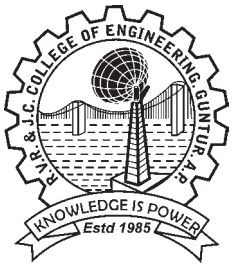
R.V.R. & J. C. COLLEGE OF ENGINEERING

(Autonomous)

Chowdavaram, GUNTUR – 522019.

Regulations (R-12), Scheme of Instruction,
Examinations and Syllabi

[Four Year B.Tech. Degree, w.e.f. 2012-13]



MECHANICAL ENGINEERING

THE INSTITUTION

Established in 1985, Rayapati Venkata Ranga Rao & Jagarlamudi Chandramouli College of Engineering, Guntur is the 'Jewel in the Crown' of Nagarjuna Education Society, which took upon itself the responsibility of enriching the society through promotion of education, literature and culture. As it always happens, the genuine intentions of the promoters of the society received the support of the Almighty. Today eight educational institutions are functioning under the banner and patronage of Nagarjuna Education Society, with R.V.R. & J.C. College of Engineering, being the flag-ship of them, of course.

The Mission

An integrated development of manpower possessing technological and managerial knowledge and skills, values and ethics needed to make an honourable living and contribute to the socio-economic development and welfare of the society.

The Genesis and Growth

Like all great institutions, the College too had a humble beginning with just 180 intake and a barely adequate infrastructure in1985, it is the determination and commitment of the Management that made the College one of the largest among Engineering Institutions in South India with excellent infrastructure, facilities and competent human resources. Today, it offers eight B.Tech., Degree Courses with an intake of 1020 plus 204 through lateral entry into the II Year for Diploma Holders, Further, the College offers MBA, MCA and M.Tech. in five specializations.

In 1998 it has become the youngest College to have been accredited and as on date all the seven eligible B.Tech. Degree Courses have been accredited in 2002,2007 and again in 2012. It has became the first Engineering College in the state to have been accredited fourth time by N.B.A., New Delhi. Further in the Academic Audit and Grading done by Andhra Pradesh State Council of Higher Education, Govt. of A.P., the institute is rated as the SECOND best among Private Engineering Colleges of A.P. and FOURTH best amongst all Engineering Colleges of A.P. including University Engineering Colleges. It has also figured among the "Top-100" Engg. Colleges in independent surveys conducted in 2006 & 2007 by the popular magazine the 'OUTLOOK'. The College received

first prize for Best Performing Professional UG College in University Examination Results for the last FIVE consecutive years. The College is a typical example of meticulous planning, resource scheduling, human endeavour and institutional management.

COURSES OFFERED

1) Under-Graduate: B.Tech.

i)	Civil Engineering (1985)	120
ii)	Mechanical Engineering (1985)	180
iii)	Electronics & Communication Engg. (1985)	180
iv)	Electrical & Electronics Engg. (1994)	120
v)	Computer Science & Engineering (1994)	180
vi)	Chemical Engineering (1996)	60
vii)	Information Technology (1998)	120
viii)	Bio-technology (2006)	60

2) Post-Graduate:

i)	Management Sciences (MBA) (1995)	120
ii)	Computer Applications (MCA) (1995)	120
iii)	M.Tech in CSE (2003)	25
iv)	M.Tech in Power Systems Engineering (2004)	18
v)	M.Tech. Structural Engineering (2004)	18
vi)	M.Tech. CAD/CAM (2004)	18
vii)	M.Tech. Communication Engineering And Signal Processing(2011)	18

The Campus

A built up area of 59,077 sq.m. on a 37.41 acres plot houses, 61 Laboratories and 18 Computer Centres besides amenities like Canteen, Seminar Halls, Auditorium, Open Air Theatre, Gymnasium, e-classrooms and Conference Halls etc. to make life in the classroom and outside easy and comfortable. Continuous power supply provided from 200 KVA, 250 KVA and 500 KVA modern Generator sets. Andhra Bank Branch located in the campus. A fleet of 24 buses, save the staff and students from the vagaries of public transport.

The aesthetically designed structures, the hill slopes on the West, a well laid out campus dotted with roads, trees and gardens merge into a stunning landscape that inspires the minds to "Think Better, Work Better".

The Work Culture

The Management and Staff are a group of uncompromising people who stretch beyond reasonable limits to attain their objective - Excellence in everything they do. The people of RVR & JC have learnt that meeting of the minds and joining hands is the easier way to success. They do meet and interact frequently to set new starting lines than to celebrate the finishing lines reached.

The People

The College is possessive of its intellectual property; a 257-strong faculty with diversity in specialization and heterogeneity in abilities, have unity in their objective of enriching the students with up-to-date technical information, data and skills. The teachers adopt a very professional attitude and commitment in imparting instruction, counseling and personality development in which the student has the final say. The emphasis is more on learning of the student than on teaching. All our teachers are rated 90% good by the students.

The 165-odd administrative and supporting people provide the logistics to run academic and administrative operations, with silent efficiency.

Discipline

Insulating the students from the vulnerable influence due to the society's contemporary aberrations is our endeavor. The institution had become the choice of the parents for its track-record of campus discipline. The ambience and the exemplary orderliness of behavior of the staff induces a self-imposed discipline in the students. The temporary abnormalities if any, are disciplined, of course.

Computer Centres

The computer facilities are vast. About 1500 terminals with latest configuration are located in fourteen Central and Department Computer Centres, all air conditioned. Software necessary for effective training and instruction as well as for consultancy are in place. All the computers in the campus have been interconnected through campus-wide intranet using Fibre Optic cables and switches. The City Computer Centre is an off-time facility for students & staff. Examination & administrative services are Computerised. Currently, 16 MBPS Wireless Internet connectivity is provided by installing a Micro Tower.

Library

The four-storied library of 87,468 volumes of 25,910 titles, 3,267 CDs and educational films is the biggest learning resource in the campus. 257 National and International Journals provide up-to-date information on any topic the students and staff look for. Orderly stacking, computerized information and the seven qualified library staff facilitate easy location of any information needed. The Digital Library is providing internet facility to all the students with 17 systems. Comfortable seating arrangement and large reading spaces provide a serene atmosphere for spending long hours in the library. The City Centre too has a reference library that is open upto 10.00 p.m.

Hostels

Four storeyed Girls hostel with a 6,040 sq.m. accommodating 400 girl students with modern facilities available. Newly constructed four storied boys hostel with a 11,152 sq.m. accommodating 500 students with modern facilities in the College campus.

The Students

From the day of induction, the staff do everything to naturalize the students to the culture of R.V.R. & J.C. College of Engineering i.e. single minded pursuit of the objective. The part played by the students in making the College, into an ideal seat of learning is significant. The students of this College consistently produce the best of the results in the University.

Extra-curricular Activities

NCC, NSS Units established in the College. Opportunities are a plenty for those with extracurricular talent. Numerous competitions are held for various levels of students, who have proved their superiority in various inter-collegiate competitions conducted by public organizations and other institutions. The students prove their leadership qualities and co-operative skills by organizing colorful functions at regular intervals.

Campus Recruitment

About 50 renowned industries / IT Organizations regularly visit the College to recruit the final years for employment. A training and placement Department monitors recruitment, short term training and personality development programmes. During the last four years the Campus recruitment steadily grew up.

DEPARTMENT OF MECHANICAL ENGINEERING

The Department was established in 1985. It started an U.G. course in Mechanical Engineering in the same year. This course had been accredited by N.B.A. and awarded 'A' Grade for three years in May, 1999, 'A' Grade for five years in May, 2002, 'A' Grade for three years in September, 2007 and accredited Fourth time in July, 2012.

Mechanical Engineering is a challenging discipline. It encompasses all important aspects of Modern Technology. In Automotive, Paper, Aerospace, Petrochemical, Automation, Robotic, Refrigeration and Air Conditioning Industries and Nanotechnology, Mechanical Engineers have been playing a leading role. Mechanical and Thermal Design of Computers and other Electronic Equipment is carried out by Mechanical Engineers.

Development of ANSYS, Pro-Engineer, Master CAM, AutoCAD packages, Mechanical Desktop, Edge CAM etc., revolutionized the way Mechanical Engineers tackle the problems. Forecasting of the failure, Diagnostics of Breakdowns, Quality Circles, Optimization of Machine elements, Preparation of New Models have become the order of the day for budding Mechanical Engineers. In the early days of the profession, most of the work of Mechanical Engineers consisted of Design & Manufacture. Now Mechanical Engineers need to know a lot of Principles from other disciplines of Engineering to stay ahead.

As science and Engineering are rapidly changing and advancing, the courses offered by the Department take care of the needs of Prospective Mechanical Engineers. Mechanical Engineering curriculum covers the following areas:

- Mechanical Design
- Thermal Sciences
- Dynamics, Vibration & Controls
- Materials and Manufacturing
- Mechatronics

Students learn several computing environments during the study and use computers for problem solving in many Mechanical Engineering courses.

- Intake capacity 180
- Provides in-depth Theoretical and Practical knowledge through lectures, visits to industries for Shop floor experience and inplant Training.
- Experienced and well trained Faculty.
- Well Equipped Laboratories.

The Department has 5 Professors all with Doctorate, 7 Assistant Professors with one Doctorate, 10 Senior Lecturers and 23 Lecturers. The entire faculty has Post-Graduate Degree in Mechanical Engineering with various specializations. Four staff members have submitted their theses and a few are in the process of submission of their theses for Ph.D. Nine staff members are in an advanced stage of research for their Ph.D.

All the staff are dedicated and have the welfare and prospect of the students as their main interest. Many of the staff have produced 100% result in the subjects taught by them for the last few years. The general feedback from the students on the Faculty is very good.

The Department regularly organizes various faculty development programmes like Induction Training for young Teachers, National seminars and conferences for the in-house faculty and faculty of the other institutions. The department organized two AICTE sponsored National Seminars "MICRO MACHINING" and "METAL MATRIX COMPOSITES" and a National Conference on "Recent Advances in Mechanical Engineering (NCRAME)"

Department's highly skilled and motivated Technicians have fabricated a number of Test-Rigs for regular laboratory work. They have done innovative projects for which APCOST and the Management of the College awarded grants and funds. Our Technicians always lend a helping hand to the final year students of all Branches in fabricating and completing their project works.

The Department has sprawling Workshops, where Carpentry, Tin smithy, Welding and House Wiring are taught to students of all branches of First Year. Thermal Sciences laboratory has equipment and test-rigs pertaining to IC Engines, Fuels and Lubricants, Air Compressors, Heat Transfer, Refrigeration and Air Conditioning and Automobiles. Experiments to study fundamentals and vibrations of linkages,

constructional features and effect of vibration on the life of machinery are carried out in Kinematics and Vibration laboratory, Machine shop, CAD/CAM Laboratory, Metrology Laboratory and Industrial Engineering Laboratory.

The Department's pride is the CAD/CAM Laboratory in which Rs.27 Lakhs from projects sanctioned by AICTE, New Delhi were invested. The laboratory boasts of 90 computer systems with Pentium IV, a server and latest and advanced Software like AutoCAD, Mechanical Desktop, CATIA, MSC Nastran, Autodesk Inventor, CAEFEM, ANSYS, Pro E, CadianMech-2002.

The Department was awarded a MODROB's project by AICTE with a sanction of an amount of Rs.12 Lakhs to establish Mechatronics Laboratory for B.Tech and M.Tech (CAD/CAM) students. The laboratory consists of 18 P-IV latest systems and Mechatronics equipment, which enable the students to learn principles of equipment and simulation software.

A total of Rs. 59 Lakhs have been received by the department for up gradation of various laboratories and computer systems from funding agencies like AICTE, APCOST, NEDCAP etc.

The Department library has 750 Text Books, 20 Video Cassettes, 28 Journals, NPTEL video Lectures and 500 Project Work Reports in its stock. It caters to the needs of students for good text books and reference books in various subjects.

Every student of Mechanical Engineering will become a member of RVR & JC Mechanical Engineering Association (RAJMEA). It conducts Technical Seminars, Quizzes and Group Discussions by various students and arranges Guest Lectures by eminent persons from Industry and Academic Institutions. Short and Long Industrial Study Tours are arranged frequently to improve the knowledge base of the students. MechMantra is an annual feature organized by RAJMEA as a National Level Technical Students Meet in Mechanical Engineering. A SAE India Collegiate Club is functioning in which 72 student and 2 faculty members were registered.

Regular counseling and advice is given to the students of Mechanical Engineering by all the Faculty of the Department to improve their learning, ability and overall performance apart from guiding in their career.

R.V.R. & J.C. COLLEGE OF ENGINEERING::GUNTUR (AUTONOMOUS)

REGULATIONS (R-12) FOR

FOUR - YEAR B.TECH. DEGREE COURSE

(with effective from the batch of students admitted into first year B.Tech. from the academic year 2012-2013).

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:

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

2.2 In addition to the core electives, an open elective (non-departmental elective) is to be offered in the first semester of fourth year by all branches of B.Tech. courses.

3.0. **DURATION OF THE COURSE AND MEDIUM OF INSTRUCTION**

3.1 The duration of the course is four academic years consisting of two semesters in each academic year. The medium of instruction and examination is English.

3.2 The duration of the course for the students (Diploma Holders) admitted under lateral entry into II/IV B.Tech. is three academic years consisting of two semesters in each academic year. The medium of instruction and the Examination is English.

4.0. **MINIMUM INSTRUCTION DAYS**

Each semester shall consist of a minimum number of 90 days of instruction excluding the days allotted for tests, examinations and preparation holidays.

5.0 **EVALUATION**

The performance of the students in each semester shall be evaluated subject wise

5.1. The distribution of marks between sessionals (based on internal assessment) and Semester end Examination is as follows:

Nature of the subject	Sessional Marks	End Semester Exam. Marks
Theory subjects/Design and/ or Drawing/Practicals	40	60
Mini Project / Term Paper	100	----
Project work	80	120 (Viva voce)

5.2. In each of the Semesters, 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 15 marks out of 18 marks (80% approx.) to that midterm examination in which the student scores more marks and the remaining 3 marks (20% approx.) for other midterm examination in which the student scores less marks. Similarly a weightage of 10 marks (80% approx.) out of 12 marks earmarked for assignment tests shall be given for the assignment in which the student scores more marks and remaining 2 marks (20%

approx.) shall be given for the assignment test in which the student scores less marks.

Five marks are allotted for attendance in the respective theory subjects in a graded manner as indicated in ***clause 7.2.*** The remaining 5 marks out of the 40 marks earmarked for the internal sessional marks are awarded (quiz/online examination) by the concerned teacher in the respective theory subjects.

5.3. The evaluation for Laboratory class work consists of a weightage of 25 marks for day to day laboratory work including record work and 15 marks for internal laboratory examination including Viva-voce examination.

In case of Project work, the sessional marks shall be awarded based on the weekly progress, the performance in two Seminars and the Project Report submitted at the end of the semester. The allotment of sessional marks for Seminars and day-to-day class work shall be 30 and 50 respectively.

NOTE : 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.

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

6.0. **LABORATORY / PRACTICAL CLASSES**

In any semester, a minimum of 90 percent experiments / exercises specified in the syllabus for laboratory course shall be completed by the student and get the record certified by the concerned Head of the Department, to be eligible to face the Semester end 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 totalling the number of hours / periods of lectures, design and / or drawing, practical's 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.

7.2 A weightage in sessional marks up to a maximum of 5 marks out of 40 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% - 4 marks

Attendance of 90% and above - 5 marks

7.3 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 ***Clause 7.1*** above, provided the Principal is satisfied with the genuineness of the reasons and the conduct of the student.

7.4 A student who could not satisfy the minimum attendance requirements as given above, in any semester, is not eligible to appear for the semester end examinations and shall have to repeat that 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 semester subsequently and satisfy the above requirements afresh to become eligible to appear for the semester-end examination.

9.0. **SEMESTER END EXAMINATION**

9.1. For each theory subject, there shall be a comprehensive semester end Examination of three hours duration at the end of each Semester, unless 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 semester end examination shall be conducted by one internal and one external examiner appointed by the Principal of the College, the duration being that approved in the detailed Schemes of Instruction & Examination.

9.3 Viva-voce Examination in Project Work shall be conducted by one internal examiner and one external examiner appointed by the Principal.

10.0 **CONDITIONS FOR PASS**

A candidate shall be declared to have passed the Semester end Examination in individual subjects if he / she secures a minimum of 35% marks in theory and 50% marks in Practical subjects and drawing subjects (including Project Viva-voce).

11.0 **AWARD OF CREDITS**

Credits are awarded for each Theory/Practical Subjects. Each theory subject is awarded four credits and each practical subject is awarded two credits. Project work is awarded ten credits. However for some specific subjects more/less than four credits may be awarded by individual boards. The total number of credits for all the four years put together should be in the range of 218-224 for any branch.

11.1 AWARD OF GRADES

S.No.	Range of Marks	Grade	Grade Points
1	≥85%	S	10.0
2	75%-84%	A	9.0
3	65%-74%	B	8.0
4	55%-64%	C	7.0
5	45%-54%	D	6.0
6	40%-44%	E	5.0
7	≤39%	F (Fail)	0.0
8	The grade "W" represents withdrawal/absent (subsequently changed into pass or E to S or F grade in the same semester)	W	0.0

11.2 A Student securing 'F' grade in any subject there by securing zero grade points has to reappear and secure at least 'E' grade in the subsequent examinations for that subject.

11.3 After each semester, Grade sheet will be issued which will contain the following details:

- The list of subjects for each semester and corresponding credits and Grades obtained
- The Grade Point Average(GPA) for each semester and
- The Cumulative Grade Point Average(CGPA) of all subjects put together up to that semester from first semester onwards

GPA is calculated based on the following formula:

$$\frac{\sum[No.of\ Credits\ X\ Grade\ Points]}{\sum of\ Credits}$$

CGPA will be calculated in a similar manner, considering all the subjects enrolled from first semester onwards.

12.0 **CONDITIONS FOR PROMOTION**

12.1 A student shall be eligible for promotion to II/IV 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/IV B.Tech.

12.2 A student shall be eligible for promotion to III/IV B.Tech. Course if he / she secures a minimum of 70% of the total number of credits from two regular and one supplementary examinations of first semester and one regular and one supplementary examinations of second semester of I/IV B.Tech.(including practical subjects) in addition to satisfying the minimum requirements of attendance and sessional marks stipulated in ***Clauses 5 and 7*** in II/IV B.Tech.

12.3 A student shall be eligible for promotion to IV/IV B.Tech. course if he/she secures a minimum of 70% of the total number of credits from three regular and two supplementary examinations of first semester and two regular and two supplementary examinations of second semester of I/IV B.Tech. and two regular and one supplementary examinations of II/IV B.Tech. first semester and

one regular and one supplementary examinations of II/IV B.Tech. second semester (including practical subjects) in addition to satisfying the minimum requirements of attendance and sessional marks stipulated in ***Clauses 5 and 7*** in III/IV B.Tech.

12.4 A student (Diploma Holder) admitted under lateral entry into II/IV B.Tech. shall be eligible for promotion to IV/IV B.Tech. course if he/she secures a minimum of 70% of the total number of credits from two regular & one supplementary examinations of II/IV B.Tech. first semester and one regular and one supplementary examinations of II/IV B.Tech. second semester (including practical subjects) in addition to satisfying the minimum requirements of attendance and sessional marks stipulated in ***Clauses 5 and 7*** in III/IV B.Tech.

13.0 **ELIGIBILITY FOR AWARD OF B.TECH. DEGREE**

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

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

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

A Student, who fails to fulfill all the academic requirements for the award of the degree within eight academic years from the year of admission, shall forfeit his/her seat in B.Tech. course.

13.3 A student (Diploma Holder) admitted under lateral entry into II/IV B.Tech., who fails to fulfill all the academic requirements for the award of the degree within six academic years from the year of admission, shall forfeit his/her seat in B.Tech. course.

14.0 **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.

S.No.	Class	CGPA
1	First Class With Distinction	8.0 or more
2	First Class	6.5 or more but less than 8.0
3	Second Class	5.0 or more but less than 6.5

15.0 **IMPROVEMENT OF CLASS**

15.1 A candidate, after becoming eligible for the award of the Degree, may reappear for the semester end 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.

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

15.2 A single Grade sheet shall be issued to the candidate after incorporating the Credits and Grades secured in subsequent improvements.

15.3 A consolidated Grade Sheet shall be issued to the candidate indicating the CGPA of all the four years put together along with the Provisional Certificate.

16.0 **AWARD OF RANK**

The rank shall be awarded based on the following:

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

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

16.3 For the purpose of awarding rank in each branch, the CGPA calculated based on the Grades secured at the first attempt only shall be considered.

16.4 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.

17.0 **SUPPLEMENTARY EXAMINATIONS**

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

18.0 **TRANSITORY REGULATIONS**

A Candidate, who is detained or discontinued in the semester, on readmission shall be required to do all the courses in the curriculum prescribed for such batch of students in which the students joins subsequently. However, exemption will be given to those candidates who have already passed in such courses, which he / she had passed in the earlier semester(s).

18.1 A student, following the Acharya Nagarjuna University (ANU), Guntur, curriculum, detained due to lack of academics/attendance at the end of the first semester of second year, shall join the autonomous batch of third semester. Such students will study all the courses prescribed for that batch, in which the student joins. The first year marks shall not be converted into course credits. However, the student has to clear all the first year backlog subjects by appearing the supplementary examinations, conducted by ANU, Guntur and courses prescribed by Autonomous stream for the award of Degree. The class will be awarded based on the academic performance of a student. Such candidates will be considered on par with lateral entry candidates of autonomous stream and will be governed by regulations applicable to lateral entry candidates' category.

18.2 A student, following ANU, Guntur, curriculum, detained due to lack of academics / attendance at the end of the second semester of second year and also at the subsequent semesters, shall join with the autonomous batch at the appropriate semester. Such

candidates shall be required to pass in all the courses in the programme prescribed by concerned BOS for such batch of students, to be eligible for the award of degree. However, exemption will be given in all those courses of the semester(s) of the batch, which he / she had passed earlier. The student has to clear all his/ her backlog subjects by appearing the supplementary examinations, conducted by ANU, Guntur and College (Autonomous stream) for the award of degree. The class will be awarded based on the academic performance of a student in the autonomous pattern.

19.0 CONDUCT AND DISCIPLINE

(a) Students shall conduct themselves within and outside the premises of the institute in a manner befitting the students of our institution.

(b) As per the order of Honourable Supreme Court of India, ragging in any form is considered as a criminal offence and is banned. Any form of ragging will be severely dealt with.

(c) The following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.

(i) Lack of courtesy and decorum, indecent behaviour anywhere within or outside the campus.

(ii) Wilful damage of college / individual property

(iii) Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.

(iv) Mutilation or unauthorized possession of library books.

(v) Noisy and unseemly behaviour, disturbing studies of fellow students.

(vi) Hacking of computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber-crime etc.)

(vii) Usage of camera / cell phone in the campus

(viii) Plagiarism of any nature

(ix) Any other acts of gross indiscipline as decided by the academic council from time to time.

(d) Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute / hostel, debar from examination, disallowing the use of certain facilities of the institute, rustication for a specified period or even outright expulsion from the institute or even handing over the case to appropriate law enforcement or the judiciary, as required by the circumstances.

(e) For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the chief warden, the Head of the Department and the Principal respectively, shall have the authority to reprimand or impose fine.

(f) Cases of adoption of unfair means and / or any malpractice in an examination shall be reported to the Principal for taking appropriate action.

(g) All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the academic council.

(h) The institute level standing disciplinary action committee constituted by the academic council, shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.

(i) The Principal shall deal with any academic problem, which is not covered under these rules and regulations, in consultation with the programmes committee in an appropriate manner, and subsequently such actions shall be placed before the academic council for ratification. Any emergency modification of regulation, approved by the appropriate authority, shall be reported to the academic council for ratification.

(j) "Grievance and Redressal Committee" (General) constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters.

20.0 MALPRACTICES

20.1 The Principal shall refer the cases of malpractices in internal assessment tests and semester-end examinations to a malpractice enquiry committee constituted by him / her for the purpose. Such committee shall follow the approved scales of punishment. The Principal shall take necessary action, against the erring students basing on the recommendations of the committee.

20.2 Any action on the part of a candidate during an examination trying to get undue advantage or trying to help another, or drive the same through unfair means is punishable according to the provisions contained hereunder. The involvement of the staff, who are in-charge of conducting examinations, valuing examination papers and preparing / keeping records of documents relating to the examinations in such acts (inclusive of providing incorrect or misleading information) that infringe upon the course of natural justice to one and all concerned in the examination shall be viewed seriously and recommended for award of appropriate punishment after thorough enquiry.

21.0 AMENDMENTS TO REGULATIONS

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

R.V.R. & J.C. COLLEGE OF ENGINEERING, GUNTUR-19.

(AUTONOMOUS)

SCHEME OF INSTRUCTION AND EXAMINATION

For the batch w.e.f. 2012-2013

MECHANICAL ENGINEERING

I/IV B.Tech. **FIRST SEMESTER**

Sl. No.	COURSE DETAILS		Scheme of Instruction		Scheme of Examination			Credits
	Code No.	Subject Name	Periods per week		Maximum Marks		Total Marks	
			Lecture/ Tutorial	Drawing / Practical	Sessional	Semister		
1	BT/CE/CHE/CS/EC/EE/IT/ME - 111	Engineering Mathematics-I	4+1	-	40	60	100	4
2	BT/CE/Ch.E/CS/EC/EE/IT/ME - 112	Engineering Physics-I	3+1	-	40	60	100	3
3	EC/EE/ME-113	Engineering Chemistry - I	3+1	-	40	60	100	3
4	EC/EE/ME-114	C-Programming	4+1	-	40	60	100	4
5	ME 115	Engineering Mechanics-I	4+1	-	40	60	100	4
6	EC/EE/ME-151	Chemistry Lab	-	3	40	60	100	2
7	EC/EE/ME-152	Workshop	-	3	40	60	100	2
8	EC/EE/ME-153	C-Programming Lab	-	3	40	60	100	2
		Total	**18+5**	**9**	**320**	**480**	**800**	**24**
SECOND SEMESTER								
1	BT/CE/CHE/CS/EC/EE/IT/ME - 121	Engineering Mathematics-II	4+1	-	40	60	100	4
2	BT/CE/Ch.E/CS/EC/EE/IT/ME - 122	Engineering Physics-II	3+1	-	40	60	100	3
3	EC/EE/ME - 123	Engineering Chemistry - II	3+1	-	40	60	100	3
4	EC/EE/ME-124	Technical English & Communication Skills	4+1	-	40	60	100	4
5	ME 125	Engineering Mechanics-II	4+1	-	40	60	100	4
6	ME-126	Engineering Graphics	2	4	40	60	100	4
7	EC/EE/ME-161	Physics Lab	-	3	40	60	100	2
8	EC/EE/ME-162	English Languatge Lab	-	3	40	60	100	2
		Total	**20+5**	**10**	**320**	**480**	**800**	**26**

THIRD SEMESTER

II/IV B.Tech.

Sl. No.	COURSE DETAILS		Scheme of Instruction		Scheme of Examination			Credits
	Code No.	Subject Name	Periods per week		Maximum Marks		Total Marks	
			Lecture/ Tutorial	Drawing / Practical	Sessional	Semister		
1	ME/ChE - 211	ComputationalTechniques	4	-	40	60	100	4
2	ME-212	Mechanics of Materials-I	4+1	-	40	60	100	4
3	ME-213	Theory of Machanisms & Machines	4+1	-	40	60	100	4
4	ME-214	Casting,Welding and Metal Working Processes	4	-	40	60	100	4
5.	ME 215	Basic Thermodynamics	4+1	-	40	60	100	4
6	ME 216	Fluid Mechanics	4	-	40	60	100	4
7.	ME 251	Machine Drawing & Computer Aided Drafting Lab	-	6	40	60	100	2
8.	ME 252	Fluid Mechanics & Strength of Materials Lab	-	3	40	60	100	2
9.	ME 253	Communication Skills Lab	-	3	40	60	100	2
		Total	**24+3**	**12**	**360**	**540**	**900**	**30**
FOURTH SEMESTER								
1	ME/ChE - 221	Probability & Complex Analysis	4	-	40	60	100	4
2	ME-222	Mechanics of Materials-II	4+1	-	40	60	100	4
3	ME-223	Electrical Technology	3+1	-	40	60	100	3
4	ME-224	Mateiral Science & Metallurgy	3+1	-	40	60	100	3
5.	ME 225	Applied Thermodynamics	4+1	-	40	60	100	4
6	ME 226	Hydraulic Machines	4	-	40	60	100	4
7.	ME227	Environmental Studies	4	-	40	60	100	4
8.	ME 261	Basic Manufacturing Processes Lab	-	3	40	60	100	2
9.	ME 262	Computer Application in Mechanical Engineering	-	3	40	60	100	2
		Total	**26+4**	**6**	**360**	**540**	**900**	**30**

FIFTH SEMESTER

III/IV B.Tech.

Sl. No.	COURSE DETAILS		Scheme of Instruction		Scheme of Examination			Credits
	Code No.	Subject Name	Periods per week		Maximum Marks		Total Marks	
			Lecture/ Tutorial	Drawing / Practical	Sessional	Semister		
1	ME-311	Operations Research	4+1	-	40	60	100	4
2	ME-312	Design of Machine Elements	4+1	-	40	60	100	4
3	ME-313	Dynamics & Vibration of Machinery	4+1	-	40	60	100	4
4	ME-314	Metal Cuttifng & Machine Tools	4	-	40	60	100	4
5	ME- 315	I.C. Engines and Gas Turbines	4	-	40	60	100	4
6	ME - 316	Baic Electronics & Micro Processors	3+1	-	40	60	100	3
7	ME- 351	Machine Tools Lab	-	6	40	60	100	2
8	ME -352	Fuels & I.C. Engines Lab	-	3	40	60	100	2
9	ME -353	Electrical & Electronics Lab	-	3	40	60	100	2
		Total	**23+4**	**9**	**360**	**540**	**900**	**29**
SIX SEMESTER								
1	ME-321	Operations Management	4	-	40	60	100	4
2	ME-322	Design of Transmission Elements	4+1	-	40	60	100	4
3	ME-323	Engineering Metrology	3+1	-	40	60	100	4
4	ME-324	Manufacturing Engineering	4	-	40	60	100	4
5	ME- 325	Heat Transfer	4+1	-	40	60	100	4
6	ME - 326	Elective-I	4	-	40	60	100	4
7	ME- 361	Modeling Lab	-	3	40	60	100	2
8	ME -362	Heat Transfer Lab	-	3	40	60	100	2
9	ME -363	Advanced Communication Skills Lab	-	3	40	60	100	2
		Total	**23+4**	**9**	**360**	**540**	**900**	**29**

ME 326 Elective-I

ME326/A : Mechanical Measurements & Control Systems.
ME326/B : Refrigeration & Air Conditioning (Lecture Hours : 4+1)
ME 326/C : Industrial Tribology
ME 326/D : Mechanics of Composite Materials
ME 326/E : Industry based elective

SEVENTH SEMESTER

IV/IV B.Tech.

Sl. No.	COURSE DETAILS		Scheme of Instruction		Scheme of Examination			Credits
	Code No.	Subject Name	Periods per week		Maximum Marks		Total Marks	
			Lecture* Tutorial	Drawing / Practical	Sessional	Semister		
1	ME-411	Professional Ethics & Human Values	3+1	-	40	60	100	3
2	ME-412	Advanced Machine Design	4+1	-	40	60	100	4
3	ME-413	Automobile Engineering	4	-	40	60	100	4
4	ME-414	Finite Element Methods	4+1	-	40	60	100	4
5	ME- 415	Elective-II (OPEN) Offered to other Branches	3+1	-	40	60	100	3
6	ME - 416	Elective - III	4	-	40	60	100	4
7	ME- 451	Analysis Lab	-	3	40	60	100	2
8	ME -452	Design & metrology Lab	-	3	40	60	100	2
9	ME -453	Term Paper	-	3	100	-	100	2
		Total	**22+4**	**9**	**420**	**480**	**900**	**28**
EIGHTH SEMESTER								
1	ME-421	Industrial Engineering & Management	4	-	40	60	100	4
2	ME-422	Automation & CAM	4	-	40	60	100	4
3	ME-423	Energy Resources Utilization	4	-	40	60	100	4
4	ME-424	Elective - IV	4	-	40	60	100	4
5	ME- 461	CAM Lab	-	3	40	60	100	2
6	ME-462	Project Work	-	9	80	120	200	10
		Total	**16**	**12**	**280**	**420**	**700**	**28**

ME 415 Elective - II (Open)
(To be selected other than home branch)

ME 415/A : Robotics
ME 415/B : Operations Research
CE 415/A : Finite Element Method
CE 415/B : Remote Sensing and GIS
BT 415/A : Bio Sensors & Bio Electronics
BT 415 /B : Biomedical Instrumentation
ChE 415/A : Energy Engineering
ChE 415/B : Bio-fuels
CS 415/A : Java Programming
CS 415/B : Database Management Systems
EC415/A : Applied Electronics
EC415/B : Basic Communication
IT 415/A : Web Technologies
IT 415/B : Software Engineering
EE415/A : Renewable Energy Sources
EE415/B : Utilization of Electrical Energy

ME 416 Elective - III

M.E 416/A : Mechatronics
ME 416/B : Computational Fluid Dynamics
ME 416/C : Design for Manufacturing
ME 416/D : Computer Aided Design

ME 424 Elective - IV

M.E 424/A : Robotics
ME 424/B : Nano Technology
ME 424/C : Advanced concepts in Mech. Engg.
ME 414/D : Fluid Power & Control Systems

I/IV Year B.Tech. - First Semester

BT/CE/ChE/CS/IT/EC/EE/ME - 111

ENGINEERING MATHEMATICS - I

Lectures	:	*4 periods / week*	*Sessional Marks*	:	*40*
Tutorials	:	*1 period / week*	*Semester Exam Marks*	:	*60*
Semester Exam	:	*3 hrs*	*Credits*	:	*4*

Course Objectives:

- *To provide knowledge on solving ordinary differential equations and applications of first order ordinary differential equations.*
- *To give basic knowledge on evaluation of double, triple integrals, area and volume.*
- *To provide knowledge and skills in writing a periodic function in its Fourier series form and on their applications.*
- *To develop skills for applying them in future on various engineering applications*

Learning Outcomes:

- *Understand methods of solving First order and Higher order ordinary differential equations along with some physical applications.*
- *Understand the relation between two variables by Curve fitting.*
- *Able to evaluate double, triple integrals and the area, volume by double & triple integrals respectively.*
- *Understand the concept of Fourier-series representation of periodic functions and their applications.*

UNIT - I **(15)**

Ordinary Differential Equations: Introduction, Linear equation, Bernoulli's equation, Exact differential equations, Equations reducible to exact equations, Orthogonal trajectories, Newton's law of cooling. Linear differential equations with constant coefficients: Definition, Theorem, Operator D, Rules for finding the complementary function, Inverse operator, Rules for finding the particular integral, working procedure to solve the equation.

UNIT - II **(15)**

Method of variation of parameters, Equations reducible to linear equations with constant coefficients: 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), Lines of regression.

UNIT - III **(15)**

Fourier series: Introduction, Euler's formulae, Conditions for a Fourier expansion, Functions having points of discontinuity, Change of interval, Even and Odd functions, half range series. Parseval's formula, Practical harmonic analysis.

UNIT - IV **(15)**

Multiple Integrals: Double integrals, Change of order of integration, Double integrals in polar coordinates, Area enclosed by plane curves, Triple integrals, Volume by triple integral, Change of variables in a double integral.

Beta, Gamma functions, Error function.

LEARNING RESOURCES:

TEXT BOOK:

Higher Engineering Mathematics by Dr.B.S.Grewal, Khanna Publishers, 40th Edition, 2007.

REFERENCE BOOK:

Advanced Engineering Mathematics by Erwin Kreyszig, 8th edition, 2007.

WEB REFERENCES

- *www.wikipedia.com*
- *NPTEL Lectures (IIT M)*

I/IV Year B.Tech. - First Semester

BT/CE/ChE/CS/IT/EC/EE/ME - 112
ENGINEERING PHYSICS - I

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *The production & detection of ultrasonics and its applications are presented to emphasize in understanding the medical ultrasound techniques. Superposition principle of light waves and its applications in thin films (wedge, convex shaped) are used to find the various parameters.*
- *For the identification of various vibrational modes of atoms of molecules in materials by laser Raman spectroscopy and in the study of mechanical strains and in the studies of crystals, polarized light and diffraction phenomena can effectively be used.*
- *The basics of laser light, its properties with applications in various fields and its important role played in the preparation of holograms, in analysing the optical spectra and in optical communication are presented.*
- *An overview of Maxwell's E-M equations to understand all the problems encountered in Electromagnetism and the connection to the Optics. The free electron theory and its significance to characterize the electrical and thermal properties of solids and the concept of the Fermi-Dirac distribution function to explain the Fermi energy level in metals.*

Learning Out Comes : *The students will be able to understand:*

- *The ultrasonics in various fields of science, engineering & medicine, to recognize the experimental evidence for the wave nature of light and interference in thin films and its technological applications.*
- *Diffraction spectra due to single slit on changing of wavelength and slit width. Concept and various types of polarization can be signified. Nicol prism as polarizer and analyser & its limitations.*
- *Importance of the stimulated emission in producing the lasing beam and its dependence on resonating cavity and active medium. 3D image*

production & construction and its application using highly monochromatic lasing beam. Guiding light through thin strands of dielectric material and classification.

- *Propagation of electromagnetic waves through Maxwell's equations, Distinguishing the properties of electrons and Photons.*

Unit -I (16)

Ultrasonics: production of ultrasonics by magnestriction, piezo electric oscillator methods, detection by acoustic grating method, applications in engineering and medicine, ultrasonic testing methods (pulse echo technique, ultrasonic imaging).

Interference*:* superposition principle, young's double slit experiment (qualitative treatment), stoke's principle (change of phase on reflection), interference in thin films due to reflected light (Cosine law), theory of air wedge (fringes produced by a wedge shaped thin film) and theory of newton's rings(reflected system), non-reflecting films.

Unit-II **(15)**

Diffraction: Fraunhofer diffraction due to a single slit(quantitative), theory of plane transmission diffraction grating, Rayleigh's criterion, resolving power & dispersive power of a grating.

Polarization: introduction, double refraction, construction and working of a nicol prism, nicol prism as a polarizer and analyser, quarter wave plate, production and detection of circular and elliptical polarizations(qualitative), optical activity, specific rotation, kerr and faraday effects.

Unit-III **(15)**

Lasers: Laser characteristics, spontaneous and stimulated emissions, population inversion, pumping, active system, gas (He-Ne) laser, Nd: YAG laser and semiconductor (GaAs) laser, applications of lasers.

Holography: basic principle, recording, reproduction and applications.

Fiber optics: structure of optical fiber, light propagation through optical fiber-numerical aperture, acceptance angle and acceptance cone, types of optical fibers, fiber optics in communication system and applications of optical fibres.

Unit-IV **(14)**

Electromagnetism: induced electric fields, displacement current and conduction current, Maxwell's equation - qualitative (differential & integral forms)-significance, LC oscillations (quantitative), velocity of electromagnetic wave equation in free space , poynting vector.

Statistical Physics : phase space, Maxwell-Boltzmann, Fermi-Dirac & Bose-Einstein's distribution functions(qualitative), photon gas & electron gas.

LEARNING RESOURCES :

Text Books

1. *Engineering Physics - R .K. Gaur & S. L. Gupta , Danpati Rai Publications, Delhi, 2001.*
2. Engineering Physics - Hitendra K. Malik & A.K.Singh, Tata MacGraw Hill, New Delhi,2009.

Reference Books

1. *Fundamentals of Physics - Resnick & Halliday, John Wiley sons ,9th Edition.*
2. *Engineering Physics - M.N. Avadhanulu & P.G. Kshirasagar, S.Chand & Co.Ltd , 7th Edition.*
3. *Engineering Physics - M.Arumugam, Anuradha Publications, Chennai ,5th Edition , 2006.*
4. *Engineering Physics - B. K. Pandey & S. Chaturvedi, Cengage Learning India Pvt. Ltd., Delhi.*

Web References:

- *http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT-%20Guwahati/engg_physics/index_cont.htm :*
- *Course relevant website : www.rvrjcce.ac.in/moodle/first year/2011-12/engineeringphysics*

I/IV Year B.Tech. - First Semester

EC/EE/ME/CE/CS/IT - 113
ENGINEERING CHEMISTRY - I

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives :

- *To know the quality parameters of water used in industries and for drinking purpose.*
- *To understand the methods of determining hardness, softening and desalination.*
- *To define the terms associated with phase rule and batteries.*
- *To acquire knowledge on advanced and latest material systems like liquid crystals, composites, etc.,*

Learning Outcomes :

- *Students acquire knowledge on quality and utility of water, useful in studying public health engineering.*
- *Knowledge acquired on phase rule gives good foundation for engineering students. (Specifically to Mechanical Engineering)*
- *Students know suitable replacements of metal after knowing about composite materials.*
- *Able to understand functioning of electrochemical energy systems.*
- *Would be capable of selecting appropriate lubricant for a given system*.

UNIT-I: **(Text book-1)** ***(16)***

Water Technology : various impurities of water, , hardness units and determination by EDTA method (simple problems), water technology for industrial purpose: boiler troubles- scales, sludges, caustic embrittlement, boiler corrosion, priming and foaming- causes and prevention. Internal conditioning -phosphate, calgon and carbonate treatment. External conditioning-lime soda process (simple problems), softening by ion exchange process. Desalination of brackish water by electro dialysis and reverse osmosis.

UNIT-II: (Textbook-1) **(14)**

Water treatment for drinking purpose- WHO guidelines ,sedimentation, coagulation, filtration (slow sand filter), various methods of chlorination, breakpoint chlorination.

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) ,applications eutectic compounds.

UNIT-III: (Text book-1) (15)

Electrochemistry: Electrode potential, electrochemical series and its significance, Nernst equation-related problems, Reference electrodes (SHE and Calomel electrode) Ion-selective electrode-glass electrode and measurement of pH.

Electrochemical Energy Systems: Types of electrochemical energy systems, electrochemistry of primary batteries (Lachlanche or dry cell), Secondary cells (Lead Acid cell, Ni-Cd cell), Lithium batteries (Li-MnO_2 Lithium organic electrolyte) and their advantages. Fuel cells(Oxygen-Hydrogen)

UNIT-IV: (Text book-1) (15)

Composites: Introduction, Constituents of Composites, Types -Fibre reinforced, Particulate and layered composites and their applications.

Liquid crystals: Structure of liquid crystal forming compounds, Classification and applications.

Lubricants: Classification ,liquid lubricants- viscosity,Viscosity index, Flash point, Fire point, Cloud point, Pour point, oilyness. Solid lubricants -Graphite and Molybdenum sulphide, Additives, Magnetic Particles.

LEARNING RESOURCES:

TEXT BOOKS

1. Engineering Chemistry, P.C. Jain and Monika Jain, 15th Edition, 2008, Dhanpat Rai Publishing Company, New Delhi.
2. A Text Book of Engineering Chemistry, Shashi Chawla, 3rd Edition, 2009, Dhanpat Rai and Co.(P) Ltd., New Delhi.

Reference books:

1. *A Text Book of Engineering Chemistry, S.S. Dara and S.S. Umare, 12th Edition, 2010, S.Chand and Co.Ltd.*

Web references:

- *http://www.wiziq.com/tutorial/*
- *http://www.powerstream.com/BatteryFAQ.html#lec*
- *http://www.cdeep.iitb.ac.in/nptel/Core%20Science*

I/IV Year B.Tech. - First Semester

EC/EE/ME - 114 C - PROGRAMMING

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: -- period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *Be familiar with computer software and hardware components, how they interact and its block diagram. Understand the basic problem-solving process using algorithm, Flow Charts and pseudo-code development.*
- *Understand the phases of compilation, from preprocessing through linking and loading. Learn how to customize compilation to produce intermediate files, etc*
- *Able to recognize the need for arrays and develop thorough knowledge on the concept of numerical and character arrays and get a better handle on multi- dimensional arrays, pointers, Learn to effectively use pointers for Dynamic memory allocation.*
- *Learn to use structures and unions to create custom data types in C. Have basics in File Operations. Have sound theoretical and practical knowledge in C .*

Learning Outcomes:

- *Thorough understanding of basic components of a computer and their operations.*
- *Thorough knowledge about various phases of compilation, from preprocessing through linking and loading. Learn how to customize compilation to produce intermediate files, etc.*
- *The ability to use the control structures effectively to write efficient programs.*
- *Skills to control program's memory consumption by dynamically allocating and freeing memory as needed.*
- *Have sound theoretical and practical knowledge in C and could effectively use their skills to develop programs for complex applications.*

UNIT - I (15)

Introduction: Computer Fundamentals: Computer & it's Components, Hardware / Software, Algorithm, Characterstics of algorithm, Flowchart, Symbols are used in flowchart, history of C, Basic structure of C, C language features.

C Tokens: Character set, Variables, Keywords, Data types and sizes, Type qualifiers, Numeric Constants and their forms of representation, Character Constants, String Constants, Declarations and Initialization of variables.

Operators & Expressions: Arithmetic operators, and expressions, Type-conversion rules, Coercion, Assignment operators and expressions, Increment and decrement operator, Conditional operator, Statements, Preprocessor directives, Input/ Output functions and other library functions. Relational operators and expressions. Boolean operators and expressions.

Programming Exercises for Unit I : C-Expressions for algebraic expressions, Evaluation of arithmetic and boolean expressions. Syntactic errors in a given program, Output of a given program, Values of variables at the end of execution of a program fragment, Filling the blanks in a given program, Computation of values using scientific and Engineering formulae, Finding the largest of three given numbers.

UNIT - II (15)

Conditional Statements: Blocks, If-Else statement, Else-If statement and Switch statement.

Iterative Statements: While loop, For loop, Do-While loop, Break, and continue.

Arrays: One - dimensional and character arrays, Two-dimensional numeric arrays.

Programming Exercises for Unit - II: Computation of discount on different types of products with different ranges of discount Finding the type of triangle formed by the given sides, Computation of income-tax, Computation of Electricity bill, Conversion of lower case character to its upper case, Finding the class of an input character; Sum of the digits of

a given number, Image of a given number, To find whether a given number is-prime; Fibonacci; abundant; perfect, Strong, Amstrong; deficient, Prime factors of a given number, Merging of lists, Transpose of a matrix, Product and sum of matrices, String processing-length of a string; comparison of strings; reversing a string; copying a string, Sorting of names using arrays, Graphics patterns, To print prime numbers and Fibonacci numbers in a given range, and Amicable numbers.

UNIT - III (15)

Functions: Function Definition, types of User Defined Functions, Parameter passing mechanisms, and simple recursion.

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 (15)

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.

LEARNING RESOURCES:

TEXT BOOK:

1. *Programming with C (Schaum's Outlines) by Byron Gottfried, Tata Mcgraw-Hill, 2010.*
2. *Programming with C by K R Venugopal & Sudeep R Prasad, TMH., 1997*

REFERENCE BOOKS:

1. *Programming in C by Pradip Dey and Manas Ghosh ,Second Edition,OXFORD*
2. *'C' Programming by K.Balaguruswamy, BPB.*
3. *C Complete Reference, Herbert Sheildt, TMH., 2000*

WEB REFERENCES:

- http://cprogramminglanguage.net/
- http://lectures-c.blogspot.com/
- http://www.coronadoenterprises.com/tutorials/c/c_intro.htm
- http://vfu.bg/en/e-Learning/Computer-Basics--computer_basics2.pdf

I/IV Year B.Tech. - First Semester

ME - 115 ENGINEERING MECHANICS - I

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives :

- *Study various types of force systems, basic principles of mechanics of rigid bodies and to analyze problems in a simple and logical manner*
- *Calculate the unknown forces through the use of equilibrium equations for a rigid body.*
- *Study and determine centroids and centre of gravity of various standard geometrical shapes.*
- *Analyze simple trusses using method of joints and method of sections*
- *Study and apply the principle of virtual work for solving the equilibrium of ideal systems*
- *Study the concept of moment of inertia and the mathematical calculations involved in finding moments of inertia of two dimensional areas*

Learning Outcomes :

At the end of this course the student will be able to

- *Apply the principle of rigid body equilibrium and to determine unknown forces and moments acting on a static rigid body.*
- *Determine the centroids and center of gravity of composite areas of standard geometrical shapes.*
- *Analyze the trusses using method of Joints and method of sections*
- *Calculate the moment of inertia of various shapes by integration and moment of inertia of composite areas.*

UNIT - I (15)

Concurrent Forces in a Plane:

Principles of statics, Force, Addition of two forces: Parallelogram Law - Composition and resolution of forces - Constraint, Action and Reaction. Types of supports and support reactions. Free body diagram. Equilibrium of concurrent forces in a plane - Method of projections, Method of moments.

Friction: Introduction , laws of friction, coefficient of friction , angle of friction, Problems involving dry friction, wedges.

UNIT - II (15)

Parallel Forces in a Plane: Types of parallel forces, Couple, resolution of a force into a force and a couple, general case of parallel forces in a plane

Centroid and Centre of Gravity: Concept of centroid and centre of gravity, Centroids of simple figures from basic principles, centroids of composite plane figures and curves, centre of gravity of three dimensional bodies.

UNIT-III

General Case of Forces in a Plane: Composition of forces in a plane, Equilibrium of forces in a plane, plane trusses-methods of joints and method of sections.

Force systems in a space (using vector notation) : Position vector, unit vector, force vector, resultant and equilibrium of concurrent forces in space, moment of a force about a point, moment of a force about an axis.

UNIT-IV (15)

Virtual Work: Introduction, principle of virtual work, Equilibrium of Ideal systems

Moments of Inertia of Plane Figures: Introduction, Moment of inertia of a plane figures with respect to an axis in its plane, polar moment of inertia, Parallel axis theorem, moment of inertia of composite areas.

LEARNING RESOURSES

TEXT BOOKS:

1. *Engineering mechanics by S. Timoshenko, D. H. Young and J V Rao -Tata McGraw-Hill Publishing Company Limited, New Delhi(For concepts) , 2009.*
2. *Engineering mechanics-statics and dynamics by A. K. Tayal - Umesh publications, Delhi (For numerical problems),2008*

REFERENCE BOOKS:

1. *Engineering Mechanics by S.S.Bhavikatti, New Age international Publishers,2012*
2. *Engineering Mechanics- Statics and Dynamics by Irving H. Shames, Pearson Education,2006*
3. *Singer's Engineering Mechanics: Statics and Dynamics, K.Vijaya Kumar Reddy and J Suresh Kumar, 3rd Edition SI Units-BS Publications,2010*
4. *A Textbook of Engineering mechanics statics and dynamics by J. L. Meriam and L. Kraige, 6th Edition , Wiley & Sons , 2010.*

WEB RESOURCES

- http://nptel.iitm.ac.in/
- www.learnerstv.com/Free-Engineering-video-lecture-courses.htm
- http://en.wikibooks.org/wiki/Statics

I/IV Year B.Tech. - First Semester

EC/EE/ME - 151 CHEMISTRY LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives :

- *To learn the concepts of equivalent weight, molecular weight, normality, molarity, weight percent, volume percent.*
- *To prepare molar solutions of different compounds.*
- *To know the methods of determining alkalinity, hardness and chloride ion content of water sample.*
- *To know the methods to determining purity of washing soda, percentage of available chlorine in bleaching powder.*
- *To learn the redox methods to determine Fe2+ ions present in solution.*
- *To know principles and methods involved in using instruments like conductivity bridge, spectrophotometer, pH meter and potentiometer*

Learning Outcomes :

- *Students acquire knowledge on normality, molarity, molecular weight, equivalent weight, oxidizing agent, reducing agent.*
- *Students can prepare solutions with different concentrations.*
- *Students can analyze water for its hardness, alkalinity, chloride ion content, iron content.*
- *Students understand the principles behind the development of instruments suitable for chemical analysis. Later he can use the knowledge in modifying instruments.*

(Any 10 out of the following experiments)

01. Determination of total alkalinity of water sample
    a. Standardization of HCl solution
    b. Determination of alkalinity of water

02. Determination of purity of washing soda
    a. Standardization of HCl solution
    b. Determination of percentage purity of washing soda

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

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

05. Estimation of Mohr's salt-Permanganometry
    a. Standardization of $KMnO_4$ solution
    b. Estimation of Mohr's salt

06. Estimation of Mohr's salt -Dichrometry
    a. Standardization of $K_2Cr_2O_7$ solution
    b. Estimation of Mohr's salt

07. Determination of available chlorine in bleaching powder-Iodometry
    a. Standardization of Hypo
    b. Determination of available chlorine in bleaching powder

08. Estimation of Magnesium
    a. Standardization of EDTA solution
    b. Estimation of Magnesium

09. Conductometric titration of an acid vs base

10. Potentiometric titrations: Ferrous Salt vs Dichromate

Demonstration Experiments:

11. pH metric titrations of an acid vs base

12. Spectrophotometry: Estimation of Mn/Fe

I/IV Year B.Tech. - First Semester

EC/EE/ME - 152 WORKSHOP

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives:

- *To provide the students hands on experience to make different joints in carpentry with hand tools like jack plane, various chisels & hand saws*
- *To provide the students hands on experience to make different joints in welding with tools & equipment like electric arc welding machine, TIG Welding Machine, MIG Welding Machine, hack saws, chipping tools etc.*
- *To provide the students hands on experience to make different joints in Sheet metal work with hand tools like snips, stacks, nylon mallets etc.*
- *To provide the students hands on experience to make different connections in house wiring with hand tools like cutting pliers ,tester ,lamps& lamp holders etc .*

Learning Outcomes:

To familiarize with

- *The Basics of tools and equipment used in Carpentry, Tin Smithy, Welding and House Wiring.*
- *The production of simple models in the above four trades*

LIST OF EXPERIMENTS:

Minimum three experiments should be conducted from each trade

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) Cross-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) Rectangular Tray

b) Triangular Tray

c) Pipe Joint

d) Funnel

e) Rectangular Scoop

4. **HOUSE WIRING**

a) To connect one lamp with one switch

b) To connect two lamps with one switch

c) To connect a fluorescent tube

d) Stair case wiring

e) Go down wiring

REFERENCE BOOKS:

1. *Kannaiah P. & Narayana K. C., "Manual on Work Shop Practice", Scitech Publications, Chennai, 1999.*
2. *Workshop Lab Manual , R.V.R. & J.C. College of Engineering , Guntur*

I/IV Year B.Tech. First Semester

EC/EE/ME - 153 C - PROGRAMMING LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives:

- *Understand the ANSI C/Turbo C compilers.*
- *Be able to develop various menu driven programs using conditional and control flow statements.*
- *Develop programs using structures, unions and files.*
- *Develop 'C' programs for various applications.*
- *Be able to participate and succeed in competitive examinations.*

Learning Outcomes:

- *The ability to develop various menu driven programs like generation of electricity bill, evaluation of series etc.*
- *The practical knowledge to write C programs using 1D, 2D and Multi Dimensional arrays.*
- *Able to write C programs to develop various applications using structures, unions and Files.*
- *Thorough practical knowledge to develop 'C' programs for various applications.*

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 or Switch 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 following (using loops):
   a. 1 + x2/2! + x4 / 4!+ upto ten terms
   b. x +x3/3! + x5/5!+ upto 7 digit accuracy
   c. 1+x+x2/2! +x3/3!+……upto n terms
   d. Sum of 1 + 2+ 3 +……..+n

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

4. A menu driven program to display statistical parameters (using one - dimensional array)
   i) Mean ii) Median iii) Variance iv) 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 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
   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

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

9. A menu driven program with options (using Dynamic memory allocation)
   a. Bubble sort b. Insertion 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
11. Write a program to perform the following operations on Complex numbers (using Structures & pointers):
   i) Read a Complex number
   ii) Addition of two Rational numbers
   iii) Subtraction of two Complex numbers
   iv) Multiplication of two Complex numbers
   v) Display a Complex number
12. a) Write a C program To copy the one file contents to the another file (using command line arguments).
   b) Write a C Program to count the frequencies of words in a given file.

TEXT BOOK:

1. *Programming with C (Schaum's Outlines) by Byron Gottfried, Tata Mcgraw-Hill, 2010.*
2. *Programming with C by K R Venugopal & Sudeep R Prasad, TMH., 1997*

REFERENCE BOOKS:

1. *Programming in C by Pradip Dey and Manas Ghosh ,Second Edition,OXFORD*
2. *'C' Programming by K.Balaguruswamy, BPB.*
3. *C Complete Reference, Herbert Sheildt, TMH., 2000*

WEB REFERENCES:

- *http://cprogramminglanguage.net/*
- *http://lectures-c.blogspot.com/*
- *http://www.coronadoenterprises.com/tutorials/c/c_intro.htm*
- *http://www.cprogramming.com/tutorial/c/lesson1.html*
- *http://vfu.bg/en/e-Learning/Computer-Basics--computer_basics2.pdf*

I/IV Year B.Tech.- Second Semester

BT/CE/ChE/CS/IT/EC/EE/ME - 121
ENGINEERING MATHEMATICS - II

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To apply rank concept of matrices in solving linear system of equations, finding the eigen values and eigen vectors and inverse of a matrix and getting familiarity with diagonalization and quadratic forms*
- *To get knowledge of mean value theorems, writing series expansion of functions and finding extreme values or stationary values of functions of two (or) three variables.*
- *To provide sufficient theoretical and analytical background of differentiation and integration of vector functions.*
- *To make the student to learn Laplace and inverse transforms of a function and able to solve differential equation using Laplace transforms.*

Learning Outcomes :

- *Understand the basic linear algebraic concepts.*
- *Assess the importance of derivative in mean value theorems and extreme values.*
- *Able to solve gradient, divergence, curl and integration of vector function problems.*
- *Obtain the solution of differential equation using Laplace transform.*
- *Ability of applying mathematical concepts in relevant engineering applications.*

UNIT - I **(15)**

Matrices: Rank of a matrix, vectors, Consistency of linear system of equations, Linear transformations, Characteristic equation, Properties of Eigen values (without proofs), Cayley-Hamilton theorem (without proof), Reduction to diagonal form.

UNIT- II (15)

Reduction of quadratic form to canonical form, Nature of a quadratic form, Complex matrices.

Differential Calculus: Rolle's Theorem (without proof), Lagrange's Mean value Theorem (without proof), Taylor's and Maclaurin's Series for single variable (without proof). Maxima and minima of two variables, Lagrange's method of undetermined multipliers.

UNIT-III (15)

Vector Calculus: Scalar and vector point functions, Del applied to scalar point functions, Gradient, Del applied to vector point functions, Physical interpretation of divergence and curl, Del applied twice to point functions, Del applied to products of point functions. Integration of vectors, Line integral, Surface integral, Green's theorem in the plane (without proof), Stoke's theorem (without proof), Volume integral, Gauss divergence theorem (without proof).

UNIT-IV (15)

Laplace Transforms: Introduction, Transforms of elementary functions, properties of Laplace Transforms, Existence conditions, Transforms of derivatives, Transforms of integrals, multiplication by tn, division by t. Evaluation of integrals by Laplace Transforms, Periodic function, Inverse Transforms, Convolution theorem(without proof), Application to Differential equations with constant coefficients.

LEARNING RESOURCES

TEXT BOOK:

Higher Engineering Mathematics by B.S. Grewal, Khanna publishers, 40th edition, 2007.

REFERENCE BOOK:

Advanced Engineering Mathematics by Kreyszig, 8th edition, 2007.

WEB REFERENCES

- *www.wikipedia.com*
- *NPTEL Lectures (IIT M)*

I/IV Year B.Tech. - Second Semester

BT/CE/ChE/CS/IT/EC/EE/ME - 122

ENGINEERING PHYSICS - II

Lectures	:	*3 periods / week*	*Sessional Marks*	:	*40*
Tutorials	:	*1 period / week*	*Semester End Exam Marks*	:	*60*
Semester End Exam	:	*3 hrs*	*Credits*	:	*3*

Course Objectives:

- *To explain the microscopic phenomena occurred in nature through quantum physics and the formation of the band structure and distinction of solids was explained by introducing the famous Kronig-penny model its salient features.*
- *Semiconductor concepts such as Energy band formation and classification of solids, intrinsic & extrinsic semiconductors, Hall effect & photo diode, LED and LCD are presented.*
- *Various magnetic materials and their characterization are presented to enable the student with materials science and to acquaint the student with the super conductivity property etc.*
- *Understanding of dielectric properties and the usage of materials in engineering applications. Introduced the basics of nano world and the various applications that are presently marketed are discussed with XRD and Transmission electron microscope (TEM).*

Learning Out Comes: *After going through these units, the students will be able to understand:*

- *The principles of quantum mechanics and the electron theory of metals and their band theory.*
- *Energy band formation and classification of solids & devices based on interaction of light junction diodes.*
- *Classification of Magnetic materials, characterization and their properties. Critical parameters of superconducting materials and applications.*
- *Various types of polarizations; Nano scale materials, properties & applications.*

Unit-I (16)

Principles of Quantum Mechanics: de Broglie's concept of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle-experimental verification, time independent Schrodinger's wave equation, physical significance of the wave function, particle in a box (one dimensional).

Electron Theory of metals: Failures of Classical free electron theory and quantum free electron theory(qualitative).

Band theory of Solids: Bloch theorem (Qualitative), Kronig-Penney model (Qualitative treatment), effective mass of electron.

Unit-II (14)

Semiconductor Physics: Energy band formation in solids, Classification of solids into metals, semiconductors and insulators, intrinsic & extrinsic semiconductors, density of states, intrinsic semiconductor carrier concentration, Hall effect and its uses.

Optoelectronic devices: Photo diode, LED,LCD and solar cell (qualitative treatment).

Unit -III (15)

Magnetic Materials: Introduction, orbital magnetic moment of an electron, Bohr magneton, classification of dia, para and ferro magnetic materials on the basis of magnetic moment, Hysteresis curve, soft and hard magnetic materials, Ferrites and their applications.

Superconductivity: Introduction, critical parameters (Tc, Hc, Ic), Meissner effect, types of superconductors, entropy, specific heat, energy gap and isotope effect, BCS Theory(in brief), applications of superconductors, high Tc superconductors(qualitative).

Unit -IV (15)

Dielectric Materials: Fundamental definitions: Electric dipole moment, polarization vector, polarizability, electric displacement, dielectric constant and electric susceptibility. Types of polarizations - Electric and ionic polarizations, internal fields in solids(Lorentz method), Clausius-Mossotti equation, Frequency dependence of polarization, Ferroelectrics and their applications.

Nano Technology : Basic Concepts of Nanotechnology, nano scale, introduction to nano materials, surface to volume ratio, fabrication of nano materials (sol-gel and chemical vapour deposition methods), applications of nano materials. XRD, Transmission Electron Microscope(TEM).

LEARNING RESOURCES

Text Books

1. *Applied Physics- P. K. Palanisamy, Scitech Publications.*
2. *Materials Science - M.Arumugam, Anuradha Publications, Chennai, 5th Edition , 2006.*

Reference Books

1. *Materials science - M. Vijaya and G. Rangarajan, TMH, New Delhi*
2. *Solid state physics by A. J. Dekkar*
3. *Physics of atom - Wehr and Richards.*
4. *Engineering Physics - B. K. Pandey & S. Chaturvedi, Cengage Learning India Pvt. Ltd., Delhi.*

Web References:

- *http://nptel.iitm.ac.in/courses/115104043/1*
- *http://people.seas.harvard.edu/~jones/ap216/lectures/lectures.html*
- *http://galileo.phys.virginia.edu/classes/252/home.html*
- *Course relevant website : www.rvrjcce.ac.in/moodle/first year/2011-12/engineeringphysics*

I/IV Year B.Tech. - Second Semester

CE/CS/IT/EC/EE/ME - 123
ENGINEERING CHEMISTRY - II

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *To acquire knowledge on various polymers and their mechanisms.*
- *To study the mechanisms, different types and factors influencing corrosion.*
- *To acquire knowledge on latest analytical techniques.*
- *To know the importance of green chemistry related to environmental management.*

Learning Outcomes:

- *Students know the utility of plastics in automobile, electronics, electrical and other fields.*
- *Students can relate corrosion and environment and suggest methods to prevent corrosion.*
- *Knowledge acquired on fuels gives good foundation for engineering students.*
- *Can analyse substances using techniques like Spectrophotometry, Colorimetry, Conductometry and Potentiometry.*
- *Able to design new techniques based on green chemistry principles.*

UNIT-I: (Text book-1 & 2) (18)

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

Plastics- Thermoplastic and thermosetting resins, preparation, properties and uses of Bakelite, polyesters, Teflon and PVC. Compounding of plastics.

Conducting polymers: Introduction, examples and applications, Polyacetylene- mechanism of conduction .

Rubber- Processing of latex, Drawbacks of natural rubber- Vulcanization, Synthetic rubbers- Buna-S and Buna-N, polyurethane rubber and silicone rubber.

UNIT-II: (Textbook-1) (13)

Corrosion and its control: Introduction, dry corrosion, electrochemical theory of corrosion, Types of corrosion- differential aeration, galvanic (galvanic series), Intergranular and Stress Factors affecting corrosion-oxidizers, pH, over voltage and temperature.

Protection methods: Cathodic protection, (Impressed current and sacrificial anode) corrosion inhibitors- types and mechanism of inhibition, metallic coatings-Galvanization, Tinning, Electroplating (Cu) and electro less plating (Ni)

UNIT-III: (Text book-1) (14)

Fuels: Classification of fuels, calorific value, LCV and HCV-units and determination (Bomb calorimeter), Coal- Ranking, proximate and ultimate analysis, carbonization of coal-types (using Beehive oven), Metallurgical coke-properties and uses.

Petroleum based: Fractional distillation, cracking-fixed bed, reforming, composition and uses of petrol, diesel, CNG and LPG.

UNIT-IV: (Text book-1 & 2) (15)

Analytical Techniques: Spectroscopy- Beer-Lambert's law, UV and IR-principles, Instrumentation (block diagram), Colorimetry- estimation of Iron, Conductometric (HCl vs NaOH) and potentiometric titrations (Fe(II)vs $K_2Cr_2O_7$)

Green Chemistry: Introduction, Principles and applications.

LEARNING RESOURCES:

Text books:

1. *Engineering Chemistry, P.C. Jain and Monika Jain, 15th Edition, 2008, Dhanpat Rai Publishing Company, New Delhi.*
2. *A Text Book of Engineering Chemistry, Shashi Chawla, 3rd Edition, 2009, Dhanpat Rai and Co.(P) Ltd., New Delhi.*

Reference books:

1. *A Text Book of Engineering Chemistry, S.S. Dara and S.S. Umare, 12th Edition, 2010, S.Chand and Co.Ltd.*
2. *Principles of Polymer Science, P.Bahadur and N.V. Sastry, Narora Publishing House*

Web references:

- *http://www.wiziq.com/tutorial/*
- *http://www.chem1.com/acad/webtext/states/polymers.html*
- *http://freevideolectures.com/Course/3029/Modern-Instrumental-Methods-of-Analysis*
- *http://www.cdeep.iitb.ac.in/nptel/Core%20Science/*

I/IV Year B.Tech. - Second Semester

EC/EE/ME - 124
TECHNICAL ENGLISH & COMMUNICATION SKILLS

Lectures	:	*4 periods / week*	*Sessional Marks*	:	*40*
Tutorials	:	*1 period / week*	*Semester End Exam Marks*	:	*60*
Semester Exam	:	*3 hrs*	*Credits*	:	*4*

Course objectives:

- *To make the student have better awareness on interpersonal skills and case studies*
- *To establish the importance of the meaning of new vocabulary as well as the form and of showing how words are used in context.*
- *To help the student to develop their overall knowledge and understanding of advanced grammar.*
- *To develop their abilities of written communication related to office communication and also to use foreign expressions situationally.*

Learning outcomes:

- *The student is able to have better inter and intra personal skills and also have good understanding on case studies.*
- *Able to use vocabulary contextually.*
- *Able to learn and applying the knowledge of advanced grammar in the day-to-day life.*
- *Able to develop all kinds of written communication including office communication and also foreign expressions.*

Unit - I

1. Kinesis
2. Interpersonal Skills
3. Intrapersonal Skills
4. Case Studies

Unit - II Lexis

1. Vocabulary
2. Analogies
3. Homonymys, Eponyms, Acronyms
4. Confusable words
5. One word substitute

Unit - III Syntax And Advanced Grammar

1. Correction of sentences
2. Advanced grammar
    1. Parallelism
    2. Dangling modifiers
    3. Tantology
    4. Ambiguity
    5. Word order
    6. Shift in tense, mood, voice

Unit - IV Office Communication

1. Letter writing
2. Memos
3. E-mail
4. Note taking, Note making
5. Routing slips
6. Foreign Expressions
    a. French -20
    b. Spanish - 10
    c. Italian/Latin - 20
    d Japanese - 10
    e. German - 10
    f. Russian - 10
    g. Chinese - 10

LEARNING RESOURCES

Text Books :

1. *Communication Skills - Sanjay Kumar & Pushpa Latha (OUP)- 2nd Impression, 2012*

Reference Books :

1. *Technical Communication - Meenakshi Raman & Sangeeta Sharma, Oxford Semester Press, 6th Impression, 2012*
2. *Oxford Dictionary of English Idioms - John Ayto, OUP Oxford, 08-Jul-2010*
3. *Dictionary of word origins - John Ayto, Bloomsbury, 2001*
4. *Harbrace Hand book of English*
5. *Mc Graw Hill's Hand Book of English Grammar and Usage - Markm Lysstar, Larry Beason, 2005*
6. *College Hand book*

I/IV Year B.Tech. - Second Semester

ME- 125 ENGINEERING MECHANICS - II

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives :

- *Learn principle of dynamics and apply it to impulse and momentum, work and energy which is useful to analyze turbo machineries.*
- *Study the principle of conservation of energy and direct central impact.*
- *Study and analyse the kinematics of rotation of a rigid body about a fixed axis.*
- *Learn the concept of relative velocity, instantaneous centre and dynamic equilibrium of rolling bodies in plane motion.*

Learning Outcomes :

At the end of this course the student will be able to

- *Determine velocity and acceleration of a particle under rectilinear and curvilinear translation*
- *Apply dynamic Equilibrium Equation for rigidbodies under rectilinear and curvilinear translation in the fields of Railways, Ships, guns, automobiles, Aircrafts, guns, rockets etc.,*
- *Determine the mass moments of inertia and radius of gyration of mathematically definable material bodies of standard shapes.*
- *Understand kinematics and kinetics of rotation of a rigid body about a fixed axis.*

UNIT - I (15)

Kinematics of Rectilinear Motion: Introduction to dynamics, displacement , velocity and acceleration, motion with uniform and variable acceleration

Kinetics of Rectilinear Motion: Equation of rectilinear motion - motion of a particle acted upon by a constant force - D'Alemberts principle, work and energy, impulse momentum, conservation of energy, collision of elastic bodies-direct central impact.

UNIT - II (15)

Kinematics of Curvilinear Motion: Introduction, components of motion - rectangular components - normal and tangential components.

Kinetics of Curvilinear Motion: Equations of motion-rectangular components-tangential and normal components, Equations of dynamic equilibrium - D'Alembert's principle, Work and Energy.

UNIT - III (15)

Moment of Inertia of Material Bodies: Moment of inertia of a rigid body, Moment of inertia of laminas , Moment of inertia of three dimensional bodies- solid right circular cone, solid cylinder, sphere & parallelepiped

Rotation of a rigid body about a fixed axis : Kinematics of rotation , Equation of motion for a rigid body rotating about a fixed axis , Rotation under the action of constant moment.

UNIT - IV (15)

Kinematics of plane motion : concepts of relative velocity and instantaneous center.

Kinetics of plane motion: Equations of motion, Dynamic equilibrium of symmetrical rolling bodies.

LEARNING RESOURCES

TEXT BOOKS:

1. *Engineering mechanics by S. Timoshenko, D. H. Young and J V Rao -Tata McGraw-Hill Publishing Company Limited, New Delhi(For concepts) , 2009.*
2. *Engineering mechanics-statics and dynamics by A. K. Tayal - Umesh publications, Delhi (For numerical problems) , 2008*

REFERENCE BOOKS:

1. *Engineering Mechanics by S.S.Bhavikatti, New Age international Publishers 2012*
2. *Engineering Mechanics- Statics and Dynamics by Irving H. Shames, Pearson Education , 2006*
3. *Singer's Engineering Mechanics: Statics and Dynamics, K.Vijaya Kumar Reddy and J Suresh Kumar, 3rd Edition SI Units-BS Publications , 2010.*
4. *A Textbook of Engineering mechanics statics and dynamics by J. L. Meriam and L. Kraige , Wiley India , 6th Edition , 2010.*

WEB RESOURCES

- *http://nptel.iitm.ac.in/*
- *www.learnerstv.com/Free-Engineering-video-lecture-courses.htm*

I/IV Year B.Tech. - Second Semester

ME - 126 ENGINEERING GRAPHICS

Lectures	*: 2 periods / week*	*Sessional Marks*	*: 40*
Drawing	*: 4 periods /week*	*Semester End Exam Marks*	*: 60*
Semester End Exam :	*3 hrs*	*Credits*	*: 4*

Course Objectives:

The primary objective of this course is

- *To develop the students to visualize and communicate all engineering elements*
- *To understand the fundamentals of geometry like engineering curves*
- *To visualize the different positions of planes and solids*
- *To evident the features when solids cut into sections*
- *To know the various developments & isometric views and its applications in the daily life.*

Learning Outcomes:

On completion of this course

- *The Student gets thorough knowledge of various Geometrical Elements used in Engineering Practice.*
- *He gets the insight into the Concepts of all 2 D elements like Conic Sections and 3 D Objects like various Prisms, Cylinders, Pyramids and Cones.*
- *He also understands the Projections of various objects and their representation and dimensioning.*
- *The Concept of Isometric Projections is thoroughly taught which will be useful for the visualiasation of any objects. This subject also paves the way for learing Auto Cad, CAD / CAM, CATIA and Pro E which are advanced software packages needed for every mechanical engineer*

(To be taught & examined in First angle projection)

UNIT - I

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

Conic sections : general construction , Oblong and Concentric circle method for ellipse, Tangent and Rectangular methods for parabola. **Curves :** cycloidal curves - cycloid, epicycloid and hypocycloid; involute of circe.

UNIT - II

Method of Projections: Principles of projection - First angle and third angle projection of points. Projection of straight lines. Traces of lines.

Projections of Planes : Projections of planes, projections on auxiliary planes.

UNIT - III

Projections of Solids : Projections of Cubes, Prisms, Pyramids, Cylinders and Cones with varying positions.

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).

UNIT IV

Development of Surfaces: Lateral development of cut sections of Cubes, Prisms, Pyramids, Cylinders and Cones.

Interpenetration Of Solids : Interpenetration of Prism in prism, (Treatment is limited to triangular & square prisms) and Cylinder in Cylinder with their axes perpendicular without offsets.

UNIT - V

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

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

LEARNING RESOURCES

Text Book:

1. *Engineering Drawing by N.D. Bhatt & V.M. Panchal. (Charotar Publishing House, Anand), Charotar publishing house , 50th Edition,2010.*

Reference Book:

1. *Engineering Drawing by Prof.K.L.Narayana & Prof. R.K.Kannaiah, Scitech Publications , 2010.*
2. *Engineering Graphics with AutoCAD 2002 by James D. Bethune, PHI, 2011.*

I/IV Year B.Tech. - Second Semester

EC/EE/ME - 161 PHYSICS LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives:

- *To give students a background in experimental techniques and to reinforce instruction in physical principles.*
- *Experiments are designed to incorporate lessons on measurement, data, error, or graphical analysis in addition to illustrating a physical principle.*
- *Give skills that can transfer critical thinking into problem solving methods. How to identify what data is important, how to collect that data, and then draw conclusions from it.*

Learning Out Comes:

After going through lab manual and experiments, the students will be able to understand:

- *Know, understand, and use a broad range of basic physical principles.*
- *a working capability with mathematics, numerical methods, and application of solutions.*
- *Will have a wide idea on various components & instruments.*
- *Additional problem -solving skills and practical experience are through design projects and laboratory assignments, which also provide opportunities for developing team- building and technical communication skills.*
- *Have an ability to learn independently.*

LIST OF EXPERIMENTS

(Any 10 out of the following experiments)

1. Interference fringes - measurement of thickness of a foil using wedge method.
2. Newton's rings - measurement of radius of curvature of Plano- convex lens.

3. Lissajous' figures - calibration of an audio oscillator.
4. Photo cell - characteristic curves and determination of stopping potential.
5. Diffrraction grating - measurement of wavelengths.
6. Torsional pendulum - determination of Rigidity modulus of a wire.
7. Photo-Voltaic cell - determination of fill factor.
8. Series LCR resonance circuit -determination of Q factor.
9. Sonometer - determination of A.C. frequency.
10. Laser - determination of wave length using diffraction grating.
11. B - H Curve
12. Optical Fiber - Determination of Numerical Aperture and Acceptance Angle

LEARNING RESOURCES

Reference Book :

Physics Lab Manual , R.V.R. & J.C. College of Engineering , Guntur.

I/IV Year B.Tech. - Second Semester

EE/EC/ME - 162 ENGLISH LANGUAGE LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives:

- *To identify various reasons for incorrect pronunciation and make the student understand and learn Standard Pronunciation, i.e., R.P.*
- *To develop skills to describe something, participate and present various presentations interesting and captivating.*
- *To provide sufficient understanding on the importance of reading and get to know the basic hurdles in efficient reading.*
- *To give a comprehensive understanding of having good vocabulary and learn large number of words.*
- *To make the student learn within a context by working out some situations using phrasal verbs and idioms.*

Learning Outcomes:

- *The student is able to speak with Standard Pronunciation.*
- *Able to participate in activities and make better presentations.*
- *Able to develop good and efficient reading skills.*
- *Able to acquire sufficient knowledge on vocabulary and also use them in day-to-day life.*
- *Able to use phrasal verbs and idiomatic expressions situationally.*

Phonetics

Introduction - Reasons for Incorrect Pronunciation - Received Pronunciation - Misconception about sounds. Sounds - Vowels - Consonants - Transcription - Problems of Indian English - Syllable - Word Stress - Weak Forms - Intonation.

Interactions : Dynamics of Professional Presentations - Individual & Group Presentations - Delivering Just-a-minute (JAM) Sessions - Body

Language - Group Discussions - Job Interviews- Public Speaking - Making Speeches Interesting - Delivering Different types of Speeches - Conversations, Dialogues and Debates - Features of a Good Conversation - Short Conversations - Telephonic Skills - Debate - Situational Dialogues.

Reading comprehension

The Art of Effective Reading - Benefits of Effective Reading - Types - Methods of Reading - Different Passages for Reading Comprehension - Reading Comprehension - Identifying the Central Idea - Inferring Lexical and Contextual Meaning.

Word origins

Introduction - Word Formation - Synonyms- Antonyms - Learning words through Situations - Substitution - Idioms - Phrasal Verbs - Developing Technical Vocabulary.

Idioms and phrases

What are phrasal verbs? What they mean? Particles in phrasal verbs - Nouns and Adjectives based on Phrasal Verbs. Types of Idioms - Idioms for Situations - Idioms that comment on People, Stories & Reports.

LEARNING RESOURCES

Text Books :

1. *Keep talking- Communicative fluency activities for language teaching, - Fiederike Klippelr, Cambridge Semester Press.*
2. *At the chalk face- Practical Techniques in Language Teaching - Alan Matthews,Mary spratt, Les Dangerfield, ELBS*
3. *Games for Language Learning - Andrew Wright, David Betteridge, Miclael Buckby, Cambridge Semester Press.*
4. *Interactive classroom activities (10 titles - Cambridge Publication)*
5. *Better English Pronunciation - J.D.O' Connor, Second Edition, 2009, Cambridge Semester Press.*

Software :

1. *Author plus - clarity*
2. *Call centre communication - clarity*

II/IV Year B.Tech.-Third Semester

ChE/ME - 211 COMPUTATIONAL TECHNIQUES

Lectures	:	*4 periods / week*	*Sessional Marks*	:	*40*
Tutorials	:	*1 period / week*	*Semester End Exam Marks*	:	*60*
Semester Exam	:	*3 hrs*	*Credits*	:	*4*

Course Objectives:

- *Focused in partial differential equations and their applications.*
- *Chemical Engineering applications are emphasized.*
- *Focused on numerical methods for Mechanical Engineering.*
- *Numerical solution of ordinary differential equations and partial differential equations.*

Learning Outcomes: *After completion of the course, student's posses:*

- *Solve first order linear and non linear, higher order linear partial differential equations.*
- *Solve the Laplace's equation and Wave equation for a variety of boundary conditions.*
- *Solve non linear equations and interpolating the values for the given data of equal and unequal intervals.*
- *Find the numerical solution of ordinary differential equations and partial differential equations.*

UNIT - I

Partial Differential Equations: Introduction, Formation of Partial Differential Equations, Solutions of a Partial Differential Equations, Equations solvable by direct integration, Linear equations of the first order, Non-Linear equations of the first order using 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. (15)

UNIT - II

Applications of Partial Differential Equations: Introduction, Method of separation of variables, One dimensional wave equation, One dimensional heat equation- steady and unsteady states, Two dimensional heat flow

equation- Steady state heat flow -Laplace's equation in Cartesian coordinates. (15)

UNIT - III

Numerical Methods: Solution of Algebraic and Transcendental Equations: Introduction, Newton-Raphson Method, Solution of Linear Simultaneous Equations: Gauss Seidel Iterative Method.

Finite Differences & Interpolation: Introduction, Finite difference operators, Symbolic relations, Differences of a polynomial, Newton's forward and backward interpolation formulae, Interpolation with Unequal intervals: Lagrange's Interpolation, inverse interpolation.

Numerical Differentiation: Finding first and second order Differentials using Newton's formulae.
(15)

UNIT - IV

Numerical Integration: Trapezoidal rule, Simpson's one-third rule.

Numerical Solutions of Ordinary Differential Equations (first order): Picard's Method, Euler's Method, Runge-Kutta Method of fourth order, Simultaneous equations (R K method).

Numerical Solutions of Partial Differential Equations: Classification of Partial Differential Equation of second order, Solutions of Laplace's and Poisson's Equations by iteration methods. (15)

LEARNING RESOURCES:

TEXT BOOK:

Higher Engineering Mathematics, B.S.Grewal, 40th edition, Khanna publishers, New Delhi, 2007.

REFERENCE BOOKS:

1. *Advanced Engineering Mathematics by Erwin Kreyszig, Johnwiley & Sons, 8th edition, 2007.*
2. *A text book of Engineering Mathematics by N.P. Bali, Lakshmi publications, 6th edition, 2003..*

Web References

- *www.wikipedia.com*
- *NPTEL Lectures (IIT M)*

II/IV Year B.Tech. - Third Semester

ME - 212 MECHANICS OF MATERIALS- I

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

Mechanics of Materials deals with the behavior of solid bodies subjected to various types of loading. This course allows engineers to design structures, predict failures and understand the physical properties of materials. The objectives of this course are to.

- *Understand basic concepts of stress, strain and their relations based on linear elasticity. Material behaviors due to different types of loading will be discussed.*
- *Compute stresses and deformation of a member due to an axial loading under uniform and non-uniform conditions.*
- *Derive mathematically torsion equation and apply the torsion equation to compute torsional stresses in solid and hollow shafts.*
- *Understand the theory of simple bending.*
- *Compute combined stresses and strains at a point across any plane in a two dimensional system.*

***Learning Outcomes**:*

At the end of this course students will be able to

- *Analyze and design structural members subjected to tension, compression, and torsion and bending using fundamental concepts of stress, strain and elastic behavior*
- *Calculate combined stresses and strains at a point across any plane in a two dimensional system and principal stresses.*
- *Apply graphical and analytical methods to compute principal stresses and strain and locate principal planes*
- *Conduct themselves professionally and with regard to their responsibilities to society, especially with respect to designing structures to prevent failure.*

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)

Thermal Stress and Strain, 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 Modulus of Elasticity(E)and Modulus of Rigidity(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)

LEARNING RESOURCES

TEXT BOOKS :

1. *Mechanics of Materials by Gere and Timoshenko, C B S Publishers , 2nd edition , 2011*
2. *Strength of materials by Sadhu Singh, Khanna Publishers , 10th Edition .*

REFERENCE :

1. *Engineering Mechanics of Solids by E.P.Popov , PHI , 2nd Edition*
2. *Introduction to Solid Mechanics by I.H. Shames , PHI , 3rd Edition.*
3. *Strength of Materials by R.S. Khurmi , S.Chand , 2nd Edition , 2012.*

COURSE RELEVANT WEB SITES FOR REFERENCE

- *http://nptel.iitm.ac.in/*
- *www.learnerstv.com/Free-Engineering-video-lecture-courses.htm*

II/IV Year B.Tech.- Third Semester

ME - 213 THEORY OF MECHANISMS & MACHINES

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives

- *Defines terms associated with mechanisms and machines. Gives the classification of Kinematic Pair and mechanisms.*
- *Determines velocity for various links in mechanisms using velocity diagram. Determines acceleration for various links in mechanisms.*
- *Determines Instantaneous centre for various mechanisms.*
- *Brief study of Stages of synthesis and Concepts of type, Number and dimensional synthesis.*
- *Introduction of cams and their classification, design of cam profile by using Graphical synthesis for various followers such as Knife Edge, Roller and Flat faced Followers.*
- *Explains various terms used in Gear terminology. Gives the Comparison of various tooth forms.*
- *Gives the classification of Gear Trains.*

Learning Outcomes

- *Students can determine the velocities of links in various mechanisms by drawing velocity diagrams. Ability to determine the accelerations of links in various mechanisms by drawing acceleration diagrams.*
- *Understands the concepts of synthesis.*
- *Ability to analyze data and design Cam systems for various followers.*
- *Understand the concepts of Gear terminology and can do numerical problems on Gears.*
- *Ability to indentify data, formulate and solve problems on Gear trains.*

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)

Accelaration 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)

LEARNING RESOURCES

TEXT BOOKS :

1. *Theory of Machines of by S.S.Rattan. TMH, second re print , 2009.*
2. *Theory of Mechanisms and Machines by C.S.Sharma, Kamlesh Purohit, PHI , 2006.*

REFERENCE BOOK :

1. *Theory of Mechanisms and Machines by Ghosh and Mallik , East West Press, New Delhi,Re print 2000.*
2. *Theory of Mechanism and Machine by J.E. Shigley, MGH , 2nd Edition.*

WEB REFERENCES :

- http://nptel.iitk.ac.in
- http://ptumech.loremate.com/tom1/node/1
- http://www.youtube.com/watch?v=6coD3oOuhr8

II/IV Year B.Tech. - Third Semester

ME - 214
CASTING, WELDING & METAL WORKING PROCESSES

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives

During the course, students would gain the knowledge of

- *Basic aspects of pattern preparation, constituents, preparation and testing of sand molds.*
- *Basics of cupola furnace and operations.*
- *Principle, procedure, and applications of various special casting methods.*
- *Various defects, their causes and remedies and Procedure for cleaning of casting.*
- *Principles of operation, applications, advantages and disadvantages of various welding processes. Various Welding defects, their causes and remedies.*
- *Basics of hot and cold working processes.*
- *Fundamentals of rolling, forging, extrusion, tube making, swaging, spinning, coining and wire drawing processes and their applications.*
- *Fundamentals of sheet metal working, and high energy rate forming processes.*

Learning Outcomes

At the end of this course, the students will be able to

- *Choose proper pattern material and able to design a pattern*
- *Choose proper constituents and prepare sand molds*
- *Control various casting defects.*
- *Choose proper welding processes for the given application*
- *Control various welding defects.*
- *Choose proper metal working processes for the given application*

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. Ultrasonic welding and Adhesive bonding, Brazing & Soldering, welding defects - causes and remedies. (15)

UNIT- IV

Metal Working Processes : Introduction, Hot and Cold working of metals.

Rolling : Types of rolling mills, roll passes

Forging : Types, description and types of forging, defects in forged parts.

Extrusion : Classification, description and application of extrusion process, Tube making, Swaging, Spinning, Coining, Embossing and Wire drawing, Explosive forming and electro hydraulic forming. (15)

LEARNING RESOURCES

TEXT BOOKS:

1. *Manufacturing Technology-Vol- I by PN Rao,TMH , 3rd Edition , 2009.*
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,9th Edition 2002..*

REFERENCE BOOKS:

1. *Welding Technology by Little, TMH , 2001.*
2. *Principles of Metal Casting by Heine, Loper, Rosenthal, TMH , 2005.*
3. *Manufacturing Engineering & Technology, Kalpakjain, Pearson Education , 4th Edition.*

WEB REFERENCES :

- *NPTEL Lectures*
- *http://teacher.buet.ac.bd/shabnam/14250_ch3.pdf*
- *http://me.emu.edu.tr/majid/MENG364/2_casting.pdf*
- *http://en.wikipedia.org/wiki/Metalworking*

II/IV Year B.Tech.- Third Semester

ME 215 - BASIC THERMODYNAMICS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives

- *To make the student distinguish among system, boundary and surroundings and grasp the concept of temperature.*
- *To make the student to differentiate between work & heat and explain the internal energy.*
- *Student will be able to solve the problems that occur in thermal systems.*
- *Student can understand the concepts of heat engine and refrigerator and calculate Thermal Efficiency and COP.*
- *Student can calculate the entropy change in any process and in a cycle and calculate maximum work that can be obtained from a system.*
- *Student can explain the various processes of any thermodynamic cycle and derive the relevant expressions for thermal efficiency and MEP of the given cycle.*

Learning Outcomes

- *Students can analyze and synthesize various processes and cycles.*
- *Evaluate energy output, efficiency, and amount of heat energy required for various thermal systems.*
- *Explain the various concepts in thermodynamics and differentiate between work producing and work consuming equipment.*
- *Evaluate the output of various thermal power plants.*
- *Apply his knowledge of basics for planning, design, erection and operation of any power plant.*

UNIT I

Fundamental Concepts and Definitions: Introduction, Macroscopic and microscopic points of view, Thermodynamic system and control volume, Perfect gases, Gas laws, 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. (10)

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. (5)

UNIT II

First Law of Thermodynamics for Non-Flow Systems: First law of Thermodynamics 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 Law of Thermodynamics for Flow Systems: 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 Clausius, 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. (9)

UNIT IV

Availability & Irreversibility: Introduction, Available energy referred to a Cycle, Quality of energy, Maximum work in a reversible process, Availability in Steady flow process. (7)

Air standard Cycles: Air standard Otto, Diesel, Dual Combustion and Brayton cycles, Air standard efficiency and MEP. (8)

LEARNING RESOURCES

TEXT BOOKS:

1. *Engineering Thermodynamics- P.K.Nag, TMH, New Delhi,2009.*
2. *Thermal Engineering- M.M. Rathore, TMH, New Delhi,2010.*
3. *Thermal Engineering -Rajput, Laxmi Publ, New Delhi,2012.*

REFERENCE BOOKS:

1. *Fundamentals of Engineering Thermodynamics-Rathakrishnan-PHI, 2nd Edition, New Delhi.*
2. *Thermodynamics -- J.P.Holman, 4th Edition,MGH, New York,2002.*
3. *Engineering Thermodynamics-Cengel & Boles, TMH,2000.*

Books in Digital Library

- *www.nptel.iitm.ac.in*

Relevant web sites

- *www.sciencedirect.com*
- *www.2.accessengineeringlibrary.com.*
- *www.asmedl.aip.org*
- *www.ieee.org/ieeexplore*
- *www.springerlink.com*

II/IV Year B.Tech. - Third Semester

ME - 216 FLUID MECHANICS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To be familiar with all the basic concepts of fluids and fluid flow phenomenon.*
- *To be familiar with the basic concepts of conservation equations and their applications to simple problems.*
- *To be familiar with concepts of basic boundary layer theory.*
- *To be familiar with basic concepts of compressible fluids.*

Learning outcomes:

- *Students are familiarized with all fluid properties.*
- *Students are familiarized with flow patterns.*
- *Students are familiarized with conservation equations with its applications for both incompressible and compressible flows,*
- *Students are familiarized with boundary layer concepts*

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, 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, , Laminar flow through a circular pipe, Hagen-Poiseulle law, Friction losses. (12)

UNIT IV

Boundary Layer Concepts: Introduction, boundary layer on a flat plate and its growth, Boundary layer in a pipe flow and calming length , boundary layer thickness on a flat plate, separation of boundary layer. (6)

Introduction to Compressible Fluid Flow: Equation of state, Gas laws, Equation of Continuity, momentum and Energy, compressible flow regimes, Mach number, Mach cone, Shock waves, Stagnation point. (9)

LEARNING RESOURCES

TEXT BOOKS:

1. *Hydraulics and fluid mechanics -P.N.Modi & S.M.Seth, Standard Book House, New Delhi,1977..*
2. *Fluid Mechanics and Fluid machines - Agarwal, TMH,2007.*

REFERENCE BOOKS:

1. *Fluid Mechanics and hydraulic machines-R.K.Bansal, Lakshmi Publications , 9th Edition , 2005.*
2. *Fluid mechanics and fluid power engineering - D.S.Kumar, SK Kataria & Sons New Delhi, Reprint 2012..*
3. *Fluid mechanics including Hydraulic machines - A.K.Jain , 8th Edition , 1995.*
4. *Fluid Mechanics-K.L.Kumar , S. Chand Publishers , 2008.*

WEB REFERENCES:

- *http://www.iscid.org/encyclopedia/Fluid_Mechanics.*
- *http://www.iscid.org/encyclopedia/Fluid_Mechanics.*
- *http://fluid.power.net/*
- *www.mastep.sjsu.edu/resources/engineer.htm*

II/IV Year B.Tech. - Third Semester

ME - 251 MACHINE DRAWING & COMPUTER AIDED DRAFTING

Drawing	*: 6 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives:

- *To make the students understand the concepts of sectioning & method of representing full & half sectional views of various symmetrical & asymmetrical components.*
- *To make the students understand the nomenclature associated with screw threaded fasteners, methods to represent and drawing of internal as well as external screw threads.*
- *To make the students understand the uses of keys, cotters & pins temporary joints possible between two shafts or shaft & hub.*
- *To make the students understand and draw assemblies of machine parts and to draw their sectional views.*
- *To make the students well versed in using the AUTOCAD drafting software for drawing various mechanical components and Assemblies.*

Learning Out Comes:

- *At the end of the course, students will be able to identify and classify the functionalities of various machine elements such as vices, bearings, screw jacks, shafts, fasteners, keys, cotters, pins..etc and their assemblies.*
- *The students will be able to draw full and half sectional views of machine parts and their assemblies both manually and by using software packages such as AUTOCAD.*

MACHINE DRAWING:

1. **Sectional views :** Introduction, full & half section
2. **Screwed fasteners :** Screw thread nomenclature - types & classification of screw threads, Square & Hexagonal headed bolted joints.
3. **Keys, Cotters and Pin joints :** Saddle & Sunk Keys, Cotter Joint with sleeve , Knuckle Joint
4. Assembly Drawings : Stuffing Box , Screw Jack , Eccentric , Pipe - Vice

COMPUTER AIDED DRAFTING (CAD) :

1. **Introduction:** Basic Drawing, Modify, editing & dimensioning commands, layers, AutoCAD - Screen Menus
2. Sectional views of castings
3. Assembly Drawings : (Any Two)

   a. Pipe vice, b. Lathe Tail Stock ; c. Swivel Bearing ; d. Screw Jack
4. Part Drawings : (Any Two)

   a. Single tool post ; b. Petrol Engine Connecting Rod ; c. Angular - plummer block

LEARNING RESOURCES

Text Book :

1. *Machine Drawing by K.L.Narayana, P.Kannaiah & K.Venkata Reddy, New Age International , 3rd Edition .*
2. *AutoCAD-14 for Engineering Drawing Made Easy by P.Nageswara Rao, TMH, 2010.*

REFERENCE BOOKS :

1. *Machine Drawing by K.R.Gopala Krishnan , Subhas Publications, 20th Edition, 2007.*
2. *An Introduction to AutoCAD 2000 by A.Yarwood, Longman Publishers.*

WEB RESOURCES:

- webserver.ignou.ac.in/schools/.../Machine%20Drawing/.../Unit-1.pdf
- ptumech.loremate.com/mdr/
- www.jtbworld.com/autocad.htm

II/IV Year B.Tech. - Third Semester

ME - 252 FLUID MECHANICS & STRENGTH OF MATERIALS LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

FM LAB

Course Objectives:

- *Apply fundamental principles of fluid mechanics for the solution of practical Mechanical engineering problems of water conveyance in pipes, pipe networks, and open channels.*
- *Describe the operating characteristics of hydraulic machinery (pumps and turbines), and the factors affecting their operation and specifications, as well as their operation in a system.*

Learning Outcomes

Upon completion of this course, students should be able to:

- *Apply fundamental knowledge of fluid mechanics in solving problems and making design of pressure-pipe in Mechanical and environmental engineering*
- *Understand the basics of hydraulic machinery and their operation design in water systems.*
- *Conduct experiments in flow measurement, hydraulic machinery and interpreting data from experiments, as well as documenting them in engineering reports*

SM LAB

Laboratory experiments cover the area of materials testing; including tension test, shear test, impact test and hardness test.

Course Objectives:

- *understanding the basic strength of materials principles by conducting experiments*
- *Learn to analyze and synthesize test results, write individual and group reports Incorporating experimental data, graphs, assessment of results, and conclusions*
- *To give more understand in basic of structural field*

Course outcomes

- *Ability to design and conduct experiments, acquire data, analyze and interpret data*

- *Physical insight into the behaviour materials and structural elements, including distribution of stresses and strains, deformations and failure modes*
- *Write individual and group reports: present objectives, describe test procedures and results, synthesize and discuss the test results, present conclusions.*

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

FLUID MECHANICS LAB:

1. Orifice - Determination of coefficient of discharge
2. Venturi 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.

STRENGTH OF MATERIALS LAB:

1. (a) Rockwell Hardness test - Determination of Hardness Number for different metal specimens such as mildsteel, cast iron, Brass, Aluminum (b) Brinnell's Hardness Test,
2. Impact Test - (a) Charpy and (b) lzod: Determination of impact strength of mild steel and cast iron specimens
3. Tension Test on UTM - Determination of mechanical properties of mild steel and cast iron specimens.
4. Tests on helical spring - Determination of stiffness of Helical springs.
5. To find the modulus of rigidity by conducting torsion test on solid circular shaft

II/IV Year B.Tech. - Third Semester

ME - 253 COMMUNICATION SKILLS LAB

Practicals	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives

- *To incorporate creativity and innovative thinking in problem solving using well structured and logical reasoning.*
- *To bring about an understanding of the importance of interpersonal skills in both professional and personal lives.*
- *To extend their abilities to: read fluently and confidently.*
- *To train the students to make inferences from information in a sentence or paragraph, cause and effect logic, functional concepts and context clues.*

Learning Outcomes

- *Arrive at objective, well-reasoned decisions in reasonable time.*
- *Comprehend and use language with accuracy, clarity, and discernment.*
- *Students express ideas in a non-judgmental environment which encourages synthesis and creative applications.*
- *Nurture students' cognitive abilities*.

1. Analytical Thinking

- Emotional intelligence, emotional quotient, cognitive skills, analysis and logical thinking, creative thinking and lateral thinking
- Managing anger, failures, disappointments
- Positive approach

Interpersonal Skills / People Skills

2. Behavioral skills -
    - Attitude, self esteem, time management, punctuality, confidence, integrity
    - Case studies
    - Role play
    - Mock press
3. Listening skills - Effective listening
4. News paper reading - Reading aloud
5. Group discussion - Do's and Don'ts, modulation of voice
    - Case Studies

LEARNING RESOURCES

TEXT BOOKS:

1. *Listening skills - Shrinky Slicy*
2. *Call centre Stories - Case Studies.*

REFERENCE BOOKS:

1. *Kevin Gallagher, Skills Development for Business and Management Students.1st edition, Oxford university press. 2010.*
2. *Daniel Goleman, Working with Emotional Intelligence (1998) Bantam Books*
3. *Hari Mohan Prasad &Rajnish Mohan, How to prepare for Group Discussions and Interview, 2nd edition, TMT*

II/IV Year B.Tech. Fourth Semester

ME/ChE - 221 PROBABILITY AND COMPLEX ANALYSIS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To connect Fourier transforms and special functions to real world applications.*
- *To introduce the undergraduate students to complex analysis as it is widely used in the fields of science and technology.*
- *To gain a geometric understanding of complex analysis functions, as well as developing computational skills in employing the powerful tools of complex analysis for solving theoretical and applied problems.*
- *To understand the basic concepts of probability and statistical inference, including confidence interval, sampling size and hypothesis testing.*

Learning Outcomes: *After completion of the course, student's posses:*

- *Understand and apply basic concepts of probability including calculating conditional and un-conditional probabilities.*
- *Understand the basic concepts of statistical inference, including confidence intervals, sample size and hypothesis testing.*
- *Determine analytic function and can find the harmonic conjugate.*
- *Apply Cauchy-Riemann equations and harmonic functions to problems of fluid mechanics, thermodynamics and electromagnetic fields.*
- *Integrate the given complex functions and can evaluate the real definite integrals.*

UNIT - I

Integral Transforms: Introduction, Definition, Fourier Integral Theorem (without proof), Fourier sine and cosine integrals, Complex form of the Fourier Integral, Fourier Transforms, Fourier sine and cosine transforms.

Complex Analysis: Introduction, Continuity, Cauchy's Riemann equations, Analytic Functions, Harmonic functions, Orthogonal system. (15)

UNIT - II

Complex Integration: Cauchy's Integral Theorem, Cauchy's Integral Formula.

Conformal Mapping: Conformal mapping, Linear fractional transformations, Special linear fractional transformations, Mapping by other functions. (15)

UNIT - III

Series: Taylor's Series (without proof), Laurent's Series (without proof).

Calculation of residues: Zeroes and Singularities, Calculation of residues, Evaluation of real definite integrals (by applying the residue theorem). (15)

UNIT - IV

Probability and Distributions: Probability and problems related to probability - addition theorem, multiplication theorem, Baye's theorem, Binomial distribution, Poisson distribution, Normal distribution.

Sampling and Inference: Sampling, Testing a Hypothesis, Sampling of Variables - large and small samples (Tests Concerning Means), Chi-Square test: Definition, Goodness of fit. (15)

LEARNING RESOURCES:

TEXT BOOK:

Higher Engineering Mathematics, B.S.Grewal, 40th edition, Khanna publishers, New Delhi, 2007.

REFERENCE BOOKS:

Advanced Engineering Mathematics by Erwin Kreyszig, Johnwiley & Sons, 8th edition, 2007.

WEB REFERENCES

- *www.wikipedia.com*
- *NPTEL Lectures (IIT M)*

II/IV Year B.Tech. - Fourth Semester

ME - 222 MECHANICS OF MATERIALS - II

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives

- *Derive and use the relationship between moment, slope and deflection.*
- *Understand the stability and buckling phenomena of columns subjected to axial loads.*
- *Analyze stresses in thin shells and spheres subjected to internal pressure.*
- *Compute stresses in crane Hook, rings of various section and chain links.*
- *Understand the bending axis and shear centre.*
- *Calculate centrifugal stresses in case of rotating ring, rotating disc and rotating disc with uniform strength.*

Learning Outcomes :

At the end of this course the student will be able to

- *Analyse fixed, propped cantilever and continuous beams*
- *Analyse and design of colums subjected to compression.*
- *Calculate the shear centre for various sections.*
- *Analyse and design thin and thick pressure vessels*
- *Calculate the centrifugal stresses in case of ring, disc and disc of uniform strength.*

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. 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)

LEARNING RESOURCES

TEXT BOOK :

1 *Mechanics of Materials by Gere and Timoshenko, C B S Publishers , 2nd edition , 2011*

2. *Strength of materials by Sadhu Singh, Khanna Publishers , 10th Edition .*

REFERENCE:

1. *Engineering Mechanics of Solids by E.P.Popov , PHI, 2nd Edition*

2. *Advanced Solid Mechanics by L.S. Srinath , TMH , 3rd Edition , 2009.*

WEB RESOURCES

- *http://nptel.iitm.ac.in/*
- *www.learnerstv.com/Free-Engineering-video-lecture-courses.htm*
- *http://en.wikibooks.org/wiki/Strength_of_Materials*

II/IV Year B.Tech. - Fourth Semester

ME - 223 ELECTRICAL TECHNOLOGY

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *Study of network elements, various conventions, network theories based on DC and based on AC*
- *The poly phase circuits and the advantages of poly phase systems and the star and delta conversions will be studied.*
- *Learns the functions and construction of DC machines, AC Machines and Transformers.*
- *A brief idea of Induction motors i.e. Three phase and Single phase Induction motors along with Synchronous Machines is given.*
- *The utilization of Electrical Measuring Instruments, Electrical Heating and Electric Traction.*

Learning Outcomes:

- *Upon the completion of this subject the Graduate will have a wide idea on Construction, Design and Operation of Electrical Machines and Utilization of Electrical Energy.*
- *A Graduate knows how an Electric Machine Works and its application in Real time i.e. Electric Traction*
- *The Graduate will be able to design the various Parts of the Electrical Machines.*
- *The Graduate Knows how the Electrical quantities are measured with Measuring Instruments.*

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. (8)

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. (8)

Utilization: Principles of resistance and induction heating - principles of electrical traction-speed time characteristics.

LEARNING RESOURCES (7)

TEXT BOOKS :

1. *Electrical Technology by B.L. Theraja, (S. Chand & Co.) , 2005. Vol-I and Vol-II*
2. *A course in Electrical Power by Soni, Gupta, Bhatnagar, Dhanpati rai & Sons, 1963.*

REFERENCE BOOKS :

1. *Electrical Technology by H. Cotton (Sir Issac Pittman & Sons Ltd., London), 1944.*
2. *Utilization of Electrical Energy by Openshaw & Taylor , English Semester press, 1946*
3. *Generalsied theory of Electrical Machines by P.S. Bimbra , KhannaPublishers, 1995.*
4. *Electrical Technology by B. Hughes (ELBS) , Longman ,1960*

Course relevant websites:

- *http://ieee-elearning.org/course/category.php?id=18*
- *http://www.virtualcollege.org/course/registered_pages/b123/9467.htm*
- *NPTEL -Electrical Technology*

II/IV Year B.Tech.- Fourth Semester

ME - 224 MATERIAL SCIENCE & METALLURGY

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *Provides a basic concept of crystal structures and deformations.*
- *Explains the importance of phase diagrams and compares the various binary and ternary phase diagrams.*
- *Conveys the significance of heat treatment and various heat treatment processes.*
- *Explains various properties and applications of composite materials.*
- *Explains concept of powder metallurgy and its applications.*
- *Provides basic concept and applications of Ferrous, Non Ferrous metals & alloys and Nano materials.*

Learning Outcomes: *After the completion of the course, the student*

- *Differentiates various phase diagrams in a binary systems. Possess basic principles of ternary diagrams.*
- *Gains the knowledge of phase transformation and able to compare the mechanism of both Martensitic and Bainitic phase transformations.*
- *Recognizes the purpose of heat treatment and important heat treatment processes.*
- *Gains knowledge in composite materials such as functions, properties, types and its applications.*
- *Familiar in powder metallurgy concepts, advantages, limitations and its wide applications.*
- *Familiar with Cast Iron, Steel, Copper, Aluminium and Nano materials in terms of its uses and applications.*

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, Austenite to pearlite, 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. (6)

Forming and shaping of plastics -Injection and Blow moulding techniques (2)

UNIT - IV

Powder Metallurgy: Powder metallurgy process, preparation of powders, characteristics of metal powders, mixing, compacting, sintering, Applications of Powder Metallurgy. (7)

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)

LEARNING RESOURCES

TEXT BOOKS:

1. *Introduction to Physical Metallurgy - Avner, McGrawHill , 2nd Edition ,1997*
2. *Material Science and Metallurgy - V. Raghavan, Pearson Education / PHI 5th Edition , 2004*
3. *Material Science and Metallurgy - R.B.Choudary - Khanna Pub , 1st Edition.*

REFERENCE BOOK:

1. *Material Science and Metallurgy - Dr.V.D.Kodgire, Everest Publishers , 2008.*
2. *A Text Book of Material Science and Metallurgy , O.P. Khanna , Dhanapat Rai Publiacations , 2012.*

Web References :

- www.asminternational.org
- henry.wells.edu
- www.ce.berkeley.edu
- www.sjsu.edu

II/IV Year B.Tech. - Fourth Semester

ME 225 - APPLIED THERMODYNAMICS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To make the student understand the process of generation of steam and working cycles of steam power plants.*
- *To understand the working of components of Steam Power plant.*
- *To know the various methods of refrigeration, their relative merits and demerits.*
- *To know the various air conditioning methods.*

Learning Outcomes:

- *The student will be able to have clear idea, about the properties of steam, the use of steam tables, use of Mollier chart.*
- *Able to understand the working of steam turbines, steam nozzles, steam condensers.*
- *Able to grasp throurough knowledge of refrigeration and Air-Conditioning systems.*
- *Knowledge about psychrometric properties, processes and Psychrometric chart.*

UNIT I

Steam Boilers: Function, classification, working of Benson & LaMont boilers, Mountings & Accessories. (4)

Pure Substance: Definition, process of steam generation, P-v, T-s and h-s diagrams, properties of Wet, Dry Saturated and Superheated steam, Use of Steam Tables, Mollier chart. (5)

Vapor Power Cycles: Rankine cycle, Effect of pressure and temperature on the Rankine cycle performance reheat cycle, regenerative cycle. (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 and Heat pump, Bell-Coleman cycle, Refrigerating effect, COP, Vapour compression refrigeration system, Influence of various parameters on cycle performance, Vapour Absorption cycle. (9)

Psychrometry and Air conditioning: Introduction, Psychrometric properties, Psychrometric chart, Psychrometric processes, Types of Air conditioning systems. (6)

LEARNING RESOURCES

TEXTBOOKS:

1. *Treatise on Heat Engineering-V.P.Vasandani and D.S.Kumar, Metropolitan Book co, New Delhi, 4th Edition.*
2. *Thermal Engineering ---Rajput, Laxmi Publ, New Delhi , 2012.*
3. *Thermal Science and Engineering- D.S.Kumar, S.K.Kataria Publ, New Delhi, 2010.*

REFERENCE BOOKS:

1. *Engineering Thermodynamics----Cengel and Boles, TMH , 2008..*
2. *Refrigeration and Air Conditioning -- C.P. Arora, TMH.*
3. *Engineering Thermodynamics-Achuthan, PHI, New Delhi , 2nd Edition..*

WEB REFERENCES:

- *http://www.iscid.org/encyclopedia/Tthermodynamics.*
- *http://www.transtutors.com/*

Note: Use of Steam Tables by R. S. Khurmi and Refrigeration and Psychrometric properties by M.L. Mathur and F.S. Mehta is permitted in Semester Examinations.

II/IV Year B.Tech. - Fourth Semester

ME - 226 HYDRAULIC MACHINES

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To be familiar with the momentum and angular momentum principles*
- *To be familiar with the Impact of jets.*
- *To be understand working of various turbines such as pelton wheel, Francis and Kaplan turbines.*
- *To be understand working of centrifugal and reciprocating pumps*
- *To be familiar with the different hydraulic systems.*

Learning Outcomes:

- *Students can able to understand the basic principles of impact of jets*
- *Easy to analyses the practical problems regarding various turbines arises in the Industries and hydro power plants*
- *Students can solve various engineering problems related to the centrifugal and reciprocating pump used in agriculture, domestic and industrial purposes*
- *Ability to Specify and select suitable hydraulic machines needed for your specific system head requirements on their projects*
- *Understand the basic principles of hydraulic equipments such as Hydraulic accumulator, intencifier, lift, ram, press used in various industrial and fluid transmission system even in hill areas*

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. (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. (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.(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)

LEARNING RESOURCES

TEXT BOOK:

1. *Hydraulics and Fluid Mechanics --P.N.Modi & S.M. Seth, Standard Book House, New Delhi , 1977.*
2. *Hydraulic Machines - Jagadish Lal ,MPP, 1994.*

REFERENCE BOOKS:

1. *Fluid Mechanics & Fluid Power Engineering - D.S.Kumar, SK Kataria &sons, New Delhi , 2012 Re Print..*
2. *Fluid Mechanics & Hydraulic Machines - R.K.Bansal , Laxmi Publications, 2005*

WEB REFERENCES:

- *www.hydraulicspneumatics.com/*
- *www.waterengr.com/*
- *http://www.efluids.com/*
- *http://fluid.power.net/*
- *www.pumps.org/*

II/IV Year B.Tech. - Fourth Semester

ME - 227 ENVIRONMENTAL SCIENCE

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives

- *To Create an awareness on various environmental pollution aspects and issues*
- *To give a comprehensive insight into natural resources , eco system and bio diversity*
- *To educate the ways and means to protect the environment from various types of pollution*
- *To impart some fundamental knowledge on human welfare measures and environmental acts*
- *To demonstrate the environmental problems like global warming , ozone layer depletion and acid rains.*

Learning Outcomes

The students are able

- *To define and explain the basic issues concerning the ability of the human community to interact in a sustainable way with the environment.*
- *To describe and discuss the environmental implications of the cycles of biologically important materials through the eco system.*
- *To discuss the benefits of sustaining each of the following resources; food, health , habitats, energy , water ,air , soil and minerals*
- *To understand the causes, effects and controlling measures of different types of environmental pollutions with some case studies*

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

LEARNING RESOURCES

Text Books

1. *Environmental Studies, by Dr. Suresh K. Dhameja, Published by S.K. Kataria & Sons, Ludhiana., 2009-10.*
2. *Environmental studies by Anubha Kaushik and C.P.Kaushik., New Age International Publishers, New Delhi., 3rd Edition, 2012.*

Reference Books

1. *T Benny Joseph, Environmental Studies, the Tata McGraw-Hill Publishing Company Limited, New Delhi., 3rd print, 2006.*

II/IV Year B.Tech. - Fourth Semester

ME 261 - BASIC MANUFACTURING PROCESSES LAB

Practicals	*:*	*3 periods / week*	*Sessional Marks*	*:*	*40*
			Semester End Exam Marks	*:*	*60*
Semester Exam	*:*	*3 hrs*	*Credits*	*:*	*2*

Course Objectives:

- *Students to know the working of lathe machine tool.*
- *Students to know preparation of moulding sand and making of moulds of different shapes and sizes.*
- *Students to know the cavities, and generating different shapes of moulds*
- *Students to know the making of a pattern which is used in mould*
- *Students to know the different types of fitting with metal plates*

Learning Outcomes:

- *Implementation of techniques and methods for performing different lathe operations, fitting operations and producing castings of different shapes.*

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.

LEARNING RESOURCES

REFERENCE BOOKS

1. Kannaiah P. & Narayana K. C., "Manual on Work Shop Practice", Scitech Publications, Chennai

II/IV Year B.Tech.- Fourth Semester

ME - 262

COMPUTER APPLICATIONS IN MECHANICAL ENGINEERING LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives:

- *The Lab helps the students to gain knowledge and skills needed for writing to use the C-code for applications in an mechanical engineering context.*

Learning Outcomes

- *Able to write programmes for mechanical engineering applications*
- *Abe to know the graphic commands and the students shall be in a position to write code for simulation of mechanisms*
- *Able to use software package like TORA to obtain results for operation research applications*

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.

III/IV Year B.Tech. - Fifth Semester

ME - 311 OPERATIONS RESAERCH

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

The objective of this course is to help students getting the following capabilities and competencies:

- *Grasp the methodology of OR problem solving.*
- *Understand and differentiate deterministic/probabilistic/stochastic static and dynamic problem solving situations.*
- *Develop formulation skills in building models*
- *Understand the basics in the field of queuing and game theory*
- *Be able to understand and interpret solutions with simulation and decision theory*

Learning Outcomes:

- *The student will develope the skills to consider real-world problems and determine whether or not linear programming is an appropriate modeling framework*
- *Develop linear programming models that consider the key elements of the real world problem*
- *Interpret the models' solutions and infer solutions to the real-world problems.*
- *Recognize and solve transportation and assignment problems.*
- *Explain the basics in the field of queuing models and Game theory.*
- *Know when simulation and decision theory can be applied in real-world problems.*

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

Queuing Theory: Queuing systems and their characteristics. Analysis of Markovian chains, Transition diagram, M/M/1 : FCFS/ ∞/ ∞ and M/ M/1 : FCFS/ ∞ /N queuing models.

Theory of games: Introduction, Rectangular two person zero person games, solution of rectangular games in tems of mixed strategies , solution of 2x2 games without saddle points, concept of dominance to reduce the given matrix , graphical method for 2xn and nx2 games (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.

Decision Theory: Introduction , decision under certainty , Decision under risk- expected value criterion , expected value combined with variance criterion , decision under uncertainity , decision tree. (15)

LEARNING RESOURCES

TEXT BOOKS:

1. *Operations Research - H.A. Taha , Pearson , 7th Edition, June 2002.*
2. *Introduction to Operations Research - Hiller and Liberman , MGH , 7th Edition , 2002.*
3. *Operations Research - R. Pannerselvam , PHI , 2nd Edition, 2006.*
4. *Quantitative techniques for management - V.Vohra , TMH , 3rd Edition.*

REFERENCES:

1. *Introduction to Operations Research - Phillips, Ravindran, James Soldberg Wiley 1976.*
2. *Optimization Theory and Applications - S.S. Rao, Wiley 1979.*
3. *Operations Research - S.D. Sharma, Kedar nath Ram nath & Co, 11th Edition , 2002.*
4. *Operations Research - Gupta and Hira , S. Chand , 2008.*

Web references:

1. *http://www2.informs.org/Resources/*
2. *http://www.mit.edu/~orc/*
3. *http://www.ieor.columbia.edu/*
4. *http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/origin.htm*
5. *http://www.wolfram.com/solutions/OperationsResearch/*

III/IV Year B.Tech. - Fifth Semester

ME - 312 DESIGN OF MACHINE ELEMENTS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objective:

- *This course is meant to formulate a practical problem and use the engineering tools and engineering sciences to solve it.*
- *To illustrate the integration of design principles, materials selection and fundamentals of design concepts.*
- *The loading conditions and accompanied stress and strain, forces, moments, torques to develop ability to analyze, design and/or select machine elements such as screws, fasteners, threaded joints under static conditions*

Learning Outcomes:

- *This course provides the knowledge to design simple mechanical components subjected to static loads and their failure and concept of factor of safety in design of simple mechanical parts*
- *To apply knowledge in designing mechanical components subjected to stress concentration combined static & variable loads by applying Soderberg, Goodman & Gerber's Equations. The student will be able to design power screws like screw jack subjected to various stresses.*
- *To design riveted joints, including boiler joint and lozenge joint subjected to internal pressure, axial loads & eccentric loads.*
- *Develop and use appropriate analytical models and software for design, modeling, and analysis*

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)

LEARNING RESOURCES

TEXT BOOKS:

1. *Design of Machine Elements by V.B. Bhandari, Tata McGraw Hill , 3rd Edition , 2010.*
2. *Machine Design by P.C. Sharma & D.K. Agarwal., S.K. Kataria & Sons , 2003.*
3. *Design of Machine Elements by C.S. Sharma & K. Purohit ,PHI Ltd,2005.*

HAND BOOKS TO BE ALLOWED IN SEMESTER EXAMINATION:

1. *Design data book, P.S.G. College of Technology, Coimbatore*
2. *Design data book, Mahadevan & Balaveera Reddy - CBS Publications , 1984.*

COURSE RELEVANT WEBSITES:

- *http://www.learnerstv.com/Free-Engineering-Video-lectures-ltv077-Page1.htm*
- *http://www.fastenal.com/content/feds/pdf/Article%20-%20Bolted%20Joint%20Design.pdf*
- *http://people.rit.edu/megite Lec%203%20Fatigue %20Failure% 2003100 4_ for_students.ppt*
- *http://engineershandbook.com/Tables/materials.htm*
- *www.nptel.iitm.ac.in/video*

III/IV Year B.Tech. - Fifth Semester

ME - 313 DYNAMICS & VIBRATION OF MACHINERY

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course objectives:

- *Students will be able to understand basic concepts of forces involved in mechanism and estimate the inertia forces and torques.*
- *The student is able to learn about the various types of governors and estimate the equilibrium speeds*
- *The student is able to learn about the balancing of rotating masses located in the same and different planes.*
- *The student is able to learn about the gyroscopic effects on rotating shaft, ships and stability of two wheelers when negotiating curved path*
- *The student is able to learn undamped and damped free and forced vibrations and how to determine the natural frequency of the single degree of freedom system*
- *The student is able to learn about the vibration measuring instruments that are useful in present life.*
- *The student is able to learn about the two degrees of freedom systems and how to draw the mode shapes of the system*

Course outcomes:

The Students are able to know

- *Unbalance in rotating machinery*
- *Estimation of Inertia forces in a crank-slider mechanism*
- *State of balance of typical multi-cylinder engines*
- *Sources, effects, types of vibration and elimination.*
- *Principal modes of vibration and mode shapes.*

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, Power of a Governor (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 and 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. (6)

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, (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)

LEARNING RESOURCES

TEXT BOOKS:

1. *Theory of Machines by S.S. Rattan , TMH , 3rd Edition , 2009.*
2. *Mechanical Vibrations - G.K.Groover , Nem Chand Bros , 7th Edition , 2003.*
3. *Mechanical Vibrations - Rao V.Dukkipati, J.Srinivas, PHI , 2004.*

REFERENCE BOOKS:

1. *Theory of Machines by T. Bevan , Cbs Publishers , 2004.*
2. *Theory of Mechanisms and Machines by A. Ghosh and A.K. Mallik, Affiliated East-West Press (P) Ltd., New Delhi , 3rd Edition ,Re Print 2000*
3. *Mechanical Vibration - S.S.Rao , Addison & Wesley , 1995.*

WEB REFERENCES:

- *Machine Dynamics by Prof. Amitabha Ghosh, IITK, Kanpur*
  http://nptel.iitm.ac.in/video.php?subjectId=112104114
- *Machine Dynamics by Prof. C. Amarnath, Prof. K. Kurien Issac, Prof. P. Seshu of IITB, Mumbai*
  http://www.cdeep.iitb.ac.in/nptel/Mechanical/Dynamics%20of%20Machines/TOC.html

III/IV Year B.Tech. - Fifth Semester

ME - 314 METAL CUTTING & MACHINE TOOLS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives

- *Understand the basic motions of tool and machine and the factors which dictate the machining process.*
- *To provide the fundamental knowledge regarding the working principle, specifications, parts and various operations performed various tools.*
- *To provide basic information regarding the way of formation of chips, deformation of work piece, generation of temperature.*
- *Establish the relation between shear angle and chip thickness ratio, stress and strain in the chip, and cutting forces.*
- *To provide information regarding the cutting tool materials and their application to different metals in metal cutting.*

Learning outcomes:

- *Know the importance of basic parameters cutting speed, feed and depth of cut which dictates the machining process.*
- *Gain the knowledge of operating the machines and their mechanisms.*
- *Learn the various forces acting on machining process which provides the basic information regarding the rigidity, capacity of the machining process.*

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 lathe, 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.

LEARNING RESOURCES (3)

TEXT BOOKS:

1. *Workshop Technology Vol. II by Hazra Chowdary , Media Promoters & Publishers, 1983*
2. *Production Engineering by P.C. Sharma, S.Chand & Co , 2007.*

REFERENCE BOOKS:

1. *Materials and Processes in Manufacturing by E.Paul De Garmo, J.T.Black and Ronald A.Kohser , John Wiley & Sons, 2003.*
2. *Manufacturing Technology , Vol II by PN.Rao, 2nd Edition ,MGH , 2009.*
3. *Manufacturing Science by A. Ghosh & A.K.Mallik , Affiliated East-West Press (P) Ltd., New Delhi ,Re Print 1998.*

WEB RESOURCES:

- *www.hgfarley.com*
- *www.kennametal.com/ - United States*
- *www.mini-lathe.com/links.htm machinedesign.com/.../designer-s-guide-tometalcutting-machinery-0608 -*
- *www.metalwebnews.com/wc.html*
- *www.britannica.com/EBchecked/topic/463000/planer*
- *www.americanmachinist.com*
- *www.machinetools.net.tw/parts/taiwan_voltage_regulator.htm*

III/IV Year B.Tech. - Fifth Semester

ME 315 - I.C. ENGINES & GAS TURBINES

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

The objective of this course is

- *To impart the knowledge of engine components, working principles of IC engines, auxiliary systems.*
- *To able the understanding of combustion aspects of SI and CI engines in addition to the methods of improving performance.*
- *To expose to the latest developments in the field of IC engines like MPFI , CRDI etc.*
- *To make the student about the working of Reciprocating and Rotary Compressors*
- *To make the student about various types of Gas turbines their working principles and basic principles of Jet and Rocket propulsion systems.*

Learning Outcomes:

On completion of this course

- *The students are expected to understand the various components, principle of operation, working of different types of I.C engines.*
- *Able to know the variables affecting the performance of IC engines and methods to improve the performance.*
- *Able to understand the Working of different types of compressors.*
- *Able to know the classification of Gas turbines and working principles of Gas turbines and methods to improve the performance of the plant.*
- *Also able to know the working principles of various jet propulsion systems like Turbo jet, Turbo prop , Ramjet and Pulse jet and Rocket propulsions systems.*

UNIT I

I.C.Engines: Introduction, Engine nomenclature, 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, Fuel injection system for SI engines -Types, electronic fuel injection system, MPFI. (4)

C. I. Engines- Air- fuel requirements, fuel 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. X(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, pressure ratio, volumetric efficiency, power input, Single-stage and Multi-stage compressors, Effect of inter-cooling, 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 inter-cooling, 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)

LEARNING RESOURCES

TEXT BOOKS:

1. *Treatise on Heat Engineering-V.P.Vasandani and D.S.Kumar, Metropolitan Book co, New Delhi, 4th Edition.*
2. *Thermal Engineering ---Rajput, Laxmi Publ, New Delhi , 2012.*
3. *Thermal Science and Engineering- D.S.kumar, S.K.Kataria Publ, New Delhi 2010.*

REFERENCE BOOKS:

1. *Fundamentals of I.C.Engines - H.N. Gupta, PHI, New Delhi , 2009*
2. *A Course in I.C. Engines - M.L.Mathur & R.P.Sharma - Dhanpat Rai & Sons-New Delhi,2010..*
3. *Gas Turbine Theory - Cohen, Rogers and Sarvanamuttu, 5th Edition.*
4. *I.C. Engines - V.Ganesan - T.M.H., New Delhi , 3rd Edition,*

WEB RESOURCES:

- *College Intranet resource: 152.152.1.100*
- *http://autoclub.rso.siuc.edu/frange.html*
- *http://www.howstuffworks.com/engine1.htm*
- *http://inventors.about.com/library/inventors/blinternalcombustion.htm*
- *http://www.animatedengines.com/*

III/IV Year B.Tech. - Fifth Semester

ME - 316 BASIC ELECTRONICS & MICRO PROCESSORS

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam :	*3 hrs*	*Credits*	*: 3*

Course Objectives:

- *To introduce the concept of electronic circuits and theorems*
- *To study the characteristics of semi conductor material*
- *To analize and design the circuit with diodes ,zener diodes and transistors*
- *To study the working and principle of digital circuit*
- *To study the various analog circuits*
- *To introduce the concept of 8085 microprocessor*

Learning outcomes:

- *By the end of the course the student is expected to analize and design of various circuit elements and circuit design-a,b,c.*
- *The students should understand the outcome of analog circuits and its equivalent circuits-b,c,d.*
- *The students should understand the outcomes of digital circuits and design -c,d,e.*
- *The students should understand the 8085 microprocessor*

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)

LEARNING RESOURCES

TEXT BOOKS:

1. *Circuit theory by A.Sudhakar & S.P. Shyam Mohan. for chapter- 1 of unit I (TMH) ,2002*
2. *Semiconductor devices & Circuits by B.P. Singh for chapter - 2 of Unit - I(Dhanpati Rai)*

3. *Linear integrated circuits by D. Roy Chaudary & S. Jain for unit-2 (New - age international) 2nd Edition,2003*
4. *Digital Design by M.Morris mano, PHI for unit - 3, 2nd Edition,1999*
5. *Microprocer & Architectures, Programming & applications with the 8085/ 8080 A by Gaoneker for Unit - IV 2nd Edition*

REFERNCE BOOKS:

1. *Electronics devices and circuits by SALIVAHANA and Vallava Raj, TMH*
2. *Integrated Electronics by Milma & Halkies ,TMH*
3. *Switching Theory and Logic Design by A. Anand Kumar PHI,2010*

WEB REFERENCES **:**

- *www.ece.umd.edu/class/enee204.../LectureNOtes/LectureMain.htm*
- *http://nptel.iitm.ac.in/course.php?brach=Ece*
- *www.technologystudent.com/elecl/opamp1.htm*
- *http://www.ece.ubc.ca/~saifz/eece256.htm*

III/IV Year B.Tech. - Fifth Semester

ME - 351 MAHINE TOOLS LAB

Drawing	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objective

- *Students will be able to understand the basic machining Process and operation of the machine and its controls*
- *Students will be able to understand the speeds & feed mechanism of different types of machine tools.*
- *To provide the knowledge regarding primary & auxiliary motions of machine tools*
- *To provide the basic knowledge regarding the tool geometry and its significance in machinery operations.*
- *To provide the basic knowledge w.r.t single point & multi point cutting tools.*

Course Outcomes

- *Students can themselves operate on the machine and produce the given components comfortably.*
- *Students should be well aware about the range of speeds, feed and depth of cut while operating various mechanisms.*
- *Students distinguish various machine tool operations.*
- *Students learn chip formation process, chip removal processes.*
- *Students identify the difference between roughing and finishing operations and machining conditions related to these operations.*

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.

III/IV Year B.Tech. - Fifth Semester

ME 352 - FUELS & I.C. ENGINES LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam :	*3 hrs*	*Credits :*	*: 2*

Course Objectives:

- *To provide practical approach of determining thermo-physical properties of some substances, which are essential in smooth working of mechanisms and machines.*
- *Also presenting Engine constructional and working details to evaluate the performance of automobile engines.*

Learning Outcomes:

- *The student can experimentally determine viscosity,calorific value, Flash and Fire points of fuels.*
- *The Students will be able to conduct performance tests on both petrol and diesel engines.*
- *The students will be able to do performance test on Reciprocating compressor and Blower.*

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

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

III/IV Year B.Tech. - Fifth Semester

ME - 353 ELECTRICAL & ELECTRONICS LAB

Practicals	*:*	*3 periods / week*	*Sessional Marks*	*:*	*40*
			Semester End Exam Marks	*:*	*60*
Semester Exam	*:*	*3 hrs*	*Credits*	*:*	*2*

Note : Minimum Four Experiments from Electrical Stream and Eight Experiments from Electronics Stream should be performed

Electrical Engineering

Course Objectives:

1 .The students are trained in starting and conducting a performance test on DC motor

2. The student is trained in starting the DC motor and control its speed.

3. The student is trained for conducting performance tests on DC generator.

Course Outcomes:

i) Student will be able to understand, how to start a DC motor and how to control the speed of DC motor.

ii) Students will have hands on practice in measuring various parameter and understanding the concepts in the operation of DC motor, DC generator,

iii) Student will be able to analyze the factors that influence various processes in a DC machinery

1. Verification of KCL / KVL
2. OCC of a DC Shunt Generator
3. Load Test on DC Shunt Generator
4. Speed Control of DC Shunt Motor
5. Swin burn Test

Electronics Engineering

Course Objectives

- To study the characteristics of Diodes and Transistors.
- To study the functioning of logical gates using discrete components, universal gates and Combination Circuits
- To verify the various flip, flop Conversions (JK & D Gray to Binary & Binary to Gray)
- To study the addition /Subtraction using 8085 Microprocessors

Learning Outcomes

- By the end of course the student is exposed to analysis and design of various circuit elements and circuit designs.
- Student should understand the outcomes of digital circuits and design.
- Students should understand the 8085 microprocessor systems.

1. VI characteristics of Si / Ge junction diode
2. VI characteristics of Zener diodes
3. Half wave rectifier (with and without filter).
4. Transistor Configuration - CE Characteristics.
5. Characteristics of JFET
6. Logic gates using discrete components
7. Logic gates using universal gate (NAND gate)
8. Combinational Circuits (half adder, full adder, half subtractor)
9. Verification of Flip-Flop (JK & D etc.,)
10. Code converters (Gray to Binary & Binary to Gray)
11. Addition and Substraction of two numbers using Microprocessor
12. Stepper Motor Control using Microprocessor
13. Traffic Signal Control using Microprocessor

III/IV Year B.Tech.- Sixth Semester

ME - 321 OPERATIONS MANAGEMENT

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives :

- *Explain the relationships between operations function and other functional areas of a business such as marketing, finance and information system and how they can work together to achieve the business strategy.*
- *Explain approaches in designing and improving processes.*
- *To apply/analyze relevant quantitative models to solve real world problems*
- *To appraise real life business situation and suggest solution alternatives as related to operation management techniques*

Learning Outcomes:

- *Students will be able to achieve maximizing output of goods and services with minimum resource inputs*
- *Able to understand plant layout design to facilitate material flow and processing of a product in the most efficient manner through the shortest possible time*
- *Understand the purpose of Supply chain management to improve the overall organization performance and customer satisfaction*
- *Minimizing throughput-time by proper sequencing by reducing delays, waiting time and idle time.*
- *Recognize the importance of Inventory control to ensure their availability with minimum capital lock up.*

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. Introduction to line balancing (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. Master scheduling formation: inputs and ouputs. Master scheduling methods. (12)

Sequencing Problem : Introduction , Processing n Jobs through 2 machines , Processing n Jobs through 3 machines , Processing 2 jobs through m machines , problems, (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)

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. (7)

UNIT - IV

Project Planning through Networks : Arrow (Network) Diagram Representation , Rules for constructing an arrow diagram , PERT , CPM, Critical path calculations , Determination of critical path , Determination of floats , Probability considerations in project (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)

LEARNING RESOURCES

TEXT BOOKS :

1. *Operations Management - Joseph G.Monks, Tata McGraw Hill, 1996.*
2. *Production and Operations Management by Stevenson , MGH / Irwin , 11th Edition , 2011.*

REFERENCE BOOKS :

1. *Materials Management - Gopalakrishnan and Sudhakaresan*
2. *Operations Research - R. Pannerselvam , PHI , 2nd Edition, 2006*
3. *PERT and CPM : Principles and Applications - L.S. Srinath , Natraj Publishers , 3/e 2009.*

WEB REFERENCES:

1. *http://nptel.iitm.ac.in/*
2. *www.learnerstv.com/Free-Engineering-video-lecture-courses.htm*
3. *http://www.apics.org/*
4. *http://www.bized.co.uk/fme/5.htm*

III/IV Year B.Tech. - Sixth Semester

ME - 322 DESIGN OF TRANSMISSION ELEMENTS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives

To provide knowledge on

- *Shafts with various types of Loading arrangements for both Strength and Rigidity aspects*
- *Journal and Anti friction Bearings, types, their construction, lubrication and selection procedures.*
- *Flexible drives like Flat & V- belts and chain drives, types, construction and selection*
- *Gears like Spur, Helical, Bevel and Worm etc. materials used, force analysis, design and Gear Forces*

Learning Outcomes

After studying this course students should be able to:

- *Know to design of the shafts for various loads*
- *Know various types of lubrication, types of Bearings , types of bearing materials and the bearing selection*
- *Know how to design various types of flywheels for various types of applications*
- *Know how to select and design proper belt or chain drive for the application*
- *Knows about various Gears, their profiles and materials, types of failures, and is capable to design and specify the Spur, helix, Bevel and Worm Gears*

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)

LEARNING RESOURCES

TEXT BOOKS:

1. *Design of Machine Elements by V.B. Bhandari, Tata McGraw Hill , 3rd Edition 2010.*
2. *Machine Design by P.C. Sharma & D.K. Agarwal., S.K. Kataria & Sons , 1997.*
3. *Design of Machine Elements by C.S. Sharma & K. Purohit ,PHI Ltd.*

HAND BOOKS TO BE ALLOWED IN SEMESTER EXAMINATION:

1. *Design data book, P.S.G. College of Technology, Coimbatore*
2. *Design data book, Mahadevan & Balaveera Reddy - CBS Publications , 1984.*

WEB REFERENCES

- *http://www.uni.edu/~rao/Md-17%20Shaft%20Design.pdf*
- *http://www.uni.edu/~rao/Md-15%20Keys%20and%20Couplings.pdf*
- *http://etidweb.tamu.edu/ftp/ENTC463/Notes/ENTC463Key%20and%20Coupling.pdf*
- *science.howstuffworks.com/transport/engines.../bearing1.htm*
- *http://www.fi.edu/time/Journey/Time/Escapements/gearint.html*

III/IV Year B.Tech.- Sixth Semester

ME - 323 ENGINEERING METROLOGY

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam :	*3 hrs*	*Credits*	*: 3*

Course objectives

- *Students will be able to understand basic concepts of Measurements and measuring equipments.*
- *Students will be able to understand and know the system of tolerances, fit between mating parts, types of fits. Students will be able to understand the concepts of assembling of components.*
- *Students will be able to understand the working of sine bar and slip gauges, comparators.*
- *Students will learn about terminology related to surface structure based on Indian standard organization.*
- *Student will study about the elements of screw thread measurements and about the gauges used to check the screw threads.*
- *Students will understand the alignment of machines like bed and chucks etc., on different machine tools and their performance.*
- *Students will be able to understand different terms like calibration accuracy precision and resolution etc., related to measuring equipments*

Learning Outcomes :

- *Analyze various methods of designing of gauges, measuring equipments used in the inspection and quality control department, examples plug gauges, ring gauges and dial gauges etc.,*
- *To use the different comparators and design of the comparators.*
- *Manufacture them professionally and with regard to their responsibilities to society, especially with respect to designing of measuring equipment to reduce the rejection rates in manufacturing sector.*
- *Communicate effectively with the workers regarding the methods of operating the measuring equipment and design of the equipment*

UNIT - I

Metrology : Introduction, Elements of engineering measurements, Linear and angular measurements, standards of length, end and line standards. (7)

Linear and Angular Measurements : Precision measurement, bore gauges, straight edges, slip gauges, angle gauges, sine bars, spirit levels, auto collimator. (8)

UNIT - II

Comparators : Mechanical comparators, Reed comparator, Sigma comparator, electrical and electronic comparators, solex pneumatic gauge, projectors, tool makers microscope. (7)

Metrology of Screw Threads And Gears : Measurement of various elements of threads, major, minor and effective diameter, thread micrometer, measurement of pitch, gear inspection, measurement of tooth thickness, gear tooth caliper. (8)

UNIT - III

Limits, Fits and Gauges : Limits, fits, tolerance and allowance, theory of limits and fits and their selection, hole bass and shaft basis system, Indian standard system of limits and fits, simple problems. Inter changeability, selective assembly, limit gauges, Taylor's principle of limit gaugeing, plug gauges, ring gauges.

Tolerance Limits of a process

Control Charts : X and R charts , Attributes , P-chart , C-Chart , U-Chart (15)

UNIT - IV

Measurement Of Surface Finish: Surface texture, roughness, waviness, Indian standard terminology, Methods of measuring surface finish, Taylor Hobson Talysurf. (8)

Interferometry: NPL flatness interferometry and gauge length interferometer. (3)

Static & Dynamic Alignment Tests : Alignment tests on Lathe, Drilling Machine and Milling Machine. (4)

LEARNING RESOURCES

TEXT BOOKS:

1. *Engg. Metrology - R.K.Jain , Khanna publishers , 20th Edition , 2012.*
2. *Hand Book of Industrial Metrology by ASTME , Prentice-Hall (1967)*

REFERENCE BOOKS:

1. *Engg.Metrology - D.M.Antony*
2. *A Text book of Engg.Metrology - I.C.Gupta , Dhanpat Rai Publications, Edition 7.*

COURSE RELEVANT WEBSITES FOR REFERENCE

- *http://emtool box.nist.gov*
- *CambridgeViscosity.com/Viscometer*
- *www.e.FlukeCal.com/Calibration*
- *www.inscotemperature.com/*
- *www.solartronmetrology.com/*

III/IV Year B.Tech.- Sixth Semester

ME - 324 MANUFACTURING ENGINEERING

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To develop knowledge in design considerations, principles and related devices used in Jigs and Fixtures*
- *To provide knowledge in manufacturing of gears and threads*
- *To develop knowledge in principles of operation, equipment and applications of unconventional machining Processes.*
- *To provide knowledge of various types of press working tools and related calculations*
- *To develop knowledge in COMPUTER AIDED INSPECTION equipment such as CMM (Coordinate Measuring Machines) and Machine vision techniques*

Learning Outcomes:

- *Ability to identify the functions of location,clamping devices and applications of JIGS & FIXTURES*
- *Able to know methods of manufacturing various types of gears,principles of gear generation and finishing methods*
- *Able to visualize screw threads production methods*
- *Able to know the principles of operation, equipment and applications of UNCONVENTIONAL MACHINING PROCESSES*
- *Able to understand PRESS WORKING TOOLS major comoponents,types of drawing dies,bending dies and related calculations.*
- *Able to know types of CMM (Coordinate Measuring Machines) and its related accessories*
- *Able to know Machine vision principle and its related equipment and applications*

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 Manufacturing: 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, Blanking and Punching operations, clearance and shear as applied to punching / blanking operations, centre of pressure and its calculation, scrap strip layout for blanking, simple related problems (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)

LEARNING RESOURCES

Text Books:

1. *Production Engineering by P.C. Sharma, S.Chand & Co , 2007.*
2. *Manufacturing Science by A. Ghosh & A.K.Mallik , Affiliated East-West Press (P) Ltd., New Delhi ,Re Print 1998.*

REFERENCE BOOKS:

1. *Manufacturing Engineering & Technology by Kalpak Jain, PHI , 5th Edition , 2005.*
2. *Engg. Metrology - R.K.Jain , Khanna publishers , 20th Edition , 2012.*
3. *Automation, production systems & CIM by M.P.Groover, PHI , 2007.*

Web References

- *http://nptel.iitm.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Manuf%20Proc%20II/New_index1.html*
- *http://aglasem.com/resources/reports/pdf/non%20conventional.pdf*
- *http://www.123eng.com/seminar/GEAR%20MFG..pdf*
- *www6.conestogac.on.ca/~ffulkerson/J&F%20Notes.pdf*
- *http://www.brownandsharpe.com/pdf/intro_to_cm.pdf*

III/IV Year B.Tech.- Sixth Semester

ME 325 - HEAT TRANSFER

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives

- *To enable the student to distinguish among the three modes.*
- *To enable the student to prepare mathematical model of the problem with appropriate boundary conditions.*
- *To enable the student to learn the basics of convective heat transfer.*
- *To enable the student to design thermal equipment.*
- *To enable the student to utilize analogies to solve heat transfer problems.*

Learning Outcomes:

- *Analyze and design various methods of heat transfer for the bodies undergoing heat exchange using fundamental concepts of Conduction, Convection and Radiation.*
- *To estimate heat loss from the system to the surroundings at an interval of time during its working eg. IC Engines, Turbines etc.*
- *Apply correlations to compute heat loss due to convection for practical applications.*
- *Design heat transfer equipment to prevent failures of components due to poor heat dissipation.*

UNIT I

Introduction: Basic Modes and Laws of Heat transfer, thermal conductivity, Steady state Heat Conduction, General conduction equation in Cartesian and Cylindrical coordinates, (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 Boltzmann'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)

LEARNING RESOURCES

TEXT BOOKS:

1. Heat and Mass Transfer - Sachdeva, New Age India, New Delhi, 2009.

2. Heat Transfer-Rajput, Laxmi Publ, New Delhi,2011.

REFERENCE BOOKS: I

1. Heat transfer - J.P.Holman, MGH, New York , 6th Edition.

2. Heat transfer - S.P.Sukhatme, TMH ,2009.

3. Heat Transfer - Cengel and Boles, TMH, New Delhi , 2008.

WEB REFERENCES:

- *IIT video lecturers (NPTEL)*
- *http://www.wisc-online.com/Objects/ViewObject.aspx?ID=SCE304*
- *http://web.cecs.pdx.edu/~gerry/heatAnimations/sphereTransient/#TOC*
- *http://rpaulsingh.com/animated%20figures/animationlisttopic.htm*
- *http://www.slideshare.net/meenng/transfer-of-heat*
- *http://www.phy.cuhk.edu.hk/contextual/heat/hea/heatp01_e.html*

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

Elective - I

III/IV Year B.Tech. - Sixth Semester

ME - 326/A

MECHANICAL MEASUREMENTS & CONTROL SYSTEMS

Lecture	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course objectives

- *Students will be able to understand the basic concepts of Measurements and measuring equipments, statistical analysis of errors.*
- *Students will be able to identify the required control systems for various equipments.*
- *Students will be able to design and use sensors and Transducers to inspect the components.*
- *Students will be able to know the working of strain gauges and bridge circuits pressure measuring devices variable head flow meters,area flow meters and flow visualization methods and different force measuring devices, torque measuring devices and dynamometers,Vibrometers and accelerometers.*

Learning Outcomes

At the end of this course the student will be able to

- *Analyze various types of measuring equipments used in control systems.*
- *To use the different Sensors for various applications.*
- *Manufacture them professionally to reduce the rejection rates in manufacturing sector.*

UNIT- I

Basic Concepts: Introduction, Measurement system elements, Definition of terms: Calibration, standards, Accuracy, Precision, Sensitivity, Resolution. (3)

Measurement Errors And Statistical Analysis: Classification of Errors, error analysis: Statistical analysis of test data- probability distributions -

method of least squares, standard deviation of the mean, Graphical analysis and curve fitting. (4)

Standard test inputs, Characteristics of zero, first and second order systems, Steady state error analysis, Transient response specifications, stability analysis of a system. (3)

Sensors And Transducers: Introduction, Transducer classification, transducer elements, variable resistance transducer elements, Variable inductance transducer elements, capacitive, Piezo electric, photo electric, Ionization transducers. Optical encoder. (5)

UNIT- II

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. (8)

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. (7)

UNIT- III

Flow Measurement: Introduction. Variable head flow meters, variable area flow meters, Hot-wire anemometer. Flow visualization methods. (3)

Temperature Measurement: Introduction, Liquid in glass thermometers, Bi-metallic thermometers, Thermo-Resistive elements, Thermocouples, Thermisters and Pyrometers. (4)

Force Measurement: Introduction, Elastic force meters, Load cells. (2)

Torque Measurement: Optical torsion meter, Electrical Torsion meter, strain gauge torsion meter. (2)

Shaft Power Measurement: Dynamometers-Mechanical, electrical, Hydraulic. (2)

Vibration Measurement: Principle of seismic instruments such as Vibrometers and accelerometers. (2)

UNIT IV

Introduction to control Systems : Introduction Definitions of control system terminology, classification of control systems, examples of control systems. (2)

Mathematical Models of physical Systems : Definition of transfer function, derivation of transfer functions of mechanical, electrical, thermal and hydraulic systems, block diagram algebra. (4)

Basic Control Actions : Types of control actions, proportional controllers, derivative and integral control actions, effects of derivative and integral control action on system performance. (4)

Transient Response Analysis : Test signals, response of first order system to various inputs, step response of second order systems, transient response specifications. (4)

LEARNING RESOURCES

TEXT BOOKS:

1. *Mechanical Measurements & Control - by D.S. Kumar , Metropoliton Book Company, 4th Reprint.*
2. *Mechanical Measurements by R.S.Sirohi & H.C.Radhakrishna , New Age International , 2008.*

REFERENCE BOOKS :

1. *Experimental methods for engineers - J.P.Holman , 6th Edition , 1994.*
2. *Mechanical Measurements - T.B.Beckwith & N.L.Buck , Addison-Wesley, 1969*
3. *Control System Engineering - Nagarath & Gopal , New Age International , 2010.*

COURSE RELEVANT WEBSITES FOR REFERENCE

- *http://emtool box.nist.gov*
- *CambridgeViscosity.com/Viscometer*
- *www.e.FlukeCal.com/Calibration*
- *www.inscotemperature.com/*
- *www.solartronmetrology.com/*

Elective - I

III/IV Year B.Tech. - Sixth Semester

ME - 326/B REFRIGERATION & AIR CONDITIONING

Lectures	:	*4 periods / week*	*Sessional Marks*	:	*40*
Tutorials	:	*1 period / week*	*Semester End Exam Marks*	:	*60*
Semester Exam	:	*3 hrs*	*Credits*	:	*4*

Course Objectives:

- *To know the various methods of refrigeration and to introduce vapor compression refrigeration cycle, analysis and methods for improving performance.*
- *To know the operation of vapor absorption system.*
- *To know the various components of refrigeration system and their working principles.*
- *To design air conditioning systems by cooling load calculations.*
- *To know the various applications of refrigeration and air conditioning systems.*

Learning Outcomes:

- *The students will get the knowledge about the principle of refrigeration, different methods of refrigeration.*
- *Able to know the various components of refrigeration system and their working principles.*
- *Able to understand what is meant by air conditioning and various psychrometric properties and processes and know the usage of Psychrometric chart.*
- *Know how to provide required environment to suit various needs of day to day requirements like comfort air conditioning, water cooling , storage of perishable food etc.,*
- *Enable them to do simple design calculations and analysis of these systems.*

UNIT I

Introduction to Refrigeration: Necessity and applications, unit of refrigeration and C.O.P, Mechanical refrigeration, types Reversed Carnot cycle of refrigeration. (6)

Air Refrigeration: Bell Coleman cycle, Open and Dense air systems, Actual refrigeration system, Necessity of aircraft refrigeration, Aircraft refrigeration systems- Types. (9)

UNIT II

Vapour Compression Refrigeration: Working principle, essential components of plant, simple vapor compression refrigeration cycle, modifications, Use of P - h charts, Refrigerants - Classification, desirable properties, commonly used refrigerants, nomenclature, Alternate refrigerants . (9)

System Components: Compressors-types, Condensers - classification, working, Evaporators - classification, working, Expansion devices - types, working. (6)

UNIT III

Vapour Absorption System: Calculation of max COP, description and working of NH3 - water system, Li - Br- H_2O system, principle of operation of three fluid absorption system and salient features. (8)

Steam Jet Refrigeration: Principle of working, applications, merits and demerits. (4)

Non-Conventional Refrigeration Methods: Principle and operation of thermoelectric refrigerator and Vortex tube or Hilsch tube. (3)

UNIT IV

Psychrometry: Introduction, Psychrometric properties and relations, Pchrometric chart, Psychrometric processes, Sensible, Latent and Total heat,Sensible Heat Factor(SHF), Bypass factor. (5)

Introduction to Air Conditioning: 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. (6)

Air Conditioning Systems: Introduction, components of Air conditioning system, Classification of Air conditioning systems, Central and Unitary, Summer, Winter and Year round systems. (4)

LEARNING RESOURCES

TEXT BOOKS:

1. *Refrigeration and air conditioning - C.P.Arora, TMH,2007.*
2. *Refrigeration and Air conditioning - Manohar Prasad, New Age India, New Delhi,2006.*
3. *A course in refrigeration and air conditioning - S.C.Arora & Domkundwar, Dhanpat Rai& sons, New Delhi,2008.*

REFERENCE BOOKS:

1. Principles of Refrigeration - Dossat,John Wiley ,5th Edition ,2001.

2. Refrigeration and air conditioning - Stoecker,2nd Edition , 1983.

WEB RESOURCES:

- *http://www.refrigerationbasics.com/index.htm*
- *http://www.howstuffworks.com/ac.htm*
- *http://www.ashrae.org*
- *http://www.taftan.com/thermodynamics/AIRCOND.HTM*
- *http://www.wisegeek.com/how-does-air-conditioning-work.htm*

NOTE: Refrigerants and Psychrometric Properties Data book - by M.L. Mathur and F.S. Mehta is allowed in the Examinations.

Elective - I

III/IV Year B.Tech. - Sixth Semester

ME - 326/C INDUSTRIAL TRIBOLOGY

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam :	*3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To provide broad based understanding of the interdisciplinary subject 'tribology' and its technological significance*
- *To understand the nature of engineering surfaces, their topography and learn about surface characterization techniques*
- *To understand the genesis of friction, the theories/laws of sliding and rolling friction*
- *To learn about consequences of wear, wear mechanisms, wear theories and analysis of wear problems*
- *To learn about the principles of lubrication, lubrication regimes, theories of hydrodynamic, elasto-hydrodynamic and mixed/ boundary lubrication*
- *Understanding the principles of bearing selection and bearing arrangement in machines.*

Learning outcomes:

- *Students will be able to identify and describe the theories of friction and the factors affecting the coefficient of friction between contacting surfaces in relative motion.*
- *Students will be able to identify wear mechanisms and show how to minimize wear for different interfacial conditions.*
- *Students will be able to identify the lubrication modes such as hydrodynamic lubrication, elasto-hydrodynamic lubrication.*
- *Students will be able to formulate elasto-hydrodynamic lubrication models for line and point contacts.*

UNIT-I:

Tribology: Introduction, tribology in design and 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, elasto-hydro 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)

LEARNING RESOURCES

TEXT BOOKS:

1. *"Principles of Tribology" by Halling j., McMillan Press Ltd , 1975.*
2. *"Friction and Wear of Engineering Materials" by ,I.M. Hutchings, Edwar Arnold,1992.*
3. *"Friction and Lubrication" E.P. Bowden and Tabor., Heinemann Edu. Books Ltd.,1974.*

REFERENCE BOOKS

1. *Tribology Hand Book", by Neale M.J., Butterworths 2nd Edition , 1999.*
2. *"Introduction to Tribology and Bearings", B.C. Majumdar, S. Chand Co.*

WEB REFERENCE:

- *http://www.imeche.org/knowledge/industries/tribology/about-the-group/terms-of-reference*
- *http://www.crcnetbase.com/doi/abs/10.1201/9780849377877.sec4*
- *http://www.ntnu.edu/ipm/tribology-lab*

Elective - I

III/IV Year B.Tech.- Sixth Semester

ME - 326/D MECHANICS OF COMPOSITE MATERIALS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives *:*

- *Study the properties of fiber and matrix materials used in commercial composites, as well as some common manufacturing techniques.*
- *Make students familiar with basic knowledge of mechanical behavior of composite materials, especially of fiber composites.*
- *Predict Elastic and strength characteristics of the composite from the known mechanical properties of components and from their geometrical structure.*
- *Evaluate stresses, strains of typical structures made of composite materials.*
- *Predict the failure strength of a laminated composite plate.*

Learning Out comes:

At the end of this course the student will be able to

- *Identify the properties of fiber and matrix materials used in commercial composites*
- *Predict the elastic properties of both long and short fiber composites based on the constituent properties.*
- *Analyze problems on micro and macro mechanical behavior of laminate*
- *Predict the failure strength of a laminated composite plate.*
- *Apply the mechanics of composites to design composite structural elements.*

UNIT-I

Introduction to Composite Materials: Introduction ,Classification: Polymer Matrix Composites, Metal Matrix Composites, Ceramic Matrix Composites, Carbon-Carbon Composites, Fiber-Reinforced Composites and nature-made composites, and applications . (8)

Reinforcements: Fibres- Glass, Silica, Kevlar, carbon, boron, silicon carbide, and born carbide fibres. Particulate composites, Polymer composites, Thermoplastics, Thermosetts, Metal matrix and ceramic composites. (7)

UNIT-II

Manufacturing methods: Autoclave, tape production, moulding methods, filament winding, man layup, pultrusion, RTM. (7)

Macromechanical Analysis of a Lamina : Introduction ,Definitions: Stress, Strain ,Elastic Moduli,Strain Energy. Hooke's Law for Different Types of Materials, Hooke's Law for a Two-Dimensional Unidirectional Lamina, Plane Stress Assumption, Reduction of Hooke's Law in Three Dimensions to Two Dimensions, Relationship of Compliance and Stiffness Matrix to Engineering Elastic Constants of a Lamina. (8)

UNIT-III

Hooke's Law for a Two-Dimensional Angle Lamina, Engineering Constants of an Angle Lamina, Invariant Form of Stiffness and Compliance Matrices for an Angle Lamina Strength Failure Theories of an Angle Lamina : Maximum Stress Failure Theory Strength Ratio, Failure Envelopes, Maximum Strain Failure Theory ,Tsai-Hill Failure Theory, Tsai-Wu Failure Theory, Comparison of Experimental Results with Failure Theories. (8)

Micromechanical Analysis of a Lamina : Introduction, Volume and Mass Fractions, Density, and Void Content, Evaluation of the Four Elastic Moduli, Strength of Materials Approach, Semi- Empirical Models ,Elasticity Approach, Elastic Moduli of Lamina with Transversely Isotropic Fibers, Ultimate Strengths of a Unidirectional Lamina, Coefficients of Thermal Expansion, Coefficients of Moisture Expansion (7)

UNIT-IV

Macromechanical Analysis of Laminates: Introduction , Laminate Code , Stress-Strain Relations for a Laminate, In-Plane and Flexural Modulus of a Laminate , Hygrothermal Effects in a Laminate, Warpage of Laminates (7)

Failure, Analysis, and Design of Laminates : Introduction , Special Cases of Laminates, Failure Criterion for a Laminate, Design of a Laminated Composite, Other Mechanical Design Issues (8)

LEARNING RESOURCES

TEXT BOOKS:

1. *Engineering Mechanics of Composite Materials by Isaac and M Daniel, Oxford Press, 1994.*
2. *Mechanics of Composite Materials, Second Edition (Mechanical Engineering), By Autar K. Kaw ,Publisher: CRC press / Taylor & Francis , 2006.*

REFERENCES:

1. *R. M. Jones, Mechanics of Composite Materials, Mc Graw Hill Company, NY,1975.*
2. *L. R. Calcote, Analysis of Laminated Composite Structures, Van N Rainfold, NY, 1969.*

WEB RESOURCES

- *http://nptel.iitm.ac.in/*
- *http://composite.about.com/*
- *http://www.springer.com/materials*

III/IV Year B.Tech.- Sixth Semester

ME - 361 MODELLING LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives

- *To provide the students with the knowledge and techniques of the research and application of CAD/CAM.*
- *To create 3D part geometry using the design module of the modeling.*
- *To develop the skills in CAD operations to visualize and create three-dimensional part models of mechanical components and assemblies.*
- *Student will be able to produce CAD drawings which communicate the appropriate manufacturing details, standards, and specifications.*

Learning outcomes:

- *The students will be able to model the given 2D and 3D components, Assemblies etc.*
- *Has ability to layout an efficient production area and industrial facility using analytical techniques and Computer-Aided Design (CAD) software.*

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 & SURFACE MODELING
ASSEMBLY MODELLING
DRAFTING
with examples of Assembly drawings.

Parts and Assemblies can be choosen from

1). "Machine Drawing" by K. L. Narayana, P. Kannaiah, K. Venkata Reddy , New Age International , 2007.

III/IV Year B.Tech. - Sixth Semester

ME -362 HEAT TRANSFER LAB

Practicals	*:*	*3 periods / week*	*Sessional Marks*	*:*	*40*
			Semester End Exam Marks	*:*	*60*
Semester Exam	*:*	*3 hrs*	*Credits*	*:*	*2*

Course Objectives:

To understand the basics of heat transfer and applications of heat transfer.

Learning Outcomes:

To know Applications of heat transfer in daily life.

Tests on Any **Ten** of the Following are to be conducted:

1. Refrigeration Test Rig
2. Air Conditioning Test Rig
3. Heat Exchanger - Parallel Flow
4. Heat Exchanger - Counter Flow
5. Emissivity Apparatus
6. Pin fin - Natural Convection & Forced Convection
7. Natural Convection from vertical Cylinder
8. Stefan - Boltzmann's Apparatus
9. Axial conduction in metal rod
10. Lagged Pipe apparatus
11. Composite slab
12. Automobile chassis - Steering and transmission systems

III/IV Year B.Tech.- Sixth Semester

ME - 363 ADVANCED COMMUNICATION SKILLS LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course objectives:

- *To expose the students to a variety of learner-friendly methods of language learning*
- *To train the students to use language effectively to face Interviews, Group Discussion and Public Speaking*
- *To expose the students to corporate etiquette, to develop proficiency in presentation, to train the students in speech writing and to develop employability skills*

Learning outcomes:

- *Capable of using language effectively to face interviews, group discussion and public speaking.*
- *Improves confidence level to speak better*
- *Become Proficient in presentations*
- *Develop felicity of expression*

1. Employability skills - Interview skills
2. Critical appreciation
   - Poems
   - Short stories
   - Life stories
   - Excerpts of great personalities
3. Film clippings
4. Briefing and explaining
5. Board room discussions
6. Presentations
7. Mini Projects

Assignment on - Visiting orphanages, old age homes, hospitals, bank, traffic etc.,

8. Speech writing
   - Acceptance speech
   - Hosting
   - Vote of thanks
   - Introducing people on the stage
   - Farewell speech
   - Compeering
   - Commentary
   - Thank you speech

LEARNING RESOURCES

BOOKS:

1. *Soft skills for Everyone - Jeff Butterfield ,Cengage learning ,First print 2010, Third Indian Reprint 2012*
2. *Personality Development and Soft Skills - Barun K.Mitra ,Oxford University Press , First published 2011.*

IV/IV Year B.Tech.- Seventh Semester

ME - 411 PROFESSIONAL ETHICS & HUMAN VALUES

Lectures	:	*3 periods / week*	*Sessional Marks*	:	*40*
Tutorials	:	*1 period / week*	*Semester End Exam Marks*	:	*60*
Semester Exam	:	*3 hrs*	*Credits*	:	*3*

Course Objectives

- *To help the students appreciate the essential complementarily between "VALUES" and "SKILLS"*
- *To facilitate the development of a Holistic perspective for value based living in a natural way.*
- *To introduce the Ethical concepts that are relevant to resolving Moral issues in Engineering and to impart reasoning and analytical skills needed to apply ethical concepts to Engineering decisions*
- *Enter into engineering work environment with well developed reasoning and analytical skills.*

Learning outcomes:

- *Able to comprehend a specific set of behaviors and values the professional interpreter must know and must abide by, including confidentiality, accuracy and integrity.*
- *Strive to achieve the highest quality, effectiveness and dignity in both the process and products of professional work.*
- *To realize the need of laws and regulations in directing Engineering practices.*
- *Protect the safety, health and welfare of the public and speak out against abuses in these areas affecting the public interest.*
- *Know and respect existing laws pertaining to professional work.*

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. (15)

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. (15)

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. (15)

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., (15)

LEARNING RESOURCES

TEXT BOOKS :

1. *Mike martin and Ronald Schinzinger, "Ethics in Engineering" McGraw-Hill, NY 1996*
2. *Govindarajan M, Natarajan S, Senthil Kumar V.S., "Engineering Ethics", PHI, 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, US, 2000 (Indian Reprint)*
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 Semester Press, Oxford, 2001.*

WEB REFERENCES

- *www.springer.com › ... › Applied Ethics & Social Responsibility*
- *www.onlineethics.org/,*
- *courses.soe.ucsc.edu/.../engineering-ethics-cases.pdf?... - United States*

IV/IV Year B.Tech.- Seventh Semester

ME - 412 ADVANCED MACHINE DESIGN

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam :	*3 hrs*	*Credits*	*: 4*

Course Objective:

- *Enable students to attain the basic knowledge required to understand, analyze, design and select machine elements.*
- *Understand the theory and its limitations and to design the machine element to perform a specified duty.*
- *Apply the systematic engineering design process including, problem definition, information collection, concept generation & selection, and design configuration to design of mechanical systems and elements.*
- *Apply optimization methods to determine the optimal solution for design configurations*

Learning Outcomes:

- *Design or select from standard tables and catalogues machine elements, components and materials given appropriate performance requirements.*
- *To master the fundamental processes of design and manufacturing and to gain an in-depth understanding of analytical and experimental methods of determination of stresses and strength of machine elements under various loading conditions.*
- *Through the study of optimum design, reliability and system design he will be able to assess the life of mechanical elements.*

UNIT - I

Springs: Introduction; Materials; Types of springs, Helical springs under axial load, Fatigue loading, Design of Concentric helical Springs , 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. (7)

I.C.Engine Components: Introduction, Design of Cylinder trunk type piston, connecting rod and side crank shaft. (8)

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. (7)

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. (5)

LEARNING RESOURCES

TEXT BOOKS:

1. *Design of Machine Elements by V.B. Bhandari, Tata McGraw Hill , 3rd Edition, 2010.*
2. *Design of Machine Elements by C.S. Sharma & K. Purohit ,PHI Ltd,2004.*
3. *Machine Design by R.S. Khurmi & J.K. Guptha , S. Chand , 2012.*
4. *Reliability Engineering by L.S. Sreekanth, 4th Edtn, East West Press 2005.*
5. *Engineering optimization by S.S. Rao, John Willy & Sons, 2009.*

HAND BOOKS TO BE ALLOWED IN SEMESTER EXAMINATION:

1. Design data book, P.S.G. College of Tech, Coimbatore
2. *Design data book, Mahadevan & Balaveera Reddy - CBS Pub.*

WEB REFERENCES:

- *http://machinedesign.com/*
- *http://ptumech.loremate.com/md2/node/6*
- *http://ptumech.loremate.com/md2/node/7*
- *http://ptumech.loremate.com/md2/node/8*
- *http://nptel.iitm.ac.in*

IV/IV Year B.Tech.- Seventh Semester

ME - 413 AUTOMOBILE ENGINEERING

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives

- *The students acquires sufficient knowledge to classify Engines, Chassis, Fuel Supply Systems, Cooling Methods, Lubrication Methods, Ignition Systems, Generating Systems, Suspension Systems and braking methods.*
- *The students get the working knowledge of assembly of various components of layout and of various electrical equipment of an automobile.*

Learning Outcomes

- *Identify the components of an automobile.*
- *Analyze the working of each of the components.*
- *Modify the design of the components.*
- *Repair and maintain of some of the components.*
- *Predict the possible breakdowns.*
- *Modernize the components for the performance improvement.*

UNIT I

Introduction: Classification of vehicles - applications, options of prime movers, arrangements of drive. (4)

Engine: Classifications based on number of strokes, cylinders, types of combustion chambers for petrol and diesel engines, valves, valve arrangements and operating Mechanisms, Piston types, Piston rings, Firing order; Crankshafts, Flywheel. (7)

Assorted Equipment: Fuel supply pumps, A.C. Mechanical and S.U. 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: Introduction to Chassis, Types, Construction Details (2)

Clutch Systems - Single-plate and Multi-plate clutches, Centrifugal clutches, wet and dry type, actuating mechanisms. (5)

Power Train: 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. (6)

Road Wheels : Tyres, Tube and Tube less wheels(2)

Vehicle Control: steering mechanisms and power steering, types of brakes and brake actuation mechanisms (air and hydraulic). (7)

LEARNING RESOURCES

TEXT BOOKS:

1. Automobile Engineering - G.B.S.Narang,Khanna Publishers,7th Reprint ,2011.

2. Automobile Engineering - R.B.Gupta, Satya Prakasan, 2009

3. Automobile Engineering - Vol I & II - Kirpal Singh, Standard Publishers,2011

REFERENCE BOOKS:

1. Automotive Mechanics - Van Nostrand Company, Joseph Heitner, 2007

2. Automobile Engineering - S.Srinivasan, 2007, TMH.

3. Automobile Engineering - K. Ramakrishna, PHI, New Delhi, 2012.

Books in Digital Library:

- *www.nptel.iitm.ac.in*

RELEVANT WEB SITES:

- *www.sciencedirect.com*
- *www.2.accessengineeringlibrary.com.*
- *www.asmedl.aip.org*
- *www.ieee.org/ieeexplore*

IV/IV Year B.Tech.- Seventh Semester

ME - 414 FINITE ELEMENT METHODS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course objectives:

- *To furnish information on advanced strength of materials and to introduce the basic concepts , background and methodology of FEM.*
- *To select suitable elements for Finite element modeling , deriving the necessary elemental matrices and for applying the principles to various mechanical systems.*
- *To learn the application of FEM to various structural problems incorporating temperature and boundary conditions .*
- *To derive the element mass matrices which help to predict dynamic behavior of the structure.*
- *To use ANSYS intelligently.*

Learning outcomes:

- *Create new solutions for the existing problems using FEA approaches.*
- *Derive element stiffness and mass matrix equations for various structural systems*
- *know the usage of different elements for different structures.*
- *Determine engineering design quantities (deformation, force, strain, stress) for bar , truss, and beam structures and under different loading conditions..*
- *Apply the steps in FEM solution to a variety of physical systems*
- *Use FEA to do projects.*

UNIT - I

Introduction :

Introduction to Finite Element Method , FDM Vs FEM , FEM Procedure, FEM Advantages , Disadvantages , FEM Applications , Stresses and Equilibrium. Strain Displacement relations. Stress - Strain relations for Plane stress and Plane Strain. (6)

One Dimensional Elements : Finite Element Modeling ,coordinates and shape functions, Potential Energy approach - Assembly of Global stiffness matrix and load vector. Finite element equations, Treatment of boundary conditions, Temperature Effects , Problems related to simple Axially loaded members. (9)

UNIT - II

Analysis of Trusses : Element stiffness matrix, Stress Calculations, Problems limited to truss with three members only. (7)

Analysis of Beams : Derivation of Element stiffness matrix for two node, two degrees of freedom per node , Beam element and Simple Problems. (8)

UNIT - III

Two Dimensional Elements : Finite element modelling of two dimensional stress analysis with constant strain triangles (CST) and treatment of boundary conditions.

Finite element modelling of Axisymmetric solids subjected to Axisymmetric loading with triangular elements. (15)

UNIT-IV

Concepts of Iso parametric, Super parametric and Sub parametric Elements, h & p elements. (2)

Stiffness and Force Matrices for Two dimensional four noded Quadrilateral element and numerical Integration by using Gaussian Quadrature. (5)

Dynamic Analysis : Formulation of finite element model, element matrices for one dimensional element, evaluation of Eigen values and Eigen vectors for a stepped bar. (8)

LEARNING RESOURCES

TEXT BOOK :

1. *Introduction to Finite Elements in Engineering, Chandraputla, Ashok and Belegundu, Prentice - Hall, 3rd edition,2003 .*
2. *The Finite Element Methods in Engineering , SS Rao, Pergamon , 5th Edition, 2011.*

REFERENCES :

1. *An Introduction to Finite Element Method, JN Reddy / Me Graw Hill, 2nd Edition, 1993.*
2. *Finite Element Methods : Basic concepts and applications, Alavala , Chennakesava. R, PHI,2009.*

WEB REFERENCES :

1. *Finite Element Method IIT Kanpur Course , Prof. C.S. Upadhyay*
   http://nptel.iitm.ac.in/video.php?subjectId=112104115
2. *Computational Methods in Design and Manufacturing by Dr.R. Krishnakumar, Department of Mechanical Engineering, IIT Madras*
   http://nptel.iitm.ac.in/video.php?subjectId=112106135

OPEN Elective -II

IV/IV Year B.Tech.- Seventh Semester

ME - 415/A ROBOTICS

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *To provide an introduction to Robotics and Automation including robot classification, design and selection, analysis and applications in industry.*
- *To provide the details of operations for a variety of sensory devices that are used on robot , the meaning of sensing, classification of sensor, that measure position, velocity & acceleration of robot joint.*
- *The goal of the course is to familiarize the students with the concepts and techniques in robot manipulator control.*

Learning Outcomes:

- *At the end of the course, students will be familiarized in basic components of robotics, classification of robots, robot grippers, Robot sensory devices, and transformations and kinematics of robot joints.*
- *An ability to apply knowledge of geometry, linear algebra, and dynamics to complex mechanical systems.*
- *An ability to design a robot mechanism to meet kinematics requirements.*
- *An ability to formulate, and solve complex kinematics and dynamics problems in robotics*

UNIT - I

Introduction to Robotics, major component of 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. (15)

LEARNING RESOURCES

TEXT BOOKS:

1. *Robotic Engineering by Richard D.Klafter, Prentice-Hall of India Pvt Ltd, 2010*
2. *Industrial Robotics by Mikell P. Groover, Tata McGraw-Hill Int. Edition 2, 2012*

REFERENCE BOOKS:

1. *Introduction To Robotics: Mechanics And Control, John J. Craig 3rd edition, pearson ,2008*
2. *Robotics: Control, Sensing, Vision, and Intelligence, K. S. Fu, R. C. Gonzales, and C. S. G. Lee, Tata McGraw-Hill, NY, 2008.*
3. *Introduction to Robotics: Analysis, Systems, Applications, Saeed B. Niku, Prentice Hall, NJ, 2010.*
4. *Robotics and control, R.K. Mittal, TMH, 2005.*

WEB REFERENCES:

- *http://nptel.iitm.ac.in/courses.php?branch=Mechanical*
- *http://academicearth.org/courses/introduction-to-robotics*

VIDEO REFERENCES

- *http://nptel.iitm.ac.in/video.php?courseId=1052*

OPEN Elective -II

IV/IV Year B.Tech.- Seventh Semester

ME - 415/B OPERATIONS RESEARCH

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*Semester End Exam Marks*	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives

- *Grasp the methodology of OR problem solving.*
- *Understand and differentiate deterministic/probabilistic/stochastic static/dynamic problem solving situations.*
- *Develop formulation skills in building models and finding solutions.*
- *Understand the basics in the field of and game theory*
- *Be able to interpret solutions on project planning through networks and simulation*

Learning outcomes:

- *Develop linear programming models that consider the key elements of the real world problem*
- *Interpret the models' solutions and infer solutions to the real-world problems.*
- *Recognize and solve transportation, game theory and dynamic programming problems.*
- *Know how project planning and when simulation can be applied to real-world problems.*

UNIT I

Linear Programming : Definition and Scope of Operations Research, Mathematical formulation of the problem, graphical method, Simplex method, artificial basis technique, 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. [8]

Assignment Problem: One to one assignment problem, optimal solutions, unbalanced assignment matrix, travelling sales man problem, maximization in A.P.

UNIT III

Theory of Games: Introduction, rectangular two person zero sum games, solution of rectangular games in terms of mixed strategies, solution of 2x2 games without saddle point, concept of dominance to reduce the given matrix, Graphical method for 2xn and nx2 games. [9]

Dynamic Programming: Introduction, Characteristics of D.P. model, the recursive equation approach, Computational Procedure in dynamic Programming, solution of an L.P. by D.P. [6]

UNIT IV

Project Planning through Networks: Introduction, Basic steps in PERT/ CPM techniques, Network diagram presentation, Rules of drawing network diagram, Fulkerson's rule, Time estimates and Critical path in network analysis, Project evaluation and review technique, Application areas of PERT/CPM techniques. [9]

Simulation: Introduction, Monte-Carlo Simulation, Application to Inventory Control, Application to Queuing Problems. [6]

LEARNING RESOURCES

TEXT BOOKS:

1. *SD Sharma, 'Operations Research (Units I,IV) Kedarnath, Ramnath & Co.,Meerut , 11th Edition , 2002..*
2. *BSGoel &S.K.Mithal,'Operations Research'(Units II,III) 'Pragathi Prakasham, Meerut, 2001.*

REFERENCES

1. *Optimization Theory and Applications - S.S. Rao , John Wiley & Sons , 1996.*
2. *Operations Research - Gupta and Hira , S Chand Publishers , 2011 Edition*

WEB REFERENCES:

- *http://www2.informs.org/Resources/*
- *http://www.mit.edu/~orc/*
- *http://www.ieor.columbia.edu/*
- *http://www.universalteacherpublications.com/univ/ebooks/or/Ch1/origin.htm*
- *http://www.wolfram.com/solutions/OperationsResearch/*

OPEN Elective -II

IV/IV Year B.Tech.- Seventh Semester

CE - 415 /A FINITE ELEMENT METHOD

Lectures / Tutorials : 4 Periods/Week	*Sessional marks*	*:*	*40*
	Semester End Exam. marks	*:*	*60*
Semester End Exam.: 3 Hours	*Credits*	*:*	*4*

Course Objectives:

- *To introduce basic principles of solid mechanics and energy methods*
- *To explain the properties of one-dimensional and two-dimensional elements*
- *Evaluation of element stiffness matrix and nodal load vector*
- *Assemblage of element stiffness matrices and nodal load vectors to obtain global stiffness matrix and global load vector*
- *To solve the simultaneous equations of equilibrium*
- *Solution to one - and two- dimensional problems*
- *To extend the method to soil / rock mechanics and inviscid and incompressible fluid flows.*

Learning Outcomes:

- *Learn the basic principles of solid mechanics and energy methods*
- *Know the properties of one-and two- dimensional elements*
- *Can evaluate element stiffness matrices and element load vectors*
- *Can obtain global stiffness matrix and nodal load vector*
- *Able to solve the simultaneous equations of equilibrium*
- *Able to obtain solutions to one- and two-dimensional problems*
- *Able to apply the method to soil / rock mechanics and inviscid and incompressible fluid flows*

UNIT -I (15)

The standard discrete system and origins of the finite element method Introduction ; The structural element and the structural system; Assembly and analysis of a structure ; The boundary conditions; Electrical and fluid networks ; The general pattern; The standard discrete system A direct physical approach to problems in elasticity: plane stress

Introduction ; Direct formulation of finite element characteristics; Generalisation to the whole region ; Displacement approach as a minimization of total potential energy; Convergence criteria; Finite element solution process; Numerical examples

UNIT -II (15)

Generalisation of the finite element concepts

Weighted residual methods - Integral or weak statements equivalent to the differential equations; Approximation to integral formulations; the Galerkin method ; Partial discretisation; Convergence Variational principles - What are variational principles ? ; Natural variational principles and their relation to governing differential equations ; Establishment of natural variational principles for linear , self-adjoint , differential equations ; Maximum, minimum or saddle point.

UNIT -III (15)

Standard and hierarchical element shape functions

Standard and hierarchical concepts; Rectangular elements - some preliminary considerations ; Completeness of polynomials ; Lagrange family ; Serendipity family Triangular element family ; Line elements Mapped elements and numerical integration

Use of shape functions in the establishment of coordinate transformations ; Geometrical conformity of elements; Variation of the unknown function within distorted, Curvilinear elements - continuity requirements; Evaluation of element matrices - transformation in local natural and area/volume coordinates; Order of convergence for mapped elements ; Numerical integration - One-dimensional and two-dimensional ; Required order of numerical integration

UNIT -IV (15)

Problems in linear elasticity

Governing equations; Finite element approximation; Displacements, strains and stresses; Numerical examples.

Field problems - Heat conduction, electric and magnetic potential and fluid flow

General quasi-harmonic equation ; Finite element solution process ; Partial discretisation - transient problems ; Numerical examples - an assessment of accuracy

LEARNING RESOURCES

TEXT BOOK

The finite element method - Its basis & Fundamentals by Zienkiewicz , Taylor and Zhu , 6th Edition, Elsevier India Private Ltd, 2007.

REFERENCE BOOKS

1. *The finite element method in engineering by S. S.Rao, Butterworth-Heinemann, New Delhi, 1999.*
2. *Introduction to the finite element method by C.S. Desai and J.F.Abel, CBS Publishers and distributors, 1987.*

Web References

- *www.wikipedia.com*
- *NPTEL Lectures (IIT M)*

OPEN Elective -II

IV/IV Year B.Tech.- Seventh Semester

CE - 415/B REMOTE SENSING AND GIS

Lectures / Tutorials	*: 4 / Periods/Week*	*Sessional Marks*	*: 40*
Semester Exam .	*: 3 Hrs*	*Semester End Exam. Marks*	*: 60*
		Credits	*: 4*

Course Objectives:

- To develop the fundamental concepts of GIS and remote sensing including the electromagnetic Spectrum, and nature of geospatial data.
- To make the student to understand the various Civil engineering applications of remote sensing.
- To familiarize s the students in the GIS based analytical and problem solving techniques for Sustainable planning and management of civil Engineering projects.

Learning Outcomes:

- Understand the importance of Remote sensing and GIS application in civil engineering
- Students are familiarize with study and identification of satellite imageries
- Students are able to learn the soft skills by using GIS technologies

UNIT - I (15)

Introductions to remote sensing; Applications and importance of remote sensing, Basic concepts and fundamentals of remote sensing Elements involved in remote sensing, electromagnetic spectrum, remote sensing terminology and units, over view of Indian Remote sensing satellites and sensors.

UNIT - II (15)

Image Interpretation : Energy resources, energy interactions with earth surface features and atmosphere, resolution, visual interpretation techniques, basic elements, converging evidence, interpretation for terrain evaluation, spectral properties of water bodies.

Geographic Information System:

Introduction, GIS definit]ion and terminology, GIS categories, components of GIS, fundamental operations of GIS, A theoretical framework for GIS.

UNIT - III (15)

Data representation:

Data collection and input overview, data input and output. Keyboard entry and coordinate geometry procedure, manual digitizing and scanning, Raster GIS, Vector GIS - Advantages and disadvantages. File management, Spatial data - Layer based GIS, Feature based GIS mapping.

GIS Analysis : GIS Spatial Analysis Computational Analysis Methods (CAM), Visual Analysis Methods (VAM), Data storage-vector data storage, attribute data storage, overview of the data manipulation and analysis. Integrated analysis of the spatial and attribute data.

UNIT - IV (15)

Applications of GIS : Application areas and user segments; Guide lines for preparation of GIS; Applications of GIS for land use and housing management; Assessment of physical transformation in an urban area.

Water Resources Applications: Land use/Land cover in water resources, Surface water mapping and inventory, Watershed management for sustainable development. Reservoir sedimentation, Ground Water Targeting and Identification of sites for artificial Recharge structures.

LEARNING RESOURCES

TEXT BOOKS:

1. *Remote Sensing and its applications by LRA Narayana, University Press 1999.*
2. *Principals of Geo physical Information Systems - Peter A Burragh and Rachael A. Mc Donnell, Oxford Publishers 2004.*

REFERENCE BOOKS :

1. *Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yeung, Prentice Hall, 2002.*
2. *Text Book of Remote Sensing and Geographical Information systems by M.Anji Reddy , 4th Edition,B.S.Publications,2012.*
3. *Geographic information Systems by Kang- tsung Chang, McGraw-Hill,2003.*
4. *Basics of Remote sensing & GIS by S.Kumar, USP,2005.*

WEB REFERENCE:

- *http://www.lib.vt.edu/subjects/maps/cartographic.html*
- *http://blogs.esri.com/esri/gisedcom/2010/01/08/using-online-resources-to-teach-remote-sensing/*
- *http://www.tec.army.mil/gis/*

OPEN Elective -II

IV/IV Year B.Tech. - Seventh Semester

BT- 415/A BIOSENSORS & BIOELECTRONICS

Lectures	*: 3 Periods /week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 Period / Week*	*Semester Examination Marks*	*: 60*
Semester Examination: 3 hours		*No. of credits*	*: 3*

Course Objectives:

- *Understand what biosensors are, their advantages and limitations.*
- *Acquire knowledge of types and construction of Biosensors.*
- *Gain knowledge and understanding of various types of transducers, their principles and applications.*
- *Understand the construction and working of biosensors and their utilities in Industry, agriculture etc.*
- *Understand the advantages of potential biomolecular computer.*
- *Acquire knowledge and appreciate the development of molecular arrays as memory stores.*
- *Acquire knowledge of assembly of photonic biomolecular memory store.*
- *Understand and appreciate information processing and prospects for biomolecular computing systems.*

Learning Outcomes:

- *Gained understanding of biosensors, their advantages and limitations.*
- *Acquired knowledge of types and construction of Biosensors.*
- *Gained knowledge and understanding of various types of transducers, their principles and applications.*
- *Developed understanding of the construction and working of biosensors and their utilities in Industry, agriculture etc.*
- *Appreciates the advantages of potential biomolecular computer.*
- *Acquired knowledge of the development of molecular arrays as memory stores.*
- *Acquired knowledge of assembly of photonic biomolecular memory store.*
- *Developed understanding of information processing and prospects for biomolecular computing systems.*

UNIT- I (15)

Introduction: Introduction to Biosensors, Advantages and Their Limitations, Various components; Biocatalysis based biosensors, Bioaffinity based biosensors and Microorganisms based biosensors; Biologically active material and analyte; Types of membranes used in biosensor constructions.

UNIT- II (15)

Transducers in Biosensors and Applications of Biosensors: Various types of transducers; Principles and applications- Colorimetric, Optical, Potentiometric, Amperometric, Conductometric, Resistometric, Piezoelectric, Semiconductor, Impedimetric, Mechanical and Molecular electronic based transducers. Chemiluminiscence based biosensors. Biosensors in clinical chemistry, medicine and health care; Biosensors for veterinary, agriculture and food; Low cost biosensors for industrial processes for online monitoring; Biosensors for environmental monitoring.

UNIT- III (15)

Molecular Electronics: Potential advantages and development towards a biomolecular computer; Development of Molecular arrays as a memory stores; Molecular wires and switches; Mechanisms of Unit assembly.

UNIT- IV (15)

Design for A Biomolecular Photonic Computer: Assembly of photonic Biomolecular memory store; Information Processing; Commercial prospects for Biomolecular computing systems.

LEARNING RESOURCES

TEXT BOOKS:

1. *Biotechnology the Science and Business, Moses V, Cape RE, Academic Publishers.*
2. *Biosensors for environmental Monitoring,Bilitewski U, Turner APF, Harwood.*
3. *Biosensors for Analytical Monitoring: EPA Biosensor Group, Rogers KR, Mascini M*

WEB REFERENCES

- *www.wikipedia.com*
- *NPTEL Lectures*

OPEN Elective -II

IV/IV Year B.Tech. - Seventh Semester

BT - 415/B BIOMEDICAL INSTRUMENTATION

Lectures	*: 3 Periods /week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 Period / Week*	*Semester Examination Marks*	*: 60*
Semester Examination: 3 hours		*No. of credits*	*: 3*

Course Objectives:

- *Acquire knowledge of the basic anatomy and physiology of various organ systems of human body viz., circulatory, nervous, musculo-skeletal, respiratory, reproductive etc.*
- *Understand the homeostatic mechanisms of the body like maintenance of body temperature.*
- *Acquire knowledge and understanding of the principles underlying the design of diagnostic equipments like ECG,EEG, EMG etc.*
- *Understand the concepts of contact impedance and effects, electrodes used and their working.*
- *Understand the transducers - types and characteristics*
- *Understand the physiological pre-amplifier and specialized amplifiers.*
- *Acquire knowledge of the built and working of X-ray machines.*
- *Develop skills in troubleshooting and maintenance of X- ray machines.*

Learning Outcomes:

- *. Gained insight into the working of various organ systems of human body.*
- *Developed an understanding of homeostatic mechanisms of human body.*
- *Acquired understanding of the principles and their application in the design of diagnostic equipments.*
- *Developed knowledge of the concepts of contact impedance and working of electrodes.*
- *Gained knowledge of the transducers, their types and characteristics.*
- *Developed knowledge of amplifiers and their applications.*
- *Gained understanding of the working of X-ray machines.*
- *Developed skills in maintenance and repair of X-ray machines.*

UNIT- I

Basic Anatomy and Physiology: Elementary ideas of cell structure, heart and circulatory system, Central nervous system, body temperature, musculo-skeletal system, Respiratory system, and reproductive system. (10)

UNIT- II

Bioelectric equipment and Bioelectric signals: Equipment - diagnostic, therapeutic and clinical laboratory; Bioelectric signals (ECG, EOG, EEG, EMG, ERG) and their characteristics; Bioelectrodes, electrodes at tissue interface, contact impedance, effects of high contact impedance, types of electrodes - Electrodes for ECG, EEG, EMG. (12)

UNIT- III

Transducers for Biomedical Applications: Resistive transducers - Muscle force and Stress (Strain gauge), Spirometry (Potentiont) humidity, (Gamstrers), Respiration (Thermistor), Inductive Transducers - Flow measurements, muscle movement (LVDT), Capacitive Transducers - Heart sound measurement; Photoelectric Transducers - Pulse transducers, Blood pressure, oxygen Analyses; Piezoelectric Transducers - Pulse pickup, ultrasonic blood flowmeter; Chemcial Transducer - Ag-Agfallas (Electrodes, PH electrode, Bioelectric Signal recording machines); Physiological pre-amplifier and specialized amplifiers, ECG lead systems details of ECG, EMG, and EEG machines. (16)

UNIT- IV

X-ray Machines and Safety aspects of Medical equipment: Basic X-Ray components and circuits, types of X-ray machines e.g. general purpose, dental image intensifier system; trouble shooting and maintenance of X- Ray machine; biological effects of X-rays and precautions. Gross current, Micro Current shock, safety standards and considerations, safety testing instruments. (8)

LEARNING RESOURCES

TEXT BOOKS

1. *Medical Instrumentation by John. G. Webster -John Wiley*
2. *Principles of Applied Biomedical Instrumentation by Goddes& Baker - John Wiley*
3. *Biomedical Instrument by Cromwell-Prentice Hall of India, New Delhi*
4. *Hand book of Medical instruments by R.S. Khandpur -TMH, New Delhi*

REFERENCE BOOKS

1. *Biomedical Instrumentation & Measurement by Carr & Brown-Pearson*
2. *Medical Electronics and Instrumentation by Sanjay Guha - University Publication*
3. *Introduction to Biomedical electronics by Edwand J. Bukstein - Sane and Co. Inc. USA*

OPEN Elective -II

IV/IV Year B.Tech. - Seventh Semester

ChE - 415/A ENERGY ENGINEERING

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives

- *To provide the knowledge about formation, classification, ranking, analysis, testing, carbonization, gasification and liquification of coal, manufacture of cock.*
- *To provide the knowledge about design, occurrence, composition, classification, exploration and production of petroleum, refining, testing and analysis of petroleum products.*
- *To provide knowledge about the non conventional energy courses and its storage*
- *To provide knowledge about the energy related problems in the world and its solutions.*

Learning Outcomes:

- *An ability to understand the importance of environment and conservation of natural resources.*
- *An ability to succeed in the competitive exams of energy industry.*
- *An ability to utilize the non conventional energies in place of conventional energies and its manufacture.*
- *An ability to maintain the sustainability in the environment.*

UNIT - I (15)

Conventional energy resources, the present scenario, scope for future development.

Coal: Origin, occurrence and reserves, classification, ranking, analysis and testing, coal carbonization, manufacture of coke, coal gasification, coal liquefaction.

UNIT - II (15)

Petroleum: Origin, occurrence and reserves, composition, classification, characteristics, exploration and production.

Petroleum Refining: Refinery processes, petroleum products, testing and analysis of petroleum products.

UNIT - III (15)

Non conventional energy sources: Solar energy, solar radiation, principles of heating and cooling, photo voltaic cells.

Bio gas products, bio-mass, wind energy, hydrogen energy, geothermal and ocean thermal energy, fuel cells.

UNIT - IV (15)

Energy storage, mechanical energy storage, water storage, solar pond, phase change storage, chemical storage.

Energy Conservation: Conservation methods in process industries, Theoretical analysis, practical limitations, equipment for energy saving / recovery.

LEARNING RESOURCES

TEXT BOOKS:

1. *Conventional Energy technology by S.B.Pandy, Tata McGraw Hill (1987)*
2. *Fuel Science by Harker and Allen,Ist edition , Oliver & Boyd (1972).*
3. *Principles of Energy conversion by Culp, Mc Graw Hill(1991)*

REFERENCE BOOKS:

1. *Hand book of Energy Technology by Considine D. M,McGraw Hill(1977).*
2. *Fuels and energy by Harker and Backhusst, Academic press (1981)*
3. *Solar Energy Thermal Process by John A Duffie, John Wiley & Sons Inc (1975).*

WEB REFERENCES

- *www.wikipedia.com*
- *NPTEL Lectures*

OPEN Elective -II

IV/IV Year B.Tech.- Seventh Semester

ChE - 415/B BIOFUELS

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period*	*Semester End Exam Marks*	*: 60*
Semester End Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives

- *To provide the knowledge about properties, composition, features of biofuels and uses of biomass and their environmental impacts.*
- *To provide the students a substantial knowledge of biofuel production technologies.*
- *To provide knowledge about the process of biogas production and methods of production of biodiesel and comparison of the standards to the conventional diesel.*
- *To provide knowledge about the production of lipids, bio hydrogen from different bacteria and algae.*

Learning Outcomes

- *An ability to describe the functional principle of biofuel technologies in small and large scale.*
- *An ability to describe the main steps and components in bioethanol, biodiesel and biogas production.*
- *An ability to Participate actively in teamwork and work with case related problem solving.*
- *An ability to work with professional problem solving in an industrial environment.*

UNIT - I (15)

Introduction:

Sources of energy, introduction of biofuels, availability of bio mass, composition of biomass, terrestrial biomass, aquatic biomass.Physical and chemical properties of biomass.useful features of biofuels, undesirable features of biofuels, energy crops, modes of utilization of biomass and their environmental impacts.

UNIT - II (15)

Biogas: The substrate, the digester, the microorganisms, the process of bio gas production, factors affecting bio gas yields, advantages, disadvantages.

Bioethanol : Bioethanol vs. Petrol, production of bio ethanol, ethanol recovery.Bio butanol.

UNIT -III (15)

Bio diesel: Sources of lipids, production of lipids, methods of production of bio diesel, comparison of bio diesel with conventional diesel.Standards of bio diesel.

UNIT - IV (15)

Bio hydrogen: Production of bio hydrogen from anaerobic bacteria, photosynthetic algae, photosynthetic-hydrogenase system.

Fuel cells: Enzymatic fuel cells, microbial fuel cells.

LEARNING RESOURCES

TEXT BOOK:

1. *Bio Technology - Expanding horizons, B.D.Sing, Kalyani Publishers, Ludhiana.*

REFERENCE BOOKS:

1. *Fundamentals of Renewable Energy Systems, D.Mukherjee, S.Chakrabarti, New Age International Publishers.*
2. *A Text Book of Biotechnology, R.C.Dubey, S.Chand & Company Ltd., New Delhi.*
3. *Non-Conventional Energy Sources, G.D.Rai, Khanna Publishers.*

WEB REFERENCES

- *www.wikipedia.com*
- *NPTEL Lectures*

OPEN Elective -II

IV/IV Year B.Tech.- Seventh Semester

CS -415/A JAVA PROGRAMMING

Lectures	*: 3 periods/week*	*Internal Marks*	*: 40*
Tutorials	*: 1 period/week*	*Semester End Exam Marks*	*: 60*
Sem End Exam Duration	*: 3 hours*	*Credits*	*: 3*

Course Objectives

- *Understand the syntax of the java and Write simple Java applications using control statements like if, if-else etc..*
- *Understand Object oriented Programming Principles like encapsulation, inheritance, and polymorphism in java.*
- *Understand how to use classes, methods and objects.*
- *Learn inheritance, Interfaces and packages.*
- *Manipulate the String & StringBuffer, Date, Collection, Enumeration, and Wrapper classes.*
- *Understand the exception handling mechanism in java.*
- *Understand the Threading mechanism in java and creating multiple threads, demonstrate the deadlock situation and inter thread communication.*
- *Under stands the I/O streams in java and use the classes Streams, Byte streams, Character streams, File class, File stream.*
- *Understand and implement Applets and use Graphics class.*
- *Understand the event handling mechanism & difference between AWT and Swing components.*
- *Understand the concept of database connectivity and write database applications with java.*
- *Understand the concept of java basic networking principles.*

Learning Outcomes

- *Familiar the syntaxes and semantics of java programming language.*
- *Understanding the concepts of OOPs; create new classes, methods, objects.*

- *Study the predefined packages, and define user defined packages and Interfaces.*
- *Implement the String and String Buffer, Date, Enumerations, and wrapper classes.*
- *Define own exception classes that may be needed in the application development.*
- *Write multitasking applications with threads and able to detect deadlock situations.*
- *Develop applets for internet applications*
- *Develop applications that are based on event driven programming.*
- *Design more efficient GUI applications with java.awt.*
- *Develop GUI applications with javax.swing. Packages.*
- *Ability to develop the Database Applications with java.sql.*
- *Design Networking applications such TCP and UDP with java.net.*

UNIT-I (16)

Introduction: Introduction to java, java buzzword, data types, dynamic initialization, scope and life time, operators, control statements, arrays, type conversion and casting, finals & blank finals.

Classes and Objects : Concepts, methods, constructors, usage of static, access control, this key word, garbage collection, overloading, parameter passing mechanisms, nested classes and inner classes.

Inheritance: Basic concepts, access specifiers, usage of super key word, method overriding, final methods and classes, abstract classes, dynamic method dispatch, Object class.

UNIT-II (14)

Interfaces: Differences between classes and interfaces, defining an interface, implementing interface, variables in interface and extending interfaces.

Packages: Creating a Package, setting CLASSPATH, Access control protection, importing packages.

Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes.

UNIT-III (15)

Strings: Exploring the String class, String buffer class, Command-line arguments.

Library: Date class, Wrapper classes.

Multithreading : Concepts of Multithreading, differences between process and thread, thread life cycle, Thread class, Runnable interface, creating multiple threads, Synchronization, thread priorities, inter thread communication, daemon threads, deadlocks.

I/O Streams: Streams, Byte streams, Character streams, File class, File streams.

UNIT-IV (15)

Applets: Concepts of Applets, life cycle of an applet, creating applets, passing parameters to applets, accessing remote applet, Color class and Graphics

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling events.

AWT: AWT Components, windows, canvas, panel, File Dialog boxes, Layout Managers, Event handling model of AWT, Adapter classes, Menu, Menu bar.

LEARNING RESOURCES

TEXT BOOK:

1. *The Complete Reference Java J2SE 7th Edition, Herbert Schildt, TMH Publishing Company Ltd, NewDelhi.*

REFERENCE BOOKS :

1. *Big Java 2nd Edition, Cay Horstmann, John Wiley and Sons,Pearson Edu.(UNIT-IV)*
2. *Beginning in Java 2, Iver Horton, Wrox Publications.*
3. *Java, Somasundaram, Jaico.*
4. *Introduction to Java programming, By Y.Daniel Liang,Pearson Publication*

WEB REFERENCES

- *www.wikipedia.com*
- *NPTEL Lectures*

OPEN Elective -II

IV/IV Year B.Tech.- Seventh Semester

CS - 415/B DATABASE MANAGEMENT SYSTEMS

Lectures	*: 3 periods/week*	*Internal Marks*	*: 40*
Tutorials	*: 1 period/week*	*Semester End Exam Marks*	*: 60*
Sem End Exam Duration : 3 hours		*Credits*	*: 3*

Course Objectives:

- *To understand the fundamental concepts, historical perspectives, current trends, structures, operations and functions of different components of Databases.*
- *To understand the structural constraints of relationships*
- *To understand the types of integrity constraints in a relational database system.*
- *To understand the concepts provided by Relational Algebra, Relational Calculus and SQL and able to specify queries on any database using them.*
- *To recognize the importance of data base analysis and design in the implementation of any database application.*
- *To understand how to perform the normalization process of relations before implementation.*
- *To understand the primary file organizations and index structures used by different database systems.*
- *To describe the role of transaction processing in a database system*
- *To understand various concurrency control mechanisms for a database system*
- *To describe the roles of recovery and security in a database system.*

Learning Outcomes:

- *An understanding of basic concepts and current trends of different database systems*
- *An understanding of various database system architectures*
- *An ability to enforce various integrity constraints*

- *An ability to write relational algebra and Relational calculus expressions*
- *An ability to use Standard Query Language and its various versions.*
- *An ability to design and develop a database that is in specified normal form.*
- *An understanding of the Importance of transaction processing*
- *An ability to use different concurrency control techniques while implementing real time applications*
- *An understanding of the importance of backup and recovery techniques.*
- *An ability to build Database systems that can handle real world problems.*

UNIT-I

Databases and Database Users: Introduction - An Example - Characteristics of the Database Approach - Actors on the Scene - Workers behind the Scene - Advantages of Using the DBMS Approach

Database System Concepts and Architecture: Data Models, Schemas, and Instances - Three-Schema Architecture and Data Independence - Database Languages and Interfaces

Data Modeling Using the Entity-Relationship (ER) Model: Using High-Level Conceptual Data Models for Database Design - An Example Database Application - Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types (15)

UNIT-II

The Relational Data Model and Relational Database Constraints: Relational Model Concepts - Relational Model Constraints and Relational Database Schemas - Update Operations, Transactions, and Dealing with Constraint Violations - Relational Database Design Using ER-to-Relational Mapping

SQL-99 : Schema Definition, Constraints, Queries, and Views: SQL Data Definition and Data Types - Specifying Constraints in SQL - Schema Change Statements in SQL - Basic Queries in SQL - More Complex SQL

Queries - INSERT, DELETE, and UPDATE Statements in SQL - Views (Virtual Tables) in SQL (15)

UNIT-III

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas - Functional Dependencies - Normal Forms Based on Primary Keys - General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form Database Security: Introduction to Database Security Issues - Discretionary Access Control Based on Granting and Revoking Privileges - Mandatory Access Control. (15)

UNIT-IV

Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Processing - Transaction and System Concepts - Desirable Properties of Transactions

Concurrency Control Techniques: Two-Phase Locking Techniques for Concurrency Control - Concurrency Control Based on Timestamp Ordering

Database Recovery Techniques: Recovery Concepts - Recovery Techniques Based on Deferred Update - Recovery Techniques Based on Immediate Update - Shadow Paging (15)

LEARNING RESOURCES

TEXT BOOK:

1. *Fundamentals of Database Systems, Ramez Elmasri and Navate, Pearson Education, 5th edition.*

REFERENCE BOOKS:

1. *Introduction to Database Systems, C.J.Date, Pearson Education.*
2. *Data base Management Systems, Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill 3rd Edition*
3. *Data base System Concepts, Silberschatz, Korth, McGraw hill, 5th edition.*

WEB REFERENCES

- *www.wikipedia.com*
- *NPTEL Lectures*

OPEN Elective -II

IV/IV Year B.Tech.- Seventh Semester

EC - 415/A APPLIED ELECTRONICS

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*University Exam Marks*	*: 60*
University Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives:

- *To Understand about various modern electronic systems.*
- *To provide clear explanation of the operation of all the important electronic devices and systems available.*
- *To know about modern audio and video systems.*
- *To knoew about various Telecommunication Systems.*

Learning Outcomes:

- *To Know about various electronic gadgets and their operation.*
- *Can be able to design various equipment used in the electronic systems.*

UNIT -I (Text Book1)

Microphones, Headphones and Headsets, Loud Speakers, Disc Recording and Reproduction , Amplifying Systems Equalizers and Mixers, Electronic Music Synthesizers. (15)

UNIT-II (Text Book1)

Commercial Sound, Theatre Sound System, Audio Systems , Color TV standards and Systems, Remote Controls, Video Systems. (15)

UNIT-III (Text Book1)

Electronic Gadgets and Home Appliances:

Telecommunication Systems, Switching Systems, Modulation Techniques, Carrier Systems, Fibre Optics (15)

UNIT-IV (Text Book1)

Data Services, Mobile Systems, Facsimile fax, Xerography (15)

LEARNING RESOURCES

TEXT BOOKS:

1. *Consumer Electronics by S.P.Bali, Pearson Education, ISBN: 9788131717592.*

REFERENCE BOOKS:

1. *Consumer Electronics for Engineers by Philip Herbert Hoff, Cambridge University Press (July 28, 1998), ISBN-10: 0521582075*
2. *Digital Consumer Electronics Handbook by Ronald K.Jurgen, (Editor) by McGraw Hill Professional Publishing, 1997. ISBN-10: 0070341435*

WEB REFERENCES:

- *http://www.newagepublishers.com/samplechapter/000969.pdf*
- *http://www.bits-pilani.ac.in:12354/qp1-9-10/EEE_C414_851_C_2009_1.pdf 3.http://nptel.iitm.ac.in*

OPEN Elective -II

IV/IV Year B.Tech.- Seventh Semester

EC - 415/B BASIC COMMUNICATION

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: 1 period / week*	*University Exam Marks*	*: 60*
University Exam	*: 3 hrs*	*Credits*	*: 3*

Course Objectives

- *To Understand an overview of communication systems.*
- *To Understand the modulation technique,need of modulation,Amplitude modulation.*
- *To understand fundamentals of digital communications*
- *To understand broadband communication systems and Television fundamentals.*

Course Outcomes:

- *Can decide the type of modulation techniques required for a specific application.*
- *Can know about various communication systems.*
- *Can know about the Television fundamentals.*

UNIT -I (Text Book 1)

Communications: Communications systems, Information, Transmitter, Channel - noise, Receiver, Modulation, Description, Need for modulation, Bandwidth Requirements, Frequency spectra of nonsinusoidal waves.

Amplitude Modulation: Amplitude Modulation Theory, Frequency spectrum of the AM wave, Representation of AM, Power relations in the AM wave, Generation of AM, Basic requirements - comparison of levels, Grid - modulated class C amplifier, Plat - modulated class C amplifier, Modulated transistor amplifiers, System summary. (15)

UNIT -II (Text Book 1)

Digital Communications: Digital Technology, Digital fundamentals, The binary number system, Digital electronics, Fundamentals of Data

Communications Systems, The emergence of data communications systems, Characteristics of data transmission circuits, Digital codes, error detection and correction, Data Sets and Interconnection Requirements, Modem classification, Modem interfacing, Interconnection of data circuits to telephone loops, Network and Control Considerations, Network organization, Switching systems, network protocols, Summary. (15)

UNIT -III (Text Book 1)

Broadband Communications Systems: Multiplexing, Frequency division multiplex, Time - division multiplex, Short and Medium - Haul Systems, Coaxial Cables, Fiber optic links, Microwave links, tropospheric Scatter links, Long Haul Systems, Submarine cables, Satellite Communications, Elements of Long-Distance Telephony, Routing codes and signaling systems, Telephone exchanges (switches) and routing, Miscellaneous practical aspects, Introduction to traffic engineering. (15)

UNIT -IV (Text Book 1)

Television Fundamentals : Requirements and Standards, Introduction to television, Television systems and standards, Black and White Transmission, fundamentals, Scanning, Banking and synchronizing pulses, Black and white Reception, Fundamentals, Common, video and sound circuits, Synchronizing circuits, Vertical deflection circuits, Horizontal deflection circuits, Color Transmission and Reception, Introduction, Color transmission, Color reception. (15)

LEARNING RESOURCES

TEXT BOOKS:

1. George Kennedy, Tata McGraw-Hill Publishing , 3rd Edition

REFERENCE BOOKS:

1. Introduction to Analog and Digital Communication, Simon Hykin S

WEB REFERENCES:

- *http://web.engr.oregonstate.edu/~magana/ECE461-561/index.htm*
- *http://www.ensc.sfu.ca/~jiel/courses/327/index.html*
- *http://www.ece.utah.edu/~npatwari/ece5520/lectureAll.pdf*
- *http://nptel.iitm.ac.in/syllabus/syllabus.php?subjectId=117105077*

OPEN Elective -II

IV/IV Year B.Tech.- Seventh Semester

IT- 415/A WEB TECHNOLOGIES

Lectures	*: 3 periods/week*	*Internal Marks*	*: 40*
Tutorials	*: 1 period/week*	*Semester End Exam Marks*	*: 60*
Sem End Exam Duration :3 hours		*Credits*	*: 3*

Course Objectives

- *Describe the basic infrastructure and architecture of the Internet, including the main protocols.*
- *Write a valid XHTML document involving a variety of element types, including hyperlinks, images, lists, tables, and forms.*
- *Use CSS to implement a variety of presentation effects in XHTML and XML documents, including explicit positioning of elements*
- *Understand the need of scripting language, accessing XHTML elements using DOM, dynamic styles, validating user inputs, events for user interactions.*
- *Understand the need of XML documents, XML DTDs differ from XML schemas, discuss ways in which an XSL transform differs from processing an XML document using a DOM API.*

Learning Outcomes:

After completion of the course, student posses:

- *Understands the basic infrastructure and architecture of the Internet, including the main protocols.*
- *Ability to create static XHTML web pages and to apply style sheets for uniform look and feel for web pages using CSS.*
- *Ability to write client side scripting using JavaScript, understand how to construct programs modularly with functions, concept of arrays, and understand the object-based programming terminology.*
- *Ability to use scripting for creation of dynamic web pages, accessing elements using DOM, user interactions with events.*
- *Ability to create valid XML documents using DTDs & XML Schemas, providing styles to XML documents using XSL, and understand the importance of RSS feeds in the modern web.*

UNIT- I (13)

Fundamentals: A Brief introduction to the Internet, The World Wide Web, Web Browsers, Web Servers, Uniform Resource Locators, Multipurpose Internet Mail Extensions, The HTTP.

Introduction to XHTML: Origins and evolution of HTML, and XHTML, Basic Syntax, Standard XHTML, Document structures, Basic Text markup, images, hypertext links, lists, tables, forms, frames, syntactic differences between HTML & XHTML.

UNIT - II (17)

Cascading Style Sheets (CSS): introduction, levels of style sheets, style specification formats, selector forms, property value forms, font properties, list properties, color, alignment text, The Box model, Background images, the span and div tags.

The Basics of JavaScript: Overview of JavaScript, Object orientation and JavaScript, General Syntactic characteristics, primitives, operations and expressions, Screen output and keyboard input, control statements.

UNIT - III (15)

JavaScript : Object creation and modification, Arrays, Functions, An Example, Constructors, Pattern matching using regular expressions, Errors in scripts.

JavaScript and HTML Documents: The JavaScript Execution Environment, The Document Object Model, Element accessing in JavaScript, Events and Event Handling, Handling Events from Body elements, Handling events from Button elements, Handling Events from Text boxes and password elements, The DOM 2 Event model, The Navigator object.

UNIT - IV (15)

Dynamic Documents with JavaScript: Introduction, Element Passing, Moving Elements, Element Visibility, Changing colors and Fonts, Dynamic Content, Stacking Elements, Locating the mouse cursor, Reacting to mouse click, slow movement of elements, dragging and dropping elements.

Introduction to XML: Introduction, The syntax of XML, XML document structure, Document Type Definition, Namespaces, XML Schemas, Displaying Raw XML documents, displaying XML documents with CSS, XSLT Style sheets.

LEARNING RESOURCES

TEXT BOOKS:

1. *Robert W. Sebesta "Programming the World Wide Web", 4/e Pearson Education.*

REFERENCES:

1. *Harvey M. Deitel and Paul J. Deitel, "Internet & World Wide Web How to Program", 5/e, Pearson Education.*
2. *Jeffrey C. Jackson "Web Technologies A computer Science Perspective" Pearson Education.*
3. *Jason Cranford Teague "Visual Quick Start Guide CSS, DHTML & AJAX", "Pearson Education.*

Web References

- *www.wikipedia.com*
- *NPTEL Lectures*

OPEN Elective -II

IV/IV Year B.Tech.- Seventh Semester

IT - 415/B SOFTWARE ENGINEERING

Lectures	*: 3 periods/week*	*Internal Marks*	*: 40*
Tutorials	*: 1 period/week*	*Semester End Exam Marks*	*: 60*
Sem End Exam Duration : 3 hours		*Credits*	*: 3*

Course Objectives:

- *To make the students learn about the basic concepts on Software Engineering Methods and Practices and their appropriate application in Software industry.*
- *To develop an understanding of Software Process Models and Software Development Life Cycle.*
- *To provide an idea on Software testing techniques.*
- *To teach an understanding role of the different aspects of Software Project Management.*
- *To develope an approach on ethical and professional issues those are important for software Project Management.*

Course Outcomes:

- *Capabilities to identify, formulate, and solve Software Engineering problems.*
- *Be able to elicit, analyze and specify software requirements with various stakeholders of a software development project.*
- *Ability to participate in design, development, deployment and maintenance of a medium scale software development project.*
- *Knowledge to convey technical material through oral presentation and interaction with an audience.*
- *Ability to evaluate the impact of potential solutions to software engineering problems in a global society, using the knowledge of models, tools, and techniques.*

UNIT - I (15)

Introduction to Software Engineering: The Evolving Role of Software, the Changing Nature of Software, Legacy Software.

A Generic View of Process : A Layered Technology, A Process Framework.

Process Models : The Waterfall Model, Incremental Process Models, Evolutionary Models

An Agile View of Process : What is Agility? What is an Agile Process?

UNIT - II (20)

Software Engineering Practice: Software Engineering Practice, Communication Practices, Planning Practices, Modeling Practices, Construction Practice, Deployment.

System Engineering: Computer Based Systems, The System Engineering Hierarchy, Business Process Engineering: an overview, Product Engineering: an overview.

Requirements Engineering: Requirements Engineering Tasks, Initiating the Requirements Engineering Process.

UNIT - III (15)

Building the Analysis Model: Requirements Analysis, Analysis Modeling Approaches, Data Modeling Concepts, Flow-Oriented Modeling, Class Based Modeling.

Design Engineering: Design within the Context of Software Engineering, Design Process and Design Quality, Design Concepts.

UNIT - IV (15)

Software Quality Assurance: Quality Concepts, Quality Movement.

Testing Tactics : Software Testing Fundamentals, Black-Box Testing, White-Box Testing, Basis Path Testing, Control Structure Testing, OO Testing Methods.

LEARNING RESOURCES

TEXT BOOKS :

1. *Roger S.Pressman, 'Software Engineering- A Practitioner's Approach', Sixth Edition, McGraw- Hill International.*

REFERENCE BOOKS :

1. *Ian Sommerville, 'Software Engineering', Sixth Edition, Pearson Education.*
2. *Carlo Ghezzi, Mehdi Jazayeri, Dino Mandrioli, 'Fundamentals of Software Engineering', Second Edition, PHI.*
3. *Rajib Mall, 'Fundamentals of Software Engineering', Second Edition, PHI.*

OPEN Elective -II

IV/IV Year B.Tech.- Seventh Semester

EE - 415/A RENEWABLE ENERGY SOURCES

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam: 3 hrs		*Credits*	*: 3*

Course Objectives

- To know the depletion rate of conventional energy resources and importance of renewable energy resources.
- To know alternate viable energy sources to meet the energy requirements.
- To discuss about solar energy, wind energy, tidal energy and geothermal energy as alternate resources.

Learning Outcomes:

The student will be able to

- Know the National scene of energy production, utilization, consumption and reserves.
- Appreciate the need for non-conventional energy sources.
- Understand relative advantages and disadvantage of various non-conventional energy sources.
- Understand basic heat transfer principle, storage methods available, working and construction related to solar collectors.
- Understand the assessment of wind energy potential, wind turbines and wind generators.
- Know about ocean energy, geo thermal energy and bio energy.

UNIT-I (Text Book- 1)

Principle of Renewable Energy: Comparison of renewable and conventional energy sources - Ultimate energy sources - natural energy currents on earth - primary supply to end use - Spaghetti & Pie diagrams - energy planning - energy efficiency and management. (9)

UNIT-II (Ref. Book- 2)

Solar Radiation: Extra terrestrial solar radiation - terrestrial solar radiation - solar thermal conversion - solar thermal central receiver systems - photovoltaic energy conversion - solar cells - 4 models. (11)

UNIT-III (Text Book- 1, Ref. Book- 2)

Wind energy: Planetary and local winds - vertical axis and horizontal axis wind mills - principles of wind power - maximum power - actual power - wind turbine operation - electrical generator. (13)

UNIT-IV (Ref. Book- 1)

Energy from Oceans: Ocean temperature differences - principles of OTEC plant operations - wave energy - devices for energy extraction - tides - simple single pool tidal system.

Geothermal Energy: Origin and types - Bio fuels - classification - direct combustion for heat and electricity generator - anaerotic digestion for biogas - biogas digester - power generation. (16)

LEARNING RESOURCES

TEXT BOOKS:

1. *Renewable Energy Sources by John Twidell& Toney Weir : E&F.N. Spon*
2. *Renewable Energy Sources: Their impact on global warming and pollution by Abbasi & Abbasi -PHI*

REFERENCE BOOKS:

1. *Power plant technology by EL-Wakil, McGraw-Hill*
2. Non-Conventional Energy Sources by G.D.Rai, Khanna Pub.

WEB REFERENCES:

- *http://www.tn.gov.in/spc/tenthplan/CH_11_2.PD*
- *http://bieap.gov.in/Nonconventionalenergysourses*
- *http://www.em-ea.org/Guide%20Books/book-4/4.12App%20of%20Non%20conventional*

OPEN Elective -II

IV/IV Year B.Tech.- Seventh Semester

EE - 415/B UTILIZATION OF ELECTRICAL ENERGY

Lectures	*: 3 periods / week*	*Sessional Marks*	*: 40*
Tutorials	*: __ period / week*	*Semester End Exam Marks*	*: 60*
Semester End Exam:	*3 hrs*	*Credits*	*: 3*

Course Objectives

- *To make students to learn the usage of electrical energy for various applications such as illumination, heating, welding etc.*
- *To provide specific knowledge on Principles and characteristics of storage batteries*

Learning Outcomes:

After completing this course, students will be able to:

- *Know to utilize the electrical energy for production of heat and welding process*
- *Design heating elements such as furnaces and ovens*
- *Know the lighting calculations for different kinds of applications*
- *Gain knowledge on storage cells*

UNIT - I (Text Book- 1)

Illumination : Introduction- terms used in illumination-laws of illumination-Gas discharge lamps - Fluorescent lamps - Arc lamps - Filament lamps - comparison between filament and fluorescent lamps-square law methods of calculation - Factory lighting - flood lighting and street lighting-design of lighting schemes-introduction to Compact Fluorescent Lamps. (12)

UNIT - II (Text Book- 1)

Electric Heating: Introduction; Modes of heat transfer - Stefan's law - classification of electric heating methods- design of heating element - Construction and working of different types of induction furnaces - resistance furnace - Dielectric heating - arc furnaces . (13)

UNIT - III (Text Book- 1)

Welding: Introduction- Types of welding - resistance and arc welding - Characteristics of Carbon and metallic arc welding - comparison

(Excluding electronic controls)- requirements of good weld-ultra sonic-electron beam-laser beam welding. (10)

UNIT - IV (Text Book - 2)

Storage batteries: Applications-rating-classification-dry cell and wet cells-primary and secondary cells-charging and discharging of lead acid cells, trickle charging-methods of charging lead acid batteries-over discharging-common troubles with lead acid batteries and remedies-Nickel cadmium batteries . (10)

LEARNING RESOURCES:

TEXT BOOKS :

1. *Utilization Electric Power and electric traction by J.B. Gupta, publishers-Katson books*
2. *Utilization, generation & conservation of electrical energy by Sunil S Rao, Khanna*

   publishers.

REFERENCE BOOKS:

1. *Art and Science of Utilization of Electrical Energy by Partab H Dhanpat Rai and Sons, New Delhi. Second edition*
2. *A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U. S. Bhatnagar and A Chakraborti, Dhanpat Rai & Co. Pvt. Ltd., 2001.*

WEB REFERENCES:

- *http://nptel.iitm.ac.in/video.php?subjectId=108105060*
- *http://nptel.iitm.ac.in/courses/Webcourse-contents/IIT%20Kharagpur/Illumination%20Engg/New_index1.html*
- *www.bee-india.org*
- *www.eia.doe.gov*
- *www.irfca.org*

Elective -III

IV/IV Year B.Tech.- Seventh Semester

ME - 416/A MECHATRONICS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course objectives:

- *Appreciate its relevance to contemporary engineering design and to identify a mechatronics system*
- *Understand data acquisition, quantization theory and AD & DA conversion.*
- *Know various components and applications of pneumatic, hydraulic actuation systems and principle of operation of various types of stepper motors.*
- *Construct various one and two degree of freedom mechanical, electrical, fluid and thermal systems and construct block diagrams for various systems.*
- *Understand various components and control modes of closed loop control systems*
- *Know the architecture, programming and application of programmable logic controllers.*
- *Understand design aspects of mechatronics system and demonstrate the cases studies of mechatronics system like pick and place robot*

Learning outcomes:

- *Demonstrates how mechatronics integrates knowledge from different disciplines in order to realize engineering and consumer products that are useful in everyday life.*
- *Select suitable actuators and sensors and integrate them with embedded control computers.*
- *Select appropriate transducer signal conditioning devices for data conversion including operational amplifiers for analogue signal processing.*

- *Builds a system model for mechanical, electrical, thermal and fluid power systems.*
- *Explains various modes of operation of closed loop controllers.*
- *Explains the architecture and programming of programmable logic controllers.*
- *Designs a mechatronics system*

UNIT - I

Introduction to Mechatronics: sensors & transducers : Introduction, performance terminology, classification of sensors, selection of sensors. (5)

Signal Conditioning: Introduction data acquisition - Quantizing theory, analog to digital conversion, digital to analog conversion. (5)

Data Presentation Systems: Data presentation elements magnetic displays, data acquisition systems, systems measurement, testing and calibration. (5)

UNIT - II

Actuation Systems: Pneumatic and hydraulic actuation systems, stepper motors. (7)

System Models: Modeling of one and two degrees of freedom mechanical, electrical, fluid and thermal systems. Block diagram representations for these systems. (8)

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. (7)

Closed Loop Controllers : Continuous and discrete processes, control modes, two step, proportional , derivative, integral, PID controllers.(8)

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. (7)

Design: Designing mechatronics systems, possible design solutions, case studies of mechatronics systems - pick and place robot. (8)

LEARNING RESOURCES

TEXT BOOK:

Mechatronics by W.Bolton , (Pearson) , 4th Edition , 2011.

REFERENCE BOOKS:

1. *Mechatronics: principles , concepts and applications, by Mahalik , MGH , 2003.*
2. *Introduction to Mechatronics - David and Alcaitore Michael B.Histand (TMH), 2007.*
3. *Mechatronics By G.Onwubolu -Elsevier., Edition 1 , 2005. .*
4. *Mechatroncis system Design - Devdas shetty & Richard Kolk (Thomson) , Cenage Learning , 2010.*

COURSE RELEVANT WEB SITES FOR REFERENCE

1. *http://ocw.mit.edu/*
2. *http://nptel.iitm.ac.in/*

Elective -III

IV/IV Year B.Tech.- Seventh Semester

ME - 416/B COMPUTATIONAL FLUID DYNAMICS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To expose the student to the governing equations required for CFD and their mathematical behavior, grid generation principles and types of grids required for different problems, and make aware of solution techniques and computer codes.*

Learning Outcomes:

- *Knows various computational methods for fluid flow. Student can solve simple fluid dynamics problems*

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)

LEARNING RESOURCES

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*

WEB RESOURCES:

- *www.cfd-online.com*
- *Fluent Inc. Product Documentation*
- *http://courses.cit.cornell.edu/fluent/index.htm*
- *http://www.flow3d.com/index.html*

Elective - III

IV/IV Year B.Tech.- Seventh Semester

ME - 416/C DESIGN FOR MANUFACTURING

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam :3 hrs		*Credits*	*: 4*

Course Objectives:

- *To introduce the concepts of design for manufacturability for optimal manufacturing processes and layouts for economical batch production.*
- *To introduce various machining and casting processes and various design considerations in machining and casting of various components.*
- *To provide knowledge on weld ability of products, various welding processes, design considerations in welding.*
- *To provide knowledge on forging, various types of forging, forging design considerations and forging die design.*
- *The provide knowledge on processes such as extrusion, deep drawing, punching and blanking operations. To introduce the applicability of plastic materials in manufacturing.*

Learning Outcomes:

- *Able to apply the concepts to select appropriate materials, manufacturing processes and layouts for economical batch production.*
- *Fabricate and manufacturing mechanical components using non machining operations*
- *Gains sufficient knowledge on deep drawing, blanking, punching and extrusion.*

UNIT - I

Introduction: Design philosophy-steps in design process-general design rules for manufacturability-basic principles of designing for economical production-creativity in design (7)

Materials: Selection of materials for design-developments in material technology-criteria for material selection-material selection interrelationship with process selection-process selection charts. (8)

UNIT - II

Machining processes: Overview of various machining processes-general design rules for machining-dimensional tolerance and surface roughness-Design for machining - ease -redesigning of components for machining ease with suitable examples. General design recommendations for machined parts. (8)

Metal casting: Appraisal of various casting processes, selection of casting process,-general design considerations for casting-casting tolerance-use of solidification, simulation in casting design product design rules for sand casting. (7)

UNIT - III

Metal joining: Appraisal of various welding processes, factors in design of weldments - general design guidelines-pre and post treatment of welds-effects of thermal stresses in weld joints-design of brazed joints. (8)

Forging: Design factors for forging - closed die forging design - parting lines of dies - drop forging die design - general design recommendations. (7)

UNIT - IV

Extrusion & Sheet metal work: Design guide lines extruded sections-design principles for punching, blanking, bending, deep drawing-Keeler Goodman forging line diagram - component design for blanking. (8)

Plastics: Visco elastic and creep behavior in plastics-design guidelines for plastic components design considerations for injection moulding - design guidelines for machining and joining of plastics. (7)

LEARNING RESOURCES

TEXT BOOKS:

1. Design for manufacture, John cobert, Adisson Wesley. 1995

2. Design for Manufacture by Boothroyd, Taylor and Francis , 2001.

REFERENCES:

1. ASM Hand book Vol.20

WEB RESOURCES:

- *www.casde.iitb.ac.in/store/events/2003/IAT-Pune.../DFMA.ppt*
- *www.rose-hulman.edu/~stienstr/ME470/DFA.ppt*
- *www.design4manufacturability.com/DFM_article.htm*

Elective - III

IV/IV Year B.Tech.- Seventh Semester

ME - 416/D COMPUTER AIDED DESIGN

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course objectives:

- *This topic gives information about the product life cycle, concepts of CAD software and its applications.*
- *How CAD technology can be leveraged in the design process.*
- *Students will learn theory and practice related to wire frame modeling, assembly modeling , drafting and parametric modeling and freeform surface modeling*
- *Assembling and drafting by using solid modeling techniques*
- *Use of CAD models for downstream engineering activities such as manufacturing and finite element analysis.*

Learning Outcomes:

- *Design a part or assembly of parts using Computer Aided Design software.*
- *Use parametric modeling techniques to reflect engineering requirements.*
- *Apply top-down design principles to model a product.*
- *Use motion and interference checking to ensure that parts will not interfere throughout their complete range of motion*.

UNIT I

Introduction: Fundamentals of CAD, Design process, Applications of computer for design, Benefits of CAD, CAD work station, Graphic terminal, CAD software, CAD database and structure , Input Devices. (8)

Display Devices: Video display devices -CRT , DVST, Inherent memory display devices, Raster scan display, Raster scan systems, Random scan display , Random scan systems (7)

UNIT II

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

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. (7)

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)

LEARNING RESOURCES

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*

WEB REFERENCES

- *www.sciencedirect.com*
- *www.2.accessengineeringlibrary.com.*
- *www.asmedl.aip.org*
- *www.ieee.org/ieeexplore*

IV/IV Year B.Tech.- Seventh Semester

ME- 451 ANALYSIS LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives

- *Learn practical application of FEA using the ANSYS software*
- *Learn the proper use of ANSYS code*
- *Build computer models or transfer CAD models of structures, products, components or systems.*
- *Apply operating loads or other design performance conditions.*
- *Study the physical responses, such as stress levels , temperature distribution etc.*

Learning Outcomes

At the end of this course the student will be able to

- *Understand the basics of ANSYS capabilities, terminology and the GUI.*
- *Know how to perform a complete ANSYS analysis step-by-step.*
- *Acquire the knowledge in building solid models & meshing, apply loads, solving & reviewing results*
- *Be in a position to model and analyse for finding stress, temperature distribution etc, with the help of suitable boundary conditions.*
- *Solve various engineering problems in structural, thermal and fluid mechanics.*

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

i 2-D truss

ii 3-D truss

iii Beam analysis

2. STATIC ANALYSIS: Two Dimensional Problems

i 2-D structure with various loadings

ii 2-D structures with different materials

iii Plate with hole

3. *DYNAMIC ANALYSIS: Modal And Transient Analyses*

i Modal analysis of Solid Structure (Work Table)

ii Transient Response (spring-mass system)

4 *NON-STRUCTURAL PROBLEMS*

i Steady State heat transfer

ii Transient heat transfer

iii Fluid Analysis

LEARNING RESOURCES

REFERENCES:

1. *Introduction to Finite elements in Engineering by Chandrupatla & Belegundu, PHI, 2010.*
2. *www.mece.ualberta.ca.*
3. *Ansys , " Multiphysics User's Manual"*

IV/IV Year B.Tech.- Seventh Semester

ME - 452 DESIGN & METROLOGY LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives

- *To impart the knowledge regarding importance of accuracy & precision while taking the measurements*
- *Students are exposed to measuring the dimensions of mechanical components.*
- *Students are provided the basic knowledge about alignment of machine tools.*
- *Students are exposed to measure the cutting forces with the help of dynamometers.*
- *Students are exposed to know the importance of surface finish*

Learning Outcomes

- *Identify the importance alignment of machine tools*
- *Gain the knowledge about various design principles practically*
- *Acquire the working/ operation of various types of dynamometers.*

Any Ten Experiments should be performed:

1. Angle and taper measurement by Bevel Protractor & Sine Bar.
2. Internal and External taper measurement using Ball & Rollers
3. Measuring effective dia. Of thread using 2 wire, 3 wire method.
4. Measuring gear tooth thickness using gear tooth vernier.
5. Measuring internal dia. using bore dial gauge.
6. Measurement of Circularity , Cylindricity, Flatness and straightness using CMM.
7. Alignment test on Lathe , Drilling , Milling machines
8. Measuring external diameters using Micrometer & Plot $\bar{X}$ & R Charts
9. Measurement of surface finish using surf tester
10. Measuring different parameters of a thread / gear using tooth profile projector

11. Vibration measurements
12. Gyroscope
13. Balancing
14. Whirling of shafts
15. Governor
16. CAM Analysis
17. Photo elastic Bench
18. Wear & Friction measurement
19. Measurement of cutting forces using lathe tool dynamometer
20. Measurement of cutting forces using drill tool dynamometer

IV/IV Year B.Tech.- Seventh Semester

ME - 453 TERM PAPER

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 100*
		Semester End Exam Marks	*: ---*
Semester Exam	*: ---*	*Credits*	*: 2*

Internal marks will be awarded based on the SEMINAR presentations on their Project Aim.

- The students of the IV Year first semester are assigned mini-projects.
- The students have to study industry related or theoretical topics, which enable them to know about the real time problems.
- The progress of the work will be monitored by the coordinators, who are usually senior faculty members.
- The term paper presentation and its report will be evaluated at the end of the semester and internal marks will be awarded.
- There is no end semester examination.

Course Objectives

- *To make the graduate become an affective communicator.*
- *To prepare graduates to express the knowledge they have gained in the areas related to Mechanical Engineering.*

Learning Outcomes

- *The graduate shall be able to express problem to be solved, the method to solve the problem and the analysis done on the problem.*
- *The student will be able to know the latest tools available to get the solution of a given problem.*

IV/IV Year B.Tech.- Eighth Semester

ME - 421 INDUSTRIAL ENGINEERING & MANAGEMENT

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course objectives:

- *It aims to provide the students with an understanding of basics of productivity, work study& method study*
- *To know the tools which are used for recording information while preparing flow process charts.*
- *Students are exposed to principles of motion economy techniques the productivity of our regular day to day life activities.*
- *Students are exposed to know the importance of Ergonomics*
- *Attain familiarity with various quality control charts for variables and attributes.*
- *It aims to provide a basic insight into various Factory acts, wage and incentive systems.*
- *Provide an understanding of personnel management.*
- *It aims to provide the students with an understanding of concept of marketing and an insight into break-even analysis and product life cycle.*
- *To know the depreciation and its methods of measuring depreciation.*
- *To know the calculation of manufacturing cost of a product.*

Learning Outcomes

- *Able to understand concepts of productivity and know the ways of enhancing productivity.*
- *Acquire working knowledge of how to find the best method of doing a job and arrange a work place more productively.*
- *Appreciate the importance of work sampling and differentiate between time study and work sampling.*
- *Understand the concept of job design and analysis.*
- *Develop ability to understand what is marketing.*

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, Stop watch time study procedure, rating systems and allowances. (5)

Work Sampling : Procedure for making a work sampling study.
Ergonomics : Definition and importance. (3)

Quality Control : Tolerance limits of a process, control charts for variables : X and R charts. Control charts for 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)

Personnel Management : Functions of a personnel manager, job analysis and job design. Job evaluation and Merit rating, Wages and incentive plans, Factories Act- Related to health, working hours, environment and working conditions , Safety, Employee Welfare (10)

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: Elements of Cost - Fixed cost , Variable Cost , Prime Cost , Factory Cost , Manufacturing Cost ,Depreciation, common methods of depreciation: straight line method , declining balance method, sum of years digits method. Replacement Analysis. (8)

LEARNING RESOURCES

TEXT BOOKS :

1. *Introduction to work study - ILO , 1992.*
2. *Engineering Economy - Theusen & Theusen , PHI , 9th Edition , 2000.*
3. *Fundamentals of Marketing - Williams J Stanton, McGraw-Hill*
4. *Personnel Management - Tripathi and Reddy, McGraw-Hill, 4th Edition.*
5. *Operations Management - Joseph G.Monks, Schaum's outline series, 3rd Edition.*
6. *Estimation and Costing - Narang & Kumar*

COURSE RELEVANT WEB SITES FOR REFERENCE

1. *www.knovel.com*
2. *www.books.google.com*
3. *www.igi-global.com*
4. *www.wiley.com*
5. *www.tectime.com*
6. *www.exinfm.com*
7. *www.slideshare.net*
8. *www.economywatch.com*

IV/IV Year B.Tech. - Eighth Semester

ME - 422 AUTOMATION & COMPUTER AIDED MANUFACTURE

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives

- *Learn the principles of automation in integrating various operations and activities in a manufacturing plant to improve productivity.*
- *Classification and Important concepts of numerical control systems.*
- *Various principles of manual part programming for 2D components and computer assisted part programming in APT language.*
- *Basic concepts of CIM, GT, CAPP, FMS.*
- *Introduce the field of robotics, provide panoramic view evolution & perspective of robot, by describing major robot components & anatomy with control system along with applications*

Learning Outcomes

- *Comprehensive theoretical knowledge about modern machining processes*
- *Ability to understand about automation and transfer lines*
- *List the canned cycles available for each CNC machine.*
- *The student should be able to explain the terminology used to describe CNC, DNC and adaptive control machine tools*
- *Students will able to Prepare simple programs for CNC Turning and machining centers*
- *Student able to understand the group technology, flexible manufacturing systems and computer aided process planning*

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)

LEARNING RESOURCES

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, , New Delhi, 2002*

Web References

- *http://www.cadcamfunda.com/cam_computer_aided_manufacturing*
- *http://wings.buffalo.edu/eng/mae/courses/460-564/Course-Notes/cnc-classnotes.pdf*
- *http://www.me.nchu.edu.tw/~CIM/courses/Flexible%20Manufacturing%20Systems/Microsoft%20Word%20-%20Chapter7F-GT%20and%20FMS.pdf*

IV/IV Year B.Tech.- Eighth Semester

ME - 423 ENERGY RESOURSES UTILIZATION

Lecture	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives

- *Students will be able to understand basic principles and operation of power plants.*
- *Students will be able to explain the operation of various systems in the plant. They can evaluate the factors on which a site can be finalized*
- *Students will be able to understand the need for various systems used in power plants. They will be able to explain the cycles on which these plants operate.*
- *They can identify the components of the station and explain their working.*
- *The student is made to understand the necessity for going for nuclear power plants.*
- *They can explain the various factors of load demand and consumption and identify the various costs involved in operating a power plant. They can calculate the expenditure incurred for setting up the plant and running it.*
- *The student learns that solar energy available almost throughout the year in many places on earth and wind power systems play an important role in the overall power production.*

Learning Outcomes

- *Distinguish the differences among the variety of power plants.*
- *Explain the principles of operation of the power plants.*
- *Identify the places where a plant of a particular type can be set up.*
- *Explain the need for various types of assemblies required in a power house.*

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 handling, Pulverized system, Ash handling system, ESP, Need for Draught, High-pressure boilers-La Mont , Benson 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 and 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)

LEARNING RESOURCES

TEXT BOOKS:

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

2. Power Plant Engineering -P.K.Nag, TMH, New Delhi,2008.

3. Non Conventional Energy Sources - G.D. Rai, Khanna publ, New Delhi, 4th Edition.

REFERENCE BOOKS:

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

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

3. Power Plant Engineering - Manoj Kumar Gupta, PHI, New Delhi, 2012.

Web References

- *www.wikipedia.com*
- *NPTEL Lectures (IIT M)*
- *www.knowhow.com*

Elective - IV

IV/IV Year B.Tech.- Eighth Semester

ME - 424/A ROBOTICS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To provide an introduction to Robotics and Automation including robot classification, design and selection, analysis and applications in industry.*
- *To provide the details of operations for a variety of sensory devices that are used on robot , the meaning of sensing, classification of sensor, that measure position, velocity & acceleration of robot joint.*
- *The goal of the course is to familiarize the students with the concepts and techniques in robot manipulator control.*

Learning Outcomes:

- *At the end of the course, students will be familiarized in basic components of robotics, classification of robots, robot grippers, Robot sensory devices, and transformations and kinematics of robot joints.*
- *An ability to apply knowledge of geometry, linear algebra, and dynamics to complex mechanical systems.*
- *An ability to design a robot mechanism to meet kinematics requirements.*
- *An ability to formulate, and solve complex kinematics and dynamics problems in robotics*

UNIT - I

Introduction to Robotics, major component of 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, Robot Control Architecture. (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, Requirements of End effectors. (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, Programming Methods (15)

LEARNING RESOURCES

TEXT BOOKS:

1. *Robotic Engineering by Richard D.Klafter, Prentice-Hall of India Pvt Ltd, 2010.*
2. *Industrial Robotics by Mikell P. Groover, Tata McGraw-Hill Int. Edition 2, 2012.*

REFERENCE BOOKS:

1. *Introduction To Robotics: Mechanics And Control, John J. Craig 3rd edition, pearson ,2008*
2. *Robotics: Control, Sensing, Vision, and Intelligence, K. S. Fu, R. C. Gonzales, and C. S. G. Lee, Tata McGraw-Hill, NY, 2008.*
3. *Introduction to Robotics: Analysis, Systems, Applications, Saeed B. Niku, Prentice Hall, NJ, 2010.*
4. *Robotics and Control, R.K. Mittal and I.J. Nagarath, TMH, 2005.*

WEB REFERENCES:

- *http://nptel.iitm.ac.in/courses.php?branch=Mechanical*
- *http://academicearth.org/courses/introduction-to-roboticsVideo references:-*
- *http://nptel.iitm.ac.in/video.php?courseId=1052*

Elective - IV

IV/IV Year B.Tech. - Eighth Semester

ME - 424/B NANO TECHNOLOGY

Lectures	:	*4 periods / week*	*Sessional Marks*	:	*40*
			Semester End Exam Marks	:	*60*
Semester Exam	:	*3 hrs*	*Credits*	:	*4*

Course Objectives

- *To provide basics of nano materials and technology.*
- *To give an idea of preparation of nano size materials.*
- *To introduce to nano tubes etc.*
- *To provide knowledge on tools used in nano technology.*
- *To provide fundamentals on fabrication at nano level.*
- *Nanotechnology is an advanced course and that deals with the science and technology associated at the nanoscale. This course is a foundation to many advanced techniques that allow engineers to design miniaturized systems.*

Learning outcomes:

- *Analyze and design various methods of production and utilization of nanomaterials.*
- *To learn nanoscale manufacturing techniques.*
- *Apply methodologies to develop miniaturized systems.*
- *Conduct themselves professionally and with regard to their responsibilities to society.*

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)

LEARNING RESOURCES

TEXT BOOKS :

1. *Nano materials by J.Dutta & H.Hofman.*
2. *Nano structures & Nano materials by Guozhong cao, Imperial college press.2nd Edition.*

REFERENCE BOOKS :

1. *Micro manufacturing and Nano Technology by N.P.Mahalik,.Springer,2006.*
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.*

WEB REFERENCES

- *http://www.evidenttech.com/applications*
- *www.fli-leibniz.de/~kboehm/Kinesin.html*
- *www.fbs.leeds.ac.uk/research/contractility/dynein/model-page.htm*
- *http://www.nccr-nano.org/nccr/research/modules/module_01*
- *http://www.nano.org.uk/Wheel.htm*
- *//www.cancer.gov/cancertopics/understandingcancer/nanodevices*
- *http://www.ethicsweb.ca/nanotechnology/*
- *http://www.foresight.org/*
- *The Center for Responsible nanotechnology: http://crnano.org/*
- *http://en.wikipedia.org/wiki/Stained_glass*
- *http://www.nanotech-now.com/columns/?article=255*

Elective - IV

IV/IV Year B.Tech. - Eighth Semester

ME - 424/C

ADVANCED CONCEPTS IN MECHANICAL ENGINEERING

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course Objectives:

- *To provide knowledge to the student in understanding the concepts of various artificial intelligence programs like Neural Networks and Fuzzy logic. To make the students apply these concepts to solve various problems related to the field of mechanical Engineering.*
- *To introduce to the students the modern and advanced design approach methodologies and tools like concurrent engineering and value engineering which help them create more efficient, cost effective, robust and redundant approaches to design products, processes and layouts.*

Learning Outcomes:

- *At the end of first and second units, the students will be able to apply the concepts of artificial neural networks and fuzzy logic to design and optimize various applications covering structural, thermal, automotive and marine fields.*
- *At the end of third and fourth units, the students will be able to adopt, apply and implement the concurrent and value engineering methodologies to initiate new designs or to modify the existing designs for better and cost effective outcomes.*

UNIT-I

Neural Networks: Trends in computing, characteristics of neural networks, Artificial neural network terminology, Models of Neuron, Topology, feed forward neural networks, Direct application of ANN. (15)

UNIT - II

Fuzzy Logic: What is Fuzzy logic? History of Fuzzy logic; Basic concepts of Fuzzy logic, Introduction, Fuzzy sets, operation of fuzzy sets, properties

of fuzzy sets, Geometric interpretation of fuzzy sets, Linguistic variables, 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 for assembly, The Taguchi method for robust design, manufacturing process design rules, computer aided DFM, Group technology, summary of concurrent engineering tools. (15)

LEARNING RESOURCES

TEXT BOOKS

1. *Artificial Neural Networks by Yegnanarayana,PHI,*
2. *Fuzzy Logic by John Yen,Pearson Education.*
3. *Getting more at less cost ; The value engineering way by G Jagannatham*
4. *Computer integrated design and manufacturing by David D Bedworth, McGraw-Hill, 1991.*
5. *Neural Networks , Fuzzy Logic and Genetic Algorithms : Theory and Applications , PHI Learning Pvt. Ltd.*

WEB RESOURCES:

- *www.productivity.in/.../Value%20Analysis/g....*
- *www.cs.berkeley.edu/.../Fuzzy%20Logic,%20Neural%20Netw...*
- *www.freequality.org/.../concurrentengineering%5B1%5D.ppt*
- *www.seattlerobotics.org/encoder/mar98/fuz/flindex.html*

Elective - IV

IV/IV Year B.Tech. - Eighth Semester

ME - 424/D FLUID POWER & CONTROL SYSTEMS

Lectures	*: 4 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 4*

Course objectives :

- *The construction and working of pumps and how the pumps are specified and selected.*
- *Construction and working of various motors and types of linear actuators available.*
- *Working of various valves.*
- *Understand the working and functions of simple hydraulic circuits and components and their applications.*

Learning outcomes :

- *Identify the elements of mechanical systems*
- *Explain the working of various pumps and compute the efficiencies of the pumps*
- *Differentiate between linear and rotary actuators and classify the types of rotary and semi rotary actuators*
- *Selecting the mounting configuration for specific applications*
- *Understand various elements of hydraulic system*
- *Classify different types of accumulators and their functions*
- *Know the variety of industrial circuits*

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]

LEARNING RESOURCES

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*

WEB REFERENCES

- *http://hydraulicspneumatics.com/other-technologies/chapter-5-pneumatic-and-hydraulic-systems*
- *http://www.youtube.com/watch?v=GlisI2_M9T8*
- *http://www.youtube.com/watch?v=CoprDVmvKso*
- *http://www14.informatik.tu-muenchen.de/konferenzen/Jass06/courses/5/Papers/Ponomareva.pdf*

IV/IV Year B.Tech. - Eighth Semester

ME 461 - CAM LAB

Practicals	*: 3 periods / week*	*Sessional Marks*	*: 40*
		Semester End Exam Marks	*: 60*
Semester Exam	*: 3 hrs*	*Credits*	*: 2*

Course Objectives

- *Learn the programming of computer numerical control (CNC) machines with CAD/CAM systems.*
- *Learn CNC Manual part programming for different contours using Lathe module of the CNC Lathe software.*
- *Learn CNC Manual part programming for different contours using Mill module of the CNC Mill software.*
- *Demonstrate and make the students to create the model using Mastercam software to convert the modeled part geometry into a cutter tool path for use on a numerically controlled lathe and milling machines.*
- *Gain experience and safely operate the CNC lathe and milling machines, and programming and machining complex engineering parts.*

Learning Outcomes

- *The students are able to write a CNC program for the profile to be generated. This is done with the help of CAM software.*
- *The students are able to know and perform various operations on CNC Lathe and milling machines effectively and safely.*
- *The students are able to create models for different contours and will be in a position to convert the part geometry into a NC code which is used for machining on CNC Lathe and milling machines*

Any Ten Experiments should be performed:

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.,

IV/IV Year B.Tech. - Eighth Semester

ME - 462 PROJECT

Practicals	*: 9 periods / week*	*Sessional Marks*	*: 80*
		Semester End Exam Marks	*: 120*
Semester Exam	*: ---*	*Credits*	*: 10*

The Project Report has to be submitted at the end of the semester and marks will be awarded based on the Viva-voce examination

Methodology for Project work

- The students are divided into batches and each batch will be allotted one guide.
- Each batch consists of maximum of 5 students.
- The students are allowed to take up the problems related to core domains of curriculum such as production engineering, design, thermal engineering, industrial engineering and management.
- The students are permitted to do project work on industry related problems also.

Course Objectives

- *To prepare the graduate to analyze a problem, identify and define the computing and hard ware requirements appropriate to its solutions.*
- *To strengthen the knowledge of design and development principles in executing the projects.*
- *To provide the knowledge for preparing rich documentation.*
- *To impart the knowledge and skills to do advanced studies and research in Mechanical Engineering discipline.*
- *To equip the student with both oral and written communication skills to become an effective team oriented problem solver as well as an effective communicator with technical and non-technical stakeholders.*

Learning Outcomes

- *The graduate will able to identify and analyze a problem. The graduate will be able to function effectively on teams to accomplish a common goal.*
- *The graduate will be able to use current techniques, skill and tools necessary for completing an assignment.*
- *The graduate will be able to design and develop applications in the related areas of Mechanical Engineering.*