech. (Mech) First Semester

Lectures / Tutorials   : 4+1 Periods / week   *Sessional Marks   : 30*
University Exam.: 3 hrs.   *University Exam. Marks : 70*

UNIT I
LINEAR PROGRAMMING :Definition and Scope of Operations Research, Mathematical formulation of the problem, graphical method, Simplex method, artificial basis technique,duality,dual Simplex method. Degeneracy, alternative optima, unbounded solution, infeasible solution.

(15)

UNIT II

TRANSPORTATION PROBLEM: Introduction to the problem, LP formulation of a transportation problem. Basic feasible solution by north-west corner method, Vogel's approximation method, least cost method. Finding optimal solution by MODI method, degeneracy, unbalanced transportation matrix and Maximization in transportation model.

ASSIGNMENT PROBLEM: One-to-one assignment problem, optimal solution, unbalanced assignment matrix. Flight scheduling problems, Traveling salesman problem.

(15)

UNIT III

QUEING THEORY: Queuing systems and their characteristics. Analysis of Markovian chains, Transition diagram, M/M/1 : FCFS/ $\propto$ / $\propto$ and M/M/1 : FCFS/ $\propto$ / N queuing models.

PROJECT PLANNING THROUGH NETWORKS: Arrow (Network) Diagram representation. Rules for constructing an arrow diagram, Pert and CPM, Critical path calculations, earliest start and latest completion times, Determination of critical path, determination of floats, Probability considerations in project.

(15)

UNIT IV

SIMULATION: Definition and applications. Mantel Carlo simulation. Random numbers and random number generation: Mixed congruential method, additive congruential method and multiplicative congruential method. Application problems in queuing and inventory.

DYNAMIC PROGRAMMING: Characteristics of D.P. model, solution of optimal sub-division problem, solution of an L.P. by D.P.

(15)

TEXT BOOKS:

1. Operations Research – H.A. Taha

2. Introduction to Operations Research – Hiller and Liberman

REFERENCES:

1.   Introduction to Operations Research – Phillips, Ravindran, James Solegerg.
2.   Optimization Theory and Applications – S.S. Rao
3.   Operations Research – S.D. Sharma
4.   Operations Research – Gupta and Hira
5.   Pert and CPM Principles and Applications – L.S. Srinath

ME 312   DESIGN OF MACHINE ELEMENTS

III Year B.Tech. (Mech) First Semester

Lecturers / Tutorials   : 4+1 periods / Week   *Sessional Marks : 30*
University Exam : 3 hrs   *University Exam Marks : 70*

UNIT I
BASICS: Basic procedure of machine design, requirements and design of machine elements, traditional design methods. Design synthesis, use of standards in design, manufacturing considerations in machine design, preferred numbers and significance.

(6)

MATERIALS & THEIR PROPERTIES : Mechanical properties of materials, Common engineering materials and their properties.

(4)

DESIGN FOR STATIC STRENGTH : Simple Stresses - Combined stresses - Torsional and Bending stresses - stress strain relation, various theories of failure - Factor of safety and its importance in design.

(5)

UNIT II
 DESIGN FOR FATIGUE STRENGTH : Stress concentration, stress concentration factors, reduction of stress concentration, fluctuating stresses, fatigue failure, endurance limit, low cycle and high cycle fatigue, notch sensitivity, endurance – approximate estimation, reversed stresses – design for finite and infinite life, cumulative damage in fatigue, Soderberg and Goodman lines, modified Goodman diagrams, Gerber equation, fatigue design under combined stresses, impact stresses.

(9)

POWER SCREWS: Types - Mechanics of power screws, efficiency, Design of Screw Jack and turnbuckle.

(6)

UNIT III
FASTENERS: Riveted joints, Boiler Joints & Lozenge Joint, Design of joints under eccentric loading, Welded joints, Eccentrically loaded welded joints.

(15)

UNIT IV
THREADED JOINTS – basic types, bolt of uniform strength, materials and manufacture, eccentrically loaded bolted joints in shear, eccentric load perpendicular to axis of bolt, eccentric load on circular base.

(11)

COTTER JOINTS: Sleeve and Socket & Spigot cotter joints, Gib & cotter joint..   (4)
TEXT BOOKS:
1.   Design of machine elements by Bhandari, Tata McGraw Hill book Co.
2.   Machine Design by P.C. Sharma & D.K. Agarwal.
3. Design of Machine Elements by Sharma & Purohit ,PHI
HAND BOOKS TO BE ALLOWED IN UNIVERSITY EXAMINATION:
1.   Design data book, P.S.G. College of Technology, Coimbatore
2.   Design data book, Mahadevan & Balaveera Reddy - CBS Pub.

ME313 MACHINE DYNAMICS

III Year B.Tech. (Mech) First Semester

Lectures / Tutorials   : *4+1 Periods / week*   *Sessional Marks*   : *30*

University Exam.   : *3 hrs.*   *University Exam. Marks*   : *70*

UNIT I

DYNAMIC FORCE ANALYSIS : Introduction, D'Alembert's Principle, Equivalent Offset Inertia Force, Dynamic Analysis of Slider - Crank mechanism (Using Analytical method) Velocity and Acceleration of piston, Angular velocity and Angular Acceleration of Connecting Rod, Piston Effort (Effective Driving Force), Crank Effort. Turning Moment on Crankshaft, Inertia of connecting Rod.

(8)

GOVERNORS: Introduction, Types of Governors, Watt Governor, Porter Governor, Hartnell Governor, Sensitiveness of a Governor, Hunting, Isochronism, Stability,Controlling force.

(7)

UNIT II

BALANCING : Introduction, Static balancing, Dynamic balancing, Transferring of a Force from one plane to another, Balancing of Several Masses in Different planes, Primary & Secondary Balancing of Reciprocating Mass , Balancing of In line Engines, Balancing of V Engines.

(10)

GYROSCOPES : Angular Velocity, Angular Acceleration, Gyroscopic Torque, Gyroscopic Effect on Naval Ships, Stability of a two wheel vehicle.

(5)

UNIT III

FUNDAMENTALS OF VIBRATION:- Introduction, Definitions,Vector method of representing Harmonic Motions, Addition of two simple Harmonic motion of the same frequency.

(2)

UNDAMPED FREE VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS:- Introduction, Derivations of differential equations, solution of differential equation, Torsional vibrations, Equivalent stiffness of spring combinations, Energy method.

(6)

DAMPED FREE VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS:- Introduction, Different types of damping, Free vibrations with viscous damping, Logarithmic Decrement, Viscous dampers, Coulomb damping, Structural damping, Interfacial damping.

(7)

UNIT IV

FORCED VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS:- Introduction, Forced vibrations with constant Harmonic excitation, Forced vibration with rotating and reciprocating unbalance, forced vibrations due to excitation of the support, Critical speed of a light shaft having a single disc without damping, critical speed of a light shaft having a single disc with damping, Vibration, isolation and transmissibility, vibration measuring instruments.

(12)

TWO DEGREES OF FREEDOM SYSTEMS: Introduction, Principal modes of vibration, undamped dynamic vibration absorber. (3)

TEXT BOOKS:
1.   Theory of Machines by S.S. Rattan
2.   Theory of Mechanisms and Machines by C.S.Sharma, Kamlesh Purohit, PHI
3.   Mechanical Vibrations – G.K.Groover
4.   Mechanical Vibrations – Rao V.Dukkipati, J.Srinivas, PHI

REFERENCE BOOKS:
1.   Theory of Machines by T. Bevan
2.   Theory of Mechanisms and Machines by A. Ghosh and A.K. Mallik.
3.   Theory of Machines and Mechanisms by Jagadish Lal

4.   Mechanical Vibrations – W.T.Thomson
5.   Mechanical Vibration – S.S.Rao

ME 314   BASIC ELECTRONICS & MICRO-PROCESSORS
III Year B.Tech. (Mech) First Semester

Lectures: 4 Periods / week   *Sessional Marks   : 30*

University Exam.: 3 hrs.   *University Exam. Marks : 70*

UNIT I
BASIC CIRCUIT THEORY CONCEPTS: Circuit Components: Resistance, Inductance,Capacitance; Kirchoff's Laws: KVL (Kirchoff voltagelaw) KCL (Kirchoff Current Law) , Mesh analysis & Nodal Analysis of Simple Electric circuits: Circuit theorems: Thevinen & Nortan's Theorems.
BASIC ELECTRONIC DEVICES:
PN junction diode: Principle, characteristics:Zener diode : Principle, characteristics, Rectifiers: Definition, Half wave rectifier, Full wave rectifier; BJT: Principle & operation, Input,& output characteristics, Transistor as   a switch, Transistor as an amplifier.
FET: Principle & operation, characteristics of JFET, & MOSFET & of JEET., its characteristics.

(15)

UNIT II
ANALOG ELECTRONCS: Operation amplifiers: Definition of op-Amplifiers, Block diagram of op –Amp, details of op – Amp characteristics, Op – Amp Configurations: Inverting configuration, Non- Inverting configuration.
OP AMPLIFIERS APPLICATIONS: Summing   Amplifier,   Difference   Amplifier,   Integrator, Differentiator, Instrumentation amplifier, Comparator, Schmitt tigger,.

(15)

UNIT   III
DIGITAL ELECTRONICS: Number systems: Decimal, Binary Octal, Hexa – decimal number systems, Number system conversions.
Codes: BCD Code, Excess – 3 code.
Boolean Algebra & LogicGates: Boolean Logic Postulates. Basic logic gates, Universal Logic gates, Boolean expression simplification using K – Map Method up to 4 variables.

Combinational Logic Circuits: Definition, Combinational circuit design Procedure, Design of Combinational Circuits: half – Adder, Full – adder, Half Sub tractor, Full Sub tractor, Decoder, Encoder, Multiplexer, De – Multiplexer.
SEQUENTIAL LOGIC CIRCUITS: Definition, Flip – flops: SR, JK, T, D., Race around condition, Master – slave J.K.Flip - flop, Counters: Asynchronous versus synchronous counters, Design of ripple counters, shift registers.

(15)

UNIT IV
INTRODUCTION MICROPROCESSORS: Intel 8085 architecture, Pin diagram, Instruction set OF 8085, Addressing Modes, Development of simple assembly language Programs, Interfacing: 8255 (PPI) , Interfacing to input & output devices.

(15)

TEXT BOOKS:
1. Circuit theory by A.Sudhakar & S.P. Shyam Mohan. for chapter one of unit I (TMH)
2. Microprocer & Architectures, Programming & applications with the 8085/8080 A by Gaoneker. for Unit - IV
3. Digital Logic and Computer Design by M.Morris mano, PHI for unit – 3.
4. Semiconductor devices & Circuits by B.P. Singh for chapter – 2 of Unit – I (Dhanpati Rai)
5. Linear integrated circuits by D.Roy Chaudary& S.Jain(New - age international).

ME 315 I.C. ENGINES & GAS TURBINES

III Year B.Tech. (Mech) First Semester

Lectures   : 4 Periods / week   *Sessional Marks   : 30*

University Exam.: 3 hrs.   *University Exam. Marks : 70*

UNIT   I

I.C.ENGINES: Introduction, Basic engine nomenclature, Review and classification of I.C. Engines, working principles of S.I. and C.I. Engines (both 4 stroke and 2-stroke) - valve timing and Port Timing diagrams - Differences between S.I. & C. I. and 2 stroke & 4 stroke engines   (7)

 FUEL SUPPLY SYSTEMS: S.I. Engines- Chemically correct air-fuel ratio, Air-fuel mixture requirements, Carburetion, Simple float type carburetor, injection system, types, electronic fuel injection system, MPFI.
(4)

C. I. Engines- Air- fuel requirements, fuel supply and injection systems, Bosch fuel pump, electronic injection system, CRDI.   (4)

UNIT   II

COMBUSTION PROCESSES: S.I.Engines- Normal combustion, abnormal combustion, Knock rating and Octane number.   (3)

C.I.Engines- Ignition delay, combustion knock in C.I. engines, Knock rating and Cetane number.   (4)

  TESTING OF I.C.ENGINES: Indicator diagram, evaluation of Indicated Power, Brake power, Fuel consumption, SFC, Mechanical & thermal efficiencies, mean effective pressure, air-fuel ratio, Heat balance, Engine performance curves, Variables affecting engine performance for both S.I. & C.I. Engines.   (8)

UNIT   III

RECIPROCATING AIR COMPRESSORS: Classification, Operation, Effect of clearance volume, compression ratio, volumetric efficiency, power input, Single-stage and Multi-stage compressors, Effect of intercooling, optimum intermediate pressure in a two-stage compressor.

(7)

ROTARY COMPRESSORS: Introduction, Types and their applications, principles of working, static and total head values, Centrifugal compressor- velocity vector diagrams, pressure coefficient, pre whirl, Axial flow compressor - polytropic efficiency, Surging, Choking and Stalling, Centrifugal compressor versus axial flow compressor.
        (8)

UNIT   IV

GAS TURBINES: Closed and Open cycle gas turbines, analysis of closed cycle gas turbine, efficiencies of Compressor and turbine, cycles with intercooling, reheat and regeneration.

(8)

JET & ROCKET PROPULSION: Basic principles of Jet propulsion - specific thrust, propulsive efficiency and overall thermal efficiency of a jet engine, Principles of Rocket propulsion, Types of rocket propulsion.
(7)

TEXT BOOKS:

1.   Treatise on heat Engineering - Vasandani & Kumar-Metropolitan Book Company, New Delhi
2.   Thermal Engineering- Rajput-Laxmi Pub, New Delhi
3.   Fundamentals of I.C.Engines – H.N. Gupta, PHI, New Delhi.
REFERENCE BOOKS:

1.   Fundamentals of I.C. Engines - P.W. Gill, J.H. Smith & Ziurys- IBH & Oxford publ, Mumbai.
2.   A Course in I.C. Engines - M.L. Mathur & R.P. Sharma - Dhanpat Rai & Sons- New Delhi.
3.   Gas Turbine Theory - Cohen, Rogers and Sarvanamuttu.
4.   I.C. Engines   - V.Ganesan - T.M.H., New Delhi.

ME   316   METAL CUTTING AND MACHINE TOOLS

III Year B.Tech. (Mech) First Semester

Lectures: 4 Periods / week	*Sessional Marks*	*: 30*
University Exam. : 3 hrs.	*University Exam. Marks*	*: 70*

UNIT   I
MACHINING PROCESSES AND MACHINE TOOLS:
Introduction, Primary and Auxiliary Motions in Machine Tools, Parameters defining working motions of a Machine Tool.

(3)

LATHE :
Constructional details, specifications, classification of lathes**.**
Lathe Mechanisms: Spindle speed Mechanisms in Belt driven and All Geared Head stock, Apron and Half-nut mechanisms. Lathe accessories – various work holding devices. Lathe operations including taper turning and thread cutting and related problems.

(12)

UNIT   II
DRILLING MACHINES:
Types and specifications, spindle feed mechanism, drilling operations, drilling time.

(4)

SHAPING AND PLANING:
Constructional details, types of shapers and planers, specifications, Quick Return Mechanism and automatic feed mechanisms .

(4)

GRINDING MACHINES:
General Principles, Wheel materials, Selection and specification of grinding wheels, Truing and Dressing of grinding wheels, types of grinding machines.

(7)

UNIT   III
SURFACE FINISHING OPERATIONS: Honing and Lapping operations   (3)
MILLING MACHINES:
Working Principle, Size and Specification, Up and Down Milling, Types of milling machines, Description and working of Universal Milling machine, Milling operations, Milling cutters, Indexing methods and Indexing Head, related problems.

(12)

UNIT   IV
THEORY OF METAL CUTTING:
Introduction, Basic elements of machining, Nomenclature of single point cutting tool, Tool Geometry, Mechanics of chip formation, Types of chips. Determination of shear angle and chip thickness ratio, stress and strain in the chip, velocity relations, Merchant's theory of orthogonal cutting forces, related simple problems.

(6)
Tool wear, Tool life and Tool life criteria   (3)
Heat Generation and temperature distribution in metal cutting , cutting fluids- types and required characteristics.

(3)

CUTTING TOOL MATERIALS: Requirements of Tool materials and types ,
  ECONOMICS OF MACHINING.   (3)

TEXT BOOKS:

1. Workshop Technology Vol. II by Hazra Chowdary
2.   Production Engineering by P.C. Sharma, S.Chand & Co.

REFERENCE BOOKS:
1.   Materials and Processes in Manufacturing by E.Paul De Garmo, J.T.Black and Ronald A.Kohser.
2.   Machining and machining process by PN.Rao, TMH.
3.   Manufacturing Science by Ghosh & Mallick

ME 351   COMPUTER APPLICATIONS IN MECHANICAL ENGINEERING LAB

III Year B.Tech. (Mech) First Semester

Practicals   : 3 Periods / week   Sessional Marks   : 25
University Exam.   :   3 hrs.   University Exam. Marks : 50

Note : Develop programs for the following problems using C- language

SIMULATION EXERCISE: [Any TWO]

- Hart Mechanism

- Paucellier Mechanism

- Robert Mechanism

- Scott Russel Mechanism

- Watt Mechanism

- Pantograph Mechanism

- Four Bar Mechanism

- Slider Crank Mechanism

- Tchibicheff Mechanism

COMPUTER APPLICATIONS: [ANY FOUR]

- Numerical Methods

- Differential Equation solution

- Gauss elimination: General Matrix and skyline.

- Two dimensional stress analysis

- Cylinder subjected to internal pressure.

- 1 D Heat Transfer (conduction)

- 2 D Heat Transfer (conduction)

- O.R. applications like L.P., Queing Theory, CPM, PERT etc..

APPLICATIONS PACKAGES: [ANY ONE]

- Simple packages for Fluid flow like fluent, Star CD etc.,
- O.R. Packages like TORA, LINDO, PRIMAERA ,Etc.,
- MAT Lab.
- Any application package in Mechanical Engineering.

ME352   MACHINE SHOP PRACTICE

III Year B.Tech. (Mech) First Semester

Practicals   : 3 Periods / week   Sessional Marks   : 25

University Exam.   :   3 hrs.   University Exam. Marks : 50

TURNING :

Multi-start threading, Drilling, Boring and Internal threading

DRILLING & TAPPING :

Drilling and Tapping of Different threads

MILLING :

Key-way, Spur and Helical Gear Milling, Gear Hobbing.

SHAPING :

At least three models involving production of flat surface, Stepped surface, Cutting dovetail and rectangular grooves.

PLANING AND SLOTTING :

Working on Planing and Slotting Machines

GRINDING :

At least one model on surface grinder, cylindrical grinder or tool and cutter grinder.

ME353   BASIC ELECTRONICS & MICROPROCESSORS LABORATORY

III/IV B.Tech (Mech.) :: First Semester

Practicals   *: 3 periods / week*   *Sessional   Marks*   *: 25*
University Exam   *: 3 hrs*   *University Exam Marks*   *: 50*

(Any Ten Experiments)

1. VI characteristics of PN junction diode

2. VI characteristics of Zener diode

3. Half wave rectifier with and without filter

4. Common emitter configurations (BJT)

5. Characteristics of JFET

6. Characteristics of UJT

7. Logic gates using discrete components

8. Logic gates using universal gate (NAND gate)

9. Combinational Circuits (half adder, full adder, half subtractor)

10. Verification of Flip-Flop (JK & D etc.,)

11. Code converters (Gray to Binary & Binary to Gray)

12. Multiplexer and Demultiplexer

13. Addition of two numbers using 8085 Microprocessor

14. Subtraction of two numbers using 8085 Microprocessor

15. Addition of n-numbers using 8085 Microprocessor

ME 321 OPERATIONS MANAGEMENT
III Year B.Tech. (Mech) Second Semester

Lectures   : 4 Periods / week   Sessional Marks   : 30

University Exam.   : 3 hrs.   University Exam. Marks : 70

UNIT – I :
Forecasting : Forecasting variables, forecasting procedure, methods of forecasting: moving average, least squares, simple exponential smoothing, linear regression, correlation coefficient, problems.

(6)
Production systems :   Continuous and intermittent production. Mass and flow production, batch production, job order production, production functions.   (5)
     Plant Location and Facilities layout : Necessary factors governing plant location, principles of plant layout, types of layouts.

(4)

UNIT – II
Aggregate planning and scheduling : Long range, intermediate range and short range plans, the aggregate planning problem, aggregate planning methods, mathematical planning models, theoretical planning models (LDR) and heuristic and computer search models, problems.

(12)
     Master scheduling : Master scheduling formation: inputs and ouputs. Master scheduling methods.
(3)
UNIT – III
Materials Management and MRP : Functions of materials management, purpose of inventories, types of inventories, relevant costs in inventory control, ABC and VED analysis. Materials requirement planning (MRP) : Importance of MRP and CRP, MRP system inputs and outputs, bill of materials, MRP logic.

(8)
 Supply Chain Management: Introduction, need for supply chain management, Elements of supply chain management, Logistics, E-commerce, Steps in creating an effective supply chain, supplier management.
(7)

UNIT – IV
Economic order quantity (EOQ) models :   Deterministic continuous review models: Basic EOQ, Economic production quantity model, Basic EOQ model with shortages, Quantity discounts. Re-order point, buffer stock, reserve stock and safety stock.
Single period model for perishable goods, Multiechelon inventory models

(15)

Text Books :
   1.   Operations Management – Joseph G.Monks, Tata McGraw Hill
   2.   Production and Operations Management by Stevenson
Reference Books :
   1.   Materials Management – Gopalakrishnan and Sudhakaresan
   2.   Quality Control – Dale H.Besterfield.
   3.   Operations Research – Hiller and Lieberman, Tata McGraw Hill
   4.   Reliability Engineering- Balaguru swamy

ME 322   DESIGN OF TRANSMISSION ELEMENTS
III Year B.Tech. (Mech) Second Semester

Lectures / Tutorials :   4 + 1 Periods / week   *Sessional Marks   : 30*

University Exam.   :   3 hrs.   *University Exam. Marks : 70*

UNIT I
SHAFTS: Design of solid and hollow shafts for strength – For Bending, Torsion, Combined bending and torsion and combined bending, torsion and axial loads   (7)
KEYS: Introduction, Design of square and flat keys   (3)
SHAFT COUPLINGS: Regid couplings – Muff Coupling, Flange coupling, Flexible coupling – Modified Flange coupling   (5)

UNIT II
BEARINGS AND LUBRICATION: Lubrication, Types of lubrications, types of lubricants, properties of lubricants, types of Bearings, Bearing materials, Journal bearing design (using Mckee's equation and Raymond and Boyd charts & tables)   (8)
Ball and Roller Bearings: Static load, Dynamic load, Equivalent radial load, selection of ball and roller bearings   (7)

UNIT III
 BELT DRIVES : Flat and V-belts, Belt constructions, Geometrical relationships, Analysis of belt tensions, condition for maximum power, Selection of V-belts – Selection of Pulleys.   (11)
CHAIN DRIVES: Introduction, Chain drives, Advantages of chain drives over belt drives, Polygonal effect, Selection of roller chains.   (4)
UNIT IV
SPUR GEARS : Classification of gears, Terminology of spur gear, standard systems of Gear Tooth, Force analysis, Gear tooth failures, Selection of material, Beam Strength of gear teeth, lubrication, Lewis Equation.   (6)
HELICAL GEARS: Terminology of helical gears, virtual number of teeth, Tooth proportions, force analysis, Beam Strength of helical gears, effective load on gear tooth, wear strength of helical gears. Lewis Equation.   (3)
BEVEL GEARS: Terminology, force analysis, Beam Strength of bevel gears, wear strength. Lewis Equation.   (3)
 WORM GEARS: Terminology, Force analysis, Strength rating of worm gears, Wear rating of worm gears.

(3)

TEXT BOOKS:
1.Design of machine elements by Bhandari, Tata McGraw Hill book Co.
2.Machine Design by P.C. Sharma & D.K. Agarwal.

HAND BOOKS TO BE ALLOWED IN UNIVERSITY EXAMINATION:
1. Design data book, P.S.G. College of Tech, Coimbatore
2.   Design data book, Mahadevan & Balaveera Reddy - CBS Pub.

ME 323 HYDRAULIC MACHINES

III Year B.Tech. (Mech) Second Semester

Lectures	*: 4 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks*	*: 70*

UNIT I

INTRODUCTION: Classification of fluid machines, impulse action, linear impulse momentum and angular momentum principles.   (5)

IMPACT OF JETS: Introduction, Force exerted by a fluid jet on stationary and moving flat plate and curved vanes, flow over radial curved vanes, sprinklers.

(10)

UNIT II

HYDRAULIC TURBINES: Elements of hydroelectric power plants, Heads and efficiencies of a turbine, Classification- Pelton, Francis and Kaplan turbines, Working, proportions of turbines, comparison and selection of turbines, Numerical problems. Draft tube theory, Oil pressure Governing.

(8)

PERFORMANCE OF TURBINES: Performance under unit quantities, Performance under specific conditions - Specific speed, Expression for specific speed, Performance characteristics curves, Water hammer, Cavitations.

(7)

UNIT III

RECIPROCATING PUMPS: Types, Working principle, Power required by a Reciprocating pump, Coefficient of discharge, Slip and negative slip, Effect of Acceleration of piston on velocity and pressure in suction and delivery pipes, Indicator diagram, Air vessels

(8)

CENTRIFUGAL PUMPS: Types, Working, Reciprocating vs. Centrifugal pump, Work done by impeller, Head of a pump, losses and efficiencies, Minimum starting speed, Specific speed, Multistage pumps, Pumps in parallel, Performance characteristic curves, limitation of suction lift, NPSH, Cavitations.

(7)

UNIT IV

DIMENSIONAL ANALYSIS & MODEL SIMILITUDE: Introduction, Buckingham's PI theorem, Types of similarities, Force ratios, Dimensionless numbers, Model Laws-Reynolds and Froude law, Types of models, Scale effect.(Qualitative treatment only)

(10)

MISCELLANEOUS HYDRAULIC EQUIPMENT: Hydraulic accumulator, Hydraulic intensifier, Hydraulic press, Hydraulic lift, Hydraulic ram.

(5)

TEXT BOOK:
 1. Hydraulics and Fluid Mechanics --P.N.Modi & S.M. Seth, Standard Book House, New Delhi.
 2. Hydraulic Machines - Jagadish Lal
REFERENCE BOOKS:
 1. Fluid Mechanics & Fluid Power Engineering - D.S.Kumar, SK Kataria &sons, New Delhi.
 2. Fluid Mechanics & Hydraulic Machines - R.K.Bansal

ME 324 ENGINEERING METROLOGY & MECHANICAL MEASUREMENTS
III Year B.Tech. (Mech) Second Semester

Lectrures   :   4 Periods / week   Sessional Marks   : 30
University Exam   .:   3 hrs   University Exam. Marks : 70

METROLOGY :
UNIT - I

INTRODUCTION: Elements of engineering measurements, standards of length, end and line standards. Theory of limits, Fits, Tolerances and their selection, Hole Basis and shaft basis system, IS system of limits & fits, simple problems. Interchangeability, Selective Assembly,
GAUGES: Limit gauges, Taylor's Principle of limit gauging, plug gauges, Ring gauges and design of plain cylindrical plug and ring gauges. Slip gauges, angle gauges, sine bars, spirit levels.

(15)
UNIT - II
COMPARATORS:
Sigma comparator, Solex pneumatic gauge, electrical & electronic comparator, projectors, Tool Maker's Microscope, Auto collimator, bore gauges, straight edges, angle plates.
MEASUREMENT OF SURFACE FINISH: Surface texture, roughness , waviness, Indian standard terminology, Various methods of measuring surface finish, Tomilson surface meter and Taylor Hobson Talysurf.
MEASUREMENT OF SCREW THREADS:
MACHINE TOOL PERFORMANCE TESTS: Static and Dynamic alignment tests- Alignment tests on Lathe, Universal Milling Machine and Pillar Drilling Machines.
(15)
UNIT - III
MEASUREMENTS:
BASIC CONCEPTS: Introduction, Measurement system elements, Definition of terms: Calibration, standards, Accuracy, Precision, Sensitivity, Resolution.

(3)
STRAIN MEASUREMENT:
Introduction, electrical resistance strain gauges principle, Method of fixing and bridge circuits for measuring strain changes, Gauge factor, Temperature compensation strain gauge. Rosette, Strain gauge applications.

(6)
FLOW MEASUREMENT:
Introduction. Variable head flow meters, orifice, Pitot tube, variable area flow meters, Hot-wire anemometer. Flow visualization methods.
(6)
UNIT - IV
PRESSURE MEASUREMENT:
Introduction, pressure measurement terms, Pressure units, Bourdon tube pressure gauge, Diaphragm and Bellows, Bridgeman gauge, Low pressure measurement: McLeod gauge, thermal conductivity gauge.

(6)
TEMPERATURE MEASUREMENT:
Introduction, Liquid in glass thermometers, Bi-metallic thermometers, Thermo-Resistive elements, Thermocouples, Thermisters and Pyrometers.
(4)
FORCE AND TORQUE MEASUREMENT: Introduction,   Elastic force meters, Load cells. Dynamo meters, Mechanical ,Electrical & Transmission Dynamometers.   (5)
TEXT BOOKS:
1. Metrology - R.K.Jain , Khanna publishers
2. Mechanical Measurements & Control - by D.S. Kumar ,
REFERENCE BOOKS:
1 Engg.Metrology – D.M.Antony
2. A text book of Engg.Metrology – I.C.Gupta.

3. Mechanical Measurements - by T.G. Beckwith & N.L.Buck
4. Experimental Methods for Engineers by J.P.Hollman, TMH.

ME 325 HEAT TRANSFER
III Year B.Tech. (Mech) Second Semester

Lectures	: 4+1 Periods / week	Sessional Marks	: 30
University Exam.	: 3 hrs.	University *Exam. Marks : 70*

UNIT I

INTRODUCTION: Basic Modes and Laws of Heat transfer, thermal conductivity, Steady state Heat Conduction, General conduction equation in Cartesian, Cylindrical and Spherical coordinates, initial and boundary conditions.

(4)

ONE- DIMENSIONAL STEADY STATE HEAT CONDUCTION: Heat flow through plane wall and cylinder with constant thermal conductivity , Heat flow through composite slab and Cylinders, Thermal resistance, Electrical analogy, Thermal contact resistance, problems on variable thermal conductivity, critical insulation thickness, uniform heat generation in slabs. (7)

EXTENDED SURFACES: Types, Applications, Fin materials, Heat transfer from fins with uniform cross section, Fin efficiency and Effectiveness. (4)

UNIT II

TRANSIENT HEAT CONDUCTION (One dimensional only) - Lumped heat capacity systems. (3)

FORCED CONVECTION: Introduction, Principles of convection, Mass, Momentum and Energy equations for boundary layer, Hydrodynamic and thermal boundary layers and their thicknesses, concept of turbulence. Correlations for heat transfer in Laminar and Turbulent flows over a flat plate, and in pipes, relation between fluid friction and heat transfer in laminar & turbulent flows – Reynolds-Colburn Analogy.

(12)

UNIT   III

   NATURAL CONVECTION: Approximate analysis for laminar film on a vertical plate, Correlations for vertical plates, horizontal plates, vertical and horizontal cylinders, inclined surfaces.

(7)

HEAT EXCHANGERS: Classification, types of heat exchangers, Flow arrangement, Temperature distribution , Overall heat transfer coefficient, Fouling factor, LMTD and NTU methods of Heat exchanger analysis, correction for LMTD for use with multi pass and cross flow Heat Exchangers, Effectiveness.

(8)

UNIT   IV

RADIATION: Fundamentals of Radiation: Basic Concepts and definitions, Absorptivity, Reflectivity, Transmissivity, concept of Black body, Laws of Radiation, Kirchhoff's law, Planck's law, Wein's law, Stefan Boltzman's law. (7)

RADIANT HEAT TRANSFER: Heat Exchange by radiation between two finite parallel surfaces, Electrical analogy, solid angle and Radiation intensity, radiant heat transfer between two finite black and gray surfaces, shape factor, Radiation shields. (8)

TEXT BOOKS:

1. Heat and Mass Transfer – Sachdeva, New Age India, New Delhi

2. Heat Transfer—Rajput, Laxmi publ, New Delhi.

REFERENCE BOOKS:

1. Heat transfer - J.P.Holman, MGH, New York.

2. Heat transfer   -   S.P.Sukhatme, TMH.

3. Heat Transfer – Cengel and Boles, TMH, New Delhi

NOTE: Heat and Mass Transfer Data Book by Kothandaraman and Subramanian to be allowed in University Examination.

ME326 MANUFACTURING ENGINEERING
III Year B.Tech. (Mech) Second Semester

Lectures   : 4 Periods / week   Sessional Marks   : 30
University Exam.   : 3 hrs.   University Exam. Marks   : 70

UNIT – I
JIGS & FIXTURES : Introduction, design considerations in jigs & fixtures. The principle of six point location, locating pins. Clamping and clamping devices. A few examples of drilling jigs like box type, template jig, Inverted jig, indexing jig, fixtures – Lathe, milling

(8)

GEAR MANFUACTURING : Introduction to various gear manufacturing methods, gear shaping, gear hobbing, bevel gear generation - principles and methods, gear finishing methods.

(5)
THREAD MANUFACTURING PROCESSES : Thread rolling, thread milling, thread grinding.

(2)
UNIT – II
UNCONVENTIONAL MACHINING PROCESSES : Introduction, principles of operation, equipment and applications of AJM, USM, WJM, EDM, ECM, CHM, EBM, LBM and PAM

(15)

UNIT – III
PRESS WORKING TOOLS : Major components of a press, shear action in die cutting operation, centre of pressure and its calculation, scrap strip layout for blanking.   (6)

Types of dies – compound die, combination die, progressive die.   (3)

Drawing die – Calculation of blank size, number of draws, percentage reduction, radius on punch and die, total drawing force.   (3)

Bending die – Bending methods, spring back, bending allowance, bending force.   (3)

UNIT – IV

COMPUTER AIDED INSPECTION : Types of CMM (Coordinate Measuring Machines), CMM construction, CMM operation and programming, CMM software, Flexible inspection systems,   CMM applications and benefits.

(8)
Machine vision, principle and introduction to stages in machine vision, image acquisition and digitization, image processing and analysis, interpretation, machine vision applications.

(7)

Text Books:
1. A Text book of Production Engineering by P.C.Sharma, S.Chand & Co.
2. Manufacturing Science by Ghosh & Mallik,

Reference Books:
1. Manufacturing engineering & technology by Kalpak Jain, Pearson Education / PHI

2. Engineering metrology by R.K.Jain, Dhanpathrai & Sons
3. Automation, production systems & CIM by M.P.Groover, Pearson Education / PHI

**ME 361 CAD Lab – I
[Modelling]**

III Year B.Tech. (Mech.) Second Semester

Practicals   : 3 Periods / week   Sessional Marks   : 25
University Exam.   : 3 hrs.   University Exam. Marks : 50

3D modelling using any of the modelling packages like CATIA, Pro/ENGINEER, Uni-Graphics, Solid

Works, Ideas, AutoDesk Inventor etc.

List of Modules to be Covered:

SKETCHER

PART MODELLING

WIREFRAME MODELLING

SURFACE MODELING

ASSEMBLY MODELLING

DRAFTING

with examples of Assembly drawings.

          1) **Screw Jack**. 2) **Stuffing Box.**   **3) Eccentric.**

Parts and Assemblies can be choosen from

1). A Text book of "Machine Drawing" by K. L. Narayana, P. Kannaiah, K. Venkata Reddy.

ME 362   THERMAL ENGINEERING LABORATORY - I

III Year B.Tech. (Mech) Second Semester

Practical: 3 periods / Week   Sessional Marks: 25

University Exam: 3 hrs   University Exam Marks: 50

Any **Ten** Experiments out of the following are to be performed

1. Viscosity Measurement using Redwood No. I or No. II viscometer
2. Viscosity Measurement using Saybolt viscometer
3. Carbon residue test using Conradson's carbon residue apparatus.
4. Calorific value of gas using Junker's gas calorimeter.
5. Measurement of flash point using Pensky Martin's and Abel's apparatus.
6. Measurement of flash and fire points using Cleveland's apparatus.
7. Valve timing and port timing diagrams.
8. Air compressor - To determine Volumetric and Isothermal efficiencies.
9. Blower test Rig. - To determine Overall efficiency.
10. Single cylinder Diesel engine - Load test and Heat Balance Test.
11. Multi cylinder Petrol engine - Load Test, Heat Balance and Morse test
12. Multi cylinder Petrol engine - Economic speed test and variable speed test.
13. Single cylinder Diesel engine - variable compression ratio test.
14. Multi cylinder Diesel engine - Load test and Heat Balance test.
15. Two stroke petrol engine - Load test and Heat Balance test.

ME363   ENGLISH LANGUAGE & COMMUNICATION SKILLS LAB
[Common to all branches]
III Year B.Tech. (Mech) Second Semester

Practicals   : 3 Periods / week   Sessional Marks   : 25
University Exam.   : --   University Exam. Marks : --

The course is divided into four groups. The first group focuses on language skills, the second on writing skills, the third on personality and interaction skills and the fourth on Vocabulary.

GROUP-1:   Computer aided instruction:
1.   Phonetics: Study of speech sounds
        (a) Vowels
        (b) Consonants
        (c) Accent Training
        (d) Pronunciation
        (e) Intonation
2.   Reading Comprehension:
        (a) Reading for main idea
        (b) Scanning and Skimming the text
        (c) Inference of Lexical and Contextual meaning

GROUP-2:   Presentation/Reporting Skills:
1.   Paper Presentation:
        (a) Identification of source material
        (b) Arrangement of collected data
2.   Resume Preparation:
        (a) Identification of information
        (b) Format arrangement
3.   Technical Reporting:
        (a) Types of formats & styles
        (b) Data collection
        (c) Organization and clarity

GROUP-3:   Personality and Interaction Skills:
1.   Fundamentals of Interpersonal skills:
        (a) Body language
        (b) Listening skills
        (c) Role play
2.   Situational Rounds:
        (a) Critical thinking
        (b) Analytical thinking
        (c) Creative thinking
        (d) Observation Activity
3.   Interview Skills:
        (a) Dress code
        (b) Behaviourial attitude
        (c) Frequently asked questions
4.   Group Discussion:
        (a) Modulation of Voice, body language and fluency
        (b) Summarizing
        (c) Team spirit
5.   Telephonic Interaction:
        (a) Formal/Informal Interaction
        (b) Receiving Messages/Complaints
        (c) Tone Modulation

GROUP-4:   <u>**Vocabulary**</u>**:**
- (a)   Synonyms
- (b)   Antonyms
- (c)   Anologies
- (d)   Idioms
- (e)   One word substitute

SUGGESTED SOFTWARE:
- Cambridge Advanced Learners' Dictionary with exercises
- The Rosetta Stone English Library
- Clarity Pronunciation Power
- Mastering English in Vocabulary, Grammar, Spellings, Composition
- Dorling Kindersley series of Grammar, Punctuation, Composition etc.
- Language in Use, Foundation Books Pvt Ltd
- Learning to Speak English - 4 CDs
- Microsoft Encarta
- Murphy's English Grammar, Cambridge

SUGGESTED READING:

1.   Developing Language Skills: 1. (Foundation Books)

2.   Objective English for Competitive Examinations (Third edition) - Hari Mohan Prasad, Uma Rani Sinha (Tata McGraw Hill)

3.   Better English Pronunciation – JD O'Connor (CUP)

4.   English Pronuncing Dictionary – Daniel Jones.

5.   Effective Technical Communication - M.Ashraf Rizvi (Tata McGraw Hill)

6.   English for Engineers

   i.   Prepared by Regional Institute of English,

   ii.   South India, Bangalore (Foundation Books)

7.   Cambridge Preparation Guide for TOEFL.

8.   Dictionary of Technical Terms - F.S.Cripsin (Oxford IBH)

9.   Cambridge Advanced Learner's Dictionary

10.   Cambridge Idioms Dictionary

   a.   Basic Correspondence & Report writing -Sharma (Tata McGraw Hill)

11.   Business Correspondence and Report Writing - R.C.Sharma, Krishna Mohan, (Tata McGraw Hill)

12.   Dictionary of Misspelled and Easily Confused Words - David Downing, Deborah K.Williams (Tata McGraw Hill)

13.   Wings of Fire – Dr.A.P.J.Abdul Kalam.

14.   My Experiments with Truth – M.K.Gandhi.

ME 411 PROFESSIONAL ETHICS AND HUMAN VALUES
IV Year B.Tech. (Mech) First Semester

Lectures   : 4 Periods / week   *Sessional Marks   : 30*
University Exam.   :   3 hrs.   *University Exam. Marks   : 70*

UNIT – I
 Human Values : Morals, Values And Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue-Respect For Others – Living Peacefully – Caring – Sharing – Honesty – Courage – Valuing Time – Co-Operation – Commitment – Empathy – Self-Confidence – Character - Spirituality.
(12)

UNIT – II
 Engineering Ethics : Senses Of Engineering Ethics – Variety Of Moral Issued – Types Of Inquiry – Moral Dilemmas – Moral Autonomy – Kohlberg's Theory – Gillian's Theory – Consensus And Controversy – Professions And Professionalism- Professional Ideals And Virtues - Theories About Right Action – Self-Interest – Customs And Religion – Uses Of Ethical Theories.
(12)

UNIT – III
Engineering As Social Experimentation : Engineering As Experimentation – Engineers As Responsible Experimenters – Codes Of Ethics – Balanced Outlook On Law .

Safety, Responsibilities And Rights : Safety And Risk – Assessment Of Safety And Risk – Risk Benefit Analysis And Reducing Risk.

Collegiality And Loyalty – Respect For Authority – Collective Bargaining – Confidentiality – Conflicts Of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.
(12)

UNIT – IV
Global Issues
Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers As Managers – Consulting Engineers – Engineers As Expert Witnesses And Advisors – Moral Leadership Sample Code Of Ethics Like ASME, ASCE, IEEE, Institution Of Engineers (India), Indian Institute Of Materials Management, Institution Of Electronics And Telecommunication Engineers (IETE), India Etc.,
(9)

Text Books :
 1.   Mike martin and Ronald Schinzinger, "Ethics in Engineering" McGraw-Hill, New York 1996
 2.   Govindarajan M, Natarajan S, Senthil Kumar V.S., "Engineering Ethics", PHI, New Delhi, 2004

 References :
 1.   Charles D,Fleddermann, "Engineering Ethics", Pearson / PHI, New Jersey 2004 (Indian Reprint)
 2.   Charles E Harris, Michael S.Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases" Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
 3.   John R Boatright, "Ethics and the conduct of business" Pearson, New Delhi, 2003.
 4.   Edmund G.Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers" Oxford University Press, Oxford, 2001.

ME 412   ADVANCED MACHINE DESIGN

IV Year B.Tech. (Mech) First Semester

Lectures / Tutorials   : 4+1 periods / week   Sessional Marks   : 30
*   University Exam   : 3 hours   University Exam. Marks : 70*

UNIT – I

Springs: Introduction; Materials; Types of springs, Helical springs under axial load, Fatigue loading, Torsion springs, Spiral springs, leaf springs.

(15)

UNIT – II

Brakes and Clutches:- Introduction to Brakes, Types, Analysis and design of block brakes, band brakes, block and band brakes; Internal shoe brakes, external shoe brakes, pivoted shoe brakes, Temperture rise, Friction materials, Clutches, Analysis and design of simple and multiple disc clutches, cone clutches and centrifugal clutches, friction materials; comparison of brakes and clutches.

(15)

UNIT – III

Flywheel: Introduction, construction, Torque analysis, solid flywheel, Rimmed flywheel, stresses in rimmed flywheel, Design of flywheel.

(8)

I.C.Engine Components: Introduction, Design of trunk type piston, connecting rod and crank shaft.

(7)

UNIT – IV

Optimum design: Optimization function of single variable and multi variables, optimization techniques, Interval halving and Golden section methods, optimum design of tension bar for minimum deflection, cost and weight, Torsion member for minimum deflection, cost and weight.

(6)

Reliability and life expectances: Introduction, Method of achieving reliability, Series, Parallel and series and parallel reliability, Analysis.   (3)

System design: Introduction, Human aspects of design, Standardization, Practical tips for problems encountered in design with examples.

(6)

TEXT BOOKS:
1.   Design of machine elements by Bhandari, Tata McGraw Hill book Co.
2.   Machine Design by Sharma & Purohit.
3.   Machine Design by Khurmi & Guptha

HAND BOOKS TO BE ALLOWED IN UNIVERSITY EXAMINATION:
1.   Design data book, P.S.G. College of Tech, Coimbatore
2.   Design data book, Mahadevan & Balaveera Reddy - CBS Pub.

ME 413   FINITE ELEMENT ANALYSIS
IV Year B.Tech. (Mech) Second Semester

Lecturers/ Tutorials: 4+1 periods / Week   Sessional Marks   : 30
University Exam   : 3 hrs   University Exam Marks : 70

UNIT - I
FUNDAMENTAL CONCEPTS: Introduction, historical background, Analysis of 3-D stresses & strains, stress-strain relations, stress cubic, principal stress caliculations, temperature effects, potential energy and equilibrium, the Rayleigh-Ritz method, Weighted Residual Method, Galerkin's method, Saint venant's principle, Von Mises stress.

(15)

UNIT-II
BASIC CONCEPTS OF F.E.M. AND ONE DIMENSIONAL PROBLEMS : Fundamental concepts, Finite Element Modeling, Coordinates and Shape functions, The Potential Energy Approach, The Galerkin Approach, Assembly of the Global Stiffness Matrix and Load Vector, Properties of Global Stiffness Matrix, The Finite Element equations; Treatment of boundary conditions, Examples of Axially Loaded Members.

(8)

ANALYSIS OF PLANE TRUSSES : Introduction, ***Plane Trusses:*** Local and Global Coordinate systems, Element Stiffness Matrix, Stress Calculations, Example of plane Truss with three members.

(7)

UNIT   III
TWO DIMENSIONAL PROBLEMS : Introduction, Plane Stress and Plane Strain, Finite Element Modeling, Constant Strain Triangle (CST); Iso-parametric representation, Potential Energy Approach, Element Stiffness, Force terms, Galerkin Approach, Stress calculation, Problem modeling and boundary conditions, Examples of plane Stress and plane Strain problems with three degrees of freedom using CST Element.

(10)

Stiffness of Beam Element, Definitions of Iso-parametric and sub-parametric Elements.

(5)

UNIT   IV
Axi-Symmetric solids subjected to Axi-Symmetric loading : Introduction, Axi-Symmetric formulation, FEM using triangular element, problem modeling and boundary conditions.   (5)

Scalar Field Problems : Introduction, steady-state heat transfer, one-dimensional heat conduction, governing equation, boundary conditions, the one dimensional element, functional approach for heat conduction.

(10)
Text Books:
1.   Introduction to Finite Elements in Engineering by Chandrupatla & Belegundu, PHI.
2.   Finite Element Analysis by P.Seshu, PHI publications
References:
1. Finite Element Analysis by C.S.Krishna Moorthy.
2. Finite Element Analysis by L.J.Segerlind.
3. Cook, Robert Davis et al, "Concepts and Applications of Finite Element
   Analysis" , Wiley, John & Sons,1999

4. George R Buchanan, "Schaum's Outline of Finite Element Analysis",
   McGraw Hill Company, 1994.
5. David V. Hutton, "Fundamentals of Finite Element Analysis "Mc Graw Hill Company.

ME 414   AUTOMATION & COMPUTER AIDED MANUFACTURING
IV Year B.Tech. (Mech) First Semester

Lectures	: *4 Periods / week*	*Sessional Marks*		: *30*
University Exam.	: *3 hrs.*	*University Exam. Marks*		: *70*

UNIT – I
Automation : Automation in production systems – automated manufacturing systems, computerized manufacturing support systems, reasons for automating, merits and demerits, automation principles and strategies, manufacturing industries and products, manufacturing operations – processing and assembly operations, other factory operations.   (8)

Industrial Robotics : Introduction, robot anatomy, joints and links, common robot and configurations, joint drive systems, robot control systems, end effectors, sensors in robotics, applications of robots – material handling, processing, assembly and inspection.   (7)

UNIT - II
NUMERICAL CONTROL : Introduction, basic components of an NC system, classifications of NC systems, nomenclature of NC machine axes, interpolation methods, features of CNC, the machine control unit for CNC, CNC software, direct numerical control, distributed numerical control, applications of NC, advantages and disadvantages of NC, adaptive control machining.

                (15)
UNIT – III
NC PART PROGRAMMING : NC coding systems, manual part programming, simple examples on drilling, milling and turning operations, computer assisted part programming, part programming with APT language, simple examples in drilling and milling operations.

            (15)

UNIT – IV
GROUP TECHNOLOGY & CELLULAR MANUFACTURING : Introduction, part families, parts classification and coding, features of parts classification of coding system, OPITZ , MICLASS, Product Flow Analysis, composite part concept, machine cell design, applications.

            (6)

COMPUTER AIDED PROCESS PLANNING : Introduction, retrieval CAPP system, generative CAPP systems, benefits of CAPP.

            (3)

FLEXIBLE MANUFACTURING SYSTEMS : Introduction, types of FMS, components, FMS layout configurations, computer control system, human resources, applications and benefits.

            (4)

Introduction to Computer Integrated Manufacturing.   (2)

TEXT BOOK:
 1. Automation, Production systems and Computer Integrated Manufacturing by M.P.Groover, Pearson Education / PHI.

REFERENCE BOOKS :
1. CAD/CAM by M.P.Groover and E.W.Zimmers, Pearson Education / PHI.
2. CAD/CAM by P.N.Rao, TMH

ME 415   INDUSTRIAL ENGINEERING & MANAGEMENT
IV   Year B.Tech. (Mech) First Semester

Lectures   *: 4 periods / week*   *Sessional Marks*   *: 30*
University Exam   *: 3 hours*   *University Exam. Marks   : 70*

UNIT – I :
PRODUCTIVITY: Definition, methods to measure productivity, measures to improve productivity
(5)
WORK STUDY: Introduction, Management techniques to reduce work content and ineffective time.

(3)
METHOD STUDY : Procedure, Tools for recording information: charts and diagrams, use of fundamental hand motions (Therbligs), principles of motion economy, SIMO chart, cycle graph and chrono cycle graph.

(7)

UNIT – II
WORK MEASUREMENT : Objectives and techniques, time study methods and rating systems. Allowances : Standard and allowed time.

(5)
WORK SAMPLING : Activity sampling, confidence levels, number of observations, use of random number tables, procedure for making a work sampling study.
(3)
QUALITY CONTROL : Tolerance limits of a process, control charts for variables : X and R charts. Control charts of attributes, p-chart, c-chart and u-chart, zero defect programs, problems.

(7)

UNIT – III
GENERAL MANAGEMENT : Principles of scientific management, brief treatment of managerial functions : planning, organizing, staffing, directing, coordinating and controlling.

(5)
Forms of Business Organisation : Salient features of sole proprietorship, partnership, joint stock company: private limited and public limited companies.   (5)
PERSONNEL MANAGEMENT : The personnel function, functions of a personnel manager, job analysis and job design. Job evaluation and Merit rating

(5)

UNIT – IV
MARKETING MANAGEMENT: Concept of selling and marketing – differences, functions of marketing, market research, advertising and sales promotion, break-even analysis, distribution channels – types, product life cycle.   (7)
FINANCIAL MANAGEMENT: Functions of finance, simple and compound interest, depreciation, common methods of depreciation: straight line method , declining balance method, sum of years digits method. Financial ratio analysis, Managerial Economics.

(8)

Text Books :
1. Introduction to work study – ILO
2. Engineering Economy – Theusen & Theusen
3. Fundamentals of Marketing – Williams J Stanton
4. Personnel Management – Tripathi and Reddy
5. Operations Management – Joseph G.Monks

ME 416/1   AUTOMOBILE ENGINEERING

IV Year B.Tech. (Mech) First Semester Elective

Lectures	*: 4 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks : 70*	

UNIT   I

INTRODUCTION: Classification of vehicles – applications, options of prime movers, transmission and arrangements.

(4)

ENGINE: Engine Classifications - number of strokes, cylinders, types of combustion chambers for petrol and diesel engines, valves, valve arrangements and operating Mechanisms, Piston - design basis, types, piston rings, firing order; Crankshafts, Flywheel.

(7)

ASSORTED EQUIPMENT: Fuel supply pumps, Mechanical and Electrical type Diaphragm pumps, Air and Fuel Filters, super chargers, Mufflers.

(4)

UNIT   II

COOLING SYSTEMS: Need for cooling system, Air and water cooling.

(3)

LUBRICATING SYSTEMS: Various lubricating systems for I.C. Engines.

(3)

ELECTRICAL SYSTEM: Ignition system, Spark plugs, Distributor, Electronic Ignition, Alternator, cutout, Current and voltage regulators, charging circuit, starting motors, lighting, instruments and accessories. (9)

UNIT   III

CHASSIS & TRANSMISSION SYSTEMS: Introduction to Chassis & Transmission, Clutches – Single-plate and Multi-plate clutches, Centrifugal clutches, wet and dry type, actuating mechanisms.

(7)

TRANSMISSION: Gear Box - Theory, Four speed and Five Speed Sliding Mesh, Constant mesh & synchromesh type, selector mechanism, automatic transmission, overdrive, propeller shaft, differential - principle of working.

(8)

UNIT   IV

SUSPENSION SYSTEMS: Need for suspension systems, springs, shock absorbers, axles – front and rear, different methods of floating rear axle, front axle and wheel alignment.

(8)

VEHICLE CONTROL: steering mechanisms and power steering, types of brakes and brake actuation mechanisms (air and hydraulic).

(7)

 TEXT BOOKS:
1. Automobile Engineering   - G.B.S.Narang.
2. Automobile Engineering - R.B.Gupta
3. Automobile Engineering - Vol I & II - Kirpal Singh
REFERENCE BOOKS:
1. Automotive Mechanics   - Joseph Heitner
2. Automobile Engineering - S.Srinivasan

ME 416/2   FLUID POWER & CONTROL SYSTEMS
IV Year B.Tech. (Mech) First Semester

Practicals	*: 4 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks : 70*	

UNIT I
HUDRAULIC PUMPS & PRESSURE REGULATION:
Pressure regulation, pump types: Gear Pump, Vane Pump, Piston Pump, Combination Pumps. selection and specification of pumps, pump characteristics

[9]

Air Compressors Types**:** Piston, Screw rotary and Dynamic compressors

[6]

UNIT II
HYDRAULIC & PNEUMATIC ACTUATORS:
Linear and Rotary Actuators-Selection, Specification and Characteristics, Hydraulic and pneumatic accessories

[15]

UNIT III
CONTROL AND REGULATION ELEMENTS:
Pressure-direction and flow control valves,relief valves, non return and safety valves-actuation systems

[15]
UNIT IV
HYDRAULIC CIRCUITS
Reciprocation, quick return, Sequencing synchronizing circuits-accumulator circuits-industrial circuits-press circuits-hydraulic milling machine-grinding, planning, copying, forklift, earth mover circuits-design and selection of components-safety and emergency mandrels.

[15]
TEXT BOOK:
1. Andrew Parr, "Hydraulics and Pneumatics", (HB), Jaico Publishing House, 1999
REFERENCES:
1. Antony Espossito, "Fluid power with Applications", Prentice Hall, 1980
2. Dudleyt A.Pease and John J.Pippenger, "Basic Fluid Power", Prentice Hall, 1987

ME 416/3 OPTIMIZATION TECHNIQUES
IV Year B.Tech. (Mech) First Semester

Practicals   : 4 Periods / week   Sessional Marks   : 30
University Exam.   : 3 hrs.   University Exam. Marks : 70

UNIT - I
INTRODUCTION
General Characteristics of mechanical elements, adequate and optimum design, principles of optimization, formulation of objective function, design constraints -Classification of optimization problems.

(15)
UNIT - II
OPTIMIZATION TECHNIQUES
Single variable and multivariable optimization, Techniques of unconstrained minimization - Golden Section - Random , pattern and gradient search methods -Interpolation methods.

(15)
UNIT - III
OPTIMIZATION WITH EQUALITY AND INEQUALITY CONSTRAINTS: Direct methods - Indirect methods using penalty functions Lagrange multipliers; Geometric programming and stochastic programming; Multi objective optimization.

(15)
UNIT - IV
ENGINEERING APPLICATIONS
Structural applications - Design of simple truss members. Design application - design of simple axial, transverse loaded members for minimum cost, maximum weight, - Design of shafts and torsionally loaded members - Design of springs, Dynamic Applications - Optimum design of single, two degree freedom system, vibration absorbers. Application in Mechanism - Optimum design of simple linkage mechanism.

(15)
TEXT BOOKS:
1. Singeresu S. Rao, "Engineering Optimization - Theory and Practice" New Age Intl. Ltd.Publishers, 2000

REFERENCES:
1. Johnson Ray, C., "Optimum design of mechanical elements", John Wiley & Sons, 1981
2. Goldberg, D.E., "Genetic algorithms in search, optimization and machine learning",   Addison-Wesley, NewYork, 1989
3. Kalyanamoy Deb, "Optimization for Engineering design algorithms and Examples",   Prentice Hall of India, 1995

ME 416/4 REFRIGERATION & AIRCONDITIONING

IV Year B.Tech. (Mech) First Semester Elective

Lectures	: 4 Periods / week	Sessional Marks	: 30
University Exam.	: 3 hrs.	University Exam. Marks : 70	

UNIT I

INTRODUCTION TO REFRIGERATION: Necessity and applications, unit of refrigeration and C.O.P, mechanical refrigeration, types of ideal cycle of refrigeration, Refrigerants- desirable properties, commonly used refrigerants, nomenclature.

(6)

AIR REFRIGERATION: Bell Coleman cycle and Brayton cycle, Open and Dense air systems, Actual refrigeration system, refrigeration needs of aircrafts, adoption of air refrigeration, Justification, types of systems, problems.

(9)

UNIT II

VAPOUR COMPRESSION REFRIGERATION: Working principle, essential components of plant, simple vapor compression refrigeration cycle, Multi pressure systems – multistage compression, multi evaporator system, Cascade system, use of p – h charts, problems.

(8)

SYSTEM COMPONENTS: Compressors- general classification, comparison, advantages and disadvantages, Condensers - classification, working, Evaporators - classification, working, Expansion devices - types, working.

(7)

UNIT III

VAPOUR ABSORPTION SYSTEM: Calculation of max COP, description and working of NH_3 - water system, Li - Br, H_2O system, principle of operation of three fluid absorption system and salient features.

(10)

STEAM JET REFRIGERATION: Principle of working, application, merits and demerits.

(2)

NON-CONVENTIONAL REFRIGERATION METHODS: Principle and operation of thermoelectric refrigerator and Vortex tube or Hirsch tube.

(3)

UNIT IV

INTRODUCTION TO AIR CONDITIONING: Psychrometric properties and processes, sensible and latent heat loads, S–load characterization and SHF, need for ventilation, infiltration, concepts of RSHF, ASHF, ESHF & ADP, concept of human comfort and effective temperature, comfort air conditioning, industrial air conditioning requirements, air conditioning load calculations.

(9)

AIR CONDITIONING SYSTEMS: Classification of equipment, cooling, heating, humidification and dehumidification, filters, grills and registers, deodorants, fans and blowers, heat pump, heat sources, different heat pump circuits, application.

(6)

TEXT BOOKS:

1. Refrigeration and air conditioning   - C.P.Arora, TMH.
2. Refrigeration and Air conditioning   -   Manohar Prasad, New Age India, New Delhi.
3. A course in refrigeration and air conditioning   - S.C.Arora & Domkundwar, Dhanpat Rai& sons, New Delhi.

REFERENCE BOOKS:

1. Principles of Refrigeration   -   Dossat.
2. Refrigeration and air conditioning   -   Stoecker.

NOTE: Refrigeration and Air conditioning Data book by Manohar Prasad is allowed in the

   University Examination

ME 416 /5 COMPUTER GRAPHICS
IV Year B.Tech. (Mech) First Semester Elective

Lectures   : 4 Periods / week   Sessional Marks   : 30

University Exam.   : 3 hrs.   University Exam. Marks : 70

UNIT I
GEOMETRY AND LINE GENERATION: Introduction, Lines, Line segments, Perpendicular Lines, Distance between a point and a Line, Vectors, Pixels and Frame Buffers.

GRAPHIC PRIMITIVES: Introduction, Display devices, Primitive operations, The Display-File Interpreter, Normalized Device Coordinates, Display-File structures.

(15)

UNIT II
POINT PLOTTING TECHNIQUES: Coordinate system, Incremental methods, Line Drawing Algorithms, Circle generators.

LINE DRAWING DISPLAYS: The CRT, Inherent-Memory devices, The storage-Tube display, The Refresh Line-Drawing Display.

(15)

UNIT III
POLYGONS: Introduction to Polygons, Polygon representation, Polygon Interfacing Algorithms, Filling Polygons, Filling with a pattern, Initializing, Antialiasing

TRANSFORMATIONS: Introduction, Scaling Transformations, Rotation, Homogeneous Coordinates and Translations, Coordinate Transformations, Rotation about an Arbitrary point, Inverse Transformations.

(15)

UNIT IV
SEGMENTS *(Algorithmic Approach only)* : Introduction, The Segment table, Segment creation, Closing a Segment, Deleting a Segment, Renaming a Segment.

WINDOWING AND CLIPPING: Introduction, The Viewing Transformation, Viewing transformation implementation, Clipping, The Cohen-Sutherland Algorithm, Clipping of Polygons.

(15)

TEXT BOOK:
Computer Graphics by Steven Harrington.
REFERENCE BOOKS:
1. Procedural elements for Computer Graphics by Rogers.
2. Principles of Interactive Graphics by Newman and Sproull.

Acharya Nagarjuna University   Mechanical Engineering Syllabus
ME 416/6 INDUSTRIAL TRIBOLOGY

IV Year B.Tech. (Mech) First Semester Elective

Lectures   : 4 Periods / week   Sessional Marks   : 30

University Exam.   : 3 hrs.   University Exam. Marks : 70

UNIT-I:
TRIBOLOGY: Introduction, tribology in design, tribology in industry, economic considerations.

(5)

FRICTION: Introduction, laws of friction, sources of sliding friction, adhesion, ploughing, energy dissipation mechanisms, friction characteristics of metals, friction of non metals, friction of ceramic materials, rolling friction, source of rolling friction, stick slip motion, measurement of friction.

(10)
UNIT-II:
WEAR: Types of wear, various factors affecting wear, simple theory of sliding wear, mechanism of sliding wear of metals, abrasive wear, materials of adhesive and abrasive wear situation, corrosive wear, surface fatigue wear situations, brittle fracture wear, wear of ceramics, wear measurement.

(8)
LUBRICANTS AND LUBRICATION TYPES: Types and properties of lubricants, testing methods, hydro dynamic lubrication, elastohydro dynamic lubrication, boundary lubrication, solid lubrication, hydrostatic lubrication.

(7)
UNIT-III:
FILM LUBRICATION THEORY: Fluid film in simple shear, viscous flow between very close parallel plates, shear stress variation, Reynolds equation for film lubrication, high speed unloaded journal bearings, loaded journal bearings, reaction torque on the bearings, virtual coefficient of friction, the somerfield diagram.

(10)

LUBRICATION IN SPECIAL CONDITIONS: Forging, wire drawing, extrusion, rolling, lubrication used for wire ropes.

(5)
UNIT-IV
SURFACE ENGINEERING AND MATERIALS FOR BEARINGS: Surface modifications, transformation hardening, surface fusion, thermo chemical processes, surface coatings, plating and anodizing, fusion processes, vapour phase processes, materials for rolling element bearings, materials for fluid film bearings, materials for marginally lubricated and dry bearings.

(15)

TEXT BOOKS:
1.   "Principles of Tribology" by Halling j., McMillan Press Ltd.
2.   "Friction and Wear of Engineering Materials" by ,I.M. Hutchings, Edwar Arnold, London ,1992.
3.   "Friction and Lubrication" E.P. Bowden and Tabor., Heinemann Educational Books Ltd.,1974.

REFERENCE BOOKS
   1. "Theory and Practice of Lubrication for Engineering", by Fuller D.D., (John Wiley and Sons)

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2. "Basic Lubrication Theory", by Cameron A., (Wiley Eastern Ltd.)
3. Tribology Hand Book", by Neale M.J., Butterworths
4. "Introduction to Tribology and Bearings", B.C. Majumdar, H. Wheeler and Company Pvt. Ltd.

ME451 CAD LAB – II
(Analysis)
IV/IV B.Tech (Mech.) :: First Semester

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 25*
University Exam	*: 3 hrs*	*University Exam Marks*	*: 50*

The following analysis can be performed by using any of the analysis soft wares like ANSYS, ALGOR, NASTRAN, NISA, ABAQUS etc.,

1. STATIC ANALYSIS: TRUSS AND FRAME STRUCTURES

   2-D truss
   3-D truss
   Beam analysis

2. STATIC ANALYSIS: TWO DIMENSIONAL PROBLEMS
   2-D structure with various loadings
   2-D structures with different materials
   Plate with hole

3. DYNAMIC ANALYSIS: MODAL AND TRANSIENT ANALYSES

   Modal analysis
   Transient Response (spring-mass system)

4 NON-STRUCTURAL PROBLEMS

   Steady State heat transfer
   Transient heat transfer

REFERENCES:
1. Introduction to Finite elements in Engineering by Chandrupatla & Belegundu, PHI.
2. www.mece.ualberta.ca.

ME 452   THERMAL ENGINEERING LABORATORY-II

IV Year B.Tech. (Mech) First Semester

Practicals   : 3 Periods / week   Sessional Marks   : 25

University Exam.   : 3 hrs.   University Exam. Marks : 50

Conduct Tests on Any **Ten** of the Following:

1. Refrigeration Test Rig
2. Air Conditioning Test Rig
3. Heat Exchanger – Parallel Flow
4. Heat Exchanger – Counter Flow
5. Composite Slab / Metal Rod
6. Critical Heat flux Apparatus
7. Emissivity Apparatus
8. Pin fin – Natural Convection
9. Pin fin – Forced Convection
10. Insulating powder Apparatus
11. Drop wise and film wise condensation Apparatus
12. Forced Convection Apparatus
13. Stefan – Boltzmann's Apparatus
14. Lagged pipe Apparatus

ME 453   TERM PAPER

IV Year B.Tech. (Mech) First Semester

Practicals   : 3 periods / Week   Sessional Marks   : 25

University Exam : 3 hrs   University Exam Marks   : --

Internal marks will be awarded based on the SEMINAR presentation at the end of the on their PROJECT WORK

ME 421 MECHATRONICS

IVYear B.Tech. (Mech) Second Semester

Lectures	*: 4 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks*	*: 70*

UNIT – I
INTRODUCTION TO MECHATRONICS, sensors & transducers : Introduction, performance terminology, classification of sensors, selection of sensors.
Signal Conditioning: Introduction data acquisition – Quantizing theory, analog to digital conversion, digital to analog conversion.
Data Presentation Systems: Data presentation elements magnetic displays, data acquisition systems, systems measurement, testing and calibration.

[15]
UNIT – II
ACTUATION SYSTEMS: Pneumatic and hydraulic actuation systems, stepper motors.
System Models: Modeling of one and two degrees of freedom mechanical, electrical, fluid and thermal systems. Block diagram representations for these systems.

[15]
UNIT– III
DYNAMIC RESPONSE of systems zero order, First order and second order systems. Block diagram representation, Transfer function. Systems in series, Systems with feed back loops , frequency response.

CLOSED LOOP CONTROLLERS : Continuous and discrete processes, control modes, two step, proportional , derivative, integral, PID controllers.

[15]
UNIT – IV
PLC : Introduction, basic structure, I/P, O/P, processing, programming, ladder diagrams, timers, internal relays and counters, data handling, analogue input and output selection of PLC.
DESIGN: Designing mechatronics systems, possible design solutions, case studies of mechatronics systems – pick and place robot.

[15]
TEXT BOOK:
Mechatronics by W.Bolton (Pearson)

REFERENCE BOOKS:
    1. Mechatronics by Mahalik
    2. Introduction to Mechatronics – David and Alcaitore Michael B.Histand (TMH)
    3. Mechanical Measurement – D.S.Kumar.
    4. Mechatronics By G.Onwubolu -Elsevier. .
    5. Mechatroncis system Design – Devdas shetty & Richard Kolk (Thomson)

ME 422   COMPUTER AIDED DESIGN
IV Year B.Tech. (Mech) Second Semester

Lectures   : 4 Periods / week   Sessional Marks   : 30
University Exam.   : 3 hrs.   University Exam. Marks   : 70

UNIT I
INTRODUCTION: Fundamentals of CAD, Design process, Applications of computer for design, Benefits of CAD, Computer peripherals for CAD work station, Graphic terminal, CAD software, CAD database and structure.

(7)

DISPLAY DEVICES: Video display devices – Raster scan display, CRT , DVST, Inherent memory display devices, Random Scan Display, Raster scan systems, Random scan systems – and work station, Input devices.

(8)
UNIT II
PRIMITIVES: Points and Lines, Line drawing algorithms, DDA algorithm, Bresenham's line algorithm, Circle generation algorithm, Mid point circle algorithm.   (7)

GEOMETRIC MODELING: 2D wire frame modeling, 3D Wire frame modeling, Wire frame models , Entities and their definitions. Concept of Parametric and nonparametric representation of curve, Curve fitting techniques, Definitions of cubic splines.

(8)
UNIT III
SURFACE MODELING: Surface modeling and entities, Algebraic and geometric form, Parametric space of Surface, Blending functions, Surface of revolution,.

(7)
SOLID MODELING: Solid models, Solid entities, Solid representation, Sweep representation, Constructive solid geometry and Boundary representation, Solid modeling based applications.

(8)
UNIT IV
GEOMETRIC TRANSFORMATIONS: Transformation Principles, Translation,Scaling, Rotation, Matrix Representations and Homogeneous Coordinates, Composite transformations .

(10)
WINDOWS and CLIPPING: Introduction, The Viewing Transformation, Viewing transformation implementation, Clipping operation.

(5)

TEXT BOOKS:
1.   CAD/CAM by Mikel P.Groover and Emory W.Zimmers,Prentice Hall of India , Delhi
2.   CAD/CAM by P.N.Rao, Tata McGrawhill , Delhi
3.   CAD/CAM by Ibrahim Zeid, Tata McGrawhill,Delhi.
4.   Principles of Interactive Computer Graphics by Newman and Sproull, McGrawhill

ME 423   ENERGY RESOURCES UTILIZATION

IV Year B.Tech. (Mech) Second Semester

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs*	*University Exam. Marks*	*: 70*

UNIT   I

INTRODUCTION: Various Energy sources, types of power plants.   (1)

HYDRO ELECTRIC POWER PLANT: Hydrology, Rainfall, Run off and their measurement, hydrograph, Flow duration curve, Mass curve and calculation of storage capacity, site selection of hydro plant, different types of hydro plants.   (9)

DIESEL AND GAS TURBINE POWER PLANTS: Classification, main components of plant, plant layout, application and comparison with other plants.   (5)

UNIT   II

THERMAL POWER PLANT: General layout, Fuels, Coal analysis, Coal handling, burning of coal - stoker and pulverized systems, Ash handling systems, ESP, Need for Draught, High-pressure boilers, Condensers, cooling ponds and towers (wet and dry types), Deaeration.   (15)

UNIT   III

NUCLEAR POWER PLANTS: Nuclear Fission, Nuclear Fuels, Components of Reactor, types of Nuclear Reactors, Breeding, Fast Breeder Reactor, Radiation shields, nuclear waste disposal.

(7)

FLUCTUATING LOADS ON POWER PLANTS: Various performance Factors (load factor, diversity factor, use factor etc.).   (3)

POWER PLANT ECONOMICS: Fixed costs, operating costs, cost per kWh, comparison of fixed and operating costs of hydro, thermal, nuclear plants, power tariffs.   (3)

POLLUTION AND CONTROL: Introduction, particulate and gaseous pollutants, thermal pollution and solid waste pollution, methods to control pollution - brief description.   (2)

UNIT   IV

SOLAR ENERGY: Solar collectors, solar energy storage, solar ponds, solar energy utilization and applications.   (4)

WIND POWER: Basic principle, different types of wind mills, wind energy conversion systems, other applications.   (3)

GEOTHERMAL POWER: sources, energy conversion system.   (2)

OTEC: ocean thermal energy conversion systems, introduction to tidal power.   (3)

DIRECT ENERGY CONVERSION SYSTEMS: Fuel cells, MHD, Solar cell.   (3)

TEXT BOOKS:

1. Power Plant Engineering   - G.R. Nagpal, Khanna publ, New Delhi

2. Power Plant Engineering –P.K.Nag, TMH

3. Non Conventional Energy Sources   - G.D. Rai, Khanna publ, New Delhi.

REFERENCE BOOKS:

1. Power Plant Technology   -   M.M. El Wakil, MGH, New York.

2. Principles of Energy Conversion   -   A.W.Culp, MGH, New York.

ME 424   ROBOTICS

IVYear B.Tech. (Mech) Second Semester

Lectures   : 4 Periods / week   Sessional Marks: 30
University Exam.   :   3 hrs.   University Exam. Marks: 70

UNIT – I
Introduction to Robotics, major component so a robot, robotic like devices, classification of robots – Classification by coordinate system and by control method, Specifications of robots, fixed versus flexible automation, economic analysis, overview of robot application.

[15]

UNIT – II
Robot end Effectors : Introduction, end effectors, interfacing, types of end effectors, grippers and tools, considerations in the selection and design of remote centered devices.

[15]

UNIT – III
Robotic sensory devices : Objective, Non-optical position sensors – potentiometers, synchros, inductocyn, optical position sensors – opto interrupters, optical encoders (absolute & incremental)

Proximity sensors : Contact type , non contact type – reflected light scanning laser sensors.

Touch & slip sensors : Touch sensors – proximity rod & photo detector sensors, slip sensors – Forced oscillation slip sensor, interrupted type slip sensors, force and torque sensors.

[15]

UNIT – IV
Transformations and Kinematics : Objectives, homogenous coordinates, basic transformation operations, forward solution – Denavit Hartenberg procedure. Simple problems involving planar manipulators, inverse or backward solution – problems involved, techniques.
Introduction to Trajectory Planning, the manipulator jacobian.

[15]

TEXT BOOKS :

1.   Robotic Engineering by Richard D.Klafter
2.   Industrial Robotics by Mikell P.Groover

REFERENCE BOOKS :

1.   Introduction to Robotics – John J.Ceaig
2.   Robotics – K.S.Fu, Gonzalez & Hee
3.   Robotics for Enginers by Yoram Korex.

ME – 425 / 1 ADVANCED CONCEPTS IN MECHANICAL ENGINEERING

IVYear B.Tech. (Mech) Second Semester

Lectures   : 4 Periods / week   Sessional Marks: 30
University Exam. : 3 hrs.   University Exam. Marks: 70

UNIT-I

Neural Networks: Trends in computing, characteristics of neural networks, Artificial neural network terminology, Models of Neuron, Topology, Activation dynamics model, feed forward neural networks, Direct application of ANN.

[15]

UNIT – II

Fuzzy Logic: What is Fuzzy logic? History of Fuzzy logic; Motivation, Basic concepts of Fuzzy logic, Introduction, Fuzzy sets, operation of fuzzy sets, properties of fuzzy sets, Geometric interpretation of fuzzy sets, Linguistic variables, possibility distributions, Fuzzy rules.

[15]

UNIT – III
Value Engineering: Introduction, phases in value Engineering, Orientation phase, information phase, function phase, creation phase, evaluation phase, recommendation phase, implementation phase, audit phase, managing the value engineering programme.

[15]

UNIT – IV
Concurrent Engineering: Key definitions, Driving force behind concurrent engineering, The meaning of concurrent engineering, schemes for concurrent engineering, Axiomatic design, DFM guide lines , design science, design for assembly, The Taguchi method for robust design, manufacturing process design rules, computer aided DFM, Group technology, failure mode and effect analysis, summary of concurrent engineering tools.

[15]

TEXT BOOKS

1. Artificial Neural Networks by Yegnanarayana
2. Fuzzy Logic by John Yen
3. Getting more at less cost ; The value engineering way by G Jagannatham
4. Computer integrated design and manufacturing by David D Bedworth

ME 425/2 : FLEXIBLE MANUFACTURING SYSTEMS & GROUP TECHNOLOGY
IV Year B.Tech. (Mech) Second Semester

Lectures   : 4 Periods / week   Sessional Marks   : 30
University Exam.   : 3 hrs.   *University Exam. Marks   : 70*

UNIT I
INTRODUCTION: Manufacturing Automation, Definition and types of FMS, Architecture of FMS, Work piece flow in FMS, Performance measures of FMS.

WORK STATION : CNC Machines, Machine Centres, Inspection Stations.   (15)

UNIT II
AUTOMATED MATERIAL HANDLING : Function of MHS, Types of Material handling equipment, Conveyor systems, AGVs, Industrial Robots.

AUTOMATED STORAGE SYSTEMS: Characteristics of Storage Systems   (15)

UNIT III
COMPUTER CONTROL SYSTEM OF FMS : Functions of Computer, Control system architecture, Factory level, Cell level control systems, Equipment control systems, Factory communications, Local area networks, Data files and system reports.
GROUP TECHNOLOGY : Introduction, need of G.T. Part families, Methods for developing part families,
                                                            (15)

UNIT IV
Basic type of Codes – hierarchical codes, Attribute code, Hybrid code, selecting a coding system, Developing a coding system in an industry, examples of coding systems, MICLASS, OPITZ, CODE systems.

Facility Design using, GT, Economic modeling in GT environment – production planning cost model, Economics of GT, Application of GT for design retrieval, CAPP, NIC, MR and FMS.
                                                            (15)

TEXT BOOK:

Automation, Production Systems and Computer Integrated Manufacturing by M.P.Groover.

REFERENCES:

1. Performance Modeling of Automated Manufacturing Systems , N.Viswanadham, Y.Narahari.

2. CAD/CAM Handbook by Eric Teichloz.

1. Computer Integrated Design and Manufacturing by Bedworth Henderson, Wolfe.

2. CAD/CAM by Groover and Zimmers.

ME 425/3 ENTERPRISE RESOURCE PLANNING

IVYear B.Tech. (Mech) Second Semester Elective

Lectures	*: 4 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks*	*: 70*

UNIT I
MANUFACTURING INDUSTRY: Management characteristics and Information Requirements. Industry classification, Product , Market, Process characteristics, Manufacturing Planning, and control, Technoiques ERP ,Concept & Evaluation History: MRP -1 , MRP – 2, Advancement, Client survivor Technology, RDBMS.

SALES PURCHASE, INVENTRORY CONTROL, CONCEPTS: Classifications, coding of Material , Finished goods, sales, Enquires, Quotation, Order , Invoices, Delivery, Finished good valuation, Purchase requisition, Enquiry, Supplier, Quotation, Purchase order, Material Receipts, Material issues, Methods of issue, valuation (FIFO/LIFO, Weighted Average cost/ std.Cost). Returns, From operations, Returns to supplier, Stock Adjustments, Physical stock verification, ABC Analysis, Lot and Locations, Controls, Replenishment order control (Safety, stocks, Report paint, Economic order quantity).

(15)

UNIT II
MANUFACTURING: product configuration, Bill of material, Master production Scheduling, Material. Requirement Planning, Capacity, Requirement Planning, Loading and Scheduling. An over view of man power planning and customer manufacturing planning.
 FINANCIAL AND COST ACCOUNTING:
Basic accounting principles, Daybook, cash, journal, purchase and sales, Ledgers, - general, supplier , customer, Advances. etc., Bank Reconciliation, Trial Balance, Profit, & Loss, Income & Expenditure. Account and Balance sheet. Fixed assets and depreciation Budgeting – Revenue, Capital cash, Cost. Elements – Direct materials, Direct Labour, Direct expenses, and over heads. Margin of Cost and Break even analysis standard costing.Activity based costing.

(15)

UNIT III
INTRODUCTION TO A TYPICAL ERP SOFTWARE : Overview of ERP modules and tools of a software like BaaN.
DISTRIBUTION MODULE: Module architecture, an over view, Item data, Purchase orderings/ Control, sales, Ordering, Control, Replenishment order Control, Electronic Data Interchange.

(15)

UNIT IV
MANUFACTURING MODULE: Module architecture – an overview, capacity Requirement Planning. Engineering Change Control, Engineering data management, Master Production. Scheduling, Masterials Requirement planning, Product classification / Configuration , Production Planning and Control, Repetitive Manufacturing,.
FINANCE MODULE: Module architecture an overview, accounts payable, Accounts receivable, General Ledger, cost allocation, cash management, Activity based costing, Fixed assets, Financial, Budgeting system.

(15)

TEXT BOOKS: 1) Joseph or Ticks", Materials Requirement Planning the New Way in Production, and Inventory Management (McGraw Hill Books company New Delhi1975.,
Reference Book:
BaaN –Student Manuals BaaN Education Books.Hyderabad..1990.

ME 425/4 :　COMPUTATIONAL FLUID DYNAMICS

IVYear B.Tech. (Mech) Second Semester Elective
Lectures	*:　4 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*:　3 hrs.*	*University Exam. Marks*	*: 70*

UNIT I
INTRODUCTION:-CFD as a design tool**,** as a research tool, impact of CFD, Applications. (3)
GOVERNING EQUATIONS: - Continuity, Momentum and Energy equations in3 Dimensions, Navier-Stokes equations, Single Generic Integral form equations for Continuity, Momentum and Energy.

(12)
UNIT II
  DISCRETIZATION:-Basic aspects of discretization, Techniques used--Finite Difference, Finite Volume and Finite Element, comparison of above, difference equations, Explicit and Implicit approaches.

(15)
UNIT III
GRID GENERATION AND TRANSFORMATION:-Generation of grid, Transformation of non- uniform grids, General transformation of equations, form of governing equations suitable for CFD, Compressed grids, Boundary filled coordinate systems—Elliptic grid generation, Adaptive grids, Modern developments in grid generation.

(15)

UNIT IV
CFD TECHNIQUES:-Introduction, LAX-WENDORFF technique, MACCORMICK technique, CRANK-NICHOLSON technique, Relaxation technique, ADI technique, suitability for different conditions. Aspects of numerical dissipation and dispersion.

(15)

TEXT BOOKS:
1. Computational Fluid Dynamics, Basics with Applications—ANDERSON Jr.-MGH, 1995
2. Numerical Heat Transfer and Fluid Flow—PATANKAR-Hemisphere, NY, 1980

REFERENCE BOOK:
1.   Computational Fluid Dynamics for Engineering—HOFFMAN K.A. - Engineering Education System, Austin, TX, 1989

ME 425 / 5: COMPUTER INTEGRATED MANUFACTURING
IV Year B.Tech. (Mech) Second Semester

Lectures	*: 4 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks*	*: 70*

UNIT - I

INTRODUCTION: Evolution of CIM, Definition of CIM, CIM Hardware & Software, Nature and role of the elements of CIM system. Product Development Through CIM: Product development cycle, Sequential engineering, Concurrent engineering.

COMPUTER AIDED ENGINEERING: Design for Manufacturing and Assembly, CAE Analysis: Finite Element Analysis (FEA)**,** Mass Property Analysis, Design Verification, Tolerance Analysis. CAE Evaluation: Prototyping, Rapid Prototyping.

(15)

UNIT - II

PLANNING OF RESOURCES IN CIM: MRP I, MRP II, Capacity Requirement Planning, Just-in-time (JIT), Enterprise Resource Planning (ERP), Supply Chain Management (SCM), Virtual manufacturing (VM), Dynamic Enterprise Modeling (DEM).

CIM DATA BASE AND DBMS: Data Base requirements of CIM, Data Base Models: Hierarchical, Network, RDBMS. SQL, Product Data Management (PDM).

(15)

UNIT - III

COMPUTER AIDED QUALITY CONTROL: Total Quality Management (TQM) and CIM, CMM, Vision Systems, Computer Aided Inspection using Robots, Integrated Computer Aided Inspection systems, Flexible Inspection System (FIS).

SHOP FLOOR DATA COLLECTION SYSTEMS: On-line and Off-line data collection systems, Bar Code Technology, Optical Character recognition, Magnetic ink character recognition, Voice recognition, Smart Carts, Data Acquisition Systems (DAS).

(15)

UNIT - IV

FUNDAMENTALS OF DATA COMMUNICATIONS: Simplified Data Communication Model, Circuit Switching, Packet Switching, Frame Relay, ATM, ISDN, Broad Band ISDN. Analog and Digital Data Transmission, Synchronous and Asynchronous Data Transmission. Multiplexers, CODEC and MODEM.

FUNDAMENTALS OF NETWOKING: Networking Concepts, LAN, WAN, internet. Network topologies: Star, Ring, Bus, Tree. Communication Medium: Twisted pair, Co-axial cables, fiber optic systems, and wireless media. Medium Access Control Methods: CSMA, CSMA/CD, Token Ring, Token Bus. Signaling Methods: Base band, broad band, Carrier band. Network Protocols: OSI Reference Model, TCP/IP, MAP/TOP. Network Devices: Repeaters, Bridges, Routers, Gateways.

(15)

TEXT BOOKS:

CAD/CAM/CIM- by P.Radhakrishnan, S.Subramanyan and V.Raju, New Age International (P) Ltd,2003.
1. Computer Integrated Manufacturing- by James A. Rehg, Henry W. Krebber, Perarson Education, Inc., 2002.
2. Automation, Production systems and Computer Integrated Manufacturing- by   M.P.Groover, Prentice-Hall of India, 2003.

REFERENCE BOOKS:

1. Computer Integrated Manufacturing Hand Book- by Eric Teicholz and Joel Orr, Mc Graw-Hill, 1987.
2. Computer Networks- by Andraw S. Tanenbaum, Prentice-Hall of India, 1996.
3. Data of Computer Communications- by William Stallings, Prentice-Hall of India, 1997.

ME 425 /6 : Nano Technology (Elective)
IV Year B.Tech. (Mech) Second Semester

Lectures	*: 4 Periods / week*	*Sessional Marks*	*: 30*
University Exam.	*: 3 hrs.*	*University Exam. Marks*	*: 70*

UNIT - I
Introduction
Evolution of science and technology, Introduction to Nanotechnology, Nanotechnology-Definition, Difference between Nanoscience and Nanotechnology, Feynman predictions on Nanotechnology, Moore's law, Bottom up and top down approaches, challenges in Nanotechnology .

(15)
UNIT - II
Nano materials, Synthesis :
History of materials, Nanomaterials-Definition, Classification of Nanostructured materials, causes of interest in nanomaterials, some present and future applications of nanomaterials.

(7)
Processing of nano materials:
Processes for producing ultrafine powders-mechanical grinding, wet chemical synthesis of nanomaterials. Gas phase synthesis of nano materials, gas condensation processes, chemical vapour condensation, laser ablation.

(8)
UNIT - III
Special nanomaterials :
Carbon nanotubes, nano composites, nano fluids-An overview over preparation, properties, applications.

(7)
Characterization and tools :
Electron Microscopy Techniques: Scanning Electron Microscopy, Transmission Electron Microscopy, Scanning Tunneling Microscopy, Atomic Force Microscopy, Scanning Probe Microscopy– X ray methods –Fluorescence

(8)
UNIT - IV
Nanofabrication :
Introduction – micro, nanofabrication: Optical lithography, Electron beam lithography, Atomic lithography, Molecular beam epitaxy, MEMS, NEMS –An introduction.

(9)
Nanotechnology applications in Mechanical Engineering
Nanomechanics, nanoscale heat transfer, nanomachining, molecular dynamic simulation – An introduction.

(6)
Text Books :
1. Nano materials by J.Dutta & H.Hofman.
2. Nano structures & Nano materials by Guozhong cao, Imperial college press.
Reference Books :
1. Micro manufacturing and Nano Technology by N.P.Mahalik.
2. Nano Technology by Mark Ratner & Danier Ratner, Prentice Hall
3. Nano materials by A S Edelstein& R C Cammarata, Institute of physics publishing, Bristol and Philadelphia.

ME 461   CAM LAB
IV Year B.Tech. (Mech) Second Semester

Practicals   : 3 periods / Week   *Sessional Marks: 25*
University Exam: 3 hrs   *University Exam Marks: 50*

(Any Ten Experiments)

        1.Manual Part Programming examples in plain turning, step turning, taper turning, contour turning, thread cutting, drilling, boring, taper boring, counter boring, parting off with and without using Canned Cycles and sub programs on CNC Lathe .

        2. Manual Part Programming examples in drilling, pocket milling and profile milling with and without using Canned Cycles and sub programs on CNC Milling Machine..

        3.Modelling, part program generation and tool path simulation using any one   of the CAM software packages like Master CAM, Edge CAM, Ideas, Pro - E, CATIA etc.,

ME 462   DESIGN & METROLOGY LABORATORY
IV Year B.Tech. (Mech) Second Semester

Practicals   : 3 periods / Week   Sessional Marks   : 25
         University Exam : 3 hrs   University Exam Marks: 50

(Any Twelve Experiments)

1. Angle and taper measurement by Bevel Protractor & Sine Bar.

2. Internal taper measurement using Ball & Rollers

3. External taper measurement using Ball & Rollers.

4. Measuring effective dia. Of thread using 2 wire, 3 wire method.

5. Measuring gear tooth thickness using gear tooth vernier.

6. Measuring internal dia. Using bore dial gauge.

7. Alignment test on lathe machine

8. Alignment test on drilling machine

9. Alignment test on milling machine

10. Measuring external diameters using Micrometer & Plot X & $\overline{R}$ Charts

11. Measurement of surface finish using surf tester

12. Measuring different parameters of a thread / gear using tooth profile projector

13. Vibration measurements

14. Gyroscope

15. Balancing

16. Whirling of shafts

17. Governor

18. CAM Analysis

19. Wear & Friction measurement

20. Force & Torque measurement

21. Journal Bearing

22. Photo elastic Bench

23. Measurement of cutting forces using lathe tool dynamometer

24. Measurement of cutting forces using drill tool dynamometer

ME 463 :   PROJECT WORK

IV Year B.Tech. (Mech) Second Semester

Practicals   : 6 Periods / week   Sessional Marks   : 50
University Exam.   :   3 hrs.   University Exam. Marks   : 100

The Project Report has to be submitted at the end of the semester and marks will be awarded based on the Viva-voce examination