AR - 16

ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

MECHANICAL ENGINEERING

B. TECH. FOUR YEARS DEGREE PROGRAMME

(Applicable for the batches admitted from 2016-17)

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS)

Approved By AICTE
Accredited by NBA
Recognized under 2(f) and 12(b) of UGC
Permanently Affiliated to JNTUK, Kakinada.
K. Kotturu, TEKKALI-532 201, Srikakulam, Andhra Pradesh

VISION OF THE INSTITUTE

To evolve into a premier engineering institute in the country by continuously enhancing the range of our competencies, expanding the gamut of our activities and extending the frontiers of our operations.

MISSION OF THE INSTITUTE

Synergizing knowledge, technology and human resource, we impart the best quality education in Technology and Management. In the process, we make education more objective so that efficiency for employability increases on a continued basis.

DEPARTMENT OF MECHANICAL ENGINEERING

Aditya Institute of Technology and Management established the Department of Mechanical Engineering (ME) in 2004 with an initial intake of 60 students and got approval for additional intake of another 60 seats in 2011-12. A Post Graduate Program (M. Tech) in Thermal Engineering is introduced in 2011-12 with an intake of 18 seats, and the intake is increased to 24 during 2012-13, and it is further increased to 30 during 2014-2015.

The Department of Mechanical Engineering received NBA accreditation in 2013 for 2 years. This Institution is also accredited by NAAC. The college received TEQIP funds in Phase-II under sub-component 1.1. These two important additions surely enhance the prestige of the institution; and in turn help students to improve their academic standards. Both the B. Tech and M. Tech programs are duly approved by the AICTE and Govt. of A.P. and affiliated to JNTUK.

VISION OF THE DEPARTMENT

Mechanical Engineering Department shall be the desirable place for quality education/study and shall emerge as centre of excellence with outstanding faculty, facilities, education and research.

MISSION OF THE DEPARTMENT

1. Mechanical Engineering Program dedicates itself to provide students with a set of skills, knowledge and attitude that will permit its graduates to succeed and thrive as engineers and leaders.
2. The department expands the frontier of knowledge in the field of Mechanical Engineering and improves the professional potential of students and staff through education programs.
3. The department prepares its graduates to pursue life-long learning, serve the profession and meet intellectual, ethical and career challenges
4. The department maintains a vital, state-of-the-art research center to provide its students and faculty with opportunities to create, interpret, apply and disseminate knowledge.

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PROGRAM EDUCATIONAL OBJECTIVES

PEO1: Possess knowledge and competencies for careers in mechanical and allied engineering.
PEO2: Pursue higher education or research or take up entrepreneurial endeavors.
PEO3: Create new methods/processes to meet societys needs with their knowledge of Mechanical Engineering.
PEO4: Demonstrate a commitment to the society and profession through involvement with society and/or professional organizations.

PROGRAM OUTCOMES

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use researchbased knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Lifelong learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO):

1. Analyze, design and evaluate mechanical components as per given specifications using Engineering and Design Analysis software tools

2. Operate and maintain thermal systems including IC engines, refrigeration & airconditioning, and power generating systems.

3. Apply traditional and modern methods to manufacture components and systems with quality assurance by developing process plans accordingly.

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Permanently Affiliated to JNTUK, Kakinada.
K.Kotturu, Tekkali, Srikakulam-532201, Andhra Pradesh

Academic Regulations 2016 for B. Tech.

(Effective for the students admitted into I year from the **Academic Year 2016-2017** and onwards)

1. Award of B. Tech. Degree

A student will be declared eligible for the award of the B. Tech. Degree if he/she fulfills the following academic regulations.

(a) Pursued a course of study for not less than four academic years and not more than

(b) Registered for **180** credits and he/she must secure total **180** credits.

2. Students, who fail to complete their Four years Course of study within **8** years or fail to acquire the 180 Credits for the award of the degree within **8** academic years from the year of their admission, shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

3. Courses of study

The following courses of study are offered at present with specialization in the B.Tech. Course.

Sl. No.	Branch Code-Abbreviation	Branch
01	01-CE	Civil Engineering
02	02-EEE	Electrical and Electronics Engineering
03	03-ME	Mechanical Engineering
04	04-ECE	Electronics and Communication Engineering
05	05-CSE	Computer Science and Engineering
06	12-IT	Information Technology

And any other course as approved by the authorities of the University from time to time.

4. Credits (Semester system from I year onwards):

Sl. No	Course	Credits
1	**Theory Course**	**2/2.5/3/3.5/4.5**
2	**Open Electives**	**02**
3	**Laboratory Course**	**1.5**
4	**Advanced Laboratory Course**	**02**
5	**Self Study Course/Internship**	**01**
6	**Employability skills**	**1.5**
7	**Project**	**06**

5. Open Electives:

There is one open elective in each semester from 2-1 Semester to 4-1 semester. The student can choose one open elective of respective semester. The pattern of Midterm examinations and end examinations of these courses is similar to regular theory courses and the valuation is purely internal.

6. MOOCs:

Explore all possibilities to run at least one subject in every semester from 2-1 semester onwards as a Moocs.

7. Evaluation Methodology:

The performance of a student in each semester shall be evaluated subject – wise with a maximum of **100** marks for theory course and **75** marks for laboratory and other courses. The project work shall be evaluated for **200** marks.

7.1 Theory course:

For theory courses the distribution shall be **30** marks for internal midterm evaluation and **70** marks for the External End - Examinations.

Out of 30 internal midterm marks – **25** marks are allotted for descriptive exam and 5 marks for continuous assessment tests.

Process of conducting assessment test: The assessment test will be conducted for 5 marks. Teacher should give 5 questions after completion of **One and half** units to the students, from which the student has to answer any one of the questions suggested by the teacher in the classroom itself. Similarly there will be another two assessment tests after completion of **Three** units and **Four and half** units from prescribed syllabus. The average marks of these **THREE** tests will be considered for 5 marks for the continuous assessment tests finally.

(i) Pattern for Internal Midterm Examinations (25 marks):

For theory courses of each semester, there shall be **2** Midterm exams. Each descriptive exam is to be held for **25** marks with the duration of **120** minuets.

For final calculation of internal marks, weightage of 80% will be given to the student who performed well either in first Mid or second Mid and 20% weightage will be given to other Mid term examinations.

Mid paper contains four descriptive type questions. The student should answer 3 out of 4 questions. Each question carries 10 marks (3@10=30M) and Scale-down to 25 Marks.

The first Midterm examination to be conducted usually after 8 weeks of instruction or after completion of 50 percent syllabus, the second Midterm examination to be conducted usually at the end of instruction after completion of remaining 50 percent syllabus.

(ii) Pattern for External End Examinations (70 marks):

The question paper shall have descriptive type questions for70 marks. There shall be one question from each unit with internal choice. Each question carries 14 marks. Each course shall consist of five units of syllabus. The student should answer total 5 questions. (5x14M=70M)

7.2. Laboratory Course:

(i) **(a)** For practical subjects there shall be continuous evaluation during the semester for **25** internal marks and **50** semester end examination marks. Out of the **25** marks for internal: **10** marks for day to day work, **5** marks for record and **10** marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner from outside the college.

(b) For the benefit of the students, two advanced labs are introduced with some specialized areas in each B.Tech. Program.

(ii.) For the course having design and / or drawing, (such as Engineering Drawing, Machine Drawing) and estimation, the distribution shall be 30 marks for internal evaluation (15 marks for day–to–day work, and 15 marks for internal tests) and 70 marks for end examination.
For award of marks for internal tests. weightage of 80% will be given to the student who performed well either in first test or second test and 20% weightage will be given to other test.

7.3 Project Work:

Out of a total of 200 marks for the project work, **60** marks shall be for Project Internal Evaluation and **140** marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be made at the end of the IV year. The Internal Evaluation shall be made on the basis of two seminars given by each student on the topic of his project which was evaluated by an internal committee.

7.4 Self Study Course:

Two Periods per week (which includes library, e-learning, Internet and presentation) are allotted for this course. Self Study shall be evaluated for 75 Marks.
Out of **75** Marks, **25** marks for day-to-day evaluation and **50** marks on the basis of end examination conducted by internal committee consisting of Head of the Department, Two Senior faculty Members of the department concerned. There shall be no external examination for self-study.

7.5 Audit Course:

Audit course is one among the compulsory courses and does not carry any credits. The audit courses will start from the II year I- semester onwards. The list of audit courses are shown below:

i) Professional Ethics and Morals
ii) Intellectual Property Rights & Patents

7.6 Employability Skills:

Employability skills shall be evaluated for **75** marks. **25** marks for day-to-day evaluation and **50** marks on the basis of end (internal) examination. There is no external examination for employability skills.
Three Periods per week are allotted for this course and evaluated in 4-1 semester.

7.7 Internship:

All the students shall undergo the internship period of **4** weeks and the students have an option of choosing their own industry which may be related to their respective branch. A self study report for the internship shall be submitted and evaluated during the IV year II-Semester and will be evaluated for a total of **75** marks consists of **25** marks for internal assessment and **50** marks for end examination.

Internal assessment for **25** marks shall be done by the internship supervisor. Semester end examination for **50** marks shall be conducted by committee consists of Head of the Department, internal supervisor and an external examiner.

8. Attendance Requirements:

(i.) A student shall be eligible to appear for End Semester examinations, if he/she acquires a minimum of **75%** of attendance in aggregate of all the subjects.

(ii.) Condonation of shortage of attendance in aggregate up to **10%** (**65%** and above and below 75%) in each semester with genuine reasons and shall be approved by a committee duly appointed by the college. The condonation approved otherwise it can be reviewed by the College academic committee.

(iii.) A Student will not be promoted to the next semester unless he satisfies the attendance requirement of the present semester. They may seek re-admission for that semester when offered next.

(iv.) Shortage of Attendance below **65%** in aggregate shall in NO case be condoned.

(v.) Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.

(vi.) A fee stipulated by the college shall be payable towards condonation of shortage of attendance.

9. Minimum Academic Requirements:

9.1 Conditions for pass and award of credits for a course:

a) A candidate shall be declared to have passed in individual course if he/she secures a minimum of 40% aggregate marks i.e 40 out of 100, 30 out of 75 (Internal & Semester end examination marks put together), subject to a minimum of 35% marks i.e 24 marks out of 70 and 17 out of 50 in semester end examination.

b) On passing a course of a programme, the student shall earn assigned credits in that Course.

9.2 Method of Awarding Letter Grades and Grade Points for a Course.

A letter grade and grade points will be awarded to a student in each course based on his/her performance as per the grading system given below.

Table: Grading System for B.Tech. Programme

Percentage	Grade Points	Letter Grade
95-100%	10	O
85-<95%	9	A+
75-<85%	8	A
65-<75%	7	B^+
55-<65%	6	B
45-<55%	5	C
40%-<45%	4	P
< 40%	0	F (Fail)

9.3. Calculation of Semester Grade Points Average (SGPA)* for semester

The performance of each student at the end of the each semester is indicated in terms of SGPA. The SGPA is calculated as below:

$$SGPA = \frac{\Sigma(CR \times GP)}{\Sigma CR}$$ (for all courses passed in semester)

Where CR = Credits of a Course
GP = Grade points awarded for a course
*SGPA is calculated for the candidates who passed all the courses in that semester.

9.4, Calculation of Cumulative Grade Points Average (CGPA) and Award of Division for Entire Programme.

The CGPA is calculated as below:

$$CGPA = \frac{\Sigma(CR \times GP)}{\Sigma CR}$$ (For entire programme)

Where CR = Credits of a course
GP = Grade points awarded for a course

Table: Award of Divisions

CGPA	DIVISION
≥ 7.5	First Class with distinction
≥ 6.5 and < 7.5	First Class
≥ 5.5 and <6.5	Second Class
≥ 4.0 and <5.5	Pass Class
< 4.0	Fail

9.5 Supplementary Examinations:

Supplementary examinations will be conducted in every semester.

9.6 Conditions for Promotion:

(i.) A student will be promoted to second year, if he/she put up the minimum attendance requirement.

(ii.) A student shall be promoted from II to III year only if he fulfills the academic requirement of total **50%** credits (if number credits is in fraction, it will be rounded off to lower digit) from regular and supplementary examinations of I year and II year examinations, irrespective of whether the candidate takes the examination or not.

(iii.) A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** credits (if number of credits is in fraction, it will be rounded off to lower digit) from regular and supplementary examinations of I Year, II Year and III Year examinations, irrespective of whether the candidate takes the examinations or not.

(iv.) A student shall register and put up minimum attendance in all **180** credits and earn all **180** credits, marks obtained in **180** credits shall be considered for the calculation of percentage of marks.

10. Course pattern:

(i.) The entire course of study is of four academic years and each year will have TWO Semesters (Total EIGHT Semesters).

(ii.) A student is eligible to appear for the end examination in a subject, but absent for it or failed in the end examinations may appear for that subject's **supplementary** examinations, when offered.

(iii.) When a student is detained due to lack of credits / shortage of attendance, he may be re-admitted when the semester is offered after fulfillment of academic regulations. Whereas the academic regulations hold good with the regulations he/she first admitted.

11. Minimum Instruction Days:

The minimum instruction days for each semester shall be **95** clear instruction days.

12. **There shall be no branch transfer after the completion of admission process**.

13. **General:**

(i.) Where the words "he" "him" "his", occur in the regulations, they include "she", "her", "hers".
(ii.) The academic regulation should be read as a whole for the purpose of any interpretation.
(iii.) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the principal is final.
(iv.) The College may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

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ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT: TEKKALI
SRIKAKULAM-532201, Andhra Pradesh (India)
Academic Regulations 2016 (AR16) for B. Tech. (Lateral Entry Scheme)

(Effective for the students getting admitted into II year from the Academic Year 2017- 2018 and onwards)

1. **Award of B. Tech. Degree**

A student will be declared eligible for the award of the B. Tech. Degree if he/she fulfills the following academic regulations.

(a.) Pursued a course of study for not less than three academic years and not more than six academic years.

(b.) Registered for **131** credits and must secure **131** credits.

2. Students, who fail to complete their three year Course of study within six years or fail to acquire the **131** Credits for the award of the degree within **6** academic years from the year of their admission, shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

3. **Promotion Rule:**

(a.) A lateral entry student will be promoted to II year to III year if he puts up the minimum required attendance in II year.

(b.) A student shall be promoted from III year to IV year only if he fulfills the academic requirements of total **50%** of credits (if number of credits is in fraction, it will be rounded off to lower digit) from the II Year and III Year examinations , whether the candidate takes the examinations or not.

4. Minimum Academic Requirements:

4.1 Conditions for pass and award of credits for a course:

a) A candidate shall be declared to have passed in individual course if he/she secures a minimum of 40% aggregate marks (Internal & Semester end examination marks put together), subject to a minimum of 35% marks in semester end examination.

b) On passing a course of a programme, the student shall earn assigned credits in that Course.

4.2 Method of Awarding Letter Grades and Grade Points for a Course.

A letter grade and grade points will be awarded to a student in each course based on his/her performance as per the grading system given below.

Table: Grading System for B.Tech. Programme

Percentage	Grade Points	Letter Grade
95-100%	10	O
85-<95%	9	A+
75-<85%	8	A
65-<75%	7	B^+
55-<65%	6	B
45-<55%	5	C
40%-<45%	4	P
< 40%	0	F (Fail)

4.3 Calculation of Semester Grade Points Average (SGPA)* for semester

The performance of each student at the end of the each semester is indicated in terms of SGPA. The SGPA is calculated as below:

$$SGPA = \frac{\Sigma(CR \times GP)}{\Sigma CR} \quad \text{(for all courses passed in semester)}$$

Where CR = Credits of a Course
GP = Grade points awarded for a course
*SGPA is calculated for the candidates who passed all the courses in that semester.

4.4 Calculation of Cumulative Grade Points Average (CGPA) and Award of Division for Entire Programme.

The CGPA is calculated as below:

$$CGPA = \frac{\Sigma(CR \times GP)}{\Sigma CR} \quad \text{(for entire programme)}$$

Where CR = Credits of a course
GP = Grade points awarded for a course

Table: Award of Divisions

CGPA	DIVISION
≥ 7.5	First Class with distinction
≥ 6.5 and < 7.5	First Class
≥ 5.5 and < 6.5	Second Class
≥ 4.0 and <5.5	Pass Class
< 4.0	Fail

5. All other regulations as applicable for B. Tech. Four- year degree course (Regular) will hold good for B. Tech. (Lateral Entry Scheme)

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

	Nature of Malpractices/Improper conduct	Punishment
1 (a)	If the student possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the student which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	If the student gives assistance or guidance or receives it from any other student orally or by any other body language methods or communicates through cell phones with any student or students in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the students involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2	If the student has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year.
3	If the student impersonates any other student in connection with the examination.	The student who has impersonated shall be expelled from examination hall. The student is also debarred and forfeits the seat. The performance of the original student, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

4	If the student smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
5	If the student uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6	If the student refuses to obey the orders of the Chief Superintendent/Assistant -Superintendent / any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

7	If the student leaves the exam hall taking away answer script or intentionally tears off the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred for two consecutive semesters from class work and all University examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8	If the student possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The student is also debarred and forfeits the seat.
9	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the college, expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and. a police case will be registered against them.
10	If the student comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the student has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the student has appeared including practical examinations and project work of that semester/year examinations.

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI

(An Autonomous Institution)

MECHANICAL ENGINEERING

COURSE STRUCTURE (AR16)

I Year – I Semester

S. No.	Subject Code	Subject	L	T	P	Credits	Marks		
							Int.	Ext.	Total
1	16HS1001	English	3	0	-	3.0	30	70	100
2	16BS1001	Engineering Mathematics – I	3	1	-	3.5	30	70	100
3	16ME1003	Engineering Mechanics (Statics)	3	1	-	3.5	30	70	100
4	16BS1004	Engineering Chemistry	3	1	-	3.5	30	70	100
5	16ME1001	Engineering Drawing	3	0	-	3.0	30	70	100
6	16CS1001	Computer Programming	3	1	-	3.5	30	70	100
7	16HS1101	Basic English Communication Skills Lab	-	-	3	1.5	25	50	75
8	16BS1102	Engineering Chemistry Lab	-	-	3	1.5	25	50	75
9	16CS1101	Computer Programming Lab	-	-	3	1.5	25	50	75
Total Credits			**18**	**4**	**9**	**24.5**	**255**	**570**	**825**

I Year – II Semester

S. No.	Subject Code	Subject	L	T	P	Credits	Marks		
							Int.	Ext.	Total
1	16HS1002	English Communication Practice	3	0	-	3.0	30	70	100
2	16HS1003	Environmental Studies	3	0	-	3.0	30	70	100
3	16BS1002	Engineering Mathematics – II	3	1	-	3.5	30	70	100
4	16EE1004	Basic Electrical and Electronics Engineering	3	1	-	3.5	30	70	100
5	16ME1004	Engineering Mechanics (Dynamics)	3	1	-	3.5	30	70	100
6	16BS1003	Engineering Physics	3	1	-	3.5	30	70	100
7	16EE1103	Electrical and Electronics Engineering Lab	-	-	3	1.5	25	50	75
8	16ME1101	Engineering Workshop Lab	-	-	3	1.5	25	50	75
9	16BS1101	Engineering Physics Lab	-	-	3	1.5	25	50	75
Total Credits			**18**	**4**	**9**	**24.5**	**255**	**570**	**825**

II Year – I Semester

S. No.	Subject Code	Subject	L	T	P	Credits	Marks		
							Int.	Ext.	Total
1	16ME2005	Mechanics of Solids	3	1	-	3.5	30	70	100
2	16ME2006	Production Technology	3	0	-	3.0	30	70	100
3	16ME2007	Thermodynamics	3	1	-	3.5	30	70	100
4	16ME2008	Fluid Mechanics and Hydraulic Machinery	3	1	-	3.5	30	70	100
5	16ME2009	Advanced Engineering Drawing	1	0	2	2.0	30	70	100
6	XXXX	**Open Elective - I**	2	0	-	2.0	30	70	100
7	16ME2102	Production Technology Lab	-	-	3	1.5	25	50	75
8	16ME2103	Mechanics of Solids Lab	-	-	3	1.5	25	50	75
9	16ME2104	Fluid Mechanics and Hydraulic Machinery Lab	-	-	3	1.5	25	50	75
10	16HS2201	Professional Ethics & Morals	2	-	-	-	-	-	-
Total Credits			**17**	**3**	**11**	**22.0**	**255**	**570**	**825**

Subject Code	Open Elective - I
16OE2011	Matrices and Applications
16OE2012	Water Shed Management
16OE2013	Introduction to MATLAB
16OE2015	Introduction of Electronic Measurements
16OE2016	UNIX Utilities
16OE2017	IT Systems Management

II Year – II Semester

S. No.	Subject Code	Subject	L	T	P	Credits	Marks		
							Int.	Ext.	Total
1	16BS2006	Complex Variables and statistical Methods	3	1	-	3.5	30	70	100
2	16HS2004	Managerial Economics and Financial Analysis	2	1	-	2.5	30	70	100
3	16ME2010	Thermal Engineering - I	4	1	-	4.5	30	70	100
4	16ME2011	Machine Drawing	1	4	-	3.0	30	70	100
5	16ME2012	Engineering Metallurgy	2	0	-	2.0	30	70	100
6	XXXX	**Open Elective - II**	2	0	-	2.0	30	70	100
7	16HS2102	Advanced English Communication Skills Lab	-	-	3	1.5	25	50	75
8	16ME2105	Numerical Computation Lab	-	-	3	1.5	25	50	75
9	16ME2106	Thermal Engineering Lab	-	-	3	1.5	25	50	75
10	16ME2201	Self Study Course – I	-	2	-	1.0	75	-	75
Total Credits			**14**	**9**	**9**	**23.0**	**330**	**570**	**900**

** 2 Periods which includes library, e – learning, internet and presentation.*

Subject Code	Open Elective - II
16OE2021	Transform Theory
16OE2022	Fundamentals of Building Planning
16OE2023	Renewable Energy Sources
16OE2025	Principles of Communications
16OE2026	Introduction to Java
16OE2027	Introduction to PYTHON

III Year – I Semester

S. No.	Subject Code	Subject	L	T	P	Credits	Marks		
							Int.	Ext.	Total
1	16ME3013	Design of Machine Members - I	3	1	-	3.5	30	70	100
2	16ME3014	Kinematics & Dynamics of Machinery	3	1	-	3.5	30	70	100
3	16ME3015	Metal Cutting and Machine Tools	3	0	-	3.0	30	70	100
4	16ME3016	Automobile Engineering	3	1	-	3.5	30	70	100
5	16ME3017	Instrumentation and Control Systems	2	0	-	2.0	30	70	100
6	XXXX	**Open Elective - III**	2	0	-	2.0	30	70	100
7	16ME3107	Metal Cutting and Machine Tools lab	-	-	3	1.5	25	50	75
8	16ME3108	Metrology & Instrumentation Lab	-	-	3	1.5	25	50	75
9	16ME3109	Computer Aided Design and Drafting Lab	-	-	3	1.5	25	50	75
10	16ME3202	Self Study Course – II	-	2	-	1.0	75	-	75
Total Credits			**16**	**5**	**9**	**23.0**	**330**	**570**	**900**

** 2 Periods which includes library, e – learning, internet and presentation.*

Subject Code	Open Elective - III
16OE3031	Fundamentals of Fuzzy Logic
16OE3032	Environmental Impact Assessment
16OE3033	Energy Audit Conservation and Management
16OE3035	Introduction to Signal Processing
16OE3036	Social Networks
16OE3037	Fundamentals of Computer Graphics

III Year – II Semester

S. No.	Subject Code	Subject	L	T	P	Credits	Marks		
							Int.	Ext.	Total
1	16ME3018	Design of Machine Members - II	3	1	-	3.5	30	70	100
2	16ME3019	Mechanical Vibrations	3	1	-	3.5	30	70	100
3	16ME3020	CAD/CAM	3	1	-	3.5	30	70	100
4	16ME3021	Thermal Engineering - II	3	1	-	3.5	30	70	100
5	XXXX	**Elective I**	2	0	-	2.0	30	70	100
6	XXXX	**Open Elective - IV**	2	0	-	2.0	30	70	100
7	16ME3110	Computer Aided Engineering Lab	-	-	4	2.0	25	50	75
8	16ME3111	Automobile & IC Engines lab	-	-	3	1.5	25	50	75
9	16ME3112	Dynamics of Machinery Lab	-	-	3	1.5	25	50	75
10	16HS3202	Intellective Property Rights & Patents	2	-	-	-	-	-	-
Total Credits			**18**	**4**	**10**	**23.0**	**255**	**570**	**825**

Subject Code	**Elective I**
16ME3022	Refrigeration & Air Conditioning
16ME3023	JAVA Programming
16ME3024	Condition Monitoring
16ME3025	Robotics
Subject Code	**Open Elective - IV**
16OE3041	Management Information Systems (MIS)
16OE3042	Natural Disaster Management
16OE3043	Special Machines
16OE3045	Basics of VLSI
16OE3046	Simulation and Modeling
16OE3047	Soft Computing

IV Year – I Semester

S. No.	Subject Code	Subject	L	T	P	Credits	Marks		
							Int.	Ext.	Total
1	16ME4026	Industrial Hydraulics and Pneumatics	3	-	-	3.0	30	70	100
2	16ME4027	Heat Transfer	3	1	-	3.5	30	70	100
3	16ME4028	Finite Element Methods	3	1	-	3.5	30	70	100
4	16ME4029	Operations Research	3	1	-	3.5	30	70	100
5	XXXX	**Elective II**	2	-	-	2.0	30	70	100
6	XXXX	**Open Elective - V**	2	-	-	2.0	30	70	100
7	16ME4113	Heat Transfer Lab	-	-	3	1.5	25	50	75
8	16ME4114	FEA Lab	-	-	4	2.0	25	50	75
9	16ME4115	Industrial Hydraulics and Pneumatics Lab	-	-	3	1.5	25	50	75
10	16HS4203	Employability Skills	-	3	-	1.5	75	-	75
Total Credits			**16**	**6**	**10**	**24.0**	**330**	**570**	**900**

Subject Code	**Elective II**
16ME4030	Industrial Automation
16ME4031	Statistical Quality Control
16ME4032	Design for Manufacturing and Assembly
16ME4033	Computational Fluid Dynamics
Subject Code	**Open Elective - V**
16OE4051	Project Management
16OE4052	Geographical Information Systems
16OE4053	Power Quality Management
16OE4055	Basic of Mobile Communications
16OE4056	Introduction to Cloud Computing
16OE4057	Introduction to DBMS
16OE4058	Entrepreneurial Development

IV Year – II Semester

S. No.	Subject Code	Subject	L	T	P	Credits	Marks		
							Int.	Ext.	Total
1	16ME4034	Production Planning & Control	3	0	-	3.0	30	70	100
2	XXXX	**Elective III**	3	0	-	3.0	30	70	100
3	16ME4039	Power Plant Engineering	3	0	-	3.0	30	70	100
4	16ME4203	Internship	-	-	-	1.0	25	50	75
5	16ME4204	Project	-	-	-	6.0	60	140	200
Total Credits			**9**	**0**	**-**	**16.0**	**175**	**400**	**575**

Subject Code	Elective III
16ME4035	Un Conventional Machining Processes
16ME4036	Nonconventional Sources of Energy
16ME4037	Tool Design
16ME4038	Database Management Systems

Total credits: 180

L – Lecture

T- Tutorial

P- Practical

I Year B. Tech., I Semester

ENGLISH
(Common for all Branches – Sem-I / Sem-II)

Subject Code: 16HS1001 **Internal Marks: 30**
Credits: 3.0 **External Marks: 70**

COURSE OBJECTIVES:

- To improve comprehension levels of the students while reading texts in English
- To enable students interpret data and present their perspective on it
- To help students learn the techniques of expanding their vocabulary
- To assist students use grammar effectively in both speech and writing
- To enable students to write formal letters and short essays

COURSE OUTCOME:

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

- Read and comprehend seen and unseen passages and answer questions based on them.
- Interpret the content of a passage and state their perspective.
- Understand words and their meanings, and know prefixes, suffixes, analogies, synonyms, antonyms and one word substitutes.
- Use articles, quantifiers, gerunds, infinitives, present participles and tenses appropriately.
- Write sentences, paragraphs, formal letters, emails, short essays on any given topic.

UNIT–I
Read and Proceed: Reading—Vocabulary—Grammar—Writing Sentences

UNIT–II
Health: Reading—Vocabulary—Grammar—Types of Writing

UNIT–III
Travel: Reading—Vocabulary—Grammar—Paragraph Writing

UNIT–IV
Disaster Management: Reading—Vocabulary—Grammar—Writing Letters & Emails

UNIT–V
Gender: Reading—Vocabulary—Grammar—Writing an Essay

TEXT BOOKS:

1. Rani, K. Nirupa et al. Step by Step. Pearson: New Delhi, 2013.

REFERENCE BOOKS:

1. Maison, Margaret M. Examine Your English. Orient Longman: Hyderabad, 2003.
2. Taylor, Grant. English Conversation Practice. Tata McGraw-Hill: New Delhi, 2008.
3. Wood, Frederick T. A Remedial English Grammar for Foreign Students. Macmillan, 1966.

ENGINEERING MATHEMATICS – I
(Common for all Branches – Sem-I / Sem-II)

Subject Code: 16BS1001 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To identify & solve the 1st order differential equations and apply in Engineering.
- To understand the process of solving a 2nd and higher order differential equation and solve it. Identify a 2nd and higher order differential equation & solve it in engineering topics.
- To understand the generalized mean value theorems & their use to find the series expansions of functions and in turn their application in finding the maxima and minima of two variable functions.
- To solve the multiple integrals and to develop the capacity of a student to understand the applications of multiple integrals.
- To understand the mathematical and physical interpretation of Vector differential operator operating on a vector or scalar point function, the line, surface and volume integrals, vector integral theorems and their applications to find work done, area, and volume.

COURSE OUTCOMES:

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

- Solve the 1st order differential equations by identifying the suitable method.
- Solve the 2nd and higher order differential equations and perform simple applications in Engineering.
- Estimate the maxima and minima of two variable functions under different constraints.
- Evaluate a multiple integral and apply to estimate the volume and surface area of the solids.
- Calculate grad, divergence, curl; a line, surface and volume integral. To find work done, area, and volume. Apply the vector integral theorems to evaluate multiple integrals.

UNIT-I

Linear Differential Equations of First Order

Linear differential equations of first order and first degree – exact, linear and Bernoulli. Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories.

UNIT-II

Linear Differential Equations of Second and Higher Order

Linear differential equations of second and higher order with constant coefficients- Complete solution, Operator D, Rules for finding complementary function, Inverse operator D, Rules for finding particular integral with RHS term of the type e^{ax} , Sin ax, Cos ax, polynomials in x, e^{ax} V(x), xV(x). Method of variation of parameters, Cauchy's and Euler's equations.

UNIT-III

Partial Differentiation

Introduction-Total derivative - Chain rule - Generalized Mean Value theorem for One variable & two variable functions (without proof)-Taylors and Mc Laurent's series for two variables – Functional dependence – Jacobian. Maxima and Minima of functions of two variables with constraints and without constraints.

UNIT-IV

Multiple Integrals

Multiple integrals - double and triple integrals – change of variables in Double & Triple Integrals – Change of order of integration-Cartesian and Polar coordinates.

UNIT-V

Vector Calculus

Vector Differentiation: Gradient- Divergence- Curl - Laplacian and second order operators- Vector identities (without proof).

Vector Integration - Line integral – work done – Potential function – area- surface and volume integrals. Vector integral theorems: Greens, Stokes and Gauss Divergence Theorems (Without proof) and related problems- Work done, Force.

TEXT BOOKS:

1. Higher Engineering Mathematics, 42nd edition, 2012 - B. S. Grewal, Khanna Publishers, New Delhi.
2. Engineering Mathematics, Volume-I, II 11th editions respt., 2012, Dr. T.K.V.Iyengar & others, S. Chand Publishers

REFERENCE BOOKS:

1. Engineering Mathematics, 4th edition, 2009 - B. V. Ramana, Tata McGraw Hill, New Delhi.
2. A Text Book of Engineering Mathematics – I & II, 2nd edition, 2011, U. M. Swamy & others – Excel Books, New Delhi.
3. Advanced Engineering Mathematics, 8th edition, 2009, Erwin Kreyszig- Shree Maitrey Printech Pvt.Ltd, Noida.

I Year B. Tech., I Semester

ENGINEERING MECHANICS (STATICS)

Subject Code: 16ME1003 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To develop an understanding of the principles of statics and the ability to analyze problems using static equilibrium equations.
- To introduce the basic principles of mechanics applicable to rigid bodies in equilibrium.
- To develop the fundamentals of engineering mechanics and problem solving skills essential for mechanical engineering

COURSE OUTCOMES:

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

- Construct free body diagrams and develop appropriate equilibrium equations.
- Simplify the system of forces and moments to equivalent systems and analyze systems with friction.
- Determine the axial forces in the members of determinate truss.
- Determine centroid and moment of inertia for composite areas.
- Develop the equilibrium conditions in terms of virtual work.

UNIT-I

Analysis of Forces

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. Simple problems on equilibrium of concurrent forces in space

UNIT-II

Moment, Couple and Friction

Moment of a force, Theorem of Varignon, Method of moments. Types of parallel forces Resultant. Couple, Resolution of force into force and a couple. General case of parallel forces in a plane.

Friction (Theory only):

Introduction to friction, Classification of friction, Laws of dry friction. Co-efficient of friction, Angle of friction, Angle of repose, Cone of friction, Frictional forces on wheel, Wedge friction

UNIT-III

Centroid and Area Moments of Inertia

Introduction, Determination of centroid of simple figures from basic principles, Centroid of composite plane figures, Pappus theorems.

Area Moments of Inertia, Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures.

UNIT-IV

Analysis of Trusses by Method of Joints and Method of Sections

Types of Trusses - Assumptions for forces in members of a perfect truss, Force table, Cantilever Trusses, Structures with one end hinged and the other freely supported on rollers carrying horizontal or inclined loads.

UNIT-V

Principle of Virtual Work

Principle of virtual work, advantages of principle of virtual work, principle of virtual work applied to stability of equilibrium. Application of principle of virtual work limited to beams, ladder problems and simple trusses only.

TEXT BOOKS:

1. Engineering Mechanics, S.S. Bhavikatti, J.G. Rajasekharappa, New Age Publications,
2. Engineering Mechanics, A.K. Tayal, Umesh Publications,

REFERENCES BOOKS:

1. Engineering Mechanics, S. Timoshenko, D.H. Young, Tata McGraw Hill Publications,
2. Vector Mechanics for Engineers Statics and Dynamics, 3rd SI Metric ed., Beer and Johnston, Tata McGraw Hill Publications, New Delhi.
3. Engineering Mechanics, R.V. Kulkarni, R.D. Askhevkar, S. Chand Publications,
4. Engineering Mechanics, R.S. Khurmi, S. Chand Publications,
5. Engineering Mechanics, K.L. Kumar, Tata McGraw Hill Publications,

ENGINEERING CHEMISTRY
I Year B. Tech (1st Sem. CE, ME & EEE and 2nd Sem. ECE, CSE & IT)

Subject Code: 16BS1004 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To become familiar in moulding methods of preparation of different types of plastic materials.
- To understand the determination of hardness of water sample by EDTA method.
- To understand the methods of prevention of corrosion of metal.
- To become familiar about different lubrication techniques.
- To understand about constructing the PV cell.

COURSE OUTCOMES:

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

- Different moulding techniques of plastic material.
- Determine total hardness of water by EDTA method.
- Design the metallic materials to prevent corrosion.
- Apply suitable lubrication mechanisms for various machinery parts.
- Demonstrate the working of Photovoltaic cell.

UNIT-I

Polymer Science & Inorganic Engineering Materials

Definitions of Polymer, Polymerization – Functionality – Degree of polymerization - Types of polymerization (addition and condensation polymerizations). Plastics – Definition, Thermoplastics, Thermosetting Plastics – Compounding of Plastics – Moulding of plastics into Articles (Compression, injection, transfer and extrusion moulding methods).

Cement: Classification of cements – Manufacture of Portland cement – Raw Materials - Chemical composition of Portland cement - Setting and Hardening of Portland Cement.

UNIT-II

Water Technology

Hardness of Water – Temporary and Permanent Hardness - Units and Inter Conversions of Units - Estimation of Hardness by EDTA Methods - Treatment of Water for Domestic Purposes - Sedimentation – Coagulation – Filtration - Disinfection – Sterilization – Chlorination - Break Point chlorination – Ozonisation - Industrial Water Treatments: Desalination – Electro Dialysis - Reverse Osmosis - Lime-Soda Process - Zeolite Process - Ion-Exchange Process.

UNIT-III

Corrosion and Its Control

Definition, Causes and Effects of Corrosion - Theories of Corrosion (Chemical and Electrochemical Corrosion) - Mechanism of Electrochemical Corrosion (Oxygen Absorption Type and Hydrogen Evolution Type) - Types of Corrosion (Galvanic Corrosion, Differential Aeration Corrosion, Water Line Corrosion, Pitting Corrosion and Stress corrosion) - Galvanic Series - Factors affecting Rate of Corrosion (Nature of Metal and Nature of Environment). Controlling of Corrosion: Proper Designing - Modifying the Environment - Cathodic Protection (Sacrificial Anodic and Impressed Current).

UNIT-IV

Fuel Technology & Lubricants

Classification of Crude Oil-Fractional Distillation of Petroleum- Manufacturing Of Synthetic Petrol (Fischer-Tropsch & Bergius Process) - Knocking –Anti Knocking Agents-Octane & Cetane Number.

Lubricants: Definition and functions of lubricants – classification of lubricants - mechanism of lubrication – Thick film, Thin film and Extreme pressure lubrication - properties of lubricants - Viscosity, flash and fire points, cloud and pour points, aniline point, neutralization number and mechanical strength.

UNIT-V

Energy Sources

Chemical Sources of Energy: Single electrode potential - Faraday Laws – electro chemical series - Nernst Equation – reference electrodes – calomel electrode – NHE (or) SHE -

Renewable Energy Source (Solar Energy): Green house concept – harnessing of solar energy – Photovoltaic cells – concentrated power plants – parabolic trough – solar dish - solar tower.

TEXT BOOKS:

1. "Engineering Chemistry", P. C. Jain and Monica Jain, DhanpatRai Publications, Co., New Delhi, 2004, 16th Edition.
2. "A Text Book of Engineering Chemistry", S.S. Dara, S. S. Umare, S. Chand & Co., Ltd., 1986, 12th Edition.

REFERENCES BOOKS:

1. "A Text Book of Engineering Chemistry", Sunita Rattan, S.K. Kataria & Sons, 2012, 4th Edition.
2. "A Text Book of Engineering Chemistry", S. Nagarajan, R. Gopalan, D. Venkatappayya, Vikas Publishing House, 2013, 3rd Edition.
3. "Engineering Chemistry", Wiley India Editorial Team, Wiley Publishers, 2011, 5th Edition..

I Year B. Tech., I Semester

ENGINEERING DRAWING
(Common for all Branches – Sem-I / Sem-II)

Subject Code: 16ME1001 **Internal Marks: 30**
Credits: 3.0 **External Marks: 70**

COURSE OBJECTIVES:

- Able to develop drawing skills and representation of I angle and III angle projection, isometric Projection, Isometric drawing.

COURSE OUTCOMES:

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

- Construct polygons, conics, cycloid and scales (plain, diagonal, vernier).
- Draw projection of points and straight lines in any quadrant, and determine its true length and true inclination.
- Project plane surfaces inclined to both reference planes using first angle projection.
- Draw projections of simple solids inclined to one reference plane only.
- Convert orthographic views into isometric projections and vice-versa.

UNIT-I

Lines, Lettering and Dimensioning: Introduction to drawing instruments and their uses, Types of lines, Lettering ,Elements of dimensioning and systems of dimensioning.

Construction of scales: Plain Scale, Diagonal & Vernier Scales.

Geometric Constructions and Engineering Curves: Construction of Polygons, Construction of Conic sections–parabola, ellipse and hyperbola using General Method, construction of ellipse using oblong and concentric circles methods. Construction of cycloid & involute.

UNIT-II

Orthographic Projections: First and Third Angle Projections:
Projections of Points. Projections of Straight Lines inclined to one reference plane only.

UNIT-III

Projections of Planes: Perpendicular planes & planes inclined to one reference plane and both reference planes.

UNIT-IV

Projections of Solids: Classification of solids. Projections of Prism, Cylinder, Pyramid, & Cone inclined to one reference plane only.

UNIT-V

Conversion of Orthographic Projections to Isometric Projections: Conversion of Orthographic Views to Isometric views

Conversion of Isometric Projection to Orthographic Projections: Conversion of Isometric view to Orthographic views

TEXT BOOKS:

1. Engineering Drawing, N. D. Bhatt, V. M. Panchal, Charotar Publications,
2. Engineering Drawing, K. L .Narayana, P.Kanniah, Scitech Publications,

REFERENCE BOOKS:

1. Engineering Drawing and Graphics, 2nd ed., K. Venugopal, New Age International Publications,
2. Fundamentals of Engineering Drawing, 11th ed., Luzadder, J. Warren, D.M. Jon, Prentice Hall India Publications,

I Year B. Tech., I Semester

COMPUTER PROGRAMMING

Subject Code: 16CS1001 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To impart adequate knowledge on the need of programming languages and problem solving techniques.
- To develop programming skills using the fundamentals and basis of C language.
- To enable effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
- To teach the issues in the file organization and the usage of file systems.
- To impart the knowledge about pointers this is the backbone of effective memory handling.
- To study the advantages of user defined data type this provides flexibility for application development.

COURSE OUTCOMES:

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

- Understand the fundamentals of C programming.
- Choose loops and decision making statements for problem solving.
- Implement different operations on arrays and solve problems using functions.
- Understand pointers, structures and unions.
- Implement file operations in C programming for a given application.

UNIT-I

Computer Languages: Machine, Assembly and High-level, algorithm, flowchart, Program Development Steps.

Introduction to C: Character set, **Tokens:** Identifiers, keywords, data types, constants, variables, **Operators:** Arithmetic, relational, logical, assignment, bitwise, conditional and special (increment, decrement, comma)

Basic I/O statements, structure of a program, simple programs.

UNIT-II

Control Structures:

Decision Making: if, if-else, nested if, switch. **Iteration:** while, for, do-while, nested loops. **Branching:** Break, continue, goto.

UNIT-III

Arrays: Definition, Types: 1D, 2D, declaration, initialization, accessing elements, Matrix operations.

Functions: Definition, user defined function declaration, types of user defined functions, parameter passing, recursion, library functions, storage classes, passing arrays to function, string manipulations, preprocessor.

UNIT-IV

Pointers: Definition, initialization, operations on pointers, functions and pointers, arrays and pointers, pointers to pointers, dynamic memory allocation

Structures: Definition, declaration, initialization, accessing members, array of structures, arrays within structure, functions and structures, pointers to structures, nested structures, unions

UNIT-V

File Handling: Types, operations on files, modes, file I/O functions, Random Access Functions.

TEXT BOOKS:

1. E. Balagutusamy. 2011. C Programming, Tata Mc Graw Hill Publications, New Delhi India.
2. Yashwant Kanikar. 2012. Let Us C, 8th ed., PBP Publications,

REFERENCE BOOKS:

1. Dr. N.B. Venkateswarlu, 2009. C and Data Structures: A Snap Shot Oriented Treatise Using Live Engineering Examples, S Chand & Co., New Delhi.
2. B. W. Kernighan, Dennis M. Ritchie, The C – Programming Language, PHI.

I Year B. Tech., I Semester

BASIC ENGLISH COMMUNICATION SKILLS LAB

Subject Code: 16HS1101 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- To get students pronounce words correctly and speak with proper intonation
- To help students understand people speaking with different accents
- To enable students to describe objects and events effectively
- To help students approach a book with effective reading techniques
- To help students comprehend and interpret data provided in graphs, tables etc.

COURSE OUTCOME:

On completion of this course, students should be able to

- Pronounce words accurately based on the knowledge of speech sounds and use appropriate intonation patterns in speech.
- Comprehend audio and video clips of different accents.
- Describe / discuss / explain a given situation / context well.
- Read and recall what they have read.
- Understand and interpret information provided in graphs, tables etc.

UNIT-I

Received Pronunciation—Speech sounds of English—Intonation.

UNIT-II

Comprehension of Audio and Video Clips of different Accents.

UNIT-III

Greetings—Self-introduction—Introducing others—Story telling—Narrating an incident / event / person / picture.

UNIT-IV

Reading: SQ3R Technique (Survey-Question-Read-Recite/Recall-Review).

UNIT-V

Interpreting data of graphs, tables etc. orally and in writing

TEXT BOOKS:

1. Rani, K. Nirupa et al. Speak Well, Orient Blackswan, Hyderabad 2012.

REFERENCE BOOKS:

1. Prasad, M. Hari et al. Strengthen Your Steps. Maruthi: Hyderabad, 2010.
2. Prasad, M. Hari et al. Strengthen Your Communication Skills. Maruthi: Hyd, 2014.
3. Ashraf, M. Rizvi. Effective Technical Communication. Tata McGraw-Hill, 2005.

I Year B. Tech., I Semester

ENGINEERING CHEMISTRY LAB
(Common for all Branches – Sem-I / Sem-II)

Subject Code: 16BS1102 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:
- To understand the determination of Dissolved Oxygen and Turbidity of water samples.
- To become familiar with the determination of viscosity, flash point and acid value of oil.
- To learn concepts of pH and conductometric titrations.
- To understand the determination of hardness of water by EDTA method.
- To become familiar about all the instruments in the chemistry laboratories.

COURSE OUTCOMES:
On completion of this course, students should be able to
- Determine Dissolved Oxygen. and Turbidity of water samples.
- Explain the importance of viscosity, Flash point and Acid value of a lubricant.
- Determine the amount of acid or base by pH metric and conductometric titrations.
- Determine the hardness of various water samples.
- Operate all the instruments in the chemistry laboratory analysis.

LIST OF EXPERIMENTS: (Any Twelve experiments have to be completed)

1. Determination of Dissolved Oxygen present in the given water sample by Modern Winkler's Method.
2. Nephelometric determination of Turbidity present in the given water sample.
3. Determination of Kinematic Viscosity of a given oil sample by using Viscometer.
4. Determination of Flash and Fire points of given Oil Samples.
5. Determination of acid number of given lubricating oil.
6. Determination of Strength of a strong acid by pH metric Method.
7. Conductometric determination of Strength of an Acid using strong base.
8. Conductometric determination of mixture of acids using strong base.
9. Determination of Total Hardness of water sample by using EDTA Method.
10. Colorimetric determination of Iron (III).
11. Potentiometric determination of Mohr's salt using $K_2Cr_2O_7$.
12. Potentiometric determination of strong acid using strong base.
13. Determination of manganese dioxide in manganese ore (pyrolusite).
14. Estimation of Viscosity of an Organic Solvent by using Ostwald Viscometer.
15. Preparation and calculation of the yield of Phenol-Formaldehyde Resin (Bakelite).

TEXT BOOKS:
1. "Practical Engineering Chemistry" by K.Mukkanti, etal. B.S.Publications, Hyderabad (2011).
2. "Lab Manual on Engineering Chemistry" by Sudharani, Dhanpat Rai Publications, Co., New Delhi., (2009).

REFERENCE BOOKS:

1. "Engineering Chemistry Lab Manual" by Shuchi Tiwari (2010), SCITECH Publications.
2. "Vogel's Text Book of Quantitative Chemical Analysis", 6th Edition by G. J. Jeffery, J. Bassett, J. Mendham, R.C. Denney, Longman Scientific & Technical Publications, New York.
3. "A Text Book of Engineering Chemistry" by R. N. Goyal and H. Goel, Ane Books (P) Ltd.(2009).
4. "A Text Book on experiments and calculations Engineering" by S.S. Dara, S.Chand & Company Ltd. (2003).
5. "Instrumental methods of Chemical Analysis", Gurudeep R, Chatwal Sham, K. Anand, Latest Edition (2015), Himalaya Publications.

COMPUTER PROGRAMMING LAB

Subject Code: 16CS1101 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- To gain experience about structured programming.
- To help students to understand the implementation of C language.
- To understand various features in C.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Solve the given problem using the syntactical structures of C language.
- Develop, execute and document computerized solution for various problems using the features of C language.
- Design programs involving decision structures and loops.
- Implement modularity and code reusability concepts using functions.
- Read and write C programs that uses pointers, structures and files.

LIST OF EXPERIMENTS

Ex 1: Write the C programs calculate the following
a) Area of triangle when sides are given.
b) Sum of first n numbers.
c) Interchanging values of two variables.

Ex 2: Write the C programs to perform the following
a) Read lower case character and convert into upper case.
b) Find maximum of 3 values using conditional operator.
c) Calculate area and perimeter of circle.

Ex 3: Write C programs for the following using decision making statements
a) Check the given number is even / odd.
b) Find the Largest among 3 values.
c) Calculate the grades of a student.

Ex 4:
a) Arithmetical operations using switch-case.
b) Read a number and display in reverse.
c) Check for Armstrong number property

Ex 5:
a) Check for strong number property
b) Generate Fibonacci series.
c) Generate Prime numbers between two numbers.

Ex 6: Implement the following using arrays
a) Largest and smallest from a list of elements.
b) Find the position of given element from a list.
c) Arrange the elements in order.

Ex 7: Implement the following using arrays
a) Matrix addition.
b) Matrix Multiplication.
c) Transpose of given matrix

Ex 8: Calculate ${}^{n}C_{r}$ value using functions.
Write functions to perform
a) String copy
b) String concatenation
c) String comparison

Ex 9:
a) Factorial using recursion and non recursion.
b) GCD using recursion and non recursion.

Ex 10:
a) Find the sum and average of list of elements using DMA Functions
b) Implementation of call by reference

Ex 11:
a) Implementation of array of structure.
b) Demonstration of Union.

Ex 12:
a) Copy the contents of one file into another.
b) Count the number of characters, words and lines in a file.
c)

TEXT BOOKS:
1. E. Balagutuswamy "C Programming", Tata McGraw Hill.
2. Yashwant Kanikar "Let Us C".

REFERENCE BOOKS:
1. Dr. N.B Venkateswarlu, "C and Data Structures: A Snap Shot Oriented Treatise Using Live Engineering Examples" S. Chand & Co, New Delhi.
2. B. W Kernighan, Dennis M. Ritchie "The C – Programming Language, PHI.

ENGLISH COMMUNICATION PRACTICE
(Common to all Branches)

Subject Code: 16HS1002 **Internal Marks: 30**
Credits: 3.0 **External Marks: 70**

COURSE OBJECTIVES:

- To assist students use grammar effectively in both speech and writing
- To improve communication skills of students by making them participate in different language activities
- To help students acquire the study skills of 'Note taking' and 'Note making'
- To assist students to use reading techniques learnt in English for other subjects
- To enable students to summarize, paraphrase and review a piece of writing

COURSE OUTCOME:

On completion of this course, students should be able to

- Use grammar appropriately in speech and writing.
- Describe, discuss, explain and interpret a given situation / context effectively.
- Read texts and listen to lectures and make notes on them.
- Apply reading techniques in their other subjects.
- Summarize, paraphrase and review a piece of writing efficiently.

UNIT–I

Grammar: Regular & Irregular Verbs—Tenses—Voice—Reported Speech—Auxiliaries and Modals—If Conditionals— Degrees of Comparison— Simple, Compound, Complex Sentences—Question Tag—Correction of Sentences

UNIT –II

Situational Dialogues—Acceptance and Rejection of Invitation—Debate—JAM— Public Speaking

UNIT–III

Study Skills: Note taking and Note making.

UNIT-IV

Intensive and Extensive reading—Skimming and Scanning

UNIT–V

Summarising / Paraphrasing / Reviewing an article orally and in writing.

TEXT BOOK:

1. Rani, K. Nirupa et al. Speak Well. Orient Blackswan: Hyderabad, 2012.

REFERENCE BOOKS:

1. Wood, Frederick T. A Remedial English Grammar for Foreign Students. Macmillan, 1966.
2. Heaton, John Brian et al. Longman Dictionary of Common Errors. Longman, 1977.
3. Taylor, Grant. English Conversation Practice. Tata McGraw-Hill: New Delhi, 2008.
4. Ashraf, M. Rizvi. Effective Technical Communication. Tata McGraw-Hill, 2005.

I Year B. Tech., II Semester

ENVIRONMENTAL STUDIES
(Common for all Branches – Sem-I / Sem-II)

Subject Code: 16HS1003 **Internal Marks: 30**
Credits: 3.0 **External Marks: 70**

COURSE OBJECTIVES:

- Memorize the overall knowledge of the environment; differentiate the resources, reserves, importance and conservation.
- Identify the significance, arrangement, causes of annihilation of ecosystems and biodiversity; recognize the importance of their protection and preservation.
- Discriminate various causes, effects of a range of environmental pollutions and describe the appropriate control methods.
- Identify the sustainable development; evaluate the different environmental management issues and environmental legal issues.
- Describe the variations in population growth, recognizes the human health problems and evaluate the environmental assets.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Recognize the general issues of environment and know how to conserve the environment, speak well again on various resources, present status and their better usage.
- Explain the interdependency of life in the ecosystem, demonstrate the structural and functional setup, classify and appraise the importance of diversity on the earth and differentiate the conservation methods.
- Examine the various types of pollutants and their impacts along with their control methods; review the different types of solid wastes, impacts and their ecofriendly disposal methods.
- Translate the concept of sustainable development by green technologies, experiment on the environmental management systems for clean, green, safe and healthy environment through clean development mechanisms.
- Evaluate the changing trends of population curves among different nations, discuss how to limit the current population size, collect and compile the information to document the environmental assets.

UNIT-I

Multidisciplinary Nature of Environmental Studies:

Definition of Environment – Scope, Importance and multidisciplinary nature of the course - Need for Public Awareness

Natural Resources:

Forest Resources - Use and over exploitation - deforestation – consequences – solutions - case studies

Water Resources - Use and over utilization - dams - benefits and problems on Tribes and Environment

Mineral Resources - Use and exploitation - Tribal and environmental effects of extracting and using mineral resources - case studies

Food Resources – Food security concept - changes caused by agriculture and overgrazing - effects of modern agriculture – fertilizer - pesticide problems - water logging - salinity – concept of sustainable agricultural methods - case studies

Energy Resources - Non-renewable energy resources – coal – crude oil - natural gas - use of renewable and alternate energy sources - case studies

Land resources – Reasons for land degradation - Human induced landslides - soil erosion and desertification

UNIT-II

Ecosystems:

Definition – Structure of ecosystem: producers - consumers – decomposers. Functions of ecosystem: Food chains - food webs - ecological pyramids - Energy flow - Nutrient cycles (Carbon cycle and Nitrogen cycle). Ecological succession, Types - characteristic features of the following ecosystems: Forest ecosystem - Grassland ecosystem - Desert ecosystem - Aquatic ecosystems (lakes and oceans)

Biodiversity and its Conservation:

Definition of Biodiversity – genetic, species and ecosystem diversities - Values of biodiversity - Bio-geographical classification of India - India as a mega-diversity nation – Hotspots of biodiversity (India) - Endangered and endemic species of India – Threats to biodiversity - Conservation of biodiversity

UNIT-III

Environmental Pollution:

Definition – causes - effects - control measures of Air pollution - Water pollution - Marine pollution - Noise pollution - Nuclear hazards

Solid waste Management: Causes - effects - disposal methods of urban waste - biomedical wastes - case studies

Disaster management: floods – earthquakes - cyclones

UNIT-IV

Social Issues and the Environment:

Concept of Unsustainable and Sustainable development – Urbanization and Urban problems related to energy - Water conservation: Rain water harvesting - Watershed management - Resettlement and rehabilitation of people - case studies. Global environmental challenges: climate change - global warming – acid rains - ozone layer depletion - World summits on environment: Stockholm conference – Rio-earth summit – Kyoto protocol – EIA - definition – significance - scope – stages of EIA – Concept of Bioremediation – Concept of Carbon Sequestration – Environment (Protection) Act - Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act - Wildlife (Protection) Act - Forest (Conservation) Act

UNIT-V

Human Population and the Environment:

Population growth patterns - variation among nations - Population problems - control -Environment and human health - Role of information Technology in Environment and human health

Field work:

Visit to local area to document environmental assets - River/ forest/ grassland/ hill/ mountain

Visit to local polluted sites Urban/ Rural/ industrial/ Agricultural

Study of common plants/ insects/ birds - Study of simple ecosystems ponds/ rivers/ hill slopes

TEXT BOOKS:

1. Shashi Chawla. 2015, A Text book of Environmental Studies, Revised edition, TMH, New Delhi
2. Bharucha, E. 2005, Text book of Environmental Studies, First edition, Universities Press (India) Pvt. Ltd., Hyderabad
3. Suresh K. Dhameja. 2006-07, Environmental Studies, Third revised edition, S.K. Kataria & Sons (P) Ltd., New Delhi
4. Benny Joseph. 2015, Environmental Studies, Revised edition, TMH, New Delhi

REFERENCE BOOKS:

1. Odum, E.P. 1971, Fundamentals of Ecology, Third edition, W.B. Saunders & Co (P) Ltd., Philadelphia.
2. P. D. Sharma. 1996, Ecology and Environment, Revised edition, Rastogi Publications (P) Ltd
3. Cunningham, W.P., Cunningham, M.A., Principles of Environmental Science, TMH, New Delhi
4. Peavy, Rowe and Tchobanoglous, Environmental Engineering, Mc Graw – Hill International edition
5. Graedel, T.E., Allenby, B.R., Industrial Ecology and Sustainable Engineering, Pearson Publications.

ENGINEERING MATHEMATICS – II
(Common to all Branches)

Subject Code: 16BS1002 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To solve the algebraic and transcendental equations, using different numerical method. Estimate the best curve for a given data.
- To estimate the value of derivatives, evaluate the definite integrals using different numerical methods and calculate the numerical solution of an ordinary differential equation i.e IVP .
- To explain Laplace transform of continuous functions using Laplace transform formulae & properties, apply Laplace transform to solve an I.V.P &B.V.P
- Perform the Fourier series and half range series expansion of different functions in different intervals.
- Interpret the methods of solving a linear and non-linear 1^{st} order partial differential equation and evaluate wave equations & heat equations using method of separation of variables.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Solve the algebraic and transcendental equations by identifying suitable numerical methods, estimate a linear and non-linear curve to the given data by the method of least squares, calculate the value of dependent variable for a particular x by deducing the unknown function $y = f(x)$ for an evenly or unevenly spaced points.
- Estimate the value of derivatives, evaluate the definite integrals using different numerical methods and evaluate an IVP.
- Deduce Laplace transform of different continuous functions using different properties and solve an I.V.P & B.V.P applying Laplace transform.
- Evaluate the Fourier series and half range series expansions of different functions for different intervals.
- Solve a linear and non-linear 1^{st} order partial differential equation and using method of separation of variables evaluate a wave equation & heat equation

UNIT-I

Numerical Solutions of Equations and Interpolation

Solution of Algebraic and Transcendental Equations: Introduction – The Bisection Method – The Method of False Position – The Iteration Method – Newton-Raphson Method.

Interpolation: Introduction – Finite differences- Forward Differences – Backward differences – Central differences – Symbolic relations and separation of symbols-Differences of a polynomial – Newton's formulae for interpolation – Interpolation with unevenly spaced points – Lagrange's Interpolation formula.

UNIT-II

Numerical Differentiation, Integration and solution of Ordinary Differential Equations

Numerical Differentiation and Integration: Numerical Differentiation using finite differences – Trapezoidal rule – Simpson's 1/3 Rule –Simpson's 3/8 Rule.

Solution of Ordinary Differential Equations: Solution by Taylor's series – Picard's Method of successive Approximations – Euler's and Modified Euler's Method – Runge – Kutta Methods – Predictor – Corrector Methods – Milne's Method.

UNIT-III

Laplace and Inverse Laplace transforms

Laplace transforms of standard functions – Shifting Theorems, Transforms of derivatives and integrals – Unit step function – Dirac's delta function – Inverse Laplace transforms – Convolution theorem. Solution of ordinary differential equations using Laplace transforms.

UNIT-IV

Fourier Series

Determination of Fourier coefficients (without proof) – Fourier series – even and odd functions – Fourier series in an arbitrary interval– Half-range sine and cosine series.

UNIT-V

Partial Differential Equations

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – solutions of first order linear (Lagrange) equation and non-linear (standard type) equations. Solution of linear Partial differential equations with constant coefficients – Method of Separation of Variables- One dimensional Wave and Heat equations.

TEXT BOOKS:

1. Higher Engineering Mathematics, 42nd edition, 2012 - B.S. Grewal, Khanna Publications, New Delhi.
2. Ravindranath, V. and Vijayalaxmi, A., 2nd edition, 2012, A Text Book on Mathematical Methods, Himalaya Publishing House, Bombay.

REFERENCE BOOKS:

1. Mathematical Methods, 6th edition, 2011, Dr. T. K.V.Iyengar & others S. Chand Publications.
2. Engineering Mathematics, 4th edition, 2009 - B. V. Ramana, Tata McGraw Hill, New Delhi.
3. Engineering Mathematics Volume-II, 6th edition, 2012, T.K.V Iyengar, &others, S.Chand Co. New Delhi.

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: 16EE1004 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To introduce electric circuits and its analysis
- To have knowledge on DC Machines.
- To understand the performance of transformers and induction motors.
- To understand the operation of alternators and measuring instruments.
- To educate about the different types of semiconductor devices.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Ability to analyze electrical circuits for both DC and AC
- Identify and Define different types of dc generators
- Ability to generalize AC machines.
- Classify different types of measuring instruments.
- To outline semiconductor devices.

UNIT –I

Basic Electrical Components: Basic definitions, Types of elements, Ohm's Law,symbols, R, Land C and their V-I relationships, Resistive networks, Inductive networks,Capacitivenetworks, Series & Parallel circuits, Kirchhoff's Laws, Star-delta and delta-star transformations, simple problems.

UNIT-II

DC Machines: Generator-Principle of Operation, construction, EMF equation, Classification; O.C.C, internal and external characteristics of shunt generator. Motor-principle of operation, Torque equation, Speed Control Methods, Testing of DC motors, Operation of 3 point starter.

UNIT-III

Transformers: Operation of a Single Phase Transformer, EMF equation, Equivalent Circuit, losses, Regulation and Efficiency of a single phase transformer, O.C and S.C Tests.
Three Phase induction Motor: Principle of Operation of 3-Φ induction motor, power and torque equations, Torque-Speed Characteristics of 3- Φ induction Motor.

UNIT-IV

Alternators: Principle of operation of alternator, emf equation, regulation by synchronous impedance method.
Measuring Instruments:
Types of instruments, principle operation of permanent magnet Moving Coil and Moving Iron instruments advantages, disadvantages

UNIT-V

Semiconductor devices: P-N junction diode- V-I characteristics, applications, rectifiers-half wave, full wave (simple problems) P-N-P,N-P-N transistor, common base, common emitter configuration.

TEXT BOOKS:

1. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.
2. Basic Electrical Engineering - Dr.K.B.MadhuSahu, Scitech Publications.

REFERENCE BOOKS:

1. Electronic components Dr. K. Padmanabhan, Laxmi publications, New Delhi.
2. Electronic Devices and circuits S. Salivhanan, N. Suresh Kumar, A. Vallavaraj Tata McGraw-Hill Education Private Limited, New Delhi second edition.
3. Principles of Electrical and Electronics Engineering by V. K. Mehta, S. Chand & Co

ENGINEERING MECHANICS (DYNAMICS)

Subject Code: 16ME1004 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To teach the basic principles of mechanics applicable to the motion of particles and rigid bodies.
- To introduce with mathematical description of the plane motion of rigid bodies.
- This course is designed to enable students to acquire fundamental knowledge for engineering design.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Determine the mass moment of inertia of rigid bodies.
- Determine the kinematic relations of particles & rigid bodies.
- Apply equations of motion to particle and rigid body.
- Analyze motion of particles & rigid bodies using the principle of energy and momentum methods.
- Apply the concepts of relative velocity and instantaneous center method.

UNIT-I

CG of Material Bodies: Hemisphere, Right circular cone, Simple Composite bodies

Moment of Inertia of Material Bodies: Moment of inertia of Regular laminas- slender bar, rectangular plate, Circular plate, circular ring, Moment of inertia of 3D bodies- cone, solid cylinder, sphere & parallelopiped.

UNIT-II

Kinematics of Rectilinear Translation: Introduction, displacement, velocity and acceleration. Motion with Uniform and Variable acceleration.

Kinematics of Curvilinear Motion: Introduction, rectangular components of velocity & acceleration, Normal and Tangential acceleration and Motion of projectiles.

UNIT-III

Kinetics of Rectilinear Translation: Equations of rectilinear motion. Equations of Dynamic Equilibrium: D'Alembert's Principle, Impulse & Momentum and Work Energy methods in rectilinear motion.

Kinetics of Curvilinear Motion: D'Alembert's Principle, Impulse & Momentum and Work Energy methods in curvilinear motion.

UNIT–IV

Kinematics of Plane Motion: Concepts of relative velocity and instantaneous center.

Kinetics of Plane Motion: Equations of motion, Dynamic equilibrium of symmetrical rolling bodies. Impulse & Momentum and Work Energy methods in plane motion.

UNIT–V

Impact-Collision - Direct central Impact.

Rotation of a Rigid Body about a Fixed Axis: Kinematics of rotation, Equation of motion for a rigid body rotating about a fixed axis.

TEXT BOOKS:

1. Engineering Mechanics, S.S. Bhavikati, J.G. Rajasekharappa, New Age Publications,
2. Engineering Mechanics, A.K. Tayal,Umesh Publications,

REFERENCES BOOKS:

1. Engineering Mechanics, S. Timoshenko, D.H. Young,TMH Publications,
2. Vector Mechanics for Engineers Statics and Dynamics, 3rd SI Metric ed., Beer and Johnston, Tata McGraw Hill Publications, New Delhi 2010.
3. Engineering Mechanics, R.V. Kulkarni, R.D. Askhevkar, S. Chand Publications,
4. Engineering Mechanics, R.S. Khurmi, S. Chand Publications,
5. Engineering Mechanics, K.L. Kumar, Tata McGraw Hill Publications,

ENGINEERING PHYSICS
(Common for all Branches – at Sem-I / Sem -II)

Subject Code: 16BS1003 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To realize the principles of optics in designing optical devices
- To comprehend the Principles of Lasers and Fiber Optics
- To define the shortcoming of classical physics and describe the need for modifications to classical theory
- To possess an insight on Magnetic Properties pertaining to Material Fabrication
- To estimate the response of E-Field on Dielectric Materials to control the device performance

COURSE OUTCOME:

On completion of this course, students should be able to

- Apply the principles of optics in designing optical devices
- Outline the Principles of Lasers and Fiber Optics
- Resolve the discrepancies in classical estimates through quantum principles
- Interpret the knowledge of Magnetic Properties in Material Fabrication
- Explain the response of E-Field on Dielectric Materials to control the device performance

UNIT- I: WAVE OPTICS

Interference - Introduction, Principle of Superposition of Waves, Interference in Plane Parallel Film due to Reflected Light, Newton's Rings under Reflected Light - Determination of Wavelength of Monochromatic Source of Light, Applications of Interference-Testing of Flatness of Surfaces, Anti Reflecting Coatings.

Diffraction - Introduction, Differences between Interference and Diffraction, Fraunhofer Diffraction due to Single Slit – Intensity Distribution.

UNIT-II: LASERS & FIBER OPTICS

Lasers - Introduction, Characteristics of Lasers- Coherence, Directionality, Monochromacity and High Intensity, Principle of Laser – Absorption, Spontaneous and Stimulated Emission, Einstein Coefficients (Qualitative), Population Inversion, Optical Resonator and Lasing Action, Ruby Laser [Three Level System], Helium-Neon Laser [Four Level System], Applications of Lasers in Industry, Scientific and Medical Fields.

Fiber Optics - Introduction, Optical Fiber Construction, Principle of Optical Fiber – Total Internal Reflection, Conditions for Light to Propagate - Numerical Aperture and Acceptance Angle, Differences between Step Index Fibers and Graded Index Fibers, Differences between Single Mode Fibers and Multimode Fibers, Appications of Optical Fibers in Communication.

UNIT-III: PRELIMINARY QUANTUM MECHANICS

Introduction, Waves and Particles, Wave Particle Duality and De-Broglie Hypothesis, Heisenberg's Uncertainty Principle – Applications (a) Non Existence of Electrons in Nucleus (b) Existence of Protons and Neutrons in Nucleus (c) Radiation of Light from an excited atom, Time independent Schrödinger wave equation, Physical Significance of Wave Function, Particle in One Dimensional Potential Box, Comparison of Maxwell Boltzmann, Bose Einstein and Fermi Dirac Statistics (Qualitative Treatment only).

UNIT-IV: MAGNETIC PROPERTIES

Introduction, Basic Terms, Relation between B, H & I, Origin of Magnetic Moment – Bohr Magnetron, Classification of Magnetic Materials – Dia, Para and Ferro, Domain Theory of Ferromagnetism – Hysteresis, , Soft and Hard Magnetic Materials, Applications- Ferrites and Eddy Current Losses Transformer Cores, Concept of Magnetostriction.

UNIT-V: DIELECTRIC MATERIALS

Introduction, Basic Terms – Relation between D, E & P, Electronic Polarizability, Ionic Polarizability, Orienational Polarizability (both Qualitative and Quantitative), Total Polarizability, Frequency Dependence of Polarizability, Dielectric Loss and Dielectric Breakdown, Applications of Dielectrics – Solid Insulating Materials, Liquid Insulating Materials, Dielectric Heating, Concept of Ferro Electricity - Spontaneous Polarization in Barium Titanate Crystal, Concept of Piezoelectricity.

TEXTS BOOKS:

1. A Textbook of Engineering Physics, M N Avadhanulu & P G Kshirsagar, S.Chand Publishers

REFERENCE BOOKS:

1. University Physics, Young and Freedman
2. Fundamentals of Physics, Resnick, Halliday, Walker.
3. Concepts of Modern Physics, Arthur Beiser, McGraw-Hill Publications.
4. Solid State Physics, S.O. Pillai, New Age International Publications.
5. Engineering Physics, Vol-I & II, P.K. Palani Swamy, Scitech Publications, Hyderabad.
6. Engineering Physics, Vol-I& II, Dr. K. Vijaykumar, S. Chand Publications, New Delhi.
7. Engineering Physics, Dr. S. Mani Naidu, Pearson Publications, Chennai.

ELECTRICAL AND ELECTRONICS ENGINEERING LAB

Subject Code: 16EE1103 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- To verify the basic laws related to electrical engineering, to understand the working of different DC machines, AC Machines, Transformers and their performance characteristics with the help of suitable tests.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Analyze DC electrical circuits.
- Determine performance of DC machines.
- Interpret performance of AC Machines.
- Understand the transistor characteristics.
- Distinguish the full wave rectifier with and with our filters.

Any Ten of the following experiments:

1. To verify ohm's law
2. To verify (a) Kirchoff's current law
   (b) Kirchoff's voltage law
3. Swinburne's test on D.C. Shunt machine. (Predetermination of efficiency of a given D.C. Shunt machine working as motor and generator).
4. OC and SC tests on single phase transformer (Predetermination of efficiency and regulation at given power factors)
5. Brake test on 3-phase Induction motor (Determination of performance characteristics)
6. Regulation of alternator by Synchronous impedance method.
7. Speed control of D.C. Shunt motor by
   a) Armature Voltage control b) Field flux control method
8. Brake test on D.C Shunt Motor
9. Magnetization characteristics of D.C Shunt Generator
10. Transistor CE Characteristics (Input and Output)
11. Full wave Rectifier with and without filters.
12. CE Amplifiers.

Additional Experiments:

13. Class A Power Amplifier
14. RC Phase Shift Oscillator

I Year B. Tech., II Semester

ENGINEEING WORKSHOP LAB

(Common for all Branches – Sem-I / Sem-II)

Subject Code: 16ME1101 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- The Engineering Workshop Practice for engineers is a training lab course spread over entire semester. The modules include training on different trades like Fitting, Carpentry, Black smithy etc. which makes the students to learn how various joints are made using wood and other metal pieces.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Make half-lap, mortise & tenon, corner dovetail or bridle wooden joints.
- Develop sheet metal into objects like square tray, taper side tray, conical funnel or elbow pipe.
- Forge MS rod from round to square cross-section, or into L- or S- bend.
- Fabricate MS pieces into either a straight, square, dovetail or V-fit.
- Connect a staircase or a tube light house-wiring electrical circuit.

I. Wood Working Technology - Familiarity with different types of woods used and tools used in wood Working technology.

Tasks to be performed:

1) To make Half – Lap joint 2) To make Mortise and Tenon joint
3) To make Corner Dovetail joint 4) To make Briddle joint.

II. Sheet Metal Working – Familiarity with different types of tools used in sheet metal working, developments of sheet metal jobs from GI sheets, knowledge of basic concepts of soldering.

Tasks to be performed:

1) To make Square Tray 2) To make Taper side Tray
3) To make Conical Funnel 4) To make Elbow Pipe.

III. Forging Technology – Familiarity with different types of tools used in forging technology. Knowledge of different types of furnaces like coal fired, electrical furnaces etc...

Tasks to be performed:

1) To make round M.S rod to square bar 2) To make L bend in given M.S. Rod.
3) To make S bend in given M.S. Rod. 4) To perform heat treatment tests like annealing, normalizing etc...

IV. Fitting Technology – Familiarity with different types of tools used in fitting technology.

Tasks to be performed:

1) To make "V" – fitting 2) To make square fitting
3) To make Dovetail fitting 4) To make Straight fitting

V.HOUSE WIRING

1) Tube light connection
2) Staircase connection

Note: **Any two jobs from each trade must be performed by the student.**

I Year B. Tech., II Semester

ENGINEEING PHYSICS LAB
(Common for all Branches – Sem-I / Sem-II)

Subject Code: 16BS1101 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- To Interpret the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
- To use classic experimental techniques to understand the Phenomenon of resonance with equipment such as sonometer, Melde's apparatus and volume resonator to measure desired properties
- To operate optical systems and design Instrumentation with precision measurements to estimate error for targeted accuracy
- To attain ability to use Techniques and Skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
- To characterize magnetic, dielectric and semiconducting material devices

COURSE OUTCOMES:

On completion of this course, students should be able to

- Infer the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum.
- Apply classic experimental techniques to comprehend the phenomenon of resonance with equipment such as sonometer, Melde's apparatus and volume resonator to measure desired properties.
- Demonstrate the ability to measure properties of optical systems and design instrumentation with precision measurements to estimate error for targeted accuracy.
- Illustrate techniques and skills associated with Modern Engineering Tools such as Lasers and Fiber Optics.
- Evaluate characteristics of magnetic, dielectric and semiconducting material devices.

LIST OF EXPERIMENTS (Any Ten Experiments have to be completed)

1. Precision Measurements and Instruments
2. Error Analysis and Graph Drawing
3. Determination of Rigidity Modulus of the Material of Wire using Torsional Pendulum
4. Verification of Laws of Transverse vibrations in Stretched Strings using Sonometer
5. Wedge method – Determination of Thickness of Thin Object
6. Determination of Numerical Aperture and Bending Loss of an Optical Fiber
7. Determination of Acceleration due to Gravity (g) using Compound Pendulum
8. Determination of Energy Band Gap using the given Semiconductor Diode
9. Newton's Rings – Determination of the Radius of Curvature of given Plano Convex Lens
10. Slit Width Determination with Single Slit Diffraction Pattern using LASER
11. Study of Characteristics of Thermistor
12. Determination of Wavelength of Monochromatic Source using LASER Diffraction
13. Determination of the Frequency of the given Tuning Fork using Volume Resonator
14. Study of the variation of Magnetic Field along the axis of a Circular Coil using Stewart and Gee's Method.
15. Diffraction Grating: Normal Incidence – Determination of Wavelength of Monochromatic Source

MANUAL / RECORD BOOK:

1. Manual cum Record for Engineering Physics Lab, Prof. M. Rama Rao, Acme Learning Publications,
2. Lab Manual of Engineering Physics, Dr. Y. Aparna, Dr. K. Venkateswara Rao, VGS Booklinks Publications, Vijayawada.

II Year B. Tech., I Semester

MECHANICS OF SOLIDS

Subject Code: 16ME2005 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To gain fundamental understanding of the concepts of stress and strain by analysis of solids and structures.
- To study engineering properties of materials, force-deformation, and stress-strain relationship.
- To understand shear force and bending moment diagrams.
- To understand shear stresses and bending stresses.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Compute normal, shear, principle stresses and strain energy of components subjected to external forces and temperature changes.
- Compute shear force and bending moments for statically determinate cantilever or simply-supported beams subjected to various loads.
- Determine flexural stresses and deformations using bending formula, and shear stresses and deformations using shear formula.
- Compute beam deflections using double integration, Macaulay and moment-area methods.
- Calculate longitudinal, hoop and radial stresses for thin and thick, simple and compound cylinders subjected to both internal and external pressures.

UNIT-I

SIMPLE STRESSES & STRAINS:

Elasticity and plasticity, Types of stresses and strains, Hooke's law, Stress-strain diagram for mild steel, Working stress, Factor of safety, Lateral strain, Poisson's ratio, Volumetric strain, Elastic modulii and relationship between them – Bars of varying section – Composite bars – Temperature stresses – Strain energy – Resilience – Gradual, sudden, impact and shock loadings.

UNIT-II

PRINCIPAL STRESSES:

Stresses on an oblique plane when a member subjected to tensile, compressive and shear stresses. Principal planes and principal stresses for general stress system.

Mohr’s circle construction for like stresses, unlike stresses and two perpendicular direct stresses along with simple shear. Mohr’s circle construction for principal stresses.

SHEAR FORCE AND BENDING MOMENT:

Definition of beam, Types of beams, Concept of shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported, overhanging beams subjected to point loads, U.D.L, uniformly varying loads and combination of these loads – Point of contra flexure – Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT-III

FLEXURAL STRESS:

Theory of simple bending, Assumptions – Derivation of bending equation $M/I = \sigma/y = E/R$, Neutral axis – Determination bending stresses – Section modulus of rectangular and circular sections (solid and hollow), I, T, angle, channel sections.

SHEAR STRESSES:
Derivation of shear formula – Shear stress distribution across various cross sections like rectangular, circular, triangular, I & T – Stresses.

UNIT-IV
TORSION
Shafts Subjected to pure torsion, Torsion equation, Torsional rigidity, Comparison of solid and hallow shafts. Shafts in series and shafts in parallel.

COLUMNS AND STRUTS:
Definition, classification and strength of columns. Euler's formula for long columns, Assumptions, limitations. Derivations of Euler's formula for different end conditions. Rankine's Hypothesis for struts / columns. Columns subjected to eccentric loading.

UNIT-V
DEFLECTION OF BEAMS:
Bending into a circular arc – Slope, deflection and radius of curvature, Differential equation for the elastic line of a beam – Double integration and Macaulay's methods – Determination of slope and deflection for cantilever and simply supported beams subjected to point loads and uniformly varying loads – Moment area method, application to simple cases including overhanging beams.

TEXT BOOKS:
1. Strength of Materials, S.S. Rattan, Tata McGraw Hill Publications,
2. Strength of Materials, R.K. Rajput, S. Chand Publications,

REFERENCES BOOKS:
1. Strength of Materials, S.S. Bhavikatti, Lakshmi Publications,
2. Analysis of Structures Vol-I, Vazirani, Ratwani, Khanna Publications,
3. Mechanics of Materials, Ferdinand Beer, E. Russell Johnston, John DeWolf, David Mazurek, Tata McGraw Hill Publications,
4. Engineering Mechanics of Solids, Egor P. Popov, Prentice Hall India Publications,

PRODUCTION TECHNOLOGY

Subject Code: 16ME2006 **Internal Marks: 30**
Credits: 3.0 **External Marks: 70**

COURSE OBJECTIVES:

- To understand different manufacturing processes.
- To understand fundamental concepts related to forging and other mechanical working processes.
- To understand various tools, equipment and processes used in pattern making, mold and core making and foundry shop.
- To learn necessary details of various welding and allied joining processes such as gas welding, arc welding, resistance welding, brazing and soldering.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Outline functions, types and design considerations of various elements of casting process including patterns, molding materials especially of sand, gating, riser, runner and melting furnaces.
- Comprehend the working of different welding processes including arc, gas, resistance and other weldings, along with their subtypes of welding.
- Calculate rolling process parameters, and understand both forming and rolling processes.
- Explain principles of various kinds of extrusion, drawing, forging and sheet metal working processes.
- Explain various high velocity forming processes and plastic injection and blow molding processes.

UNIT-I

Foundry: Fundamentals, Introduction to casting process, Process steps, Advantages, Applications, Pattern types and pattern allowances – Molding materials, Importance of constituents, Molding tools and equipment. **Molding process:** Sand molding types: Types of sands – CO_2 molding – Shell molding.

Melting and Casting: Melting furnaces, Crucible furnace, Cupola, Other furnaces: Electrical, Induction furnaces, casting defects, Remedies. **Gating system:** Elements of gating system, Gating system design, Calculation of gating system dimensions for simple objects, Riser design, chills and chaplets, solidification of casting.

UNIT-II

Welding: Fundamentals, classification of welding processes, types of welds, and types of joints. **Gas Welding:** Equipment, oxy-acetylene flame, types, gas welding procedure, gas cutting. **Arc Welding:** Principle of arc, Equipment, Electrodes, Shielded metal arc welding, Tungsten Inert Gas welding (TIG), Metal Inert Gas (MIG) welding, Mode of metal transfer in GMAW process, submerged arc welding.
Resistance Welding: Principle, Spot welding, Seam welding, Projection welding, Flash welding.

Other Welding Process: Laser beam welding, Thermit welding. Brazing, Braze welding, Soldering, Weld Defects.

UNIT-III

Forming: Fundamentals, Introduction to metal working process, Hot working, Cold working.

Rolling: Rolling fundamentals, Analysis of rolling process- Derivation of Length of deformation zone, Angle of bite, Maximum reduction possible for one pass, Rolling stand arrangements.

Extrusion & Drawing: Extrusion fundamentals, Classification of Extrusion- Forward Extrusion, Backward Extrusion, Impact extrusion, Hydrostatic extrusion. Types of drawing: Wire drawing, Tube drawing.

UNIT-IV

Forging: Fundamentals, Types of forging operations- Drawing out, upsetting. Forging types - Smith, Press, Drop forging.

Sheet Metal Working: Principles of sheet metal working, Punching and blanking. Types of Dies, Cup Drawing, Bending, Embossing, Coining.

UNIT-V

High Velocity Forming: High velocity forming types - Explosive forming, Magnetic pulse forming, Electro hydraulic forming.

Plastics Processing: Types of plastics, Properties, Additives, Applications of plastics, Injection molding, Blow molding.

TEXT BOOKS:

1. Manufacturing Technology Vol-I, P.N. Rao, Tata McGraw Hill Publications,
2. Production Technology, P. C. Sharma, S. Chand Publications,

REFERENCE BOOKS:

1. Production Technology, R.K. Jain, Khanna Publications,
2. Elements of Workshop Technology Vol-II, S.K. Hajra Choudhury, A.K. Hajra Choudhury, Nirjhar Roy, Media Promoters Publications,
3. Production Technology, Hindustan Machine Tools Publications,
4. Workshop Technology Vol - II, W.A.J. Chapman, Oxford Publications,

THERMODYNAMICS

Subject Code: 16ME2007 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To identify and formulate elementary level engineering problems related to thermodynamics and energy transformation in a conceptual form as well as in terms of mathematical and physical models.
- To apply the basic principles of classical thermodynamics to the analysis of processes and cycles involving pure simple substances.
- To effectively generalize the basic axioms of classical, macroscopic thermodynamic analysis and to extrapolate these concepts to systems and substances not necessarily covered in the course.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Apply basic concepts, zeroth law and first law to non-flow processes of thermodynamics.
- Apply steady flow energy equation to flow systems, and second law and entropy calculations to thermodynamic components.
- Calculate available and unavailable energies, determine irreversibility, and apply Maxwell's equations. Determine energy transferred using equations and Mollier charts for pure substances with phase transformation.
- Determine properties of mixtures from the properties of its constituents and composition. Calculate energy transfers in various psychrometric processes using psychrometric properties.
- Derive thermal efficiency and mean effective pressures for various thermodynamic cycles and compare their performances.

UNIT-I

Introduction and Zeroth Law:

Introduction, Basic Concepts: System, Control volume, Surrounding, Boundaries, Types of systems, Macroscopic and microscopic view points, Concept of continuum, Thermodynamic equilibrium, State, Property, Process, Cycle: Reversible and Irreversible – Energy in state and transition, Work, Heat – Point function, Path unction – Zeroth Law of Thermodynamics – Concept of Temperature, Principles of Thermometry, Joule's Experiments.

First Law Applied to Non-Flow Processes: First law, Corollaries – First law applied to various non-flow processes – Change in Internal Energy – Systems undergoing a cycle and change of state – Throttling and free expansion.

UNIT-II

First Law Applied to Flow Systems: Steady Flow Energy Equation – Limitations of First law.

Second Law: Second law – Kelvin Plank statement, Clausius statement, Their equivalence, Corollaries – Perpetual Motion Machines (PMM) of first kind and second kind – Carnot Cycle – Heat Engines, Heat Pumps, Carnot Efficiency – Clausius theorem, Clausius inequality – Concept of entropy- Principle of increase of entropy, Entropy and disorder – Third Law.

UNIT-III

Availability and Irreversibility: Energy and available energy – Helmholtz function and Gibbs function – Availability in steady flow and non-flow processes – Entropy equation for flow process – Irreversibility and change of Entropy - Maxwell's Equations.

Pure Substances: Introduction, P-V-T surfaces, T-S & H-S diagrams, Mollier charts, Phase transformations – Triple point at critical state properties during change of phase, – Dryness fraction – Various thermodynamic processes and energy transfer.

UNIT-IV

Gas Laws: Perfect gas laws – Equation of state, Universal gas constant, Vander Waal's equation of state.

Mixtures: Mixtures of perfect gases, Mole fraction, Mass fraction – Gravimetric and volumetric analysis – Dalton's Law of partial pressure – Avogadro's Laws of additive volumes – Mole fraction, volume fraction and partial pressure, Equivalent gas constant, Molecular internal energy, Enthalpy, Specific heats and entropy of mixture of perfect gases and vapor, Introduction to Psychrometry.

UNIT-V

Thermodynamic Cycles: Cycles: Otto, Diesel, Dual Combustion, Sterling, Atkinson, Ericcson, Lenoir – Description and representation on P–V and T-S diagram, Thermal efficiency, Mean effective pressures on air standard basis – Comparison of Cycles.

TEXT BOOKS:

1. Engineering Thermodynamics, P.K. Nag, Tata McGraw-Hill Publications,
2. Thermal Engineering, R.K. Rajput, S.Chand Publications,
3. Steam Tables & Mollier Charts. (**Permitted for Exam**)
4. Refrigeration Tables & Charts. (**Permitted for Exam**)

REFERENCES BOOKS:

1. Thermal Engineering, P.L. Ballaney, Khanna Publications,
2. Thermal Engineering, M.L.Mathur, F.S.Mehta, Jain Brothers Publications,
3. Introduction to Thermodynamics, J.B.Jones, G.A.Hawkins, John Wiley Publications,
4. Fundamentals of Thermodynamics, Gordon John Van Wylen, Richard Edwin Sonntag, John Wiley Publications,

FLUID MECHANICS AND HYDRAULIC MACHINERY

Subject Code: 16ME2008 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To provide knowledge on different fluid properties and fluid flow.
- To provide basic knowledge on hydraulic turbines and pumps.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Define various physical properties of fluids, and understand how manometers are used to measure fluid pressure. List various flow classifications.
- Derive and solve problems based on continuity equation. Apply Euler, Bernoulli, Navier-Stokes, Impulse-momentum equations to solve practical fluid flow problems.
- Compute losses in fluid flow using Darcy Weisbach equation. Explain and solve problems based on various flow measurement devices.
- Illustrate mechanism and construction of various Hydraulic Turbines like Pelton wheel, Kaplan and Francis. Compute efficiencies and select suitable turbine using characteristic curves, governing and cavitation.
- Calculate efficiency and performance characteristics of centrifugal and reciprocating pumps.

UNIT-I

Introduction: Physical properties of fluids: Specific mass, Specific weight, Specific Volume – Specific gravity, Viscosity, Surface tension & Capillarity, Vapour pressure and Compressibility – Pressure: Pascal's law, Hydrostatic law, Atmospheric, Gauge and Vacuum pressure – Measurement of pressure, Pressure gauges – Manometers: Simple & Differential manometers

Fluid Kinematics: Description of fluid flow: Path line, Stream line, Streak line, Stream tube, Velocity & Acceleration – Classification of fluid flows: Steady & Unsteady, Uniform & Non-uniform, Rotational & Irrotational flows – Reynolds Experiment: Laminar & Turbulent flows - Continuity equation for 1D, 2D and 3D flows – Stream function, Velocity potential function and Flow net analysis

UNIT-II

Fluid dynamics: Surface and Body forces – Euler's and Bernoulli's equations for flow along a stream line for 3D flow – Navier-Stokes equations (Explanation only) – Momentum equation and its applications: Force on pipe bend – Flow between parallel plates, Flow through long tubes, Flow through inclined tubes

Measurement of flow: Pitot tube, Venturimeter and Orificemeter, Flow nozzle and Turbine flow meter

UNIT-III

Closed Conduit Flow: Darcy Weisbach equation – Minor losses in pipes: Pipes in series and pipes in parallel – Total energy line and Hydraulic gradient line

Impact of jet on vanes: Impact of jet on Flat, Inclined & Curved vanes (Stationary & Movable), Impact of jet on series of curved vanes

UNIT-IV

Hydraulic Turbines: Classification of turbines: Impulse and Reaction turbines – Pelton Wheel, Francis turbine and Kaplan turbine – working proportions, work done, efficiencies, hydraulic design – Draft tube: Theory, functions and efficiency

Performance of hydraulic turbines: Geometric similarity – Unit and Specific quantities – Characteristic curves – Governing of turbines – Selection of type of turbine – Cavitation – Surge tanks – Water hammer

UNIT-V

Centrifugal pumps: Classification, working, and work done – Manometric head – Losses and efficiencies – Specific speed – Pumps in series and parallel – Performance curves – NPSH

Reciprocating pumps: Working, Discharge, Slip and indicator diagrams

TEXT BOOKS:

1. Hydraulics, Fluid Mechanics and Hydraulic Machinery, P.N. Modi, S.M. Seth, Standard Book House Publications,
2. Fluid Mechanics and Hydraulic Machines, R.K. Rajput, S. Chand Publications,

REFERENCE BOOKS:

1. Fluid Mechanics and Fluid Power Engineering, D.S. Kumar, S.K. Kotaria & Sons Publications,
2. Fluid Mechanics and Machinery, D. Rama Durgaiah, New Age Publications,
3. Hydraulic Machines, T.R. Banga, S.C. Sharma, Khanna Publications,
4. Instrumentation for Engineering Measurements, James W. Dally, William E. Riley, John Wiley and Sons Publications,

ADVANCED ENGINEERING DRAWING

Subject Code: 16ME2009 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To gain knowledge on projections of planes and solids using auxiliary views.
- To gain Knowledge on sectional views of various solid bodies.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Draw auxiliary views of regular planes and solids on auxiliary planes.
- Draw sectional views of prisms and pyramids resting on their base.
- Draw sectional views of cylinders, right circular cones resting on their base.
- Develop lateral surfaces of right regular solids and transition pieces.
- Generate views of interpenetrated simple solids like cylinder & cylinder, cylinder & prism, cylinder & cone.

UNIT-I
PROJECTIONS OF AUXILIARY PLANES:
Auxiliary views of regular solids.

UNIT-II
SECTIONS OF POLYHEDRA:
Sections of Prisms, Pyramids, resting on their base.

UNIT-III
SECTIONS OF SOLIDS OF REVOLUTION:
Sections of Cylinders and Right circular cones resting on their base.

UNIT-IV
DEVELOPMENTS OF SURFACES:
Development of lateral surfaces of right regular solids.

UNIT-V
INTERPENETRATION OF SOLIDS:
Interpenetration of cylinder and cylinder, cylinder and prism, cylinder and cone.

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhatt, Charotar Publications,
2. Engineering Drawing, Dhananjay. M. Johle, Tata McGraw Hill Publications,

PRODUCTION TECHNOLOGY LAB

Subject Code: 16ME2102 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- Practically understand different manufacturing processes in production technology.
- Practically understand the difference between cold working and hot working processes.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Prepare green sand mold for single-piece and multi-piece patterns.
- Create joints using electric arc, spot, gas welding techniques.
- Outline practical procedure for TIG and MIG welding.
- Form plastic parts using injection and blow molding.
- Fabricate a pipe bend and a washer using hydraulic and mechanical press.

LIST OF EXPERIMENTS:

I. MOLDING PRACTICE:

1. Preparation of a green sand mould using single piece pattern.
2. Preparation of a green sand mould using multi piece pattern.

II. WELDING PRACTICE:

3. Preparation of a butt joint using electric arc welding.
4. Preparation of a lap joint using arc welding.
5. Preparation of a lap joint using spot welding.
6. Preparation of corner joint using electric arc welding.
7. Preparation of **T** joint using electric arc welding.

III. PLASTIC MOLDING:

Injection Molding:

8. Preparation of a key chain by using two plate mold**.**
9. Preparation of a bottle cap by using three plate mold**.**

Blow Molding:

10. Preparation of a bottle by using blow molding technique.

IV. MECHANICAL PRESSES:

11. Preparation of a pipe bends using hydraulic press.
12. Preparation of a washer using mechanical press.

MECHANICS OF SOLIDS LAB

Subject Code: 16ME2103 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- To understand different material testing techniques.
- To find hardness, tensile, compressive, bending and shear strength of given specimens.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Find mechanical properties of given specimen using tension test, compression test, bending test, shear test on universal testing machine.
- Determine modulus of rigidity of a given specimen using torsion test.
- Grade the specimen by conducting Izod and Charpy impact test.
- Determine the hardness of different specimens using Brinell and Rockwell hardness tests.
- Compute spring stiffness by measuring spring deformations for applied loads.

LIST OF EXPERIMENTS:

1. Direct tension test.
2. Bending test on simply supported beam.
3. Torsion test.
4. Hardness tests:
   a) Brinell hardness test.
   b) Rockwell hardness test.
5. Test on springs.
6. Compression test on cube.
7. Impact test.
8. Punch shear test.

Note: Any 6 of the above experiments are to be conducted.

FLUID MECHANICS AND HYDRAULIC MACHINERY LAB

Subject Code: 16ME2104 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- To give the practical exposure about fundamentals of fluid mechanics and hydraulics.
- To provide practical knowledge about the turbo-machinery.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Conduct impact of jet on vanes, and performance test on Pelton wheel.
- Conduct performance tests on Francis turbine and Kaplan turbine.
- Conduct performance tests on single-stage and multi-stage centrifugal pump and reciprocating pump.
- Calibrate Venturimeter and orifice meter.
- Determine head loss and friction factor for a given pipeline.

List of Experiments

1. Calibration of Venturimeter
2. Calibration of Orificemeter
3. Impact of Jet on Vanes
4. Calibration of Turbine flow meter
5. Determination of Friction factor for give closed conduit
6. Effect of minor losses in closed conduit flow
7. Performance test on Single-stage Centrifugal pump
8. Performance test on Mulit-stage Centrifugal pump
9. Performance test on Reciprocating pump
10. Performance test on Pelton wheel
11. Performance test on Francis turbine

Note: conduct any 10 experiments from the given list.

PROFESSIONAL ETHICS AND MORALS

Subject Code: 16HS2201 **Internal Marks: 0**
Credits: 0 **External Marks: 0**

COURSE OBJECTIVES:

- To help students regulate their behavior in a professional environment as employees.
- To make students aware of the impact of taking non-ethical engineering decisions.
- To understand that mind and desire control is needed for being ethical.
- To understand organizational culture and to adapt to varying cultures without compromising ethical values.

COURSE OUTCOMES:

On completion of this course, students should be able

- Realize the importance of human values.
- Understand that excessive desires of the mind make a person unethical and restless, while fewer desires lead to peace and professional progress.
- Assess different types of risks involved in unethical practices. Know various means of protesting against unethical practices.
- Assess the benefits of restraining from unethical practices like bribery, extortion, nepotism, nexus between politicians and industrialists.
- Summarize case studies of ethical violations in Chernobyl meltdown, Challenger disaster, Ford Pinto design, Kingfisher Airlines financial misappropriation.

UNIT-I

Introduction to Terminology in Ethics: Integrity, Honesty, Courage, Empathy, Personality, Character, Self-Confidence, Respect for Others – Work culture, Social responsibility, Responsibilities as a citizen, Cooperation and commitment – Religion vs. Spirituality, Philosophy, Customs and practices – Self-interest, Fear, Deception, Ignorance, Ego, Uncritical acceptance of authority.

UNIT-II

Mind and Its Mysteries: What is Mind? Mind and body, Mind and food – Mental faculties – Theory of perception, Memory, Imagination, Thought-Culture, Desires – Cultivation of Virtues, Control of Senses and Mind – Concentration, Meditation and Enlightenment.

UNIT-III

Risk and Safety in Engineering: Estimating risk – What is acceptable risk? – Engineer's liability, Changing legal rights of the employees by non-participation, by protest – Environmental laws and judicial intervention in related matters.

UNIT-IV

Non-Ethical Practices in Vogue: Conflict of Interest, Occupational crime – How multinational corporations influence government decisions, public policy – Engineers as managers, advisors and experts, Engineers as moral leaders – Problem of bribery, extortion, grease payments, nepotism – Nexus between politicians and industrialists.

Case Study: Chinese Minister Sentenced to Death for Corruption.

UNIT-V

Case Studies – Variety of Moral Issues in Profession: Chernobyl nuclear disaster, Fukushima reactor meltdown, Challenger blowup, Ford Pinto design, Highway safety, Kingfisher Airlines financial misappropriation.

TEXT BOOKS:

1. Engineering Ethics, Charles E Harris, Micheal J Rabins, Cengage Learning Publications,
2. Ethics in Engineering, Mike Martin and Roland Schinzinger, McGraw Hill Publications,
3. Mind, Its Mysteries and Control, Swami Sivananda, Divine Life Society Publications,

MATRICES AND APPLICATIONS
(Open Elective – I)

Subject Code: 16OE2011 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES*:*

- To calculate the rank of a matrix and solve linear system of equations by different methods.
- Understand the concept of eigen values, eigen vectors of real and complex matrices, Cayley's Hamilton theorem and its applications.
- To solve Linear system of equations by Numerical Methods.
- To acquire the knowledge of reduction of quadratic to canonical form and study its nature.
- To acquire the knowledge of matrix computations using mat lab.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Calculate the rank of a matrix and solve linear system of equations by different methods.
- Calculate eigen values, eigen vectors of real and complex matrices, apply Cayley's Hamilton theorem to calculate the powers and inverse of matrices.
- Solve Linear system of equations by LU –Factorization, Matrix Inverse, Gauss seidal Method, Eigen Values by Iteration (Power Method), Tridiagonalization and QR-Factorization.
- Deduce quadratic to canonical form by different methods.
- Compute matrix operations using mat lab.

UNIT-I

Matrices and Linear System of Equations: Matrices-Rank of Matrix-By Definition-Echelon form, Normal form- PAQ form-Solution of homogeneous and non homogeneous Linear System of equations – condition of consistency - Direct methods- Gauss elimination, Gauss Jordan .

UNIT-II

Eigen Values and Eigen Vectors: Eigen values - Eigen vectors – Properties – Cayley -Hamilton Theorem (without proof) - Inverse and powers of a matrix by using Cayley-Hamilton theorem.
Complex matrix-conjugate matrix – Hermitian and skew Hermitian matrix- eigen values and eigen vectors- properties.

UNIT-III

Numerical Methods in Linear Algebra: Linear System : LU –Factorization , Matrix Inverse, Gauss seidal Method, Eigen Values by Iteration (Power Method), Tridiagonalization and QR-Factorization.

UNIT-IV

Quadratic forms: Quadratic forms- Reduction of quadratic form to canonical form – Rank - Positive, negative definite - semi definite - index – signature.

UNIT-V

Computation by using MATLAB: Solving a linear system, Gaussian elimination, Finding Eigenvalues and Eigenvectors.

TEXT BOOKS:

1. Higher Engineering Mathematics, 42nd edition, 2012 - B. S. Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics Volume - II, 6th editions respt., 2012, T.K.V Iyengar, & others, S. Chand
   Co. New Delhi.
3. Getting Started with Mat Lab, Rudra Pratap, Oxford University press, 2014 print.
4. Advanced Engineering Mathematics, Erwin Kreyszig,8th Edition.

REFERENCE BOOKS:

1. Mathematical Methods, 4th edition, 2009, B.V Ramana, Tata McGraw Hill, New Delhi.
2. Ravindranath, V. and Vijayalaxmi, A., 2nd edition, 2012, A Text Book on Mathematical Methods
   Himalaya Publishing House, Bombay.
3. Dean G. Duffy, Advanced engineering mathematics with MatLab, CRC Press.
4. Advanced Engineering Mathematics, 8th edition, 2009, Erwin Kreyszig- Shree Maitrey Printech Pvt.Ltd, Noida.

WATER SHED MANAGEMENT
(Open Elective – I)

Subject Code: 16OE2012 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To study the concept, objectives, need &Integrated and multidisciplinary approach of watershed development, characteristics of watershed
- To study the principles of erosion which include Types ,factors affecting, Effects, and measures to control erosion which include contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rock fill dams, brushwood dam, Gabion.
- To study the water harvesting which include Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks
- To study the Land management which include Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils.
- To study the Ecosystem management which include Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture.

COURSE OUTCOMES:

On completion of this course, students should be able to

- To understand the concept, objectives, need &Integrated and multidisciplinary approach of watershed development, characteristics of watershed
- To learn the principles of erosion which include Types ,factors affecting, Effects and measures To control erosion which include contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rock fill dams, brushwood dam, Gabion
- To understand the Land management which include Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils.
- To learn the water harvesting which include Rainwater Harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks
- To understand the Ecosystem management which include Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture,

UNIT-I

Introduction: Concept of watershed development, objectives of watershed development, need for watershed development in India, Integrated and multidisciplinary approach for watershed management.

Characteristics of watershed: size, shape, physiography, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on watersheds.

UNIT-II

Principles of erosion: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability,

Measures to control erosion: Contour techniques, ploughing, furrowing, trenching, bunding, terracing, gully control, rock fill dams, brushwood dam, Gabion.

UNIT-III

Water Harvesting: Rainwater harvesting, catchment harvesting, harvesting structures, soil moisture conservation, check dams, artificial recharge, farm ponds, percolation tanks.

UNIT-IV

Land Management: Land use and Land capability classification, management of forest, agricultural, grassland and wild land. Reclamation of saline and alkaline soils.

UNIT-V

Ecosystem Management: Role of Ecosystem, crop husbandry, soil enrichment, inter, mixed and strip cropping, cropping pattern, sustainable agriculture, bio-mass management, dry land agriculture

TEXT BOOKS:

1. Watershed Management by JVS Murthy, - New Age International Publishers.
2. Water Resource Engineering by R. Awurbs and WP James, - Prentice Hall Publishers.

REFERENCE BOOKS:

1. Land and Water Management by VVN Murthy, - Kalyani Publications.
2. Irrigation and Water Management by D.K.Majumdar, Printice Hall of India.

II Year B. Tech., I Semester

INTURDUCTION TO MATLAB
(Open Elective – I)

Subject Code: 16OE2013 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVE:
- MATLAB is a popular language for numerical computations.
- This course introduces students how to write program in MATLAB, and demonstrate its use for solving engineering problems.

COURSE OUTCOMES: By the end of this course, the student will be able to
- State the MATLAB environment and its applications
- Illustrate file management and the use of arrays and strings
- Develop program scripts and functions using MATLAB environment and to use basic flow controls
- Create plots and to carryout numerical computations and analysis
- Develop mathematical modeling of physical systems using Simulink

UNIT-I
Introduction to MATLAB: Historical Background, Applications, Scope of MATLAB, Importance of MATLAB for Engineers, Features, MATLAB Windows (Editor, Work Space, Command History, Command Window). Operations with Variables, Naming and Checking Existence, Clearing Operations, Commands, Data types, Operators.

UNIT-II
Data and Data Flow in MATLAB: Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Numbers, Strings, Functions, File Input-Output, Importing and Exporting of data.

UNIT-III
MATLAB Programming: Conditional Statements, Loops, Writing Script Files, Error Correction, Saving Files, Worked out Examples.

UNIT-IV
MATLAB Advanced: Plotting, Graphics, Creating Plot & Editing Plot, GUI (Graphical User Interface). MATLAB- Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

UNIT-V
SIMULINK: Introduction, Importance, Model Based Design, Tools, Mathematical Modeling, Converting Mathematical Model into Simulink Model, Running Simulink Models, Importing Exporting Data, Solver Configuration, Masking Block/Model.

TEXT BOOKS:
1. Getting Started With Matlab: A Quick Introduction For Scientists And Engineers (English) by Rudra Pratap, OXFORD University Press.
2. MATLAB Programming by Y. Kirani Singh, B.B. Chaudhuri, PHI Publication

REFERENCE BOOKS:

1. MATLAB® Programming For Engineers Fourth edition by Stephen J. Chapman
2. Applied Numerical Methods Using MATLAB 1st Edition by Won Y. Yang , Wenwu Cao, Tae-Sang Chung, John Morris.

INTRODUCTION OF ELECTRONIC MEASUREMENTS
(Open Elective – I)

Subject Code: 16OE2015 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVE:

- Study of performance characteristics of different electronic measuring instruments.
- Subject introduces Signal Generator and Wave Analyzers for analysis of EM spectrum.
- Deals about Oscilloscopes and internal circuitry for measurement of electronic parameters.
- Brief discussion about all AC bridges, design methods and its applications.
- This subject includes transducers for the measurement of non electrical parameters and its signal conditioning techniques using electronic circuitry.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Identify electronic instruments, their Characteristics and use.
- Describe various signal generators, wave analyzers for distortion measurements.
- Measure Amplitude, Frequency and Phase of various signals using different types of CRO's.
- Design the AC bridges for measurement of resistance, inductance, capacitance for frequency changes.
- Explain various types of transducers and their applications for measuring non- electrical parameters.

UNIT-I

Performance characteristics of instruments: Static characteristics, accuracy, resolution, precision, expected value, error and sensitivity. Errors in measurement and dynamic characteristics: speed of response, fidelity, lag and dynamic error.
Voltmeters: Multirange, range extension.
Ammeters: Shunt and thermocouple type ammeter.
Ohmmeters: Series type and shunt type.

UNIT-II

Signal Generators - standard and AF sine and square wave signal generators, function Generators, Wave Analyzers, Harmonic distortion analyzers.

UNIT-III

Cathode Ray Oscilloscopes: CRT features, Block Diagram of CRO, Dual beam CRO, measurement of amplitude and frequency, Dual trace oscilloscope, Digital storage oscilloscope.

UNIT-IV

AC Bridges: Measurement of inductance: Maxwell's bridge, Anderson bridge.
Measurement of capacitance: Schearing bridge. Wheatstone bridge and Wien Bridge

UNIT-V

Transducers: Classification of Transducers**,** Linear Variable Differential Transformer, Thermocouples, thermistors, Data acquisition systems.

TEXT BOOKS:

1. Electronic instrumentation – H.S.Kalsi, Tata McGraw Hill, 2004, 2/e.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 2002, 5/e.

REFERENCE BOOKS:

1. Electronic Instrumentation & Measurements - David A. Bell, PHI, 2003, 2/e.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A.Witte, Pearson Education, 2004, 2/e.

UNIX UTILITIES
(Open Elective – I)

Subject Code: 16OE2016 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVE:

- State the major components and describe the architecture of the UNIX operating system
- Organize and manipulate files and directories
- Use UNIX utilities to create simple tools for the information processing
- Use I/O redirection, pipes, quoting, and filename expansion mechanisms.
- Develop the user interface menu system using shell scripting constructs.

COURSE OUTCOMES:

On completion of this course the student should be able to

- Identify and use UNIX utilities to create and manage simple file processing operations, organize directory structures with appropriate security.
- Effectively use the UNIX system to accomplish typical personal, office, technical, and software development tasks.
- Monitor system performance and network activities.
- Effectively use software development tools including libraries, preprocessors, compilers, linkers, and make files.
- Comprehend technical documentation, prepare simple readable user documentation and adhere to style guidelines.
- Develop shell scripts to perform more complex tasks.

UNIT-I

UNIX Overview: What Is UNIX? History of UNIX, UNIX Philosophy, Why UNIX? , UNIX Components, System V vs. BSD, Comparing UNIX and Windows.

Getting Started: Logging on to the System, Your Home Directory, Using UNIX Commands, Special Characters, Terminal Control Keys, Changing Your Password, Getting Information, Logging off the System

UNIT-II

UNIX File systems: Hierarchical File Structure, File Types, File Names Pathnames, File and Directory Commands, Access Permissions, Standard UNIX File System

Editors: UNIX Editors, The Standard Display Editor - vi, vi Commands, Setting vi Options, pico: One Alternative to vi

UNIT-III

The Shell: What is the Shell? ,Processes ,Redirection ,Pipes ,Filters ,Features (csh) ,Variables (csh), Initialization Files ,Logout Files

Electronic Mail: Electronic Mail Overview, Standard UNIX Mail, Sending Mail, Send Mode Commands, Reading Mail, Command Mode Commands, Saving Mail and Using Folders, Customizing Mail, pine: One Alternative to UNIX Mail

UNIT-IV

Common UNIX Utilities: Alphabetical List, Functional List Shell Scripts: What is a Shell Script? , Expressions, Control Structures, Miscellaneous.

UNIT-V

Network Related Utilities: talk, finger, ping, traceroute, ftp, telnet, rlogin, rsh, rcp

X Windows Environment: What is X Windows? , Getting Started Using X Windows, Using the Window Manager, Customizing Your X Clients, Some Common X Clients

TEXT BOOKS:

1. Sumitabha Das, 3rd Edition, UNIX the Ultimate Guide, TMH
2. Behrouz A. ForouZan, Richard F Gilberg, UNIX and Shell Programming, CENGAGE

REFERENCE BOOKS:

1. Dr. N B Venkateswarlu, Advanced Unix Programming, BS Publications

Reference Link:

http://parallel.vub.ac.be/documentation/linux/unixdoc_download/UnixIntro.html#Utilities.

IT SYSTEMS MANAGEMENT
(Open Elective – I)

Subject Code: 16OE2017 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- Provides extensive theoretical knowledge of IT infrastructure
- Enhances the student's computing environment knowledge.
- Provides broad based knowledge of IT System management.
- Develops management skills required for an increasingly international business environment.
- Builds upon the essential core network and storage management with greater emphasis .

COURSE OUTCOMES:

On completion of this course, students should be able to

- Describe the business value and processes of ICT services in an organisation and apply that knowledge and skill with initiative to a workplace scenario
- Analyze and evaluate the impact of new and current ICT services to an organisation;
- Describe how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organisation;
- Characteristics of the network that affect user satisfaction.
- Define, track, and maintain data and data resources.

UNIT-I

IT Infrastructure: Overview: Definitions, Infrastructure management activities, Evolutions of Systems since 1960s (Mainframes-to-Midrange-to-PCs-to-Client-server computing-to-New age systems) and their Management, growth of internet, current business demands and IT systems issues, complexity of today's computing environment.

UNIT-II

IT Infrastructure Management: Factors to consider in designing IT organizations and IT infrastructure, Determining customer's Requirements, Identifying System Components to manage, Data, applications, Tools and their integration, Patterns for IT systems management, Information Technology Infrastructure Library (ITIL).

UNIT-III

Current computing environment: Complexity of current computing, multiple technologies, multiple vendors, multiple users, e- Waste disposal.

IT system Management: Common tasks in IT system management, approaches for organization Managemnt, Models in IT system design, IT management systems context diagram, patterns for IT system Management

UNIT-IV

Data communications and Network Management Overview: Communications protocols and Standards, Case Histories of Networking and Management, Challenges of Information Technology Managers, Network Management: Goals, Organization, and Functions.

UNIT-V

Storage Management: Types of Storage management, Benefits of storage management, backups, Archive, Recovery, Disaster recovery.Space management, Hierarchical storage management, Network attached storage.

TEXT BOOKS:

1. IT Infrastructure & Its Management,By Phalguni Gupta, Tata McGraw-Hill Education. (Unit 1,2,3,5)
2. Network Management, Principles and Practice, Mani Subrahmanian, Pearson Education. (Unit 4)

REFERENCE BOOKS:

1. Ivanka Menken, ITIL V3 Foundation Certification Exam Preparation Course in a Book for Passing the ITIL V3 Foundation Exam, Second Edition (The Art of Service), 2009.
2. Van Haren, Passing the ITIL Foundation, Van Haren Publishing, 2011.

COMPLEX VARIABLES AND STATISTICAL METHODS

Subject Code: 16BS2006 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- Test if a function is analytic, harmonic and then find a harmonic conjugate via the Cauchy-Riemann equations.
- Identify and classify zeros and singular points of functions, calculate the residues by Residue theorem. Evaluate integrals using the Cauchy Integral.
- Find Laurent series expansion of complex functions understanding region of convergence, the residues by Laurent Series.
- Understand the proof of Baye's theorem, understand the properties of Discrete and Continuous distributions and the characteristics of probability distribution under different conditions using Binomial, Poisson and Normal.
- Use tabular and graphical formats for displaying univariate (bivariate) data sets and calculate correlation, regression coefficients.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Can identify an analytic function, harmonic function; find harmonic conjugate function via Cauchy-Riemann equations.
- Can identify and classify zeros and singular points of a function, calculate the residues by residue theorem and evaluate integrals using the Cauchy Integral formulae.
- Can find Laurent series expansion of complex functions for different region of convergence and calculate the residues by Laurent Series.
- Can apply Baye's theorem to solve industry related problems, recognize where the use of certain standard probability distributions would be appropriate.
- Can use appropriate tabular and graphical formats for displaying univariate (bivariate) data sets and carry out correlation, regression analysis.

UNIT-I

Complex Functions: Functions of a complex variable-Continuity-Differntiability-analyticity-Properties-Cauchy-Reimann equations in Cartesian and polar coordinates (without proof). Harmonic and conjugate harmonic functions – Milne-Thompson method.

UNIT-II

Complex Integration and Residues: Cauchy's integral theorem-Cauchy's integral formula-Generalized Cauchy's integral formula (without proofs). Singular point - isolated singular point-pole of order m-essential singularity. Residue- Evaluation of residue by formula -Residue theorem (without proof).

UNIT-III

Laurent's Series: Power series-radius of convergence of power series- Laurent's Theorem - Laurent's Series-calculation of Residue by Laurent's series.

UNIT-IV

Probability and Distributions: Conditional Probability-Baye's theorem, Random variables – Discrete and continuous, Mathematical Expectations. Binomial, Poisson, Normal distributions and related properties.

UNIT-V

Correlation and Regression: Concept of correlation–types of correlation-scatter diagram-Karl-Pearson correlation coefficient method and its properties-Regression-Linear regression and its properties-non-linear regression-curve fitting-Straight line, 2^{nd} degree parabola, power curve ($y=ax^b$), exponential curves($y= ab^x$, $y = ae^{bx}$)

TEXT BOOKS:

1. Complex Analysis And Statistical Methods, T.K.V.Iyengar, B.Krishna Gandhi and Others, S. Chand & Company.
2. Probability and Statistics for Engineers, Miller and John E.Freund, Prentice Hall of India
3. Higher Engineering Mathematics B. S. Grewel.

REFERENCE BOOKS:

1. Advanced Engineering Mathematics, Irvin Kreyszig, Wiley India Pvt.Ltd.
2. Probability and Statistics, Athanasios-Papoulis-Pearson education.

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS

Subject Code: 16HS2004 **Internal Marks: 30**
Credits: 2.5 **External Marks: 70**

COURSE OBJECTIVES:

- To provide the basic knowledge of economics and accounting.
- To create an awareness about the market conditions.
- To develop the ability of forecasting.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Learn demand analysis, demand determinants and law of demand.
- Understand demand forecasting and its governing factors.
- Understand theory of cost analysis and production.
- Understand market structures and types of market competition.
- Understand financial accounting including double-entry book keeping, journal, ledger and final accounts.

UNIT-I

Introduction to Managerial Economics: Definition, nature and scope of managerial economics.
Demand Analysis: Demand determinants, Law of demand and its exceptions.

UNIT-II

Elasticity of Demand: Definition, Types.
Demand Forecasting: Factors governing demand forecasting – Methods of demand forecasting: Survey methods, Statistical methods, Expert opinion method, Test marketing, Controlled experiments, Judgmental approach to demand forecasting.

UNIT-III

Theory of Production and Cost Analysis: Production function – Isoquants and Isocosts, MRTS, Least cost combination of inputs – Cobb-Douglas production function, Laws of returns – Internal and external economies of scale.
Cost Analysis: Cost concepts – Break-Even Analysis (BEA), Determination of break-even point (simple problems), Managerial significance and limitations of BEA.

UNIT-IV

Introduction to Markets: Market structures, Types of competition, Features of perfect competition, Monopoly and monopolistic competition and Price determination.
Capital Budgeting: Project evaluation techniques-Traditional, modern (simple problems).

UNIT-V

Introduction to Financial Accounting: Double-Entry book keeping, Journal, Ledger, Trial Balance – Final accounts (Trading account, Profit and loss account, Balance sheet with simple adjustments).

TEXT BOOKS:

1. Managerial Economics and Financial Analysis, S.A. Siddiqui, A.S. Siddiqui, New Age Publications,
2. Managerial Economics, Varshney, Maheswari, Sultan Chand Publications,

REFERENCE BOOKS:

1. Managerial Economics and Financial Analysis, A.R. Aryasri, Tata McGraw Hill Publications,
2. Managerial Economics, D.N. Dwivedi, Vikas Publications,

THERMAL ENGINEERING - I

Subject Code: 16ME2010 **Internal Marks: 30**
Credits: 4.5 **External Marks: 70**

COURSE OBJECTIVES:

- To learn the testing and performance of different IC engines.
- To learn about air cycles and their analysis.
- To learn about working and operation of different air compressors.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Analyze air standard, fuel air and actual air cycles in terms of various losses. Understand construction, working and mechanism of engine subsystems.
- Describe combustion processes occurring in SI engines. Identify the factors affecting flame speed, ignition lag, flame propagation and knocking.
- Describe processes of combustion in CI engine and effect of various parameters. Explain diesel knock reduction methods like swirl and auto-ignition.
- Calculate engine performance using various parameters and heat balance sheet.
- Explain operating and working principles of rotary, reciprocating and axial flow compressors.

UNIT-I

Actual Cycles and Their Analysis: Introduction, Comparison of air standard and actual cycles – Time loss factor, Heat loss factor, Exhaust blowdown, Loss due to gas exchange process, Volumetric efficiency, Loss due to rubbing friction.

I.C. Engines: Classification, Working principles, Valve and port timing diagrams – Air-standard, air-fuel and actual cycles –, Ignition, Cooling system- pressurized lubrication, Principle of Wankel engine.

UNIT-II

Combustion in S.I. Engines: Carburetor –principle and working-Normal combustion and abnormal combustion, Importance of flame speed and effect of engine variables, Types of abnormal combustion, Pre-ignition and knocking, Fuel requirements and fuel rating, Anti-knock additives, Combustion chamber requirements, types.

UNIT-III

Combustion in C.I. Engines: Diesel injection system-Types-Four stages of combustion, Delay period and its importance, Effect of engine variables, Diesel knock – Need for air movement, Suction, Compression and Combustion induced turbulence – Open and divided combustion chambers and nozzles – Fuel requirements and fuel rating.

UNIT-IV

Testing and Performance: Parameters of performance – Measurement of cylinder pressure, Fuel consumption, Air intake, Exhaust gas composition – Brake power, Determination of frictional losses and indicated power – Performance test – Heat balance sheet.

UNIT-V

Reciprocating Compressors: Principle of operation, Work required, Isothermal efficiency, Volumetric efficiency – Effect of clearance, Stage compression.

Rotary Compressors: Roots Blower, Vane sealed compressor – mechanical details and principles of working, efficiency considerations.

Axial Flow Compressors: Mechanical details and principle of operation – Velocity triangles and energy transfer per stage – Degree of reaction, Work done factor, isentropic efficiency.

TEXT BOOKS:

1. Internal Combustion Engines, V.Ganesan, Tata McGraw Hill Publications,
2. A Course in Internal Combustion Engines, M. L. Mathur, R. P.Sharma, Dhanpat Rai Publications,
3. Thermal Engineering, R.K. Rajput, Laxmi Publications,

REFERENCE BOOKS:

1. Thermal Engineering, P.L.Ballaney, Khanna Publications,
2. Internal Combustion Engine Fundamentals, John B Heywood, McGraw Hill Publications,
3. A Course in Thermal Engineering, S.C. Arora, S. Domukundwar, Dhanpat Rai Publications,

II Year B. Tech., II Semester

MACHINE DRAWING

Subject Code: 16ME2011 **Internal Marks: 30**
Credits: 3.0 **External Marks: 70**

COURSE OBJECTIVES:

- To provide knowledge on views of different machine parts.
- To draw the assemblies of engine parts.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Represent the conventions of different machine components.
- Draw simple machine elements including screw threads, bolts, nuts and keys.
- Draw simple machine elements including cotter and knuckle joints, riveted joints, shaft couplings, journal and foot-step bearings.
- Draw assembly drawings of engine parts like stuffing box, steam engine cross head, eccentric, connecting rod, piston etc.
- Draw assembly drawings of other machine parts like screw jack, vice, Plummer block, lathe tailstock, and valves like steam stop valve, spring loaded safety valve, feed check valve etc.

MACHINE DRAWING CONVENTIONS:

Need for drawing conventions, Introduction to ISI conventions

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

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

I. DRAWING OF MACHINE ELEMENTS AND SIMPLE PARTS:

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

(i) Popular forms of Screw threads, bolts, nuts, stud bolts, tap bolts, set screws.

(ii) Keys, cotter joint and knuckle joint.

(iii) Riveted joints for plates.

(iv) Shaft coupling, spigot and socket pipe joint.

(v) Journal bearing and foot step bearing.

II. ASSEMBLY DRAWINGS:

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

(i) Engine parts – Stuffing box, Steam engine cross head, Eccentric, Petrol engine connecting rod, piston assembly.

(ii) Other machine parts – Screw jack, Machine vice, Plummer block, Lathe tailstock.

(iii) Valves – Steam stop valve, Spring loaded safety valve, Feed check valve.

III. COMPUTER AIDED DRAWING OF COMPONENTS (Demonstration only).

TEXT BOOKS:

1. Machine Drawing, K.L. Narayana, P. Kannaiah, K. Venkata Reddy, New Age Publications,
2. Machine Drawing, N D Bhatt, Charotar Publications,

REFERENCE BOOKS:

1. Machine Drawing, R.K. Dhawan, S.Chand Publications,
2. Machine Drawing, P.S.Gill, Tata McGraw Hill Publications,
3. Machine Drawing, Basudeb Bhattacharya, Oxford Publications,

II Year B. Tech., II Semester

ENGINEERING METALLURGY

Subject Code: 16ME2012 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To understand different engineering materials and their structures.
- To understand the phase diagrams.
- To understand the powder metallurgy processes.
- To understand various heat treatment processes.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Gain thorough knowledge in engineering materials and their structures.
- Understand necessity of alloying and effect of alloying element on properties of materials.
- Understand thoroughly Iron carbon equilibrium diagram.
- Describe different types of cast irons and steels.
- Gain knowledge of heat treatment processes and powder metallurgy.

UNIT-I

Structure of Metals: Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys .

UNIT-II

Constitution of Alloys: Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.

UNIT-III

Equilibrium of Diagrams : Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, Study of Iron and Iron carbide phase diagram.

UNIT-IV

Cast Irons and Steels: Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheriodal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, tool and die steels.

UNIT-V

Heat treatment of steels: Stages of heat treatment and cooling methods. Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability, surface - hardening methods.

Powder Metallurgy: Definition, Methods of production of metal powders, Stages in powder metallurgical components preparation, Design considerations.

TEXT BOOKS:

1. Introduction to Physical Metallurgy / Sidney H. Avener.
2. Elements of Material science / V. Rahghavan

REFERENCE BOOKS:

1. An introduction to Metallurgy , sir Alan Cottrell , second edition universities press (India) private limited
2. Engineering materials and metallurgy/R.K.Rajput/ S.Chand.
3. Science of Engineering Materials / Agarwal

ADCANCED ENGLISH COMMUNICATION SKILLS LAB
(Common to all branches)

Subject Code: 16HS2102 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- To provide students with a wide range of vocabulary to enable them to take language tests for higher education and employment
- To prepare students for making presentations
- To enable students to participate in group discussions
- To prepare students for facing interviews confidently

COURSE OUTCOMES:

On completion of this course, students should be able to

- State meanings, synonyms, antonyms, analogies, idioms, phrases, one word substitutes, word roots, prefixes and suffixes for words in general.
- Present and interpret data on select topics using pre-existing slides.
- Contribute proactively and extrapolate in group discussions.
- Prepare résumé / CV and face interview.
- Develop communication skills by playing different roles.

UNIT-I

Vocabulary Extension for facing competitive examinations

UNIT-II

Paper, PowerPoint and Video Presentations

UNIT-III

Group Discussion

UNIT-IV

Job Application and résumé / CV Writing—Interview Preparation

UNIT- V

Speaking: Role-play

TEXT BOOKS:

Advanced Communication Skills Lab. Version 1.0 (Software). K-VAN Solutions Pvt. Ltd.

REFERENCE BOOKS:

1. Rani, K. Nirupa et al. Speak Well. Orient Blackswan: Hyderabad, 2012.
2. Prasad, M. Hari et al. Strengthen Your Steps. Maruthi: Hyderabad, 2010.
3. Prasad, M. Hari et al. Strengthen Your Communication Skills. Maruthi: Hyd, 2014.
4. Ashraf, M. Rizvi. Effective Technical Communication. Tata McGraw-Hill, 2005.

NUMERICAL COMPUTATIONS LAB

Subject Code: 16ME2105 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- To develop basic knowledge on usage of Matlab to solve engineering problems.
- To use Matlab's curve fitting, statistics, optimization and partial differential equation toolboxes to solve simple problems.
- To use Simulink's SimMechanics, SimDriveline, SimHydraulics modules to model simple systems behavior.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Solve engineering mathematical problems using numerical methods in Matlab.
- Use Matlab's curve fitting, statistics, optimization and partial differential equation toolboxes to solve simple problems.
- Use Simulink's SimMechanics, SimDriveline, SimHydraulics modules to model simple systems behavior.

LIST OF EXPERIMENTS

1) Write a Matlab code for finding roots of an equation (1) Bisection (2) Newton methods.
2) Write a Matlab code for solving system of linear equations using Gauss elimination method.
3) Write a Matlab code for finding natural cubic spline that interpolates a table of values.
4) Write a Matlab code for determining least square polynomial fit of degree m for given data.
5) Write a Matlab code for solving ordinary differential equation using Runge-Kutta 2^{nd} & 4^{th} order method.
6) Write a Matlab code for solving ordinary differential equation using finite difference methods.
7) Solve problems using Matlab optimization toolbox, partial differential equation toolbox.
8) Solve a problem using curve fitting toolbox, statistics toolbox.
9) Using Simulink/SimMechanics model a simple mechanical or robotic system involving translation and rotational joints.
10) Using Simulink/SimDriveline model a manual transmission gear box.
11) Using Simulink/SimHydraulics model a simple hydraulic system.
12) Using Simulink/SimHydraulics model a simple pneumatic system.

TEXT BOOKS:

1. Introduction to Numerical Methods, A Matlab Approch, Abdelwahab Kharab, Ronald B Guenther, Chapman & CRC Press.
2. Simulink User Manual, Mathworks Corporation.
3. Matlab Toolboxes Introduction, Mathworks Corporation.

REFERENCE BOOKS:

1. Chapman S.J. Essentials of MATLAB Programming (CENGAGE Leaning, 2nd ed., 2008)

THERMAL ENGINEERING LAB

Subject Code: 16ME2106 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- To gain knowledge on the testing and performance of different IC engines.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Measure and draw valve and port timing diagrams on IC engines.
- Determine engine frictional power by motoring, retardation and Morse tests.
- Conduct economical speed test and heat balance test on an engine.
- Conduct performance tests on 4-stroke diesel, 2-stroke petrol engines.
- Conduct performance test on multi-stage reciprocating air compressor. Study various types of boilers with its mountings and accessories.

LIST OF EXPERIMENTS:

1. Valve Timing Diagram (single cylinder 4 stroke diesel engine)
2. Port Timing Diagram (single cylinder 2 stroke petrol engine)
3. Determination of Frictional Power by Retardation Test.
4. Determination of Frictional Power by Motoring Test.
5. Determination of Frictional Power by Morse Test.
6. Economical Speed Test.
7. Heat-Balance Sheet.
8. Performance Test on a 4-Stroke Diesel Engine.
9. Performance Test on a 2-Stroke Petrol Engine.
10. Determination of Calorific Value of a fuel.
11. Study of Boilers.(Demonstration)
12. Demonstration of Disassembly / Assembly of Engines.
13. Determination of dryness fraction of steam using Steam calorimeter

Note: Any 10 of the above experiments are to be conducted.

SELF STUDY COURSE - I

Subject Code: 16ME2201 **Internal Marks: 75**
Credits: 1.0

COURSE OBJECTIVES:

- To identify sources of information.
- To collect relevant information.
- To interpret information.
- To move from problem to solution.

COURSE OUTCOMES:

On completion of this course, students should be able

- Locate sources of information.
- Filter and select relevant information.
- Apply information to real world problems and solve them.

1. Data collection through internet related to mechanical engineering.

2. Data collection from library and other sources related to mechanical engineering.

3. Seminar presentation on advanced topics like modeling and simulation of different mechanical engineering systems, design and analysis of various components.

4. Group discussion related to mechanical engineering.

TRANSFORM THEORY
(Open Elective – II)

Subject Code: 16OE2021 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To deduce Z- transform of discrete functions using Z- transform.
- To deduce inverse Z- transform of discrete functions and understand their properties, and solve their related problems.
- To calculate the Fourier transforms for different functions, understand their properties, and solve their related problems.
- To acquire the knowledge of Inverse Fourier transforms and Finite Fourier Transforms, their properties.
- To Solve of difference equations, Boundary value problems (Heat Conduction-Transverse Vibrations of a string-Transmission Lines).

COURSE OUTCOMES:

On completion of this course, students should be able to

- Evaluate Z- transform of discrete functions and solve their related problems.
- Find the inverse z-transforms of discrete functions using the properties and solve their related problems.
- Derive the Fourier transforms of different functions using different properties, and solve related problems.
- Deduce the Inverse Fourier transforms and Finite Fourier Transforms different functions using different properties.
- Apply Z-transform to solve difference equations and Fourier Transforms to solve Boundary value problems (Heat Conduction-Transverse Vibrations of a string-Transmission Lines).

UNIT-I

Z- Transforms: Z-transform – Linear property – Damping rule – Shifting rule – Initial and final value theorems- Z transforms of functions multiplied by n and divided by n- unit step function.

UNIT-II

Inverse Z- Transforms: Inverse Z-Transforms- by Basic formulae, Partial fractions, Convolution theorem, Solution of Difference equations by Z-transforms

UNIT-III

Fourier Transforms: Fourier Integral Theorem (only statement)- Fourier sine and cosine integrals – complex form of Fourier Integral- Fourier transform – Fourier sine and cosine transforms – properties.

UNIT-IV

Inverse Fourier transforms: Inverse Fourier transforms-Inverse Fourier sine and cosine transforms - properties – Finite Fourier Sine and cosine transforms. Convolution Theorem for Fourier transforms.

UNIT-V

Applications: Solution of difference equations by Z-transform. Solutions of Boundary value problems (Heat Conduction-Transverse Vibrations of a string-Transmission Lines)

TEXT BOOKS:

1. Higher Engineering Mathematics, 42nd edition, 2012 - B. S. Grewal, Khanna Publishers, New Delhi
2. Engineering Mathematics Volume - II, III, 6th editions respt., 2012, T.K.V Iyengar, & others, S. Chand Co. New Delhi.

REFERENCE BOOKS:

1. Mathematical Methods, 4th edition, 2009, B.V Ramana, Tata McGraw Hill, New Delhi.
2. Ravindranath, V. and Vijayalaxmi, A., 2nd edition, 2012, A Text Book on Mathematical Methods, Himalaya Publishing House, Bombay.
3. Dean G. Duffy, Advanced engineering mathematics with MatLab, CRC Press.
4. Advanced Engineering Mathematics, 8th edition, 2009, Erwin Kreyszig- Shree Maitrey Printech Pvt. Ltd., Noida.

FUNDAMENTALS OF BUILDING PLANNING
(Open Elective – II)

Subject Code: 16OE2022 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

Students will have

- To study about conventional building materials such as brick, cement, steel ,wood, modern building materials, plumbing fixtures, sanitary fittings, materials for building electrification, ready to use building materials currently available in the market.
- To study about minimum standards for various parts of buildings, requirements of different rooms and their grouping, characteristics of various types of residential buildings, study of structural elements of building, minimum standards for septic tank balcony, corridor and staircase.
- To know about orientation of buildings based on earths motion round the sun, significance of bond for brick walls, study of drawings pertaining to doors, windows, ventilators and roofs, prefabricated buildings and toilets , estimate of approximate cost of buildings, economical methods of building construction.
- To know about objectives of building byelaws, floor area ratio floor space index, principles under laying building bye laws, classification of buildings, open space requirements, built up area limitations, height of buildings, wall thickness, lightening and ventilation requirements.
- To know about the study of drawings pertaining to the plan, elevation and sections of residential buildings from the given line diagram, study of specifications pertaining to Buildings.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Understand about conventional building materials such as brick, cement, steel ,wood, modern building materials, plumbing fixtures, sanitary fittings, materials for building electrification, ready to use building materials currently available in the market.
- Understand about minimum standards for various parts of buildings, requirements of different rooms and their grouping, characteristics of various types of residential buildings, study of structural elements of building, minimum standards for septic tank balcony, corridor and staircase.
- Understand about orientation of buildings based on earths motion round the sun, significance of bond for brick walls, study of drawings pertaining to doors, windows, ventilators and roofs, prefabricated buildings and toilets , estimate of approximate cost of buildings, economical methods of building construction.
- Learn about objectives of building byelaws, floor area ratio floor space index, principles under laying building bye laws, classification of buildings, open space requirements, built up area limitations, height of buildings, wall thickness, lightening and ventilation requirements.
- Learn about the study of drawings pertaining to the plan, elevation and sections of residential buildings from the given line diagram, study of specifications pertaining to Buildings.

Part A

UNIT-I

Building Materials: Conventional Building Materials such as Brick, Cement, Steel, Wood - Modern Building Materials – Plumbing Fixtures – Sanitary fittings – Materials for Building Electrification – Ready to use building materials currently available in the market.

UNIT-II

Design of Residential buildings: Minimum standards for various parts of buildings, requirements of different rooms and their grouping, characteristics of various types of residential buildings - Study of structural elements of Building – Minimum standards for Septic tank, balcony, corridor and staircase.

UNIT-III

Fundamentals of Building Construction: Orientation of Buildings based on Earths motion round the Sun – Significance of Bond for Brick walls – Study of drawings pertaining to doors, Windows, ventilators and roofs – Prefabricated Buildings and Toilets – Estimation of approximate cost of Buildings - Economical methods of Building construction.

UNIT-IV

Building Byelaws and Regulations: Introduction- terminology- objectives of building byelaws- floor area ratio floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of buildings- wall thickness – lightening and ventilation requirements.

UNIT-V

Plan, Elevation and Sections of Residential Buildings: Study of Drawings Pertaining to the Plan, Elevation and sections of Residential buildings from the given line diagram – Study of Specifications Pertaining to Buildings.

TEXT BOOKS:

1. Planning and Design of buildings by Y.S. Sane
2. Planning, designing and Scheduling by Gurucharan Singh and Jagadish Singh
3. Building planning and drawing by M. Chakravarthi.

REFERENCE BOOKS:

1. Building drawing by Shah and Kale
2. ‘A’ Series & ‘B’ Series of JNTU Engineering College, Anantapur,

RENEWABLE ENERGY SOURCES
(Open Elective – II)

Subject Code: 16OE2023 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To Outline the concept regarding the physics of the sun
- To Outline the concept regarding the collection of solar energy and storage of solar energy
- To Outline the concept regarding different types of wind mills and different types of biogas digester
- To Outline the concept regarding geothermal energy conversion
- To Outline the concept regarding direct energy conversion

COURSE OUTCOMES:

On completion of this course, students should be able to

- Define different kind of solar radiation
- Utilize different methods of collection of solar energy and storage of solar energy
- Classify different types of wind mills and biogas digesters
- Classify different types of geothermal energy sources and utilize different types of extracting techniques
- Distinguish different kinds of direct energy conversion techniques

UNIT-I

Principles of Solar Radiation: Role and potential of new and renewable source, the solar energy option, physics of the sun, the solar constant, extraterrestrial and terrestrial solar radiation, instruments for measuring solar radiation.

UNIT-II

Solar Energy Collection, Storage and Applications: Flat plate and concentrating collectors, Different methods of storage -Sensible, latent heat . Solar Applications- solar heating/cooling technique, solar distillation and, photovoltaic energy conversion.

UNIT-III

Wind and Biomass Energy: Sources and potentials, horizontal and vertical axis windmills. Principles of Bio-Conversion, Anaerobic/aerobic digestion, gas yield, I.C. Engine operation and economic aspects.

UNIT-IV

Geothermal and Ocean Energy: Resources, types of wells, methods of harnessing the energy. OTEC, Principles utilization, setting of OTEC plants, Tidal and wave energy: Potential and conversion techniques,

UNIT-V

Direct Energy Conversion: Need for DEC, principles of DEC. Thermoelectric generators, seebeck, peltier and joul Thomson effects, MHD generators, principles, hall effect, magnetic flux, principle of MHD, power generation with closed loop MHD systems. Fuel cells, principles, faraday's law's.

TEXT BOOKS:

1. Non-Conventional Energy Sources /G.D. Rai
2. Renewable Energy Technologies /Ramesh & Kumar /Narosa

REFERENCE BOOKS:

1. Renewable energy resources/ Tiwari and Ghosal/ Narosa.
2. Non-Conventional Energy / Ashok V Desai /Wiley Eastern.
3. Non-Conventional Energy Systems / K Mittal /Wheeler
4. Solar Energy /Sukhame

PRINCIPLES OF COMMUNICATIONS
(Open Elective – II)

Subject Code: 16OE2025 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- Describe various types of signals and their properties
- Explain the fundamental concepts of modulation and demodulation of analog modulation schemes.
- Understand various pulse modulation schemes and multiplexing techniques.
- Compare the different types of Digital communication systems
- Explain the basic concepts of information theory

COURSE OUTCOMES:

On completion of this course, students should be able to

- Analyze various types of signals and their properties
- Summarize the fundamental concepts like modulation, demodulation of analog modulation schemes.
- Discriminate the various pulse modulation schemes and multiplexing techniques.
- Summarize the different types of Digital communication systems
- Explain the basic concepts of information theory

UNIT-I

Introduction: Block diagram of communication systems, Types of signals, Fourier Transform for various signals, Fourier Spectrum, Power spectral density, Autocorrelation, correlation, convolution.

UNIT-II

Amplitude Modulation: Need for modulation, Types of Amplitude modulation, AM, DSB SC, SSB SC, Power and BW requirements, generation and Demodulation of AM.

Angle Modulation: Frequency & Phase modulations, advantages of FM over AM, Bandwidth consideration, Narrow band and Wide band FM, Comparison of FM & PM.

UNIT-III

Pulse Modulations: Sampling, Nyquist rate of sampling, Sampling theorem for Band limited signals, PAM, regeneration of base band signal, PWM and PPM

Multiplexing: Time Divison Multiplexing, Frequency Divison Multiplexing.

UNIT-IV

Digital Communication: Advantages, Block diagram of PCM, Quantization, effect of quantization, quantization error, Base band digital signal, DM, ADM, ADPCM and comparison.

Digital Modulation: ASK, FSK, PSK, DPSK, M -ary PSK.

UNIT-V:

Information Theory: Concept of information, rate of information and entropy, Source coding for optimum rate of information, Coding efficiency, Shanon-Fano and Huffman coding.

TEXTBOOKS:

1. Principle of Communications, Taub & Schilling, TMH, 2003.
2. Communication Systems Analog and Digital – R.P. Singh, SD Sapre, TMH, 20th reprint, 2004.

REFERENCE BOOKS:

1. Communication Systems Engineering–John. G. Proakis, Masoud and Salehi, 2nd Ed. PHI/Pearson.
2. Electronic Communication Systems – Kennedy & Davis, TMH, 4th edition, 2004.

INTRODUCTION TO JAVA
(Open Elective – II)

Subject Code: 16OE2026 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- Be able to explain the difference between object oriented programming and procedural programming
- Its main objective is to teach the basic concepts and techniques which form the object oriented programming paradigm
- Cover issues related to the definition, creation and usage of classes, objects and methods.
- Discuss the principles of inheritance and polymorphism and demonstrate though problem analysis assignments how they relate to the design of methods, abstract classes and interfaces.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Understand the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method overloading.
- Identify classes, objects, members of a class and the relationships among them needed for a specific problem
- Demonstrate the ability to understand and use Exception handling and file handling mechanism
- Arrange the concrete and abstract classes in an appropriate hierarchy.
- Develop efficient applications using OOP concept

UNIT-I:

Introduction: OOP Principles, Encapsulation, Inheritance and Polymorphism, data types, variables, declaring variables, scope and life time of variables, arrays, operators, control statements, type conversion and casting.

UNIT-II:

Classes and Objects: Concepts of classes and objects, class fundamentals Declaring objects, introducing methods, constructors, usage of static with data and methods, this key word, garbage collection, overloading methods and constructors, parameter passing – call by value, recursion..

UNIT-III:

Inheritance: Basic concepts, member access rules, usage of super key word, types of inheritance, method overriding, abstract classes, dynamic method dispatch, final keyword.

Packages and Interfaces: Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, defining an interface, implementing interface, applying interfaces.

UNIT-IV

Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions.

UNIT-V

Multithreading: Concepts of Multithreading, thread life cycle, creating multiple threads using Thread class, Runnable interface, Synchronization, thread priorities.

TEXT BOOKS:

1. Herbert Schildt, the Complete Reference Java J2SE 5th Edition TMH Publishing Company Ltd, New Delhi.
2. Dr. N.B. Venkateswarlu, Dr. E.V. Prasad, Learn Object Oriented Programming Using Java: An UML Treatment using Live Examples from Science and Engineering, S. Chand, New Delhi.

REFERENCE BOOKS:

1. H.M. Dietel and P.J. Dietel, Java How to Program, Sixth Edition, Pearson Education/PHI
2. Cay. S. Horstmann and Gary Cornell, Core Java 2, Vol 2, Advanced Features, Seventh Edition, Pearson Education.
3. Iver Horton, Beginning in Java 2, Wrox Publications.
4. Somasundaram, Java, Jaico.

INTRODUCTION TO PYTHON
(Open Elective – II)

Subject Code: 16OE2027 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

Introduction to ICPC Competitive Programming Contest

COURSE OBJECTIVES:

- Help students (who may /may not intend for CS&IT) to feel justifiably confident of their ability to write small programs.
- To provide the basic features of python programming language.
- To make students so that they can compete for jobs by providing competence & confidence in computational problem solving.
- Prepare students from other streams to make profitable use of computational methods in their chosen field.
- Prepare students who have prior programming experience or knowledge of computer science for an easier entry into computer science major.

COURSE OUTCOMES:

On successful completion of the course Students will be able to

- Be fluent in the use of procedural statements — assignments, conditional statements, loops, method calls — and arrays.
- Identify or characterize or define a problem.
- Design, code, and test small Python programs that meet requirements expressed in English. This includes a basic understanding of top-down design.
- Understand the concepts of object-oriented programming as used in Python: classes, subclasses, properties, inheritance, and overriding.

UNIT- I

Client /Server environment, Introduction to Python, History, features, python environment setup, Basic syntax, using command interpreter, Variable and Data Types, Basic data types in Python, script structure.

UNIT-II

Conditional statements, Boolean expressions, Looping Control Structures , Control Statements: Break, Continue, Pass.

UNIT-III

Python sequences: strings, Lists, Tuples, dictionaries, sets., string manipulation, functions, modules & import.

UNIT-IV

Errors and Exceptions, Handling exceptions, Files, File input/output, Text processing, file functions.

UNIT-V

Object Oriented programming: Class, object, Object Oriented Programming concepts.

TEXT BOOKS:

1. Wesley J. Chun "Core Python Programming", Second Edition, Prentice Hall
2. Allen Downey, "Think Python", Second Edition , Green Tea Press

REFERENCE BOOKS:

1. Introduction to Computation and Programming Using Python, Spring 2013 Edition, By John V. Guttag.
2. Programming in Python 3: A Complete Introduction to the Python Language (Developer's Library), by Mark Summerfield, 2nd Edition.

DESIGN OF MACHINE MEMBERS – I

Subject Code: 16ME3013 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To provide an understanding of the analytical design techniques used in design machine members.
- To understand Stress analysis, Working stresses, Failure theories, Fatigue failure.
- To design Riveted, Welded, Bolted joints and Pressure Vessels.
- To provide design methods for Shafts, Keys and couplings, power screws and springs.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Describe general considerations in design, selection of materials and manufacturing. Solve problems based on different theories of failure and design for fluctuating stresses.
- Design riveted joints with special emphasis on boiler joints, and welded joints with initial stresses and for eccentric loading.
- Design bolted joints with pre-stress and eccentric loading. Determine change in dimensions of thin and thick, simple and compound pressure vessels due to internal pressure.
- Design keys, cotter joints (spigot & socket, sleeve & cotter, jib & cotter) and knuckle joints. Design hollow and solid shafts for strength and rigidity with combined bending and axial loading. Design of power screws for heavy loading.
- Design rigid couplings (muff, split-muff, and flange) and flexible couplings. Design helical springs, helical torsional springs and leaf springs for static and fatigue loadings.

UNIT – I

INTRODUCTION: General considerations in design of engineering materials and their properties, Material selection –Manufacturing considerations in design.

STRESSES IN MACHINE MEMBERS: Simple stresses, Combined stresses, Torsional and bending stresses, Impact stresses, Stress-strain relation – Various theories of failure, Factor of safety – Design for strength and rigidity – Preferred numbers – Concept of stiffness in tension, bending, torsion and combined situations – Static strength .

STRENGTH OF MACHINE ELEMENTS:

Stress concentration, Theoretical stress concentration factor, Fatigue stress concentration factor, Notch sensitivity – Design for fluctuating stresses, endurance limit, estimation of endurance strength, Goodman line, Soderberg line, Modified Goodman line.

UNIT – II

BOLTED JOINTS: Design of bolts with pre-stresses – Design of bolted joints under eccentric loading – Locking devices – Bolts of uniform strength – Different seals.

DESIGN OF POWER SCREWS: Design of Screws – Square, ACME, Buttress Screws – Design of Nut – Compound screw, Differential screw, Ball screw, possible failures – Overhauling and self-locking screws – Stresses in power screws –Design of screw jack.

UNIT – III

RIVETED JOINTS: Design of riveted joints with initial stresses, Eccentric loading – Design of boiler joints, Design of longitudinal butt joint for a boiler, Design of circumferential lap joint for a boiler, Lozenge joint.

WELDED JOINTS: Design of welded joints with initial stresses, Eccentric loading – Strength of transverse fillet welded joints, Strength of parallel fillet welded joints, Special cases of fillet welded joints – Axially loaded unsymmetrical welded sections – Polar moment of inertia and section modulus of welds.

UNIT – IV

SHAFTS: Design of solid and hollow shafts for strength and rigidity, Design of shafts for combined bending and axial loads – Shaft sizes, BIS code. Use of internal and external circlips, gaskets and seals (stationary & rotary).

SHAFT COUPLINGS: Rigid couplings: Muff, Split-muff and flange couplings – Flexible couplings, Flange coupling (modified).

UNIT – V

KEYS, COTTERS AND KNUCKLE JOINTS: Design of keys, Stresses in keys – Cotter joints: Spigot and socket, Sleeve and cotter, Jib and cotter –Knuckle joints.

MECHANICAL SPRINGS: Stresses and deflections of helical springs, Extension and compression of springs – springs for fatigue loading – Energy storage capacity – Helical torsion springs – Coaxial springs, Leaf springs.

TEXT BOOKS:

1. Machine Design, V.B. Bhandari, Tata McGraw Hill Publications,
2. Machine Design, R.S. Khurmi, J.K. Gupta, S. Chand Publications,
3. Machine Design Data Book, V.B. Bhandari, Tata McGraw Hill Publications, (**Permitted for Exam).**

REFERENCES BOOKS:

1. Machine Design, Allen Strickland Hall, A. Holowenko, Herman G. Laughlin, Schaum Series, Tata McGraw Hill Publications,
2. Shigley's Machanical Engineering Design, Joseph E Shigley, Tata McGraw Hill Publications,
3. Machine Design, N.C. Pandya, C.S. Shah, Charotar Publications,
4. Machine Design, P.C.Sharma, D.K.Aggarwal,S.K.kataria & sons Publications,
5. Design of Machinery by Robert.L.Norton, McGraw-Hill Publications

KINEMATICS & DYNAMICS OF MACHINERY

Subject Code: 16ME3014 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To understand different mechanisms,machines and their constraints and
- To get clear idea about planar mechanisms and to determine velocity and acceleration of different parts in a given mechanism by using graphical as well as analytical techniques.
- To provide the tools necessary for kinematic and dynamic analysis of mechanisms and machines.
- To provide skills necessary to consider the role of dynamics in the design of machines.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Identify and analyze the kinematic chain in a given machine. Differentiate inversions of four bar, slider crank and double slider crank mechanism and their applications.
- Draw the velocity and acceleration diagrams of various mechanisms and determine velocities and accelerations of different parts in a given mechanism.
- Enumerate Dynamic Analysis of Four bar Linkage and Slider crank Mechanism. Solve problems on gyroscopic effects in ships, automobiles and airplanes.
- Determine spur, helical or bevel gears dimensions that meet the specified requirements. Analyze transmission ratios in planetary and differential gear system. Understand working of automobile differential.
- Explain working principles of different governors. Evaluate energy stored and dimensions of flywheel.

UNIT – I

MECHANISMS: Elements or Links, Classification: Rigid Link, Flexible and Fluid link – Types of kinematic pairs: Sliding, Turning, Rolling, Screw, Spherical pairs; Lower and higher pairs; Closed and open pairs – Constrained motion: Completely, Partially or successfully constrained, incompletely constrained. Straight Line Motion Mechanisms: Exact and approximate copiers and generated types, Peaucellier, Hart and Scott Russel, Grasshopper, Watt Chebicheff

MACHINES: Mechanism and machines, Classification of machines, Kinematic chain – Inversion of mechanisms: inversions of quadric cycle chain, Single and double slider crank chains.

UNIT-II

ANALYSIS OF MECHANISMS: Analysis of slider crank chain for displacement, velocity and acceleration of slider – Acceleration diagram for a given mechanism, Kleins construction, Coriolis component of acceleration.

PLANE MOTION OF BODY: Three centers in a line theorem – Graphical determination of instantaneous centre, Diagrams for simple mechanisms and determination of angular velocity of points and links.

UNIT-III

STATIC & DYNAMIC FORCE ANALYSIS of Slider Crank mechanism, Concept of Friction Circle and Dynamically Equivalent System

GYROSCOPES: Gyroscopic forces and torques – Gyroscopic stabilization – Gyroscopic effects in airplanes, ships & automobiles

UNIT-IV

GEARS: Higher pairs, Friction wheels, Toothed gears, Types, Law of gearing, Condition for constant velocity ratio for transmission of motion – Forms of teeth: cycloidal and involute profiles – Sliding Velocity – Phenomena of interference, Methods of interference, Condition for minimum number of teeth to avoid interference –Expressions for arc of contact and path of contact.

GEAR TRAINS: Introduction, Train value, Types – Methods of finding train value or velocity ratio for: Simple and reverted gear train, Epicyclic gear train – Selection of gear box – Differential gear of an automobile.

UNIT-V

Flywheels and their design - Turning moment, Crank effort and turning moment diagrams – Fluctuation of energy

GOVERNERS: Watt, Porter and Proell governors – Spring loaded governors - Hartnell and Hartung with auxiliary springs –Sensitiveness, isochronism and hunting.

TEXT BOOKS:

1. Theory of Machines and Mechanisms, S.S. Rattan, Tata McGraw Hill Publications,
2. Theory of Machines, R.S Khurmi, J.K Gupta, S. Chand Publications,

REFERENCES BOOKS:

1. Theory of Machines, P.L. Ballaney, Khanna Publications,
2. Theory of Machines, R.K Bansal, Laxmi Publications,
3. Theory of Machines, Sadhu Singh, Pearson Publications,
4. Theory of Machines, John Joseph Uicker, G. R. Pennock, Joseph Edward Shigley, Oxford Press Publications,

METAL CUTTING AND MACHINE TOOLS

Subject Code: 16ME3015 **Internal Marks: 30**
Credits: 3.0 **External Marks: 70**

COURSE OBJECTIVES:

- To provide basic knowledge on different machines like lathe, shaper, and planner.
- To provide clear information on cutting tool geometry.
- To provide basic concepts of measurements by using different techniques

COURSE OUTCOMES:

On completion of this course, students should be able to

- Assess machinability of different materials using specific cutting forces and surface finish. Explain theory of metal cutting including cutting tool geometry, materials, life and wear.
- Describe basic parts and various operations performed on lathe. Explain the mechanisms used in various special purpose lathes.
- Discuss parts, working principles, operations and applications of shaping, slotting, planning, milling, drilling, broaching and grinding machines.
- Explain gear cutting, gear forming, gear generation, gear shaping and gear hobbing.
- Gain knowledge in measuring techniques and instruments, limits and limit gauges, go and no-go gauges, and some of the gauges used in inspection of mechanical parts in Industry.

UNIT-I

THEORY OF METAL CUTTING: Introduction, Material removal processes, Types of machine tools – Theory of metal cutting, Cutting tool geometry, Chip formation – Orthogonal cutting, Merchant's Force diagram – Cutting tool materials, Tool wear, Tool life, Surface finish – Cutting fluids.

UNIT-II

CENTRE LATHE: Constructional features, Various operations, Taper turning methods, Thread cutting methods – Special attachments, Machining time and power estimation.

SPECIAL PURPOSE LATHES: Capstan and turret lathes, Automats, Single spindle, Swiss type, Automatic screw type, Multi spindle, Turret Indexing mechanism, Bar feed mechanism.

UNIT-III

RECIPROCATING MACHINE TOOLS: Shaper, Planer and Slotter.

MILLING, DRILLING AND ALLIED OPERATIONS, BROACHING: Types, Milling cutters, Operations, Indexing – Hole making, Drilling, Quill mechanism, Reaming, Boring, Broaching machines, Broach construction, Push, Pull, Surface and Continuous Broaching machines.

UNIT-IV

ABRASIVE PROCESSES AND GEAR CUTTING: Abrasive processes, Grinding wheel, Specifications and selection, Types of grinding process, Cylindrical grinding, Surface grinding, Centreless grinding – Honing, Lapping, Super finishing, Polishing and Buffing, Abrasive jet machining, Gear cutting, Forming, Generation, Shaping, Hobbing.

UNIT-V

SYSTEMS OF LIMITS AND FITS: Introduction, Normal size, Tolerance limits, Deviations, Allowance, Fits and their types, Unilateral and bilateral tolerance system, Hole and shaft basis systems, Interchangeability and selective assembly.

LIMIT GAUGES: Taylor's principle – Design of go and no-go gauges, plug ring, snap, gap, taper, profile and position gauges.

TEXT BOOKS:

1. A Textbook of Production Technology: Manufacturing Processes by P C Sharma, Published by S Chand & Co Ltd.,, India
2. A Textbook of Production Engineering, By P C Sharma, Published by S Chand & Co Ltd., India
3. Production Technology, R.K. Jain, S.C. Gupta, Khanna Publications,

REFERENCES BOOKS:

1. Workshop Technology Vol-II, B.S. Raghuwanshi, Khanna Publications,
2. Metal Cutting Principles, Milton C Shaw, CBS Publications,
3. Metal Cutting and Machine Tools, Geoffrey Boothroyd, CRC Press.

AUTOMOBILE ENGINEERING

Subject Code: 16ME3016 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To provide broad knowledge about the engine, transmission, braking system, steering, suspension and electrical subsystems of an automobile.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Explain construction and operation of components of engine and its lubrication system, along with engine specifications, service procedures.
- Explain the operation of the components involved in both carburetor based and direct fuel injection based fuel systems.
- Explain the working of components involved in the cooling system. Describe the mechanism of distributor-based and electronic ignition systems.
- Explain mechanism of starting and charging electrical systems, and electrical accessories. Discuss construction and operation of transmission system components including clutch, gearbox, propeller shaft, differential, axles, wheels and tires.
- Explain construction and operation of steering, suspension and braking system components.

UNIT-I

INTRODUCTION: Components of four wheeler automobile – Power transmission – Rear wheel drive, front wheel drive, 4 wheel drive – Types of automobile engines, turbo charging and super charging – Engine lubrication: Splash, Pressure lubrication systems, Oil filters, Oil pumps – Crank case ventilation, Emission from Automobiles, Pollution standards: National and International, Pollution control techniques and Noise pollution.

UNIT-II

S.I. ENGINES: Fuel supply systems, Mechanical and electrical fuel pump, fuel filters – Carburetor, Types – Air filters – Petrol injection.

C.I. ENGINES: Requirements of diesel injection systems, Types of injection systems, Fuel pump, Nozzle, Spray formation, Injection timing, Testing of fuel pumps.

UNIT-III

COOLING SYSTEM: Cooling requirements, Air cooling, Liquid cooling – Thermo, Water and Forced Circulation System – Radiators, Types – Cooling Fan, Water pump, Thermostat, Evaporating cooling, Pressure sealed cooling – Antifreeze solutions.

IGNITION SYSTEM: Function of ignition system – Battery ignition system: Constructional features of storage battery, Auto transformer, Contact breaker points, Condenser and spark plug – Magneto coil ignition system – Electronic ignition system using contact breaker, Electronic ignition using contact triggers – Spark advance and retard mechanisms.

UNIT-IV

ELECTRICAL SYSTEM: Charging circuit, Generator, Current regulator, Voltage regulator – Starting system: Bendix drive mechanism, Solenoid switch – Lighting systems, Horn, Wiper, Fuel gauge, Oil pressure gauge, Engine temperature indicator.

TRANSMISSION SYSTEM: Clutches, Principle, Types, Cone clutch, Single plate clutch, Multi plate clutch, Magnetic and centrifugal clutches, Fluid flywheel – Gear box, Types: Sliding mesh, Constant mesh, Synchro mesh, epicyclic – Overdrive torque converter – Propeller shaft – Hotch-Kiss drive, Torque-tube drive – Universal joint, Differential rear axles types – Wheels and tires.

UNIT-V

STEERING SYSTEM: Steering geometry: Camber, Castor, King pin rake, Combined angle toe in – Center point steering – **Types of steering mechanism** : Ackerman, Davis – Steering gears.

SUSPENSION SYSTEM: Objects of suspension systems – Rigid axle suspension system – Torsion bar, Shock absorber – Independent suspension system.

BRAKING SYSTEM: Mechanical braking system – Hydraulic brake system: Master cylinder, Wheel cylinder, Tandem master cylinder, Requirement of brake fluid, Pneumatic and vacuum brakes.

TEXT BOOKS:

1. Automotive Mechanics Vol-I&II, Kripal Singh, Standard Publications,
2. Automobile Engineering, William H Crouse, Donald L Anglin, McGraw Hill Publications,

REFERENCES BOOKS:

1. Automotive Technology: Principles, Diagnosis, and Service, James D. Halderman, Pearson Publications,
2. Automotive Mechanics, G.B.S. Narang, Khanna Publications,
3. Automotive Mechanics, Joseph Heitner, Van Nostrand Reinhold Publications,

III Year B. Tech., I Semester

INSTRUMENTATION AND CONTROL SYSTEMS

Subject Code: 16ME3017 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To introduce measurement system and characteristics with errors
- To introduce displacement, acceleration, vibration measuring techniques.
- To introduce force, torque, power and speed measuring techniques.
- To deal with measurement of non-electrical quantities using sensors.
- To introduce concept of control system and pid controllers

COURSE OUTCOMES:

On completion of this course, students should be able to

- Define basic principles of measurement systems, and describe dynamic performance characteristics and sources of error
- Explain various displacement, acceleration measuring instruments
- Explain various force, torque, power and speed measuring instruments
- Explain various non-electrical quantities measuring instruments.
- Explain various control system methods and pid controllers application

UNIT-I

INTRODUCTION: Basic principles and functional descriptions of measuring instruments with example – Dynamic performance characteristics, classification of error.

DISPLACEMENT MEASUREMENT: Resistive, inductive and capacitive transducers to measure linear and angular displacement.

MEASUREMENT OF ACCELERATION: principles of seismic instruments, seismic instrument based capacitive and inductive accelerometer and vibrometer.

UNIT-II

FORCE, LOAD, TORQUE AND SPEED MEASUREMENTS: elastic force meters, strain gauge load cell, electrical and strain gauge torsion meters and stroboscope speed measurement.

STRAIN MEASUREMENT: Electrical resistance strain gauges, Gauge factor and measurement of tensile and compressive strains

UNIT-III

PRESSURE MEASUREMENT: Thermal conductivity gauge, Ionization type pressure gauges, McLeod pressure gauge, Bourdon tubes, Bellows, Diaphragm gauges.

TEMPERATURE MEASUREMENT: Expansion, Resistive, Thermocouples, Pyrometers.

LEVEL MEASUREMENT: Resistive, Inductive and Capacitive types.

UNIT-IV

FLOW MEASUREMENT: Rota meter, Turbine flow meter, Hot-wire anemometer, Magnetic flow meter, Ultrasonic flow meters

HUMIDITY: Sling Psychrometer, Recording Type Psychrometer and Absorption Hygrometer.

MOISTURE: Dew point meter**.**

UNIT – V

CONTROL SYSTEM AND CONTROLLERS:

Introduction, Importance, Classification, Open and closed systems with examples. Control system terminology, P, PI, PID Control Algorithms.

TEXT BOOKS:

1. Mechanical Measurement & control, Dr.D.S. Kumar, S.K. Kataria & Sons Publications,
2. Control Systems Engineering, I.J. Nagrath, M. Gopal, New Age Publications,

REFERENCES BOOKS:

1. Measurement systems: Application and design, Earnest. O. Doeblin, Adaptation by Manik and Dhanesh, Tata McGraw Hill Publications,
2. Mechanical and Industrial Measurements, R.K. Jain, Khanna Publications,
3. A Course in Electrical & Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpat Rai Publications,

METAL CUTTING AND MACHINE TOOLS LAB

Subject Code: 16ME3107 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- To provide knowledge and hands on experience with various metal cutting machines.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Generate plain and tapered steps using turning operations on lathe machine.
- Develop threads and knurled surfaces by using lathe machine.
- Perform drilling, Tapping slotting, shaping, Planning operations using respective machines.
- Operate milling machine and produce various milled surfaces.
- Create smooth surface by using surface grinding machine.

LIST OF EXPERIMENTS:

1. Introduction of general purpose machines – Lathe, Drilling machine, Shaper, Paining machine and grinding machine. Slotting machine, Cylindrical Grinder, Surface grinder, Tool and Cutter grinder.
2. Step turning, taper turning on lathe machine.
3. Thread cutting and Knurling on lathe machine.
4. Drilling and Tapping.
5. Shaping and Planning.
6. Slotting.
7. Milling.
8. Cylindrical surface grinding.
9. Grinding tool angles.
10. Measurement of Cutting Force on Lathe
11. Measurement of Force & Torque on Milling/ Drilling Machine

METROLOGY AND INSTRUMENTATION LAB

Subject Code: 16ME3108 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- To provide basic concepts of measurements by using different techniques.
- To provide basic knowledge on mechanism of an instrument.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Measure length, diameter, bore, angle, taper, flatness using various instruments.
- Measure gears and thread by mechanical methods. Use toolmakers microscope for optical measurements.
- Conduct machine tool alignment test on lathe and milling machine.
- Measure pressure, temperature, using various instruments.
- Using capacitive transducers, LVDT
- Measurement using capacitive LVDT transistor
- Measurement of pressure, temperature and speed using varicose sensors

METROLOGY LAB

LIST OF EXPERIMENTS:

1. Measurement of lengths, heights, diameters by vernier calipers micrometers.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear teeth, vernier calipers and checking chordal addendum and chordal height of spur gear.
4. Machine tool alignment of test on the lathe.
5. Machine tool alignment test on milling machine.
6. Tool makers microscope and its application.
7. Angle and taper measurements by Bevel protractor, Sine bars.
8. Use of spirit level in finding the flatness of surface plate.
9. Thread measurement by two-wire and three-wire method or tool-makers microscope.

INSTRUMENTATION LAB

LIST OF EXPERIMENTS:

1. RPM indicator using stroboscope.
2. Bourdon tube pressure gauge.
3. Capacitive transducer.
4. LVDT.
5. RTD (Temperature measurement)
6. Temperature condoler loop

COMPUTER AIDED DESIGN AND DRAFTING LAB

Subject Code: 16ME3109 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- To understand the fundamentals of computer aided design and drafting
- To generate of basic lines and profiles in computer graphics.
- To develop isometric drawings of the given orthographic views.
- To generate orthographic views from the given isometric view.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Draw basic lines and profiles with commonly used operations in drafting software.
- Generate 2D drawings along with dimensioning in drafting software.
- Apply constraints, use layering concepts, and create assembly drawings.
- Create isometric drawings of the given orthographic views.
- Generate various orthographic views of a given model.

INTRODUCTION TO COMPUTER AIDED SKETCHING (2-D DRAWINGS):

1. Commands – Axes, Coordinate points, Creation of lines, Polylines, Square, Rectangle, Polygons, Splines, Circles, Ellipse, Text.
2. Move, Copy, Offset, Mirror, Rotate, Trim, Extend, Break, Chamfer, Fillet, Curves.
3. Constraints: Tangency, Parallelism, Inclination and Perpendicularity.
4. Dimensioning, Limits, Fits, Applying tolerances on individual dimensions.

AUTOCAD/MECHANICAL DESKTOP PRACTICE:

Drawing, Editing, Dimensioning, Plotting Commands, Layering Concepts, Hatching, Detailing, Assembly, Basic principles of GD&T (Geometric Dimensioning & Tolerancing).

Generate Orthographic Views (Front, Left, Right, Top Views) from a given isometric view.

Following production drawing assemblies have to be completed on any CAD software

1. Knuckle Joint
2. Eccentric
3. Lathe tail stock
4. Stuffing box

III Year B. Tech., I Semester

SELF STUDY COURSE – II

Subject Code: 16ME3202 **Internal Marks: 75**
Credits: 1.0

COURSE OBJECTIVES:

- To identify sources of information.
- To collect relevant information.
- To interpret information.
- To move from problem to solution.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Select relevant information from various sources including internet, library, journals, papers, mechanical engineering magazines.
- Present advanced topics in mechanical engineering like modeling and simulation of mechanical systems, design and analysis of various components etc.
- Participate actively in group discussions related to mechanical or general engineering topics.

1. Data collection through internet related to mechanical engineering.
2. Data collection from library and other sources related to mechanical engineering.
3. Seminar presentation on advanced topics like modeling and simulation of different mechanical engineering systems, design and analysis of various components.
4. Group discussion related to mechanical engineering.

FUNDAMENTALS OF FUZZY LOGIC
(Open Elective – III)

Subject Code: 16OE3031 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:
The student will be able to

- Understand the concepts of fuzzy sets, membership functions and their operations.
- Frame linguistic variables and analyze the fuzzy quantifiers.
- Frame simple fuzzy sets.
- Fuzzify any desired area of classical Mathematics using Fuzzy controllers.
- Apply the concepts of Defuzzification

COURSE OUTCOMES:
On completion of this course, students should be able to

- Perform different fuzzy operations on fuzzy sets or membership functions.
- Construct linguistic variables and estimate the fuzzy quantifiers as per the requirement.
- Construct a simple Fuzzy set.
- Develop simple Fuzzy expert system to Fuzzify any desired area with suitable controllers using different inference rules.
- Apply defuzzification process to convert a Fuzzy set to a crisp value.

UNIT-I

Fuzzy set Theory: Crisp Sets- an overview, Fuzzy sets – membership functions -types of membership functions-Triangular, Trapezoidal, Gaussian-examples. Basic Fuzzy set operations-union, intersection, complement. Properties of Fuzzy Sets, Fuzzy relations – Cartesian product, operations on fuzzy relations.

UNIT-II

Fuzzy Logic: Classical Logic – an overview, Fuzzy propositions, Fuzzy connectives, Fuzzy quantifiers, Fuzzy Inference.

UNIT-III

Construction of Fuzzy sets: Methods of construction –an overview, direct methods with one expert, direct method with multiple experts, constructions from Sample data –examples.

UNIT-IV

Fuzzy Expert System – Fuzzification: Fuzzy Controllers, Fuzzy Expert System- Fuzzification-Fuzzy membership values, linguistic Hedges, Fuzzy Logical operators, Fuzzy Inference rules.

UNIT-V

Fuzzy Expert System- Defuzzification: Defuzzification-Centre of gravity method, centre of sums method, Mean of Maximum method-examples.

TEXT BOOKS:

1. Fuzzy Sets and Fuzzy Logic-Theory and Applications, George. J. klir / Bo Yuan, Prentice-Hall of India Pvt Limited.
2. Neural Networks, Fuzzy Logic, and Genetic Algorithms, S.Rajasekharan, G.A.Vijayalakshmi Pai, PHI.

REFERENCE BOOKS:

1. Fuzzy Logic with Engineering Applications, Timothy J.Ross, 3rd edition, John wiley & sons Ltd.

ENVIRONMENTAL IMPACT ASSESSMENT
(Open Elective – III)

Subject Code: 16OE3032 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To identity different methodologies for Environmental Impact Assessment (EIA).
- To understand the basic concept of EIA.
- To apply the professional knowledge of EIA to prepare Environmental audit report.
- To aim for employment in premier consultancy organization which are preparing EIA report to industries.
- To apply the professional, ethics, attitude, team work skills, multi disciplinary approach to contribute the needs of society in the field of environmental protection

COURSE OUTCOMES:

On completion of this course, students should be able to

- Prepare EIA reports to industries.
- Create awareness among the public on the effects of pollution at local level as well as global level.
- Manage quality of soil, water & air by adopting environmental legislation
- Gets successful employment in organizations working for the protection of environment.
- Prepare environmental audit report.

UNIT-I

Basic concept of EIA : Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

UNIT-II

E I A Methodologies: Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

UNIT-III

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

UNIT-IV

Environmental Audit, objectives of Environmental Audit, Types of environmental Audit, Audit protocel, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report. Post Audit activities.

UNIT-V

Environmental legislation - The Environmental pollution Act, The water Act, The Air (Prevention & Control of pollution Act.), Mota Act, Wild life Act - Case studies and preparation of Environmental Impact assessment statement for various Industries.

TEXT BOOKS:

1. Environmental Impact Assessment Methodologies, by Y. Anjaneyulu, B.S. Publication, Sultan Bazar, KAKINADA.
2. Environmental Science and Engineering, by J. Glynn and Gary W. Hein Ke – Prentice Hall Publishers

REFERENCES BOOKS:

1. Environmental Science and Engineering, by Suresh K. Dhaneja – S.K.,Katania & Sons Publication., New Delhi.
2. Environmental Pollution and Control, by Dr H.S. Bhatia – Galgotia Publication (P) Ltd, Delhi

ENERGY AUDIT CONSERVATION AND MANAGEMENT
(Open Elective – III)

Subject Code: 16OE3033 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVE:

To introduce basic principles of energy auditing and to know something about energy management. Also it provides immense knowledge about energy efficient motors, power factor improvement, lighting and energy instruments. Finally economic aspects are analyzed.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Apply principles of energy auditing and propose energy conservation schemes.
- Demonstrate principle and organizing energy management program.
- Demonstrate the operation of energy efficient motors.
- Analyze the power factor improvement methods, illumination methods and demonstrate the operation of various energy instruments
- Analyze and compute the economic aspects of energy consumption.

UNIT-I

BASIC PRINCIPLES OF ENERGY AUDIT: Energy audit- definitions, concept, types of audit, energy index, cost index, pie charts, Sankey diagrams, load profiles, Energy conservation schemes.

UNIT-II

ENERGY MANAGEMENT: Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting.

UNIT-III

ENERGY EFFICIENT MOTORS: Energy efficient motors , factors affecting efficiency, loss distribution, constructional details, characteristics - variable speed , variable duty cycle systems, RMS hp- voltage variation-voltage unbalance- over motoring- motor energy audit.

UNIT-IV

POWER FACTOR IMPROVEMENT, LIGHTING AND ENERGY INSTRUMENTS: Power factor – methods of improvement, location of capacitors. Good lighting system design and practice, lighting control, lighting energy audit. Energy Instruments- wattmeter, data loggers, thermocouples, pyrometers, lux meters, tongue testers.

UNIT-V

ECONOMIC ASPECTS AND ANALYSIS: Economics Analysis-Depreciation Methods, time value of money, rate of return, present worth method , replacement analysis, life cycle costing analysis.

TEXT BOOKS:

1. Energy Management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
2. Energy Efficient Electric Motors by John. C. Andres, Marcel Dekker Inc. Ltd – 2nd Edition, 1995
3. Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill Publishing Company Ltd, New Delhi.

REFERENCE BOOKS:

1. Energy management by Paulo' Callaghan, Mc – Graw Hill Book company – 1st edition, 1998
2. Energy management hand book by W.C. Turner, John wiley and son, 2001.
3. Energy management and good lighting practice: fuel efficiency booklet12 – EEO.

INTRODUCTION TO SIGNAL PROCESSING
(Open Elective – III)

Subject Code: 16OE3035 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVE:

- To study the different types of discrete time signals and systems and their properties.
- To test the different systems based on their properties and calculate the frequency response
- To define the Discrete Fourier series and Discrete Fourier transform properties.
- To calculate the Fourier series and Fourier transform for the different discrete time signals and also calculate the Fourier Transform of a given sequence based on FFT algorithms
- To design a FIR and IIR filters using different techniques

COURSE OUTCOMES:

On completion of this course, students should be able to

- Discriminate the discrete systems based on their basic properties
- Determine the frequency response of different signals in Fourier domain.
- Translate the discrete time systems into hardware realization
- Design IIR filters using different techniques
- Design FIR filters using different techniques

Syllabus

UNIT-I

Signals and Systems Introduction: Basic elements of DSP , concepts of frequency in Analog and Digital signals- Sampling theorem, Impulse sampulse sampling, Natural and Flat top Sampling. Discrete time signals and sequences, – Analysis of discrete time LTI systems – Z transform – Convolution – Correlation, Frequency domain representation of discrete time signals and systems.

UNIT-II

Discrete Fourier Transform: Computation of DFT, Properties of DFT, linear convolution of sequences using DFT. Relation between Fourier transform and Z-transform.

UNIT-III

Realization of digital filters – Fundamental of FIR and IIR filters Direct, Canonic, Cascade and Paraller forms.

Fast Fourier Transform: Radix-2 decimation in time and decimation in frequency algorithms, inverse FFT.

UNIT-IV

Introduction to Butterworth and Chebyshev filters, Design of infinite impulse response filters (IIR) from analog filters-Bilinear transformation. Practical design method of IIR Low Pass Filter.

UNIT-V

Design of FIR filters: Design of FIR LPF filters using window techniques – Hamming, Hanning Comparison of IIR and FIR filters.

TEXT BOOKS:

1. Digital Signal Processing, Principles, Algorithms, and Applications – John G. Proakis, Dimitris G.Manolakis, Pearson Education/PHI, 2007.
2. Discrete Time Signal Processing – A.V.Oppenheim and R.W. Schaffer, PHI.

REFERENCE BOOKS:

1. Digital Signal Processing – Andreas Antoniou, Tata McGraw Hill , 2006.
2. Digital Signal Processing – MH Hayes, Schaum's Outlines, Tata Mc-Graw Hill, 2007.

SOCIAL NETWORKS
(Open Elective – III)

Subject Code: 16OE3036 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:
The student should be made to

- Introduce students to an academic understanding of social networks.
- Learn visualization of social networks.
- Define social networks and related terms.
- Understand the role of ontology in social networks.
- To be able to build web applications with social network features.
- Understand human behavior in social web and related communities,
- Understand the link between qualitative and quantitative methods of social network analysis.

COURSE OUTCOMES:
On completion of this course, students should be able to

- Predict human behavior in social web and related communities.
- Visualize social networks.
- Discover the capabilities and limitations of Semantics for social networks
- Understand how these Social technologies impact society and vice versa.
- Develop skills, recognize, understand, and more effectively manage new social practices online.

UNIT-I
Introduction to Social Networks and Semantic Web: Introduction to Social Networks – Emergence of the Social Web, Limitations of the Current Web, Development of Semantic Web the Semantic solution.

UNIT-II
Social Network Analysis: Social Network Analysis What is Network analysis, Development of Social Network analysis, Key Concepts and Measures in Network analysis.

UNIT-III
Web Intelligence: Web data and Semantics in Social Network applications – Electronic Sources for Network analysis: Electronic Discussion Networks, Blogs and online Communities, Web based Networks.

UNIT-IV
Knowledge Representation: Knowledge Representation on the semantic web: Ontologies and their role in the Semantic web, Ontology languages for the semantic web.

UNIT-V
Social Networks Analysis In The Sciences: History of Social Networks – Context, Methodology-Data acquisition, Representation, Storage and Reasoning, Visualization and analysis.

TEXT BOOKS:

1. Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", 1 st Edition, Springer, 2010.
3. Thinking on the Web - Berners Lee, Godel and Turing, Wiley inter science, 2008.

REFERENCE BOOKS:

1. Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition Springer, 2011.
2. Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009.

REFERENCE LINK:

1. Burt, R. S. (1984). Network items and the General Social Survey. Social Networks 6, 293-340.

FUNDAMENTALS OF COMPUTER GRAPHICS
(Open Elective – III)

Subject Code: 16OE3037 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To enlighten the working principles of display devices, and concepts of resolution.
- To understand the fundamental data-structures and algorithms used for output primitives.
- To design graphics programmes using mathematical and theoretical foundations.
- To hypothesize 3D models of objects.
- To organize steps and plan for generation of animations.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Understand the working principles of display devices, and concepts of pixel, resolution.
- Apply mathematics and logic to develop algorithms for various output primitives like lines, circles, polygons.
- Learn to manipulate 2D pictures by designing various transformations.
- Generate 3D computer graphics using interpolation and approximation functions. And derive Projection Transformations.
- Detect visible surfaces using various routines, thus hiding back faces in 3D graphics, and generate Computer Animation.

UNIT-I

Introduction: Application areas of computer graphics, overview of graphic system, video-display devices, raster-scan systems, random scan systems, input devices, Pixels and frame buffers.

UNIT-II

Output Primitives: Points and lines, line drawing algorithms, mid-point circle algorithm, Filled area primitives: scan-line polygon fill algorithm, boundary-fill and flood-fill algorithm.

UNIT -III

2-D Geometrical Transformations: Translation, scaling, rotation, reflection and shear transformation matrix representations and homogeneous co-ordinates, composite transformations, transformations between coordinates.

UNIT IV

2-D Viewing: The viewing pipe-line, window, view-port, viewing transformation, Cohen-Sutherland, Sutherland-Hodgeman polygon clipping algorithm.

3D Graphics: 3D basic Transformations, Projections, Curve generation**,** Hermite curve, Bezier curve and B-spline curve, B-spline surfaces.

UNIT V

Visible surface detection algorithms: Back-face, Z-buffer, Scan-line algorithm, Painter's algorithm, Animation.

TEXT BOOKS:

1. " Computer Graphics C version" Donald Hearn and M. Pauline Baker, Pearson/PHI

REFERENCES BOOKS:

1. Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition.
2. Computer Graphics, Steven Harrington, TMH.
3. "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education.

DESIGN OF MACHINE MEMBERS – II

Subject Code: 16ME3018 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To provide knowledge on design of IC engine components.
- To provide knowledge on design of belt drives, rope drives and chain drives.
- To provide knowledge on selection of rolling bearings and sliding contact bearings.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Design piston and cylinder for structural and thermal loads.
- Compute dimensions of connecting rod and crankshaft that can sustain various loads.
- Design power transmission components like flat & v-belts, ropes, chains, pulleys for belt and rope drives.
- Calculate major dimensions of spur and helical gears for dynamic loads, bending strength, compressive strength and wear.
- Design journal, ball, roller and thrust bearings with adequate bearing life and heat dissipation.

UNIT-I

DESIGN OF PRESSURE VESSELS: Stresses in thin cylinders and spherical shells, Thick cylinders-Principal stresses, Lame's equation, Clavarino's and Birnie's equations, Cylinders with external pressure, Autofrettage, compound cylinders, Thickness of cylindrical shells, spherical shells and End closures.

DESIGN OF CYLINDER AND PISTON: Cylinder wall, Cylinder head, Studs for cylinder head, Piston head, piston ribs and cup, piston rings, Piston barrel, Piston skirt and Piston pin.

UNIT-II

DESIGN OF CONNECTING ROD: Buckling of connecting rod, cross-section of connecting rod, Big and small end bearings, Big end cap and bolts, check for whipping stress.

DESIGN OF CRANKSHAFT: Centre crankshaft at TDC position, Centre crankshaft at angle of maximum torque, Side crankshaft at TDC position, Side crankshaft at angle of maximum torque.

UNIT-III

DESIGN OF BELT AND ROPE DRIVES: Selection of flat belts, Pulleys for flat belts, Arms of cast iron pulley, Selection of V-belts and V-grooved pulley, Construction of wire rope, Stresses in wire ropes, Rope sheaves and drums.

DESIGN OF CHAIN DRIVES: Introduction to chain drives, Roller chains, geometric relationships, Polygonal effect, Power rating of roller chains, Proportions of sprocket wheels, Design of chain drive.

UNIT-IV

DESIGN OF SPUR GEAR DRIVES: Force analysis on spur gear tooth, Gear blank design, module and face width, Beam strength of gear tooth, Effective load on gear tooth, Estimation of module based on beam strength, Wear strength of gear tooth, Estimation of module based on wear strength,

DESIGN OF HELICAL GEAR DRIVES: Force analysis on helical gear tooth, Beam strength of helical gears, Effective load on gear tooth, Wear strength of helical gears, Herringbone gears.

UNIT-V

DESIGN OF ROLLING CONTACT BEARINGS: Introduction to bearings, Types, Principle of self-aligning Bearing, Static load carrying capacity, Stribeck's equation, Dynamic load carrying capacity, Equivalent bearing load, load-life relationship, Selection of bearing, Design for cyclic loads and speeds, Bearing with a probability of survival other than 90%.

DESIGN OF SLIDIGNG CONTACT BEARINGS: Basic modes of lubrication, Petroff's equation, Mckee's investigation, Hydrostatic step bearing, Bearing design -Selection of parameters, Comparison of rolling and sliding contact bearings.

TEXT BOOKS:

1. Machine Design, V.B. Bhandari, Tata McGraw Hill Publications,
2. Machine Design, R.S. Khurmi, S. Chand Publications,
3. Machine Design Data Book, S. Md. Jalaluddin, Anuradha Publications, (**Permitted for Exam**)
4. Machine Design Data Book, V.B. Bhandari, Tata McGraw Hill Publications, (**Permitted for Exam**)

REFERENCES BOOKS:

1. Machine Design, Schaum Series, Tata McGraw Hill Publications,
2. Machine Design, Joseph E. Shigley, McGraw Hill Publications,
3. Machine Design, N.C. Pandya and C.S. Shaw, Charotar Publications,
4. Machine Design, S.Md. Jalaluddin, Anuradha Publications,

MECHANICAL VIBRATIONS

Subject Code: 16ME3019 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To develop skill on various CAM profiles and analyze the motion of followers.
- To provide skills necessary to consider the role of dynamics in the form of balancing of masses.
- To determine natural frequencies of free and forced, undamped and damped, single and two degree of freedom systems, longitudinal, transverse and torsional vibrating spring mass systems.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Draw the CAM profile for the given follower motion which may include a combination of uniform velocity, uniform acceleration/retardation, simple harmonic motions.
- Evaluate various cases of balancing of rotating masses. Use analytical and graphical methods for primary and secondary balancing of reciprocating masses.
- Determine natural frequencies of free and forced, undamped and damped, single degree of freedom system longitudinal and transverse vibrating spring mass systems. Explain whirling of shafts and critical speed.
- Determine natural frequencies of free and forced, undamped and damped two degree of freedom system longitudinal and transverse vibrating spring mass systems. Explain vibration isolation and transmissibility.
- Compute natural frequencies of torsional vibrating spring mass systems. Explain modal analysis, quarter car and full car models.

UNIT-I

CAMS: Definitions of cam and followers, Uses, Types of followers and cams, Terminology, Types of follower motion: Uniform velocity, Uniform acceleration, Simple harmonic – Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

ANALYSIS OF MOTION OF FOLLOWERS: Roller follower, circular cam with straight, concave and convex flanks.

UNIT-II

BALANCING OF ROTATING MASSES: single and multiple masses in single and different planes.

BALANCING OF RECIPROCATING MASSES: Primary, Secondary and higher balancing of reciprocating masses – Analytical and graphical methods – Locomotive balancing – Hammer blow, Swaying couple, Variation of tractive efforts -Unbalanced forces and couples.

UNIT-III

VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEM:

Introduction to Vibrations - Free vibration of single-degree-of-freedom systems - Free Vibration of mass attached to vertical spring & Damper

Harmonically excited vibration - Vibration under general forcing conditions -Transverse loads, Vibrations of beams with concentrated and distributed loads – Dunkerley's methods, Raleigh's method – Whirling of shafts, Critical speeds

UNIT-IV

VIBRATIONS OF TWO DEGREE OF FREEDOM SYSTEM:

Free vibration of two degree-of-freedom systems - Free Vibration of mass attached to vertical spring & Damper

Harmonically excited vibration - Vibration under general forcing conditions - Vibration Isolation & Transmissibility

UNIT-V

TORSIONAL VIBRATIONS: Two and Three rotor systems.

Vibration of Multi-Degree-of-Freedom Systems under Free Vibration- Natural Frequencies and mode shapes – Eigen Value problems - Quarter Car- Half Car Models

TEXT BOOKS:

1. Theory of Machines and Mechanisms, S.S. Rattan, Tata McGraw Hill Publications,
2. Theory of Machines, R.S Khurmi, J.K Gupta, S. Chand Publications,
3. Mechanical Vibrations, V.P.Singh, Dhanpatrai & Co Publications,

REFERENCES BOOKS:

1. Mechanical Vibrations, Rao, S.S., Addison Wesley Longman, PHI Publications,
2. Textbook of Mechanical Vibrations, V. Rao Srinivas, J. Dukkipati, 2nd Edition, PHI Publications,

III Year B. Tech., II Semester

CAD/CAM

Subject Code: 16ME3020 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To provide basic knowledge on computer aided drafting and modeling.
- To provide knowledge on computerized numerical control, process planning & manufacturing systems.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Describe CAD devices and software, graphic standards. Apply 2D & 3D transformations and inverse transformations.
- Develop mathematically synthetic curves and surfaces including Bezier curves and NURBS. Understand Boundary Representation (B-rep) and Constructive Solid Geometry (CSG) solid modeling methodologies.
- Write simple CNC programs to perform different operations like turning and milling.
- Explain group technology concepts in production to facilitate cellular manufacturing and develop automated process plans using variant and generative approaches.
- Differentiate steps involved in migrating from conventional manufacturing to FMS.

UNIT-I

PRODUCT LIFE CYCLE: CAD tools, CAD systems, CAD hardware, CAD specific I/O devices, Benefits of CAD – Working and Screen coordinate systems, Windowing, Modeling and Viewing – Image drawing techniques, Stroke writing, Raster scan graphical user interface, Graphics standards.

2D AND 3D TRANSFORMATIONS: Geometric Transformations, Transformations of geometric models, Mapping of geometric models, Inverse transformations and mapping, Projections of geometric models.

UNIT-II

GEOMETRIC MODELING: Wireframe models, Types and mathematical parametric representation of analytic and synthetic curves – Surface models, Types and mathematical parametric representation of analytic and synthetic surfaces – Solid models, Solid entities, Solid representation, Fundamentals of solid modeling, Introduction to Boundary Representation and Constructive Solid Geometry.

UNIT-III

NC/CNC: Definition of NC,CNC & DNC, Basic components of NC systems, Types of NC control systems, Applications of NC, Economics of NC, NC part programming methods, Simple part programming for turning and milling operations using CNC.

UNIT-IV

GROUP TECHNOLOGY: History of Group Technology (GT), Role of GT in CAD/CAM integration, Part families, Classification and coding: MICLASS and OPITZ coding systems – Benefits of GT – Cellular manufacturing, Rank Order Clustering (ROC) method.

PROCESS PLANNING: Role of process planning in CAD/CAM integration, Approaches to computer aided process planning, Variant approach and generative approaches.

UNIT-V

FLEXIBLE MANUFACTURING SYSTEMS: Definition of FMS, Components, Classification, Work station types, Functions of material handling and storage systems, FMS layout configuration, Computer control system and its functions, Economic justification of FMS, Applications and benefits.

TEXT BOOKS:

1. CAD/CAM Theory and Practice, Ibrahim Zeid, Tata McGraw Hill Publications,
2. CAD/CAM Principles & Applications, P. N. Rao, Tata McGraw Hill Publications,
3. Automation, Production Systems & Computer Integrated Manufacturing, M.P. Groover, PHI Publications,
4. Introduction to Computer Graphics – Adams Rogers

REFERENCES BOOKS:

1. CAD/CAM, M.P. Groover, Emory Zimmers, Prentice Hall India Publications,
2. Computer Integrated Manufacturing System, Yorem Koren, McGraw Hill Publications,
3. CAD/CAM/CIM, P. Radhakrishnan, S. Subramanyan, V. Raju, New Age Publications,

THERMAL ENGINEERING - II

Subject Code: 16ME3021 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

(Use of steam tables and Mollier chart is allowed)

COURSE OBJECTIVES:

- To provide knowledge of steam turbines, steam nozzles and steam condensers.
- To provide knowledge on gas turbines and jet propulsions.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Calculate thermal efficiency of Rankine cycle with and without reheating and regeneration. Determine stoichiometric air required after converting from volumetric to mass analysis and vice-versa.
- Describe the function and working of various types of boilers along with its mountings and accessories. Calculate the boiler efficiency, chimney height for natural draught, and power to drive the fans.
- Design a nozzle for given requirements and calculate its efficiency. Understand the working of various types of steam condensers along with determining mass of cooling water required.
- Determine the performance of simple and compounded, impulse and multi-stage reaction turbines by drawing velocity diagrams and computing various efficiencies.
- Calculate efficiency of Brayton cycle along with reheating, regeneration and intercooler used in gas turbines. Describe the working principles of Ramjet, Pulsejet, Turbojet and Turboprop engines.

UNIT-I

PROPERIES OF STEAM – use of steam tables and Mollier chart – Separating and Throttling Calorimeter –properties of mixtures of steam and atmospheric air.

RANKINE CYCLE - schematic layout of the steam power plant, thermodynamic analysis of Rankine cycle, modified rankine cycle Methods to improve cycle performance – Regeneration – Reheating – Binary-vapor cycles.

FUELS: Calorific value determination, Stoichiometric air required – Conversion of volumetric to mass analysis and vice-versa – Flue gas analysis, ORSAT apparatus.

UNIT-II

BOILERS: Classification, Working and sketches of: Fire-tube boilers – Cochran, Cornish, Locomotive; Water-tube boilers – Bobcock and Wilcox, Stirling; High-pressure boilers – LaMont, Loeffler, Benson, Velox.

Boiler mountings and accessories. Natural draught chimney height, Condition for maximum discharge through chimney, Power required to drive forced-draught and induced-draught fans.

UNIT-III

STEAM NOZZLES: Function of a nozzle – applications - types, Thermodynamic analysis, Area-velocity relationship Condition for maximum discharge, choking of nozzles, Critical pressure ratio, Super saturated flow, Wilson line.

STEAM CONDENSERS – purpose of a condenser in a steam power plant – surface and mixing condensers, vacuum and condenser efficiency, Different types of modern wet and dry cooling towers.

UNIT-IV

IMPULSE TURBINES: Compounding methods: Velocity, Pressure, Pressure-velocity – Velocity diagrams, Power developed, Axial thrust, Blade or diagram efficiency, Condition for maximum efficiency.

REACTION TURBINES: Degree of reaction, Parson reaction turbine, Condition for maximum efficiency, Calculation of blade height.

UNIT-V

GAS TURBINES: Simple gas turbine plant – Ideal cycle, Essential components, Parameters of performance – Actual cycle, regeneration, intercooling and reheating – Closed and semi-closed cycles – Merits and demerits

JET PROPULSION: Working and schematic of Ramjet, pulsejet, turbojet and turboprop engines – Thrust power and propulsive efficiency for a turbojet engine.

TEXT BOOKS:

1. Thermal Engineering by R.K. Rajput, S.Chand Publications,
2. A Course in Thermal Engineering, S.C. Arora, V. Domukundwar, Dhanpat Rai Publications,
3. Thermodynamics and Heat Engines- R.Yadav- Central book depot.

REFERENCES BOOKS:

1. Thermal Engineering, P.L. Ballaney, Khanna Publications,
2. Thermal Engineering, R.S. Khurmi, J.K. Gupta, S. Chand Publications,
3. Gas Turbines and Propulsive Systems, P.R. Kajuria, S.P. Dubey, Dhanpat Rai Publications,

REFRIGERATION AND AIR CONDITIONING
(Elective - I)

Subject Code : 13ME3022 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To introduce the student to applications of Refrigeration and Air conditioning
- To expose the student to different cycles of Refrigeration such as ideal cycle of Refrigeration, Air Refrigeration cycle, vapour compression Refrigeration cycle, vapour absorption refrigeration
- To provide the students with a proper understanding of Thermoelectric Refrigeration and Vortex tube Refrigeration
- To have an overview of psychrometric processes used in air conditioning
- To provide knowledge on load concepts of RSHF, GSHF, ESHF and ADP

COURSE OUTCOMES:

On completion of this course, students should be able to

- Perform thermodynamic analysis on various refrigeration cycles like Bell-Coleman cycle and Brayton cycle.
- Describe components and analyze COP of vapor compression cycles including sub-cooling and super-heating. Explain the working of condensers, refrigerants, evaporator and expansion devices.
- Describe components and analyze COP of vapor absorption cycles. Explain the working of essential components of vapor absorption refrigeration.
- Explain the working principles of non-conventional refrigeration systems like thermo-electric, vortex-tube and pulse tube refrigeration systems.
- Solve problems based on RSHF, GSHF, ESHF and ADP. Calculate air-conditioning cooling load.

UNIT-I:

Introduction to Refrigeration: Necessity and applications – Unit of refrigeration and C.O.P – Mechanical Refrigeration – Types of ideal cycle of refrigeration.

Air Refrigeration : Bell Coleman cycle and Brayton Cycle, Open and Dense air systems – Actual air refrigeration system – Refrigeration needs of Air crafts air systems – Actual air refrigeration system problems – Refrigeration needs of Air Crafts

UNIT-II:

Vapour Compression Refrigeration: – working principle and essential components of the plant – simple vapour compression refrigeration cycle – COP – Representation of cycle on T-S, P-h and h.s. charts – effect of sub cooling and super heating – cycle analysis – Actual cycle influence of various parameters on system performance – Use of p-h charts. Refrigerants – Desirable properties – common refrigerants used – Nomenclature.

UNIT-III:

Vapour Absorption System – Calculation of max COP – description and working of NH3 – water system – Li – Br system. Principle of operation three Fluid absorption system, salient features – Electrolux refrigerator. – working principle and essential components of the plant –vapour absorption refrigeration cycle – COP – Representation of cycle on T-S, P-h and h.s. charts

UNIT-IV:

Non-conventional Refrigeration System: Thermo electric refrigeration – advantages, disadvantages, applications. Vortex tube refrigeration: construction & working, advantages, disadvantages, applications. Pulse tube refrigeration: construction & working, advantages, dis advantages, applications.

UNIT-V:

Introduction to Air Conditioning: Psychometric Properties & Processes – characterization of Sensible and Latent heat loads and SHF – Need for Ventilation , infiltration – concepts of RSHF, GSHF, ESHF and ADP. Concept of human comfort and effective temperature – comfort Air conditioning - industrial air conditioning and Requirements – Air conditioning load calculations for simple application of a small room.

Air Conditioning Systems - classification of equipment, cooling, heating humidification and dehumidification, filters, grills and registers, fans and blowers.

Text Books:

1. Refrigeration and Air Conditioning, CP Arora, Tata McGraw Hill Publications,
2. A Course in Refrigeration and Air Conditioning, CP Arora, Domukundwar, Dhanpatrai & Sons.

Reference Books:

1. Principles of Refrigerations, Dossat, Willey Eastern Publications,
2. Refrigeration and Air Conditioning, Manohar Prasad, New Age Publications,
3. Refrigeration and Air Conditioning, R.S. Khurmi, J.K. Gupta, S.Chand Publications,
4. .Refrigeration and Air Conditioning, P.L. Ballaney, Khanna Publications,

JAVA PROGRAMMING
(Elective - I)

Subject Code: 16ME3023 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- The objective of the course is to teach the basic concepts and techniques which form the object oriented programming paradigm.
- Well equipped with Java SDK environment to create, debug and run simple Java programs.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Become familiar with the fundamentals and acquire programming skills in the Java language.
- Understand fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods, using class libraries, etc.
- Understand and apply various object oriented features like inheritance, polymorphism to solve various computing problems and take the statement of a business problem and from this determine suitable logic for solving the problem.
- Identify Java's standard packages and the different levels of member access and how they relate to packages and implement error handling techniques using exception handling.
- Explore common issues encountered when creating a cross-platform multi-threaded application and also develop efficient Java applets.

UNIT- I

Introduction To Java: Evolution of Java, Java Buzzwords, The Java Virtual Machine, An overview of Java- Simple Java Program, Data types, Variables, Expressions, Automatic type Conversion, Operators, Control Statements, Arrays, Strings. [Chapter [1,3,4,5, Textbook-1]

UNIT-II

Classes & Objects: Class fundamentals, Declaring Objects, Initializing the instance variables, Access Control, Constructors, Methods in Java- Overloading Methods, Static Methods, Recursion, final keyword, this keyword, garbage collection. [Chapter [6,7, Textbook-1]

UNIT-III

Inheritance: Inheritance Basics, Types of Inheritance, The Keyword 'super', Final with inheritance.
Polymorphism: Method Overriding, Dynamic Method Dispatch, Abstract Classes.
Interfaces: Interface, Multiple Inheritance using Interface, Abstract Classes vs. Interfaces.
[Chapter [8,9, Textbook-1]

UNIT-IV

Packages: Packages, Different Types of Packages, Access Protection, Importing Packages.
Exception Handling: Exception-handling fundamentals, throw Clause, throws Clause, Types of Exceptions: Built-in Exception, User Defined Exception. [Chapter [9,10, Textbook-1]

UNIT-V

Threads: Java Thread Model, Main Thread, Creating a Thread and Running it, Terminating the Thread, Creating Multiple Threads, Thread Synchronization, Thread Priorities.
Applets: Applet Basics, Applet Life Cycle, A Simple Applet, HTML applet tag, Applet Parameters. [Chapter [11,13, Textbook-1]

TEXT BOOKS:

1. Herbert Schildt, *"Java The complete reference"*, 8th Edition, McGrawHill, 2011.
2. E. Balaguruswamy, *"Programming with Java A Primer"*, 4th Edition, TataMcGraw-Hill, 2009

REFERENCES BOOKS:

1. Timothy budd, "An introduction to object-oriented programming", 3rd Edition, Pearson Education, 2009.
2. Y. Daniel Liang, "Introduction to Java programming", 9th Edition, Pearson education, 2012.
3. hpp:// en.wikibooks.org/liki/java-programming
4. hpp:// www.javabeginner.com

CONDITION MONITORING
(Elective - I)

Subject Code: 16ME3024 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To provide knowledge on maintenance types and quality circle in maintenance.
- To provide knowledge on fault diagnosis and vibration analysis.
- To understand various condition monitoring techniques.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Describe various types of maintenance.
- Understand how vibration fault diagnosis is used for imbalance, misalignment, looseness, resonance detection.
- Understand vibration measurement and analysis using time and frequency domain techniques.
- Discuss thermography and develop an ability to interpret thermal images. Explain the principles of lubrication oil analysis (chemical, contamination and wear particles).
- Describe methods for ultrasonic monitoring, analysis and inspection.

UNIT-I

MAINTENANCE ENGINEERING: Quality circle in maintenance – Maintenance Types: Breakdown, Corrective, Opportunity, Routine, Preventive and predictive, Condition based systems, Design out.

UNIT-II

FAULT DIAGNOSIS: Fault Diagnosis, Interpreting vibration measurements for common machine faults, Imbalance, Misalignment, Mechanical looseness, Bearing and gearing faults, Faults in induction motors, Resonances, Case studies, Static and dynamic balancing, International standards for vibration condition monitoring.

UNIT-III

VIBRATION MEASUREMENT AND ANALYSIS: Transducers and mounting methods, Data acquisition using instrumentation recorders: Data loggers, Time domain signal analysis, Orbit analysis, Filters, Frequency domain analysis (narrow band FFT analysis), Nyquist criteria.

UNIT-IV

THERMOGRAPHY: Basics of infrared thermography, Differences in equipment, Specific wavelength limitations, Application of IR: Electrical inspection, Mechanical inspection, Energy conversion – How to take good thermal images.

OIL AND WEAR DEBRIS ANALYSIS: Basis of oil analysis, Monitoring condition of oil, Lubricant analysis, Phyio-chemical properties, Moisture, TAN TBN, Wear debris analysis, Particle counting, Spectroscopy, Uses and limitations, Ferrography wear particle analysis, Concept of ferrography.

UNIT-V

ULTRASONIC: Ultrasonic Monitoring: leak, crack, thickness – Basics of ultrasonic monitoring, Ultrasonic theory, Test taking philosophy, Mathematics of ultrasound, Equipment and transducers, Inspection parameters and calibration, Immersion theory, Equipment quality control, Flaw origins and inspection methods, UT procedure familiarization and study recommendations – Application of ultrasound: Air leaks, Stream trap testing, Bearing lubrication, Electrical inspection, Case studies.

TEXT BOOKS:

1. Mechanical Fault Diagnosis and Condition Monitoring, R.A. Collacott, Springer Publications,
2. Management of Industrial Maintenance, Newman-Butterworth

REFERENCES BOOKS:

1. Maintenance Engineering Handbook, Lindley R Higgins, Darrin J Wikoff, R. Keith (Mobley Editor in Chief), McGraw Hill Publications,
2. Vibration Monitoring Handbook, Coxmoor's Machine & System Conditioning Monitoring, Coxmoor Pub
3. Machinery Vibration: Measurement and Analysis, Victor Wowk, McGraw Hill Publications,
4. Condition Monitoring Manual, National Productivity Council, New Delhi

ROBOTICS
(Elective - I)

Subject Code : 13ME3025 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- This subject gives the knowledge about the fundamentals of the robotics technology and its wide area of applications in various fields.
- This gives the knowledge about the kinematic and dynamic aspects of the robot construction and designing aspects of the robots.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Describe commonly used robot configurations, end effectors, drives along with robotics history and applications.
- Describe working principles of various sensors and actuators commonly used in a robot.
- Solve forward and inverse kinematic problems of common robot configurations. Solve dynamic problems using Lagrange-Euler and Newton-Euler formulations.
- Develop robot trajectory planning avoiding obstacles. Program robot motions for simple robot applications.
- Discuss robot cell design and manufacturing & non-manufacturing applications of robots.

UNIT-I

Fundamentals of Robotics: Introduction to Robotics & Overview – Historical development of Robotics – Robotics & Automation – Robotics & CAD/CAM – Classification of Robots based on Configuration & Control – Terminology - Components of Industrial Robots – DOF – End-effectors: Requirements, Challenges, Determination and Classification – Drive systems – Applications in present and future

UNIT-II: Robot Actuators & Sensing Systems

Introduction to Robotic Actuators – Classification of actuators – Difference between Electric, Pneumatic and Hydraulic actuators – Mechanical & other miscellaneous actuators

Sensing systems – Overview of sensing – Functions of sensing – Types – position sensors: potentiometer, resolvers, encoders, LVDT – Velocity sensors – Acceleration sensors – Force and Torque sensors – Optical, range & other miscellaneous sensors

UNIT-III: Kinematics & Dynamics of Manipulators

Kinematics and Dynamics: Introduction – Fundamental transformations – Properties – Homogeneous transformations – Applicable to both 2D & 3D in robotics – Forward & Inverse kinematic models – Denavit - Hartenburg (D-H) representation for rotational joints – Applicable to forward kinematics & Problems – Applicable to Inverse kinematics & Problems – Differential transformations – Jacobian – Singularities – Lagrange- Euler (LE) formulation – Newton-Euler (NE) formulation

UNIT-IV: Trajectory Planning & Programming

Trajectory planning: Introduction – Terminology – Steps in trajectory planning – types of motions – Obstacle avoidance – Trajectory generation & types of trajectory

Programming: Introduction to robot programming – methods of programming – programming languages

UNIT-V: Robot Cell Design & Applications

Robot Cell Design: Introduction – Considerations and requirements – Selection of robot

Applications: Introduction – Manufacturing & Non-manufacturing applications – Selection of robot for a particular application (Case study)

TEXT BOOKS:

1. Industrial Robotics, M. P. Groover, Pearson Education Publications,
2. Robotics & Control, R. K. Mittal, I. J. Nagarath, Tata McGraw Hill Publications,

REFERENCE BOOKS:

1. Robotics, K. S. Fu, Lee, McGraw Hill Publications,
2. An Introduction to Robot Technology, P. Coiffet, M. Chaironze, Kogam Page Publications, London.
3. Robotic Engineering, Richard D. Klafter, Prentice Hall Publications,
4. Robot Analysis and Intelligence, Asada, Slow time, Wiley Inter-Science Publications,
5. Introduction to Robotics, John J Craig, Pearson Education Publications,
6. Robot Dynamics & Control, Mark W. Spong, M. Vidyasagar, John Wiley & Sons (ASIA) Publications,

COMPUTER AIDED ENGINEERING LAB

Subject Code: 16ME3110 **Internal Marks: 25**
Credits: 2.0 **External Marks: 50**

COURSE OBJECTIVES:

- To provide knowledge of modeling tools for creating solid and surface models.
- To provide knowledge on different CAD software.
- To simulate the tool path of cutting tool on the work piece in computer aided manufacturing.
- To generate NC program on verification of tool path for simple components in turning and milling.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Understand modeling using CAD software tools.
- Create virtual models of complex 3D components.
- Develop NC program to create simple components on NC lathe and mill in a CAM package.
- Simulate the tool path and check for errors in virtual manufacturing environment.

LIST OF EXPERIMENTS:

A) MODELING:

1. 3D Part modeling – Extrusion, Cut/hole, Sweep, Draft, Loft, Blend and Rib.
2. Editing – Move, Pattern, Mirror, Round and Chamfer
3. Conversion of 3D solid model to 2D drawing - Different views, Sections, Isometric view and Dimensioning
4. Introduction to Surface Modeling.
5. 3D modeling of machine elements like Flanged coupling and Screw jack.
6. Assembly Drawing (Using Application Packages)
   Parts drawing and preparation of assembled views given part details for components followed by practicing the same using CAD packages.
7. Suggested Assemblies: (any 3)
   Shaft couplings – Plummer block – Screw jack – Lathe Tailstock – Universal Joint – Machine Vice – Stuffing box – Safety Valves - Non-return valves – Connecting rod – Piston and crank shaft – Multi plate clutch – Preparation of Bill of materials and tolerance data sheet

B) TOOL PATH SIMULATION AND NC CODE GENERATION

NC Code generation using CAD / CAM software - Post processing for standard CNC Controls for any of FANUC, Siemens, Hiedenhain etc.

Note: Use any of following software: CATIA, UNIGRAPHICS NX, SOLIDWORKS, SOLIDEDGE

AUTOMOBILE AND IC ENGINES LAB

Subject Code: 16ME3111 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- To provide broad knowledge about the engine, transmission, steering, suspension and electrical subsystems of an automobile
- To gain knowledge on the testing and performance of different IC engines.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Analyze the transmission, steering and suspension system of two stroke petrol engine and four cylinder diesel engine
- Determine frictional power by Retardation and Motoring Test
- Do testing and performance of different IC engines
- Understand the concept of boilers
- Demonstrate the Disassembly / Assembly of Engines.

LIST OF EXPERIMENTS

1. Mock layout of Two Wheeler Electrical System.
2. Cut Section of Vertical Two Stroke Petrol Engine.
3. Determination of Diesel Injector and Collector Tester.
4. Performance of Four Cylinder Diesel Engine Direct Injection Fuel System.
5. Performance of Four Cylinder Diesel Engine MPFI System.
6. Port Timing Diagram and Valve Timing Diagram.
7. Determination of Frictional Power by Retardation Test.
8. Determination of Frictional Power by Motoring Test.
9. Economical Speed Test.
10. Heat-Balance Sheet.
11. Performance Test on a 4-Stroke Diesel Engine.
12. Performance Test on a Reciprocating Air Compressor.
13. Study of Boilers.
14. Demonstration of Disassembly / Assembly of Engines.

Note: Any 10 of the above experiments are to be conducted.

DYNAMICS OF MACHINERY LAB

Subject Code: 16ME3112 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES

- To understand and verify the laws governing the kinematics and dynamics of machines.
- To understand the effect of gyroscopic couple.
- To understand the function of governors and dynamometers.
- To understand the behaviour of vibration in simple mechanical systems.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Determine gyroscopic couple.
- Test the performance of governors.
- Test for balancing of rotating masses.
- Determine the natural frequencies of vibrating systems and critical speed of rotating shaft.
- Analyze cam profile.

LIST OF EXPERIMENTS

1. Determination of gyroscopic couple using gyroscopic test rig.
2. Performance characteristics of a Watt/ Porter governor
3. Performance characteristics of a spring loaded governor
4. Experiment on Rope brake / Band brake dynamometer
5. Experiment on static and dynamic balancing apparatus
6. Determination of natural frequencies of un-damped as well as damped vibrating systems.
7. Determination of critical speed of rotating shaft
8. Experiments using universal vibrating apparatus.
9. Experiment on Cam Analysis Apparatus.
10. Experiment on Epicyclic gear train
11. Study of various gear trains
12. Study of various mechanisms

INTELLECTIVE PROPERTY RIGHTS & PATENTS

Subject Code: 16HS3202 **Internal Marks: 0**
Credits: 0 **External Marks: 0**

COURSE OBJECTIVE:

- To study the basics of intellectual property law.
- To acquire knowledge on copy right law and other formalities related to it.
- To explore knowledge on patent law and cyber law.
- To become familiar about trade mark law.
- To provide knowledge on different aspects of trade secrets.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Study basics of intellectual Property Law.
- Describe copy right law and other formalities.
- Analyze patent and cyber law.
- Explain trade mark law.
- Summarize different aspects of trade secrets.

UNIT-I

Basics of Intellectual Property Law: Introduction to Intellectual Property Law; Evolutionary past; Intellectual Property Law Basics; Types of Intellectual Property; Innovations and Inventions of Trade related Intellectual Property Rights; Agencies Responsible for Intellectual Property Registration; Infringements; Over use or Misuse of Intellectual Property Rights; and Compliance and Liability Issues.

UNIT-II

Copyright Law and Infringements: Introduction to Copyrights; Principles of Copyright; Subject Matters of Copyright; Rights Afforded by Copyright Law; Copyright Ownership; Transfer and Duration; Right to Prepare Derivative Works; Rights of Distribution; Rights of performers; Copyright Formalities and Registration; Limitations; Infringement of Copyright; International Copyright Law; and Semiconductor Chip Protection Act.

UNIT-III

Fundamentals of Patent and Cyber Law: Introduction to Patent Law; Rights and Limitations; Rights under Patent Law; Patent Requirements; Ownership and Transfer; Patent Application Process and Granting of Patent; Patent Infringement and Litigation; International Patent Law; Double Patenting; Patent Searching; Patent Cooperation Treaty; and New developments in Patent Law.
Introduction to Cyber Law; Information Technology Act; and Cyber Crime and E-commerce.

UNIT-IV

Trade Mark Law: Introduction to Trade Mark; Trade Mark Registration Process; Post registration procedures; Trade Mark maintenance; Transfer of rights; Inter parties Proceedings; Infringement; Dilution of Ownership of Trade Mark; Likelihood of confusion; Trade Mark claims; Trade Marks Litigation; and International Trade Mark Law.

UNIT-V

Principles of Trade Secrets: Introduction to Trade Secrets; Maintaining Trade Secret; Physical Security; Employee Access Limitation; Confidentiality Agreement; Trade Secret Law; Unfair Competition; Trade Secret Litigation; Breach of Contract; and Application of State Law.

TEXT BOOKS:

1. Deborah E. Bouchoux: “Intellectual Property”. Cengage learning, New Delhi
2. Kompal Bansal & Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications

REFERENCE BOOKS:

1. Prabhuddha Ganguli: ‘Intellectual Property Rights” Tata Mc-Graw –Hill, New Delhi
2. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
3. R. Radha Krishnan, S. Balasubramanian: "Intellectual PropertyRights", Excel Books. New Delhi.
4. P Narayanan, Intellectual Property Law, Eastern Law House; Third Edition (2013)

MANAGEMENT INFORMATION SYSTEMS (MIS)
(Open Elective – IV)

Subject Code: 16OE3041 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To gain knowledge on formulation and implementation best practices on technology management policies by managers
- To develop any organization in a sustainable manner by the usage tools of technology and strategy in an effective manner.
- To identify the crucial indicators related to process management and channels of technology flow for the development of the organization.
- To identify and implement the innovation factor in every process for enhancing cutting-edge performance by the organizations.
- To understand the usage of information systems in the functional areas of business..

COURSE OUTCOMES:

On completion of this course, students should be able to

- Adapt an experiential learning perspective in the stream of information technology.
- Create and expand an interface between human intelligence systems to an artificial intelligence system.
- Act autonomously in planning, implementing and reflecting at a professional level, on the development and use of technology to address organizational problems.
- Augment analytical and reflective skills in decision making.
- Acquire knowledge of the functional areas of business and the interrelationships among the functional areas within a business.

SYLLABUS

UNIT-I

Management Information Systems: MIS -Management Information systems-Concept- Nature, Importance and Scope of MIS-Structure of MIS-MIS Classification- Types of Information-Dimensions of Information-Systems-Kinds of Systems

Reference: Management Information systems, Managerial Perspectives,2/e (2006) D.P. Goyal, Macmillan Publishers India Ltd. pp.3-13

UNIT-II

Basics of Computer system: A computer System-Computer Hardware Classification-Computer Software- Database Management System- Types of Database Structures or Data Models- Advances in Database Technology.

Reference: Management Information systems, Managerial Perspectives,2/e (2006) D.P. Goyal, Macmillan Publishers India Ltd. pp.91-122

UNIT-III

Telecommunications and Networks: Telecommunications-Types of Signals-communication Channel-Characteristics of Communication Channels-Communications Hardware-Communication Networks

Reference: Management Information systems, Managerial Perspectives,2/e (2006) D.P. Goyal, Macmillan Publishers India Ltd. pp.150-171

UNIT-IV

Decision Support Systems: Decision-Making and Decision-Support Systems-Decision-Making: A Concept-Simon's Model of Decision-Making-Types of Decisions-Methods for Choosing among Alternatives-Characteristics and Capabilities of DSS-Disaster Management-System Development Approaches-System Development Stages-System Development Approaches-Systems Analysis and Design Systems Analysis-Introduction-requirement Determination- Strategies for Requirement Determination- Structured Analysis Tools -Design Methods-Detailed System Design

Reference: Management Information systems, Managerial Perspectives,2/e (2006) D.P. Goyal, Macmillan Publishers India Ltd. pp. 202-217

UNIT-V

Implementation, Maintenance, Evaluation and Security of IS: System Maintenance-Evaluation of MIS-IS Security-Information System Planning- The Nolan Stage Model-The four-Stage Model of IS Planning

Reference: Management Information systems, Managerial Perspectives,2/e (2006) D.P. Goyal, Macmillan Publishers India Ltd. pp. 320-345

TEXT BOOKS:

1. Management Information systems, Managerial Perspectives, 4/e (2016), D.P. Goyal, Macmillan Publishers India Ltd.

REFERENCES BOOKS:

1. Management Information systems, 10/e (2010), James A. O'Brien, George M. Marakas, McGraw-Hill Education.
2. Management Information systems, 12/e (2011), Kenneth C. Laudon, Jane P. Laundon, Prentice Hall.

WEB-REFERENCES:

1. *Information Technology for Management* (Global Text Project edition, c2009), by Henry C. Lucas (PDF at Global Text Project)
2. *Information Systems Foundations: Constructing and Criticising* (2005), ed. by Dennis N. Hart and Shirley Diane Gregor (multiple formats with commentary at ANU E Press)
3. *Information Systems: A Manager's Guide to Harnessing Technology* (derived from Creative Commons licensed edition published by Flat World Knowledge, ca. 2010), by John Gallaugher (PDF at saylor.org)

NATURAL DISASTER MANAGEMENT
(Open Elective – IV)

Subject Code: 16OE3042 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To understand basic concepts, definitions and Terminologies used in Disaster Management.
- To Understand Types and Categories of Disasters and its Impact.
- To promote Prevention and Preparedness for disaster
- To undertake Mitigation & Risk Reduction steps
- To prioritize Rescue and Relief operation Rehabilitation & Reconstruction

COURSE OUTCOMES:

On completion of this course, students should be able to

- Apply Disaster Concepts to Management.
- Categorize Disasters.
- Preparedness plans for disaster response.
- Monitoring and evaluation plan for disaster response.
- Setting up of early warning systems for risk reductions.

UNIT-I

Understanding Disaster: Meaning, nature, characteristics and types of Disasters, Causes and effects, Disaster-A Global View, Disaster Profile of India, The Disaster Management cycle.

UNIT-II

Natural Disasters: Causes, distribution pattern, consequences and mitigation measures for Earthquake, Tsunami, Cyclone, Floods, Droughts, Landslides

Man Made Disasters: Forest Fires, Nuclear, Biological and Chemical disaster, Road Accidents

UNIT-III

Disaster Preparedness: Introduction to disaster Preparedness, Concept & Nature, Disaster Preparedness Plan, Disaster Preparedness for People and Infrastructure, Community based Disaster Preparedness Plan. Roles & Responsibilities of Different Agencies and Government

UNIT- IV

Disaster Mitigation: Meaning and concept, Disaster Mitigation Strategies, Emerging Trends in Disaster Mitigation, Mitigation management, Role of Team and Coordination

UNIT-V

Rehabilitation, Reconstruction and Recovery: Reconstruction and Rehabilitation as Means of Development, Damage Assessment, Role of various Agencies in Disaster Management and Development, Development of Physical and Economic Infrastructure, Education and Awareness, The Philosophy of Coping with Disasters, Dealing with Victims Psychology, Role of Various Agencies in Recovery Measures, Monitoring and Evaluation of Rehabilitation Work, Constraints in Monitoring and Evaluation, Long-term Counter Disaster Planning

TEXT BOOKS:

1. Disaster Mitigation: Experiences And Reflections by Pradeep Sahni
2. Natural Hazards & Disasters by Donald Hyndman & David Hyndman - Cengage Learning

REFERENCES BOOKS:

1. R. B. Singh (Ed) Environmental Geography, Heritage Publishers New Delhi, 1990
2. Savinder Singh Environmental Geography, PrayagPustakBhawann 1997

III Year B. Tech., II Semester

SPECIAL MACHINES
(Open Elective – IV)

Subject Code: 16OE3043 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:
To develop knowledge on Principles & operation, construction, performance, maintenance, testing and performance of special motors such as BLDC motors, stepper motors and electrical motor drives.

COURSE OUTCOMES:
On completion of this course, students should be able to

- Analyze the structure of Electrical drive system of SRM motor.
- Understand open loop and closed loop control of Stepper motors and also compare the open loop and closed loop systems
- Evaluate torque, speed and position controller of BLDC motor drives.
- Explain the basic properties of magnetic materials as applied to electric machines and applications of LIM.
- Describe the operation of motor drives to meet mechanical load requirements

UNIT-I
Switched Reluctance Motor: Principle of operation, Power converter for switched reluctance motor, Control of switched reluctance motor

UNIT-II
Stepper Motors: Stepper Motors Construction – Principle of operation – Theory of torque production – Hybrid stepping motor – Variable reluctance stepping motor – Open loop and closed loop control.

UNIT-III
Brushless DC motor: Permanent Magnet Brushless DC Motor Construction – Principle of operation – Theory of brushless DC motor as variable speed synchronous motor.

UNIT-IV
Linear induction motors: Construction– principle of operation– application of linear induction drive for traction
Permanent Magnet Motors: Construction – Principle of working – Torque equation and equivalent circuits, electrically commutated DC motor.

UNIT-V
Electric Motors for traction: AC motors– DC motors –Single sided linear induction motor for traction drives – Comparison of AC and DC traction

TEXT BOOKS:
1. Special electrical Machines, K. VenkataRatnam, University press, 2009, New Delhi.
2. Special electrical machines, E.G. Janardhanan, PHI learning private limited.

REFERENCE BOOKS:
1. Brushless Permanent magnet and reluctance motor drives, Clarenden press, T.J.E. Miller, 1989, Oxford.

III Year B. Tech., II Semester

BASICS OF VLSI
(Open Elective – IV)

Subject Code: 16OE3045 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- Understand the VLSI design and VLSI technologies.
- Describe basic circuit concepts.
- Explain how to draw stick and layout diagrams
- Know about scaling and limitations.
- Can calculate the resistance and capacitance

COURSE OUTCOMES:

On completion of this course, students should be able to

- Identify different MOS technologies for VLSI design
- Distinguish characteristics of CMOS and BICMOS
- Able to draw the stick & layout diagrams of various circuits
- Analyze about scaling factors
- Evaluate the resistance and capacitance

UNIT-I

Introduction: Introduction to IC technology, the IC era, MOS and related VLSI technology and basic MOS transistors. MOS and CMOS fabrication process. Bi-CMOS technology and comparison between CMOS and bipolar technologies.

UNIT-II

Basic electrical properties of MOS and Bi-CMOS circuits : I_{ds} – V_{ds} relationship, , trans-conductance, output conductance and figure of merit. Pass transistor, MOS inverter, determination of pull-up to pull-down ratio of NMOS. NMOS inverter driven by another NMOS inverter and driven through one or more pass transistors. Alternative forms of pull-up, CMOS inverter, MOS transistor circuit model, Bi-CMOS inverter and latch-up in CMOS circuits.

UNIT-III

VLSI Circuit design process: VLSI design flow, layers of abstraction and stick diagrams. Design rules for wires, contacts and transistor layout diagrams for NMOS and CMOS inverters and gates.

UNIT-IV

Scaling of MOS circuits: Scaling models, scaling factors for device parameters and limitations of scaling.

UNIT-V

Basic circuit concepts: Sheet resistance (R_s) and its concept to MOS. Area capacitance calculations, delays, driving large capacitive load, wiring capacitances, fan-in and fan-outs and choice of layers.

TEXT BOOKS:

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Dougles and A. Pucknell, PHI, 2005.
2. Principles of CMOS VLSI Design – Weste and Eshraghian, Pearson Education, 1999.

REFERENCE BOOKS:

1. VLSI Design – Debaprasad Das, Oxford university press, 2010.
2. VLSI Design – A. Albert Raj and T. Latha, PHI Learing private limited 2010.
3. ASIC design - Smith.

SIMULATION AND MODELING
(Open Elective – IV)

Subject Code: 16OE3046 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- Educate students with fundamental knowledge of continuous and discrete system models and Gain some fundamental knowledge about system simulation techniques
- Gain knowledge probability theory and probability functions.
- Acquire knowledge queuing theory, discrete system simulation and different models of discrete system simulation
- Acquire knowledge about simulation programming techniques.
- Explain some elementary features of SIMSCRIPT and GPSS algorithms.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Differentiate continuous and discrete system models and describe system simulation techniques.
- Describe the steps in continuous system simulation and list the continuous simulation methods.
- Analyze stochastic variables and probability functions, Outline methods for discrete simulation
- Articulate queuing disciplines with mathematical solutions
- Assess problems and propose solutions to SIMSCRIPT and GPSS algorithms.

UNIT-I

Introduction: Nature of Simulation: Systems, Models and Simulation; Continuous and Discrete Systems; Components of a simulation study; Static and Dynamic physical models; Static and Dynamic Mathematical models; Advantages, Disadvantages and pitfalls of Simulation.

UNIT-II

System Simulation and Continuous System Simulation: Types of System Simulation: analytical and Simulation methods: Comparison; Monte Carlo Method; Distributed Lag Models; Cobweb Model.

UNIT –III

System Dynamics & Probability concepts in Simulation: Exponential growth and decay models; logistic curves; Generalization of growth models; System dynamics diagrams; Discrete and Continuous probability functions; Generation of Discrete distributions.

UNIT-IV:

Simulation of Queuing Systems and Discrete System Simulation: Queuing Theory: Poisson Arrival patterns; Normal and Exponential distribution; Service times and Queuing disciplines.

UNIT-V

Introduction to Simulation languages and Analysis of Simulation output: GPSS: Action times, Succession of events, Choice of paths; Conditional transfers and Program control statements; SIMSCRIPT: Organization of SIMSCRIPT Program, Names & Labels; SIMSCRIPT statements, Estimation methods.

TEXT BOOKS:

1. Geoffrey Gordon, "System Simulation", 2nd Edition, Prentice Hall, India, 2002.

REFERENCES BOOKS:

1. Jerry Banks and John S. Carson, Barry L. Nelson, David M. Nicol, "Discrete Event System Simulation", 3rd Edition, Prentice Hall, India, 2002.
2. Narsingh Deo, "System Simulation with Digital Computer, "Prentice Hall, India, 2001.
3. Thomas J. Schriber, Simulation using GPSS, John Wiley, 1991.

SOFT COMPUTING
(Open Elective – IV)

Subject Code: 16OE3047 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To provide an understanding of the soft computing field
- To provide adequate knowledge about fuzzy set theory and Fuzzy Inference.
- To expose the ideas about genetic algorithm
- To provide adequate knowledge about feedback neural networks
- To become familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inference systems.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Demonstrate Fuzzy set theory
- Apply fuzzy logic and reasoning to handle uncertainty and solve engineering problems
- Analyze the genetic algorithms and their applications
- Design single and multi-layer feed-forward neural networks
- Apply neural networks to pattern classification problems

FUZZY LOGIC

UNIT-I

Fuzzy Set Theory: Basic Definition and Terminology, Set Theoretic Operations, Membership Function Formulation and Parameterization, MF of two dimensions.

UNIT -II

Fuzzy Rules and Fuzzy Reasoning: Extension Principles and Fuzzy Relations, Fuzzy IF THEN Rules, Fuzzy Reasoning. Fuzzy Inference System Introduction, Mamdani Fuzzy Models, Sugeno Fuzzy Models.

OPTIMIZATION

UNIT –III

Derivative-free Optimization: Genetic Algorithms, Simulated Annealing ,Random Search

ARTIFICIAL NEURAL NETWORKS

UNIT –IV

Supervised Learning Neural Networks: Perceptron, Adaline, Back propagation Multi layer Perceptron, Radial Basis Function Networks

UNIT –V

Unsupervised Learning Neural Networks: Competitive Learning Networks, Kohonen Self-Organizing Networks

Learning Vector Quantization, Hebbian Learning, Principal Component Analysis.

TEXT BOOKS:

1. J. S .R. Jang, C. T. Sun and E. Mizutani, "Neuro-Fuzzy and Soft Computing", PHI, 2004, Pearson Education 2004.

REFERENCES BOOKS:

1. Timothy J. Ross, "Fuzzy Logic with Engineering Applications", McGraw-Hill, 1997.
2. Davis E. Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
3. S. Rajasekaran and G. A. V. Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithms", PHI, 2003.
4. R. Eberhart, P. Simpson and R. Dobbins, "Computational Intelligence - PC Tools", AP Professional, Boston, 1996.

INDUSTRIAL HYDRAULICS AND PNEUMATICS

Subject Code : 16ME4026 **Internal Marks: 30**
Credits: 3.0 **External Marks: 70**

COURSE OBJECTIVES:

- To understand mechanism and calculations of various types of hydraulic pumps, motors, actuators.
- To understand workings of different types of direction, pressure, flow valves, and accumulators.
- To design and draw commonly used simple hydraulic circuits.
- To understand workings of various components in pneumatic and electro-pneumatic systems.
- To design and draw commonly used simple pneumatic circuits.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Explain mechanism and calculations of various types of hydraulic pumps, motors, actuators.
- Describe workings of different types of direction, pressure, flow valves, and accumulators.
- Design and draw commonly used simple hydraulic circuits.
- Describe workings of various components in pneumatic and electro-pneumatic systems.
- Design and draw commonly used simple pneumatic circuits.

UNIT-I

Introduction to fluid power, applications of fluid power, Hydraulic fluids, Hydraulic fluid properties, Hydraulic symbols.

Hydraulic Pumps: Pumping Theory – Gear, vane, piston pumps – hydraulic Pump performance **Hydraulic Motors** – Gear, vane, piston motors –Hydraulic motor performance.

Hydraulic Actuators – Types, construction, Mechanics of hydraulic cylinder loadings – 1^{st}, 2^{nd}, 3^{rd} class lever systems,

UNIT-II

Direction control valves: Check valve, shuttle valve, two-way, three-way, four-way valves, Rotary valve, Spool type, sliding spool type valves.

Pressure control valves: pressure relief valve, pressure reducing valve, unloading valve, counterbalance valve, pressure sequence valve.

Flow control valve: Needle valve, pressure compensated valves, Non-pressure compensated valves.

Accumulators: Function, types, size, applications and circuits, accessories.

Intensifiers – Applications, circuit.

UNIT-III

Design and Drawing of Hydraulic Circuits: Hydraulic clamping circuits in machine tools, speed control in one direction-meter-in & meter-out circuits, Speed control in both directions, Regenerative circuit, standard manifold for dual speed, plastic injection molding machine circuit, hydraulic press application.

UNIT-IV

Pneumatic and Electro-Pneumatic Systems: Introduction to Pneumatic systems, Pneumatic symbols, Air Compressors – types, specifications, Air preparation system.

Air control valves–pressure regulator, Check valve, Shuttle valve, Directional Control Two-Way valve, Three-Way and Four –Way Directional Control Valves.

Pneumatic actuators-pneumatic cylinders, pneumatic rotary actuator.

Basic electrical components, Pilot operated solenoid valve, PE converter, PLC applications in fluid power.

UNIT-V

Design and Drawing of Pneumatic Systems: Control air, signal air, Numbering of valves, Basic pneumatic circuits, speed control circuits, Application of logic valves –AND, OR Gates, application of time delay valves, position and pressure sensing, pressure sequence valve, pneumatic circuit analysis.

TEXT BOOKS:

1. Fluid Power with Applications, Anthony Esposito, Pearson Publishers.
2. Introduction to Hydraulics and Pneumatics, S. Ilango, V. Soundararajan, PHI Publishers.

REFERENCE BOOKS:

1. Fluid Power Control, NPTEL Webcourse Lectures.
2. Fluid Power Transmission and Control, A. Alavudeen, K.H. Syed, N. Shanmugam, Charotar Pub.
3. Oil Hydraulic Systems, S.R. Majumdar, McGraw Hill Pub.
4. Pneumatic Systems: Principles and Maintenance, S.R. Majumdar, McGraw Hill Pub.

IV Year B. Tech., I Semester

HEAT TRANSFER

Subject Code: 16ME4027 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To provide knowledge on modes of heat transfer like conduction, convection and radiation.
- To provide knowledge on different coordinate systems used in heat transfer.
- To provide knowledge on emissivity and absorptivity.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Derive general heat conduction equation in cartesian, cylindrical and spherical coordinates. Determine heat conducted through both simple and composite plane walls, cylinders and spheres.
- Determine heat conducted through simple shapes with internal heat generation, and through various kinds of fins. Determine transient unsteady temperature distribution for simple shapes using Heisler charts.
- Determine heat convected in forced convection of both external and internal flows, laminar and turbulent flows.
- Determine heat convected in natural convection for flow over a plate. Understand and solve problems in pool boiling and condensation. Perform heat exchanger analysis and design using LMTD and NTU methods.
- Apply various radiation laws, compute shape factors for simple configurations, use electrical analogy for radiation problems and design radiation shields.

UNIT-I

Modes of Heat Transfer: Basic concepts, Mechanisms of heat transfer: Conduction, Convection, Radiation.

Conduction-I: Fourier law of conduction – General differential equation of heat conduction in cartesian and cylindrical coordinates — Conduction through plane walls, cylinders and spherical systems – Composite systems.

UNIT-II

Conduction-II: Conduction with internal heat generation – Extended surfaces – Unsteady heat conduction - Lumped analysis – Use of Heislers chart.

UNIT-III

Forced Convection: Basic Concepts, Heat transfer coefficients, Types of convection – Dimensional analysis – Boundary layer concept – Forced convection of external flows, flow over plates, cylinders and spheres – Internal flows, Laminar, Turbulent, Combined laminar and turbulent – Flow over bank of tubes.

UNIT-IV

Natural Convection: Free convection, Flow over Vertical plate, Horizontal plate, Inclined plate, Cylinders and Spheres.

Boiling & Condensation: Boiling, Pool boiling, Regimes of pool boiling – Flow boiling. Nusselts theory of condensation – Correlations in boiling and condensation

Heat Exchangers: Types of heat exchangers – Heat exchanger analysis: LMTD method, NTU Effectiveness method – Overall heat transfer coefficient, Fouling factor.

UNIT-V

Radiation: Basic concepts, Laws of radiation: Stefan-Boltzman law, Kirchoffs law – Black body radiation, Grey body radiation – Shape factor algebra, Electrical analogy – Radiation Shields.

TEXT BOOKS:

1. Fundamentals of Engineering Heat and Mass Transfer, R.C. Sachdeva, New Age Pub.
2. Heat Transfer, Yunus A Cengel, McGraw Hill Pub
3. Heat Transfer, R.K. Rajput, S. Chand Pub.
4. Heat Transfer Databook, C.P. Kothandaraman, New Age Pub. (**Permitted for Exams)**

REFERENCE BOOKS:

1. Heat Transfer, P.K. Nag, Tata McGraw Hill Pub.
2. A Course in Heat & Mass Transfer, S.C. Arora, S. Domkundwar, A.V. Domkundwar, Dhanpat Rai Pub.
3. Heat Transfer, J.P. Holman, McGraw Hill Pub.

IV Year B. Tech., I Semester

FINITE ELEMENT METHODS

Subject Code: 16ME4028 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To understand the fundamental relations of elasticity, basic concepts of variational approach and domain discretization.
- To derive element stiffness matrices for various finite element types and assemble the global stiffness matrix for calculating the nodal displacements, reaction forces, stresses and strains.
- To develop proficiency in the application of the finite element method to solve one dimensional and two dimensional problems.
- To obtain the natural frequencies and mode shapes for bars and beams using FEM.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Explain fundamental relations of elasticity, concepts of variational principles, basics of domain discretization using different types of elements, interpolation functions.
- Derive element stiffness matrices, assemble them for global stiffness matrix and solve system of linear equations to find displacements, reaction forces, strains and stresses.
- Analyze plane trusses and solve plane stress, plane strain problems using 2D CST elements.
- Analyze beams and 2D isoparametric problems with internal nodes using numerical integration procedures.
- Evaluate Eigen values and Eigen vectors for both consistent and lumped mass matrix approaches for1D bar and beam elements.

UNIT-I

Introduction to finite element method, stress and equilibrium, strain – displacement relations, stress – strain relations, plane stress and plane strain conditions, Basic Steps in FEM Formulation, General Applicability of the Method; Variational Functional, Rayleigh-Ritz method, concept of potential energy, Derivation of Elemental Equations, Imposition of Boundary Conditions, Solution of the Equations.

UNIT- II

Finite Element Modeling: Discretization of domain, element shapes, node numbering, Coordinates and shape functions, assembly of stiffness matrix and load vector, band width, Potential energy approach, Finite element equations, elimination and penalty methods, stress, strain and support reaction calculations, Applications to 1-D bar elements and Temperature effects, Applications to Quadratic bar elements.

UNIT- III

Plane Trusses: Finite element modeling - Discretization of domain, local and global numbering scheme, Finite element equations and solution.

Two-dimensional Problems Using Constant Strain Triangles: Introduction, Finite element modeling, constant strain triangle, problem modeling and boundary conditions.

UNIT-IV

Analysis of Beams: Introduction, Finite element formulation using 2D Hermite beam element, derivation of stiffness matrices, derivation of load vector for concentrated and UDL, Boundary considerations, Shear force and bending moment calculations.

Two-dimensional Isoparametric Elements and Numerical Integration: Introduction to Higher order and isoparametric elements - four-noded quadrilateral, Numerical integration & Gaussian Quadrature.

UNIT-V

Dynamic Considerations: Introduction, formulation, element consistent & lumped mass matrices, evaluation of Eigen values and Eigen vectors, Mode Shapes, Free Vibration Problems of 1D stepped bar and 2D beam with reduced matrix of order 2x2.

TEXT BOOKS:

1. Introduction to Finite Elements in Engineering, T.R. Chandraputla, Ashok. D. Belegundu, Pearson Education Pub.
2. Textbook of Finite Element Analysis, P. Seshu, Prentice-Hall Pub.
3. Finite Element Methods, Basic Concepts and Applications, Chennakesava R Alavala, PHI Pub.

REFERENCE BOOKS:

1. Concepts and Applications of Finite Element Analysis, Robert D. Cook, Wiley Pub.
2. The Finite Element Methods in Engineering, S.S. Rao, Pergamon Pub.
3. An Introduction to the Finite element method, J.N. Reddy, Tata McGraw Hill Pub.
4. Finite Element Method and Computational Structural Dynamics, Manish Shrikhande, PHI Pub.

IV Year B. Tech., I Semester

OPERATIONS RESEARCH

Subject Code: 16ME4029 **Internal Marks: 30**
Credits: 3.5 **External Marks: 70**

COURSE OBJECTIVES:

- To understand linear programming problem formulation, graphical and simplex solutions.
- To provide knowledge about the formulation of optimal solution at transportation, assignment and queuing problems.
- To provide knowledge on Project network, CPM and PERT network.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Formulate, solve linear programming problem using graphical and simplex method.
- Solve transportation and assignment problems.
- Solve sequencing problems with n-jobs & m-machines. Compute queue performance characteristics for various queuing models.
- Solve replacement and game theory problems by applying standard solution methods.
- Determine critical path for a given network using PERT and CPM techniques.

UNIT-I

Introduction to or: History, Definition, OR models, OR Techniques, Phases of implementing OR in practice.

Linear Programming: Introduction to linear programming problem formulation, Graphical solution, Simplex method, artificial variables techniques, Unrestricted variables, Degeneracy.

UNIT-II

Transportation Problem: Formulation, Optimal solution, unbalanced transportation problems, Degeneracy.

Assignment Problem: Formulation, Optimal solution, Traveling salesman problem.

UNIT-III

Sequencing: Introduction, Problems with *n* jobs and two machines, Optimal sequence algorithm, Problems with *n* jobs and three machines, Problems with n- jobs and m- machines (graphic solution.

Queuing Theory: Characteristics of Queuing models, Classification, (M/M/1:FCFS/∞/∞), (M/M/1:FCFS/N/∞), (M/M/C:FCFS/∞/∞) models.

UNIT-IV

Replacement Models: Introduction, Replacement of items that deteriorate with time, Value of money unchanging and changing, Replacement of items that fail completely.

Theory of Games: Introduction, Two-person Zero-sum games, Maximin - Minimax principle, Games without saddle points, Mixed Strategies, m x 2 & 2 x n games, Graphical solutions, Dominance property, Algebraic solutions to rectangular games.

UNIT-V

Network Models: Project network, CPM and PERT, Critical path scheduling, Cost considerations in project scheduling.

TEXT BOOKS:

1. Introduction to Operations Research by Prem Kumar Gupta, D.S. Hira, S. Chand Publishers
2. Operations Research, S.D.Sharma, Kedarnath, Ramnath & Co Pub.

REFERENCES BOOKS:

1. Operations Research, J.K. Sharma, Laxmi Pub.
2. Operations Research by P. Rama Murthy, New Age Pub.
3. CPM & PERT, L.S. Srinath, Affiliated East West Press Pub.

INDUSTRIAL AUTOMATION
(Elective - II)

Subject Code : 16ME4030 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To explain the general functions, types and strategies of automation.
- To classify the material transport systems in production and perform analysis of the transfer lines used in production.
- To apply line balancing techniques to improve the line balance and line efficiency.
- To distinguish various material handling and storage systems and explain their functions.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Explain the types and strategies of automation.
- Determine the problems and assess the performance of automated flow lines in manufacturing domain.
- Identify the bottlenecks occurred in production systems and will be able to balance the production line.
- Distinguish between different material handling systems and employ suitable material handling system. Explain various automated storage and retrieval systems.
- Discuss computer aided inspection methods including CMM and machine vision. Explain BPRE and CE methodologies.

UNIT-I

Fundamentals of Automation: Introduction to automation – Definition – Types of automation & Layouts – Reasons of automation – Automation strategies – Hydraulic & Pneumatic components used in automation – Automation in Machine tools.

UNIT-II

Automated Production Lines & Analysis: Introduction – Classification of transfer lines – Work part transfer mechanisms – Work part transfer systems – Mechanical buffer storage – Control functions – Fabrication & design considerations – Analysis of transfer lines: with and without storage buffer – Terminology used in transfer line analysis – Problems – Partial automation – Implementation.

UNIT-III

Manual & Automated Assembly Systems: Assembly systems: Introduction – Types – Manual assembly systems – Automated assembly systems – Assembly processes – Line balancing – Methods of line balancing Algorithms – Line balancing improving techniques – Flexible assembly lines.

UNIT-IV

Automated Material Handling Systems: Introduction – Principles of material handling – Types of MHS – Design & Analysis of MHS – Conveyor Systems – Types – Applications of MHS – Automated Guided Vehicle systems.

Automated Storage Systems: Introduction to storage systems – Applications of storage systems – Types of Storage systems – AS/RS – Types & Applications – Identification & Tracking Systems – Bar Codes – Types.

UNIT-V

Inspection Methods: Introduction– Classification – Machine Vision - Coordinate Measuring Machine.

Introduction to Lean and Agile manufacturing.

TEXT BOOKS:

1. Automation, Production Systems & Computer integrated Manufacturing Systems, M P Groover, PHI Publications.
2. CAD/CAM/CIM, Radhakrishnan, New Age International(P) Ltd. Publications

REFERENCE BOOKS:

1. Automation,W. Buekinsham, PHI Publications
2. Principles of CAD/CAM, P N Rao, Tata McGraw Hill Publications

STATISTICAL QUALITY CONTROL
(Elective - II)

Subject Code : 16ME4031 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To understand the concept of quality and its importance.
- To understand the concept of SQC.
- To understand process control charts for Attributes and Variables & process capability and its measurement
- To understand acceptance sampling procedure and their application.
- To understand the concept of Six Sigma and its application.

COURSE OUTCOMES:

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

- Understand the philosophy and basic concepts of quality improvement.
- Demonstrate the ability to use the methods of statistical process control.
- Demonstrate the ability to design, use, and interpret control charts for variables.
- Demonstrate the ability to design, use, and interpret control charts for attributes.
- Perform analysis of process capability and measurement system capability & Six sigma implementation.

UNIT-I

Introduction to Quality and Quality Control: Meaning of Quality, Quality costs, Need for quality improvement, Introduction to Quality Control.

Statistical Description of Quality: Random Variable, Continuous Random Variable, Normal Distribution Practical Example, Discrete Random Variable, Binomial Distribution and Poisson's Distribution.

UNIT-II

Statistical Inferences on Quality: Terminologies and Definitions, Sampling Technique, Point Estimation of Population Parameters, Interval Estimation of Population Parameters, Testing of Hypothesis.

Shewhart Control Charts: Introduction, Basics of Shewhart Control Charts, Shewhart Control Charts for Variables and Shewhart Control Charts for Attributes.

UNIT-III

Process Capability Analysis: Introduction, Techniques for Process Capability Analysis, Measures of Process Capability Analysis, Inferential Properties of Process Capability Ratios, Calculation of capability indices.

UNIT-IV

Non-Shewhart Control Charts: Introduction, Cusum Control Chart, MA Control Chart, EWMA Control Chart.

Acceptance Sampling Techniques: Introduction, Acceptance Sampling of Attributes, Acceptance Sampling of Variables.

UNIT-V

Six Sigma and its Applications: Concept of Six Sigma, Six Sigma Quality, Themes of Six Sigma, Implementation of Six Sigma, Process of Problem Solving Using Six Sigma, Case Studies.

TEXT BOOKS:

1. Montgomery, Douglas C., "Introduction to Statistical Quality Control", Sixth Edition. John Wiley and Sons, Inc.
2. Monohar Mahajan., "Statistical Quality Control", Dhanpat Rai & Sons,

REFERENCE BOOKS:

1. John.S. Oakland., "Statistical process control", 5th edition, Elsevier.
2. Grant, Eugene.L., "Statistical Quality Control", McGraw-Hill.
3. Gupta. R.C., "Statistical Quality control", Khanna Publishers.

DESIGN FOR MANUFACTURING AND ASSEMBLY
(Elective - II)

Subject Code : 16ME4032 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To introduce the concept and application for design for manufacturing and assembly to practicing designers and manufacturing engineers as well as design students
- To discuss various fundamentals of assembly and design recommendations for product development

COURSE OUTCOMES:

On completion of this course, students should be able to

- Understand constraints of manufacturing processes that limit design possibilities. Describe general design rules for manufacturability and suitable materials.
- Describe design recommendations for machined and casted parts.
- Describe design recommendations for various processes like welding, forging, extrusion, sheet metal, punching, blanking, bending and deep drawing.
- Apply principles of DFA to increase manufacturing efficiency in assembly processes and automatic assembly transfer systems.
- Apply DFA principles for manual assemblies.

UNIT-I

Introduction: Design philosophy steps in Design process - General Design rules for manufacturability - basic principles of designing for economical production - creativity in design.

Materials: Selection of Materials for design - Developments in Material technology - Criteria for material selection - Material selection interrelationship with process selection process selection charts.

UNIT-II

Machining Process: 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.

Metal Casting: Appraisal of various casting processes, selection of casting process, - general design considerations for casting - casting tolerances - use of solidification simulation in casting design - product design rules for sand casting.

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.

Forging: Design factors for Forging - Closed dies forging design - parting lines of die drop forging die design - general design recommendations..

UNIT-IV

Extrusion & Sheet Metal Work: Design guidelines for extruded sections - design principles for Punching, Blanking, Bending, Deep Drawing - Keeler Goodman Forming Line Diagram - Component Design for Blanking

Assemble Advantages: Development of the assemble process, choice of assemble method assemble advantages social effects of automation.

UNIT-V

Design of Manual Assembly: Design for assembly fits in the design process, general design guidelines for manual assembly, development of the systematic DFA methodology, assembly efficiency, classification system for manual handling, classification system for manual insertion and fastening, effect of part symmetry on handling time, effect of part thickness and size on handling time, effect of weight on handling time, parts requiring two hands for manipulation, effects of combinations of factors, effect of symmetry effect of chamfer design on insertion operations, estimation of insertion time.

TEXT BOOKS:

1. Assembly Automation and Product Design, Geoffrey Boothroyd, Marcel Dekker Pub., NY.
2. Engineering Design - Material & Processing Approach, George E. Deiter, McGraw Hill Pub.

REFERENCE BOOKS:

1. Handbook of Product Design, Geoffrey Boothroyd, Marcel and Dekker Pub., New York.
2. Computer Aided Assembly, A Delbainbre.
3. Product Design for Manufacturing and Assembly, Geoffrey Boothroyd, Peter Dewhurst, Winston Ansthony Knight, CRC Press
4. Engineering Design, George E. Dieter, Linda C. Schmidt, McGraw Hill Pub.
5. Industrial Design, Materials and Manufacture Guide, J. Lesko, John Willy and Sons Pub.

COMPUTATIONAL FLUID DYNAMICS
(Elective - II)

Subject Code : 16ME4033 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To understand the basic numerical methods to solve fluid dynamics and heat transfer problems.
- To describe finite difference method and grid generation techniques.
- To explain governing equations of fluid flow and to classify fluid flows.
- To solve transient one dimensional and two dimensional heat conduction problems.
- To explain finite volume method and describe approximations for surface and volume integrals.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Explain the differential equations for flow phenomena and numerical methods for their solution.
- Critically analyze different mathematical models and computational methods for fluid flow and heat transfer simulations.
- Solve computational problems related to fluid flows and heat transfer.
- Analyze the accuracy of a numerical solution by comparison to known solutions of simple test problems and by mesh refinement studies.
- Evaluate forces in both internal and external flows.

UNIT-I

Introduction: History and Philosophy of computational fluid dynamics, CFD as a design and research tool, Applications of CFD in engineering, Programming fundamentals, MATLAB programming, Numerical Methods

Governing equations of fluid dynamics: Models of the flow, The substantial derivative, Physical meaning of the divergence of velocity, The continuity equation, The momentum equation, The energy equation, Navier-Stokes equations for viscous flow, Euler equations for inviscid flow, Physical boundary conditions, Forms of the governing equations suited for CFD, Conservation form of the equations.

UNIT-II

Mathematical behavior of partial differential equations: Classification of quasi-linear partial differential equations, Methods of determining the classification, General behavior of Hyperbolic, Parabolic and Elliptic equations.

Basic aspects of discretization: Introduction to finite differences, Finite difference equations using Taylor series expansion and polynomials, Explicit and implicit approaches, Uniform and unequally spaced grid points.

UNIT-III

Grids with appropriate transformation: General transformation of the equations, Metrics and Jacobians, The transformed governing equations of the CFD, Boundary fitted coordinate systems, Algebraic and elliptic grid generation techniques, Adaptive grids.

Parabolic partial differential equations: Finite difference formulations, Explicit methods – FTCS, Richardson and DuFort-Frankel methods, Implicit methods – Laasonen and Crank-Nicolson methods.

UNIT-IV

Stability analysis: Discrete Perturbation Stability analysis, von Neumann Stability analysis, Error analysis, Modified equations, Artificial dissipation and dispersion.

Elliptic equations: Finite difference formulation, solution algorithms: Jacobi-iteration method, Gauss-Siedel iteration method

UNIT-V

Hyperbolic equations: Explicit and implicit finite difference formulations

Scalar representation of navier-stokes equations: Equations of fluid motion, numerical algorithms: FTCS explicit, FTBCS explicit, Dufort-Frankel explicit, Maccormack explicit and implicit, BTCS and BTBCS implicit algorithms, applications.

TEXT BOOKS:

1. Anderson, J.D.(Jr), *Computational Fluid Dynamics*, McGraw-Hill Book Company, 1995.
2. Anderson, D.A., Tannehill, J.C., and Pletcher, R.H., *Computational Fluid Mechanics and Heat Transfer*, McGraw Hill Book Company, 2002.
3. Numerical Heat Transfer and Fluid Flow by Suhas V. Patankar., CRC Press 2017.

REFERENCE BOOKS:

1. Chung, T.J., *Computational Fluid Dynamics*, Cambridge University Press, 2003.
2. Hoffman, K.A., and Chiang, S.T., *Computational Fluid Dynamics*, Vol. I, II and III, Engineering Education System, Kansas, USA, 2000.

IV Year B. Tech., I Semester

HEAT TRANSFER LAB

Subject Code : 16ME4113 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

The course content enables students to:

- Impart experimental experience in Heat Transfer Lab those support Mechanical Engineering.
- Provide students with an opportunity of direct experience of doing Heat Transfer Lab calculation so that they can understand the base of the principles and able to make a critical assessment of industrial environment.
- Teach the students fundamentals in element of Heat Transfer & its applications. So as to identify, formulate and solve the problems of Heat Transfer device designs.
- Develop an idea about how to measure heat transfer coefficients/constant like h, emissivity, Stefan Boltzmann constants for devices like metal rod, lagged pipe, etc.,
- Encourage the students to understand importance energy conversation and make them to experience with practical applications in Heat Transfer Lab.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Evaluate heat transfer through lagged pipe, Insulating powder.
- Determine the Thermal conductivity of a given metal Rod and overall heat transfer coefficient for a composite slab.
- To Measure the Heat transfer coefficient for Pin Fin, Forced convection, Natural Convection, and Drop and Film wise condensation.
- Determine heat transfer in parallel-flow and counter-flow heat exchanger.
- Determine radiation heat transfer using Stefan-Boltzman and emissivity apparatus.

List of Experiments:

1. Composite Slab Apparatus – Overall heat transfer co-efficient.
2. Heat transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere
4. Thermal Conductivity of given metal rod.
5. Heat transfer in pin-fin
6. Experiment on Transient Heat Conduction
7. Heat transfer in forced convection apparatus.
8. Heat transfer in natural convection
9. Parallel and counter flow heat exchanger.
10. Emissivity apparatus.
11. Stefan- Boltzman Apparatus.
12. Heat transfer in drop and film wise condensation.
13. Critical Heat flux apparatus.
14. Study of heat pipe and its demonstration.

IV Year B. Tech., I Semester

FEA LAB

Subject Code : 16ME4114 **Internal Marks: 25**
Credits: 2.0 **External Marks: 50**

COURSE OBJECTIVES:

- To perform finite element analysis on various components and structural elements and find the deflections and stresses for different loading conditions.
- To calculate the natural frequencies and forced response for 2D and 3D structures using FEA.
- To conduct heat transfer analysis and determine the temperature distribution in a composite slab and fin.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Determine deflections and stresses in 1D & 2D bars, trusses, and beams; and in 2D plane stress, plane strain, models by conducting static FE analysis.
- Determine deflections and stresses in 3D bodies, 3D shell components by conducting static FE analysis.
- Estimate natural frequencies and mode shapes, harmonic response of 2D beams using FEA.
- Conduct steady state thermal analysis on 2D and 3D models..

1. Introduction to finite element analysis packages ANSYS or NASTRAN

a. Static Analysis of beams and trusses.
b. Static Analysis of 2D and 3D models
c. Modal Analysis of 2D and 3D models
d. Harmonic Analysis of 2D and 3D models
e. Heat Transfer analysis of composite slab and fin.

LIST OF EXPERIMENTS

1. Static Analysis of a 1-D Bar. **[CO 1]**
2. Static Analysis of a 2-D link/truss. **[CO 1]**
3. Static Analysis of a Cantilever Beam. **[CO 1]**
4. Static Analysis of a Simple Supported Beam with UDL. **[CO 1]**
5. Static Analysis of Simply Supported Beam with Point Load. **[CO 1]**
6. Structural Analysis of Corner Angle Bracket. **[CO 1]**
7. Analysis of Simply Supported Beam in Workbench. **[CO 2]**
8. Static Analysis of an Allen wrench. **[CO 2]**
9. Modal Analysis of an Airplane Wing. **[CO 3]**
10. Thermal Analysis of Composite Slab. **[CO 4]**
11. Thermal Analysis of Circular Fin. **[CO 4]**

INDUSTRIAL HYDRAULICS AND PNEUMATICS LAB

Subject Code : 16ME4115 **Internal Marks: 25**
Credits: 1.5 **External Marks: 50**

COURSE OBJECTIVES:

- To study hydraulic meter-in, meter-out, bleed-off, transverse and feed circuits.
- To study hydraulic speed, pressure and flow control along with hydraulic valves and actuators.
- To study pneumatic single and double acting cylinders, 5/2, 3/2 way valves.
- To study pneumatic AND, OR logical circuits and pneumatic control system.
- To model direct and indirect control of single and double acting cylinder.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Design hydraulic actuator speed control circuit.
- Design hydraulic single and double acting cylinder circuits.
- Design hydraulic bleed-off, sequence valve, transverse and feed circuits.
- Design pneumatic single and double acting cylinder circuits.
- Work with pneumatic motor, Non return valve, shuttle valve, 5/2, 3/2 way valves.

LIST OF EXPERIMENTS:

Experiments using Basic Hydraulic Trainer Kit

1. Study of Hydraulic Meter-in & Meter-out & Bleed-off Circuits
2. Study of Hydraulic Transverse & Feed Circuits
3. Study of Hydraulic Speed Control, Pressure Control and Flow Control
4. Study of Hydraulic Valves, Hydraulic Actuators, Hydraulic Power Pack

Experiments using Basic Pneumatic Trainer Kit

5. Study of Pneumatic Cylinders: Single Acting, Double Acting
6. Study of Different Pneumatic circuits such as AND-OR Logical circuits.
7. Study of Pneumatic Control System
8. Study of construction & operation of pneumatic equipments such as 5/2 way valve, 3/2 way valve, pneumatic motor.

Experiments using Automation Studio Software

9. Basic circuit for direct control of a single acting cylinder.
10. Basic circuit for indirect control of a single acting cylinder.
11. Basic circuit for direct control of a double acting cylinder.
12. Basic circuit for indirect control of a single acting cylinder.

IV Year B. Tech., I Semester

EMPLOYABILITY SKILLS

Subject Code : 16HS4203 **Internal Marks: 75**
Credits: 1.5

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PROJECT MANAGEMENT
(Open Elective - V)

Subject Code : 16OE4051 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- The objective of this course is to lay an important foundation to students in managing projects with a special focus on every phase such as project planning, execution, monitoring and evaluation

COURSE OUTCOMES:

On completion of this course, students should be able to

- Understand the concept of Project Planning.
- Understanding key principles and techniques for evaluating capital expenditure proposals.
- To understand Financing of Projects.
- To Understand and assist in implementation of Projects.
- To understand and evaluate current and future trends in project management.

UNIT – I

Project Planning and Formation: Project meaning and concepts **–** Overview of total Project Management Cycle – Classification of Projects and Project Formation –Strategic Planning and Capital budgeting – Generation and Screening of Project Ideas – Generation of Ideas – Monitoring the Environment – Corporate Appraisal – Tools for Identify Investment opportunities – Scouting for Project Ideas – Preliminary Screening – Project Rating Index.

UNIT - II

Project analysis and Selection: Issues in Project Analysis - **Market and Demand Analysis –** conduct of Market Survey, Demand forecasting. **Technical analysis** – Manufacturing Process Technology, Material Inputs and Utilities, Plant Capacity, Location and Site – Machineries and Equipments, Structures and Civil Works, Environment Aspects. **Financial Estimations and projections** – Cost of Projects, Means of Finance – Estimates of sales and Productions, Working capital Requirement and its financing, Profitability Projections, Projected Cash flow Statement, Projected Balance Sheet –Time Value of Money. **Selection Criteria** – Net Present Value, Benefit Cost Ratio, Internal Rate of return, Urgency, Payback Period, Accounting Rate of Return, Assessment of Various Methods, Investment Evaluation in Practice. Project Selection Under Risk – Risk Analysis in Practice, How Financial Institutions Analyse Risk. Social Cost Benefit Analysis, Rationale for SCBA – UNIDO Approach.

UNIT – III

Project Financing and Contracts: Financing of Projects **–** Capital Structure, Working Capital**,** Financing Infrastructure Projects, Public Private Partnership, Venture Capital **-** Private Equity, Credit Risk Management. **Contracts** - Definitions of contract and Contractor. Elements of contracts, offer acceptance and consideration, Valid Contracts, Department execution of work – Master Roll Form 21 – Piece work Agreement form – Work order. Types of Contracts – Lump sum Contract, Lump sum and Schedule contract, Item rate Contract, Sub Contracts, Joint ventures, Arbitration Disputes and claim Settlement. **Tender** - Contract system with tenders, Quotation, Earnest Money, Security Money – Tender Notice, Tender Form, Bidding – Procedure – Irregularities in Bidding – award

UNIT – IV

Project Implementation: Forms of Project organisation – Human Aspects – of project Management – Pre requisites for successful project implementation – Project Monitoring and Controlling – Parameters for monitoring and Control – Process of Monitoring –Network Techniques for Project Management **–** Development of Project Network - Time Estimation **–**Determination of Critical path **–** Scheduling when Resources are Limited - PERT Model **–** CPM Model **–** Network Cost System.

UNIT – V

Project Completion, Evaluation and Management: Completion of project and Managing Transition Period – Closure of Contracts – Completion of Assets of Projects – Post Project Evaluation and Completion Audit Report. **Management** – Scope of the Construction Management, Significance of Construction management, Concept of Scientific Management, Qualities of Manager, Organisation – Authority, Policy, Recruitment process and Training Development of Personal Department, Labour problems, Labour legislation in India, Workmen compensation Act 1923, and subsequent amendments, Minimum Wages Act 1948.

TEXT BOOKS:

1. Narendra Singh, Project management and Control, Himalaya Publishing House, Mumbai 5th Edition
2. Prasanna Chandra: Projects, TMH, New Delhi, 2014, 8th Edition.
3. K.Nagarajan: Project Management, New Age International, New Delhi, 2010
4. PERT and CPM – L.S Srikanth
5. PERT and CPM – Punmia
6. Construction Management and Planning – Guna and Sen Gupta, B.

REFERENCES BOOKS:

1. Gray, Larson: Project Management-Tata McGraw Hill-2015
2. Jeffery K.Pinto: Project Management-Pearson Education-2015
3. Enzo Frigenti: Project Management-Kogan, 2015
4. R. Panneerselvam, P. Senthilkumar: Project Management, PHI, 2015
5. Guide to Project Management Body of Knowledge (PMBOK® Guide) of Project Management Institute, USA.

GEOGRAPHICAL INFORMATION SYSTEMS
(Open Elective - V)

Subject Code : 16OE4052 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:
Students will have

- To know about the fundamental concepts of Map
- To know about the basic concepts of Geographical Information System.
- To study about the concepts of DBMS in GIS
- To study about the spatial data analysis and models in GIS
- To know the various applications of GIS

COURSE OUTCOMES:
The Students will be able to

- Understand the fundamental concepts of Map
- Understand the basic concepts of Geographical Information System.
- Apply the concepts of DBMS in GIS
- Analyze the spatial data and modeling in GIS
- Apply GIS in various applications.

UNIT I
Fundamental Concepts of Map: Introduction; Classification of Maps; Scale of maps; Spatial referencing System; Map Projections- Classification; commonly used map projections and their comparisons- Grid systems.

UNIT II
Basics Concepts of Geographical information System: Introduction to GIS; components of a GIS; Geo spatial Data: Spatial Data- Attribute data-Joining Spatial and attribute data; GIS Operations: Spatial Data Input – Attribute data Management -Data display Data Exploration – Data Analysis.

UNIT III
Data Base Management Systems: Introduction - Functions of DBMS; Components of DBMS-GIS Data file Management- Simple List, Ordered Sequential Files; Data Base Models- Hierarchical Database Models, Network Systems.

UNIT IV
Spatial Data Modeling: Introduction; stages of GIS data modeling; Graphical representation of Raster data, Graphical representation of Vector data; Raster GIS Model, Vector GIS Model.

UNIT V
Application of GIS: Land use and Land cover, agriculture, forestry, geology, urban applications, flood zone delineation and mapping.

TEXT BOOKS:

1. Burrough P.A. and Rachel A. McDonell, Principles of Geographical Information Systems, Oxford Publication, 2004.
2. Remote Sensing and Geographical Information systems by M.Anji Reddy, B.S.Publications.

REFERENCES:

1. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. GIS by Kang – Tsung Chang, TMH Publications & Co.

IV Year B. Tech., I Semester

POWER QUALITY MANAGEMENT
(Open Elective - V)

Subject Code : 16OE4053 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- Introduction to custom power and study of factors governing power quality. Study of Power factor compensation techniques with power electronic devices and active Harmonic filtering. Introduction to measuring & solving power quality problems and particular standards relating to them**.**

COURSE OUTCOMES:

On completion of this course, students should be able to

- Examine different power quality issues and prepared to take up prospective projects assignment.
- Describe power distribution protection techniques and its impact on voltage quality.
- Plan to trained the work for improvement and betterment of power quality.
- Distinguish basic harmonic phenomena, methods for dealing with harmonic distortion.
- Read theoretically and practically for monitoring of power quality.

UNIT I:

Introduction To Electrical Power Quality: Definition of Power Quality, Power Quality Issues, Power Quality v/s Equipment Immunity, Electric Power Quality Standards.

UNIT II:

Power Frequency Disturbances: Common Power Frequency Disturbances, Voltage Sag, Isolation Transformers, Voltage Regulators.

UNIT III:

Electrical Transients: Types and Causes of Transients, Atmospheric Causes, Switching Loads On or Off, Interruption of Fault Circuits, Capacitor Bank Switching, Power Factor Correction.

UNIT IV:

Harmonics: Definition of Harmonics Causes of Voltage and Current Harmonics. Individual and Total Harmonic Distortion, Effect of Harmonics on Power System Devices, Harmonic Current Mitigation, power factor.

UNIT- V:

Measuring & Solving Power Quality Problems: Power Quality Measurement Devices, Harmonic Analyzers, Oscilloscopes, Data Loggers and Chart Recorders, True RMS Meters, Power Quality Measurements.

TEXT BOOKS:

1. R.C. Dugan, M.F. McGranaghan and H.W. Beaty, Electric Power Systems Quality. New York: McGraw-Hill.1996.
2. C. Sankaran, Power Quality. CRC, 2002. 5. J. Arrillaga, D.A Bradely and P.S. Bodger, Power System Harmonics. New York: Wiley, 1985.

REFERENCE BOOKS:

1. G.T. Heydt, Electric Power Quality. 2nd ed. West Lafayette, IN: Stars in a Circle, 1994.
2. A Ghosh, G. Ledwich, Power Quality Enhancement Using Custom Power Devices. Kluwer Academic, 2002.

BASICS OF MOBILE COMMUNICATIONS
(Open Elective - V)

Subject Code : 16OE4055 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To provide the fundamentals of cellular mobile communications those are important to any mobile communication system.
- To explain different frequency management and channel assignment techniques. This course also deals with handoff, dropped calls and cell splitting.
- To describe cell coverage for signal and traffic, signal reflections in various terrains, various cell sites and mobile antennas and their analysis.
- To introduce cellular mobile radio systems. It covers various types of interferences in mobile radio environment.
- To provide the student with an understanding of advanced multiple access techniques and digital cellular systems (GSM, TDMA, CDMA, SDMA).

COURSE OUTCOMES:

At the end of the course student will be able to

- Identify the limitations of conventional mobile telephone system, Understand the operation of cellular system.
- Analyze the concept of frequency Reuse channels; deduce the Co-channel interference reduction factor.
- Design of Antenna system to reduce Co-channel interference.
- Analyze frequency management and channel assignment strategies.
- Define Handoff, Distinguish types of handoffs and evaluation of dropped call rates.

UNIT - I

Cellular Mobile Systems: limitations of conventional mobile telephone system, **Performance** criteria, Types of cells, Operation of cellular systems, frequency reuse.

Types of Interferences , co-channel interference reduction factor, Desired C/I calculation in an Omni directional Antenna system.

UNIT - II

Mobile Signal Propagation: Types of propagation models, fading in propagation, Signal reflections in flat and hilly terrains, foliage loss.

UNIT - III

Cell Site Antennas: Omni and Non-Omni directional antennas, Directional antennas, Diversity antenna types, Types of cell site antennas.

Handoff Mechanism:, Types of handoff, Types of handoff initiations, and, Dropped call rates and estimation.

UNIT - IV

Frequency Management And Channel Assignment: Numbering, Grouping and, Channel assignments techniques, Channel sharing and borrowing.

UNIT - V

Digital Cellular Data Access: GSM architecture, TDMA, FDMA, CDMA.

TEXT BOOKS:

1. Mobile Cellular Telecommunications – W.C.Y. Lee, Tata McGraw Hill, 2rd Edn., 2006.
2. Wireless Communications - Theodore. S. Rapport, Pearson education, 2nd Edn., 2002.
3. G. Sasibhushana Rao, "Mobile Cellular Communications", Pearson Education, 1st Edition, 2012.

REFERENCE BOOKS:

1. Wireless and Mobile Communications – Lee McGraw Hills, 3rd Edition, 2006.
2. Wireless Communication and Networking – Jon W. Mark and WeihuaZhqung, PHI, 2005.
3. Wireless Communication Technology – R. Blake, Thompson Asia Pvt. Ltd., 2004.

INTRODUCTION TO CLOUD COMPUTING
(Open Elective - V)

Subject Code : 16OE4056 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVE:

- Understand various basic concepts related to cloud computing technologies
- Understand the architecture and concept of different cloud models: IaaS, PaaS, SaaS
- To enable students exploring some important cloud applications
- To gain competence in Cloud Security and Open Cloud delivering highly-interactive Web applications
- To understand and be able to cloud environment is collaborating with various webmail services and databases

COURSE OUTCOMES:

On completion of this course, students should be able to

- Understanding the key dimensions of the challenge of Cloud Computing
- Assessment of the economics , financial, and technological implications for selecting cloud computing for own organization
- Assessing the financial, technological, and organizational capacity of employer's for actively initiating and installing cloud-based applications.
- Understand various cloud computing security controls recommendation
- Evaluate various storage classifications and technologies.

UNIT – I

Systems modeling, clustering and virtualization: Scalable Computing over the Internet, Technologies for Network based systems, System models for Distributed and Cloud Computing

UNIT – II

Introduction to cloud computing: What Cloud Computing Is, A Short History of Cloud Computing, How Cloud Computing Works, The Pros and Cons of Cloud Computing, Who Benefits from Cloud Computing, Who Shouldn't Be Using Cloud Computing, Types of Cloud Service Development.

UNIT – III

Using Cloud Services: Collaborating on Calendars, Schedules, Task Management, Event Management, Contact Management, Project Management

UNIT – IV

Cloud security: Cloud Security Risks , Security: The Top Concern for Cloud Users, Privacy and Privacy Impact Assessment, Trust, Operating System Security, Virtual Machine Security.

UNIT – V

Storage Systems: Evolution of storage technology, storage models, file systems and database, distributed file systems, general parallel file systems. Google file system., Apache Hadoop, *NoSQL* Databases.

TEXT BOOKS:

1. Distributed and Cloud Computing, Kai Hwang, Geoffry C. Fox, Jack J. Dongarra MK Elsevier.
2. Michael Miller, Cloud Computing: "Web-Based Applications That Change the Way You Work and Collaborate Online",1st Edition, Pearson Education, New Delhi, 2009.
3. Cloud Computing, Theory and Practice, Dan C Marinescu, MK Elsevier.
4. Cloud Computing, A Hands on approach, Arshadeep Bahga, Vijay Madisetti, University Press

REFERNCE BOOK:

1. Cloud Computing, A Practical Approach, Anthony T Velte, Toby J Velte, Robert Elsenpeter, TMH
2. Mastering Cloud Computing, Foundations and Application Programming, Raj Kumar Buyya, Christen vecctiola, S Tammarai selvi, TMH

Web links: http://nptel.ac.in/courses/106106129/28

INTRODUCTION TO DBMS
(Open Elective - V)

Subject Code : 16OE4057 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- To introduce basic RDBMS concepts, SQL, Database Design and Query processing. And also to introduce transaction processing, issues and techniques relating to concurrency and recovery in multi-user database environments, and various Data structures for External Data storage and efficient retrieval.

COURSE OUTCOMES

Students will be able to:

- Differentiate Database Systems from File Systems and Define the Terminology, Features, Classifications, Characteristics embodied in Database Systems.
- Interpret, Design and Implement an E-R Model.
- Create /Modify the Structure and write optimized SQL Queries to extract and modify information from Tables or Views.
- Apply proper Techniques such as Normalization and analyze the applicability of a specific Normal form in designing a Database.
- Compare various Indexing, Hashing and File Organization Techniques.
- Explain broad range of Database Management issues including Data integrity, Concurrency and Recovery.

UNIT -I

Database System Applications, History of Data base Systems, Database Systems versus file Systems, View of Data : Data Abstraction, Instances and Schemas, Data Models :The ER Model, Relational Model, Other Data Models, Database Languages: DDL , DML, Database System Structure.

UNIT - II

Database Design and ER diagrams: Beyond ER Design, Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Conceptual Design with the ER Model, Introduction to the Relational Model, Integrity Constraint Over relations, Logical database Design: ER to Relational.

UNIT - III

The Form of a Basic SQL Query; Nested Queries: Introduction to Nested Queries, Correlated Nested Queries, Set-Comparison Operators; Aggregative Operators, NULL values : Comparison using Null values, Logical connectives AND, OR, and NOT, Outer Joins, Disallowing NULL values.

UNIT - IV

Schema refinement and Normal forms: Problems Caused by Redundancy, Decomposition, Properties of Decomposition, Functional Dependencies, Reasoning about FDS ; FIRST, SECOND, THIRD Normal Forms, BCNF, FOURTH normal forms.

UNIT - V

Transaction Concept; Transaction State, ACID properties, Concurrent Executions, Serializability, Recoverability.

File Organization and Indexing: Cluster Indexes, Primary and Secondary Indexes; Hash Based Indexing, Tree based Indexing, B+ Trees.

TEXT BOOKS:

1. Raghurama Krishnan, Johannes Gehrke: Database Management Systems.TATA McGrawHill , 3rd Edition.

REFERENCE BOOKS:

1. Peter Rob, Carlos Coronel: Data base Systems design Implementation and Management. Cengage, Learning, 7th Edition
2. Elmasri, Navrate: Fundamentals of Database Systems. Pearson Education,6th Edition
3. C. J. Date: Introduction to Database Systems. Pearson Education, 4th Edition
4. Silberschatz, Korth: Database System Concepts. McGraw hill,5th Edition
5. https://www.coursera.org/course/db

ENTREPRENEURIAL DEVELOPMENT
(Open Elective - V)

Subject Code : 16OE4058 **Internal Marks: 30**
Credits: 2.0 **External Marks: 70**

COURSE OBJECTIVES:

- The objective of this course is to expose the students to the subject of entrepreneurial development, so as to prepare them to establish a new enterprise and effectively manage the enterprise.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Understand the concept of Entrepreneurship and demonstrate the ability to provide a self analysis on Entrepreneurship qualities in the context of an Entrepreneurial career.
- Understanding Entrepreneurship Development programmes in India and contents for training for Entrepreneurial competencies.
- Create appropriate business model and develop well presented business plan that is feasible for the student.
- Understanding how to manage effectively the selected business.
- To understand problems and prospects of MSME in India

UNIT-I

Entrepreneur and Entrepreneurship: Nature and Scope of Business. Concept of Entrepreneur & Entrepreneurship,, characteristics of an Entrepreneur, , types of Entrepreneurs, Intrapreneur.. Role of Entrepreneurship in Economic development. Ethics and social responsibility of an entrepreneur. Future of Entrepreneurship in India.

UNIT –II

Entrepreneurship Development in India: Nature and development of Entrepreneurship in India - emergence of entrepreneurial class in India, Environmental factors effecting entrepreneurship, local mobility of Entrepreneurs, Concept of women entrepreneurship and rural entrepreneurship. development of women Entrepreneurship, problems and remedies of women Entrepreneurship. Entrepreneurship Development programme (EDP) - need and objectives of EDPs ,Designing Appropriate training programme for existing and new entrepreneurs . Institutions supporting for EDP - NIESBUD, EDII, NAYE,TCOs, MSMEDI,DICs, commercial Banks, Universities and Engineering colleges.

UNIT –III

Creating and Starting the Venture: Steps to start an MSME. Meaning of a project. Project Identification- Sources of new Ideas, methods of generating ideas, creative problem solving, and opportunity recognition. Project selection - meaning of project report (Business Plan)& Formulation of a project report, Preparation of sample project report of any one product and service.

UNIT – IV

Government and Institutional support to Entrepreneurs: MSME Development Act-2006. Technology Incubation Centre, Business Incubation Centre, National Skill Development Corporation, Institutional finance – sources of short term and long term capital including Venture capital. Role of SIDBI, NSIC, , EXIM Bank and commercial Banks, APSFC, etc. AP Industrial policy (2015-20) - incentives and subsides, industrial estates, AP Skill Development Corporation.

UNIT –V

Managing the Venture: Types of Ownership. Concepts of working capital management, Marketing management, Human Resource management and TQM. Problems and prospects of MSME in India. Profile of Entrepreneurs.

TEXT BOOKS:

1. H.Nandan: Fundamentals of Entrepreneurship, PHI Learning, New Delhi, 2009
2. S.S.Khanka: Entrepreneurial Development, S.Chand & Company Ltd New Delhi 2009
3. Dr.C.B.Gupta and Dr.S.S.Khanka Entrepreneurship and Small Business Management: Sultan Chand & Sons:,2010
4. Narayana Reddy: Entrepreneurship, Cengage learning, New Delhi, 2010
5. Rajeev Roy: Entrepreneurship, Oxford university press, New delhi,2010
6. Vasat Desai: The Dynamics of Entrepreneurial Development and Management, Himalaya Publishing House, 2011

REFERENCES BOOKS:

1. Robert D Hisrich, Michel P Peters, Dean A Sheperd: Entrepreneurship, Tata Mc Graw Hill Education Private ltd, 2009
2. Hisrich: Entrepreneurship, TMH, New Delhi,2009
3. Prasanna Chandra: Projects, TMH, New Delhi,2012
4. K.Nagarajan: Project Management, New Age International, New Delhi,2010

PRODUCTION PLANNING AND CONTROL

Subject Code : 16ME4034 **Internal Marks: 30**
Credits: 3.0 **External Marks: 70**

COURSE OBJECTIVES:

- To understand production systems and their characteristics.
- To evaluate types of forecasting techniques and to compare qualitative and quantitative methods.
- To understand material requirement planning procedures.
- To apply aggregate planning strategies.
- To describe routing procedure and scheduling policies & techniques.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Describe the objectives and functions of PPC and the types of production. Evaluate different types of forecasting techniques.
- Apply aggregate planning strategies. Discuss line balancing and planning methods.
- Evaluate MRP and JIT systems against traditional inventory control systems.
- Apply scheduling techniques to production systems.
- Draw route sheets. Explain activities of dispatching and expediting.

UNIT-I

Introduction to PPC and Forecasting: Definition, Objectives, Functions of Production Planning and Control, Types of Production systems and their Characteristics, Comparison between Production Planning and Production Control, Organization for PPC.

Forecasting: Introduction, Long-term and Short-term Forecasting, Classification of Forecasting Methods, Judgmental Techniques, Time Series analysis, Moving Average Forecasting, Exponential Smoothing Method, Casual Forecasting Method,

UNIT-II

Planning: Capacity Planning, Factors Influencing Effective Capacity, Aggregate Planning, Strategies and Costs.

Assembly Line Balancing, Master Production Schedule, Functions of MPS, Preparation of MPS.

UNIT-III

Planning for Materials Requirement: Inventory management, Functions of inventories, Effect of demand on Inventory stock, Determination of E.O.Q. and economic order quantity and Economic lot size, Inventory control systems : P-System and Q-System, ABC analysis.

MRP, MRP II, Concept of JIT, Basic Elements of JIT, Benefits of JIT, KANBAN System and Implementation of JIT.

UNIT-IV

Product and Service Reliability: Introduction, Definition and Measures of Reliability, Reliability Distributions, Reliability of a System with Component in Series, Parallel and Combined Series, Failure, Maintainability, Availability, Reliability Life Testing.

Business Process Re-engineering: Definition and Characteristics of BPR, Need for BPR, Steps involved in BPR.

UNIT-V:

Routing, Dispatching and Expediting:

Routing: Definition, Routing procedure, Factors affecting routing procedure, Route sheet, Bill of material.

Dispatching: Activities of dispatcher, Dispatching procedure.

Expediting: Definition, Reasons for existence of function, Types of expediting, Applications of computer in production planning and control.

TEXT BOOKS:

1. Industrial Engineering and Production Management, Martand Telsang, S. Chand Publications.
2. Operations Management – Design, Planning and Control for Manufacturing and Services, James. B. Dilworth, McGraw Hill International Publications.

REFERENCE BOOKS:

1. Modern Production / Operations Management, Elwood S. Buffa, Rakesh K. Sarin, John Wiley Publications.
2. Production Planning Control and Industrial Management, K. C. Jain, L. N. Aggarwal, Khanna Publications.
3. Theory and Problems in Production & Operations Management, S. N. Chary, Tata McGraw Hill Publications.

UNCONVENTIONAL MACHINING PROCESSES
(Elective – III)

Subject Code : 16ME4035 **Internal Marks: 30**
Credits: 3.0 **External Marks: 70**

COURSE OBJECTIVES:

- To deliver knowledge on different unconventional machining techniques and their applications.
- To study the mechanism of various unconventional machining processes such as EDM, ECM, USM, abrasive jet machining, water jet machining and abrasive water jet machining.
- Understand the applications of plasma process for machine processes.
- State various parameters influencing the machining process.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Describe the need for, and applications of UCMP. Explain the considerations in process selection. Describe USM.
- Describe AJM, WJM and AWJM processes along with material removal rate.
- Explain ECM processes like honing, deburring, ECG along with material removal rate and mechanics of cutting.
- Describe EDM, EDG and Wire EDM processes along with material removal rate and mechanics of cutting.
- Describe EBM, LBM and PAM processes along with material removal rate and mechanics of cutting.

UNIT-I

Introduction: Need for non-traditional machining methods – Classification of modern machining processes – considerations in process selection and applications.

Ultrasonic Machining: Elements of the process, mechanics of material removal, MRR process parameters, economic considerations, applications and limitations.

UNIT-II

Abrasive Jet Machining (AJM): Water jet machining, abrasive water jet machining, abrasive flow machining, magnetic abrasive finishing - process parameters, material removal rate, mechanism analysis, process capabilities, abrasive particle size, limitations and applications.

UNIT-III

Electro-Chemical Machining (ECM): Fundamentals of electro chemical machining, electro chemical grinding, Electrochemical honing and deburring process, metal removal rate in ECM, tool design, surface finish and accuracy, economic aspects of ECM.

Chemical Machining (CHM): Fundamentals of Chemical machining, masks, etchants, advantages and applications.

UNIT-IV

Electric Discharge Machining (EDM): General principle and application, Electric Discharge Grinding (EDG) and Wire EDM – Power circuits for EDM, Mechanics of metal removal in EDM, process parameters, selection of tool electrodes and dielectric fluids, surface finish and machining accuracy.

UNIT-V

Electron Beam Machining (EBM) and Laser Beam Machining (LBM): basic principle and theory, process parameters, efficiency and accuracy, applications.

Plasma Arc Machining (PAM): Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industry.

TEXT BOOK:

1. Advanced Machining Processes, V. K. Jain, Allied Publications.

REFERENCE BOOKS:

1. Modern Machining Process, P.C. Pandey, Tata McGraw Hill Publications
2. Production Technology, HMT, Tata McGraw Hill Publications
3. New Technology, A. Bhattacharyya, Institution of Engineers(India) Publications

NON CONVENTIONAL SOURCES OF ENERGY
(Elective – III)

Subject Code : 16ME4036 **Internal Marks: 30**
Credits: 3.0 **External Marks: 70**

COURSE OBJECTIVES:

- To enable the students in understanding various types of global energy resources available for power generation.
- To enable the students understand the importance of energy efficiency and conservation in the context of future energy supply
- To expose students to future energy systems and energy use scenarios with a focus on promoting the use of non-conventional energy resources and technologies.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Explain structure and Coordinate system of Sun. Solve problems based on solar radiation on titled surfaces. Understand orientation and thermal analysis of solar energy collectors.
- Explain the Sensible Heat, Latent Heat, and Stratified storage systems. Understand the mechanisms involved in harnessing solar energy in various applications.
- Classify types, components and performance characteristics of Windmills. Understand combustion characteristics of biogas.
- Generalize various types of wells to get geothermal energy. Understand the working principles involved in harnessing tidal energy and wind energy. Discuss mini-hydro-power plants.
- Describe direct energy conversion systems by using MHD generator, thermo-ionic converters and PV fuel cells.

UNIT-I

Introduction to NCSE: Role and potential of new and renewable sources of energy.

Solar Radiation: Environmental impact of solar power, structure of the sun, the solar constant, sun-earth relationships, coordinate systems and coordinates of the sun, extraterrestrial and terrestrial solar radiation, solar radiation on titled surface, instruments for measuring solar radiation and sun shine, numerical problems.

Solar Energy Collection: Flat plate and concentrating collectors, classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

UNIT-II

Solar Energy Storage and Applications: Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications-solar heating/cooling technique, solar distillation and drying, solar cookers, central power tower concept and solar chimney. Design and analysis of solar PV panels for 100 KW power generation.

UNIT-III

Wind Energy: Sources and potentials, horizontal and vertical axis windmills, performance characteristics, Betz criteria, types of winds, wind data measurement.

Bio-Mass: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking.

Bio fuels: I.C.Engine operation and economic aspects.

UNIT-IV

Geothermal Energy: Resources, types of wells, methods of harnessing the energy, potential in India.

Ocean Energy: OTEC, Principles utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy: Potential and conversion techniques, mini-hydel power plants, and their economics.

UNIT-V

Direct Energy Conversion: Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, See-beck, Peltier and Joul Thomson effects, Figure of merit, materials, applications, MHD generators, principles, dissociation and ionization, hall effect, magnetic flux, MHD accelerator, MHD Engine, power generation systems, electron gas dynamic conversion, economic aspects. Fuel cells, principles, faraday's law's, thermodynamic aspects, selection of fuels and operating conditions, photo voltaic energy conversion – types of PV cells, I-V characteristics.

TEXT BOOKS:

1. Solar Energy – Principles of Thermal Collection and Storage, S.P. Sukhatme, J.K.Nayak, TMH Pub.
2. Non-Conventional Energy Sources, G.D. Rai
3. Non-Conventional Energy Resources, B.H. Khan, Tata McGraw Hill Pub., New Delhi.

REFERENCE BOOKS:

1. Solar Power Engineering, B.S Magal, Frank Kreith, J.F Kreith
2. Principles of Solar Energy, Frank Krieth, John F Kreider
3. Non-Conventional Energy, Ashok V Desai, Wiley Eastern Pub.
4. Renewable Energy Technologies, Ramesh, Kumar, Narosa Pub.

TOOL DESIGN
(Elective – III)

Subject Code: 16ME4037 **Internal Marks: 30**
Credits: 3.0 **External Marks: 70**

COURSE OBJECTIVES:

- To gain knowledge on designing of various cutting tools.
- To gain knowledge on designing of jigs and fixtures.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Explain unconventional machining processes and super-finishing processes.
- Design single and multi-point cutting tools.
- Design twist drills and reamers.
- Design press tools including die-sets and plastic tools.
- Design jigs and fixtures for various machine tool operations.

UNIT-I

Classification and coding of carbide tools, Coated tools

Unconventional Machining Processes: Principles of working and applications of USM, EDM, ECM, AJM, LBM, and EBM

Super-finishing Processes: Honing, Lapping Burnishing, Ballizing, Polishing.

UNIT-II

Design of Single-Point Cutting Tools: Form Tools, Design of flat and circular form tools, Tool holding methods.

Design of Multi-Point Cutting Tools: Milling Cutters: Major types, design and manufacturing of peripheral, end and face milling cutters, forces and power estimation, grinding of milling cutters.

Broaches: Pull and Push types. Internal and External broaches, geometry and design and manufacturing of pull type and push type broaches.

UNIT-III

Drills: Twist drill geometry, Design and manufacturing of twist drill – Effect of variation of different angles on torque and thrust forces – Types and design of shanks – Sharpening of twist drill, Design and manufacture of twist drills.

Reamers: Types, Geometry, Reaming allowance, Tolerance disposition.

UNIT-IV

Design of Press Tools: Die set elements – Design of die set for simple components in Blanking, Piercing, Bending, Drawing, Forging and Spinning.

Plastic Tools: Plastic dies for simple components.

UNIT-V

Jigs & Fixtures: Design principles and constructional features – Locating methods associated with flat, cylindrical, internal and external surfaces, Types of locating pins, Requirements and choice of locating systems, Redundant location, Fool proofing – Setting blocks, Types of clamping devices and their basic elements, Quick action clamps and nuts.

TEXT BOOKS:

1. Tool Design, Cyril Donaldson, V. C. Goold, Tata McGraw Hill Pub.
2. Production Engineering Design (Tool Design, Surender Keshav, Umesh Chandra, Satya Prakashan Pub.

REFERENCES BOOKS:

1. Design of Cutting Tools, Rodin, Mir Publications, Moscow.
2. Metal Cutting Theory and practice, Amitabha Bhattacharya, Inyong Ham, ASTME Pub.

DATABASE MANAGEMENT SYSTEM
(Elective – III)

Subject Code: 16ME4038 **Internal Marks: 30**
Credits: 3.0 **External Marks: 70**

COURSE OBJECTIVES:

- To introduce basic RDBMS concepts, SQL, Database Design and Query processing. And also to introduce transaction processing, issues and techniques relating to concurrency and recovery in multi-user database environments, and various Data structures for External Data storage and efficient retrieval

COURSE OUTCOMES:

On completion of this course, students should be able to

- Differentiate Database Systems from File Systems and Define the Terminology, Features, Classifications, Characteristics embodied in Database Systems.
- Interpret, Design and Implement an E-R Model.
- Create /Modify the Structure and write optimized SQL Queries to extract and modify Information from Tables or Views.
- Apply proper Techniques such as Normalization and analyze the applicability of a Specific Normal form in designing a Database.
- Explain broad range of Database Management issues including Data integrity, Concurrency and Recovery and Compare various Indexing, Hashing and File Organization Techniques.

UNIT-I

Database System Applications: Database Systems versus file Systems; View of Data : Data Abstraction, Instances and Schemas ; Data Models :The ER Model ,Relational Model, Other Data Models ;Database Languages: DDL , DML ,Database Access from Application Programs; Data base Users and Administrators; Transaction Management ;Database System Structure: Storage Manager, the Query Processor.(Korth)

UNIT-II

Database Design and ER Diagrams: Beyond ER Design; Entities, Attributes and Entity sets; Relationships and Relationship sets; Additional features of ER Model ;Conceptual Design with the ER Model ;Introduction to the Relational Model; Integrity Constraint Over relations ; Enforcing Integrity constraints; Querying relational data ; Logical database Design :ER to Relational. Introduction to Views: Destroying/Altering tables and Views.(Ramakrishnan)

UNIT-III

SQL: Queries, Constraints , Triggers: Over view ;The Form of a Basic SQL Query ; Nested Queries: Introduction to Nested Queries, Correlated Nested Queries, Set-Comparison Operators; Aggregative Operators ; NULL values : Comparison using Null values; Logical connectives AND, OR, and NOT, Impact on SQL Constructs, Outer Joins , Disallowing NULL values;
Complex Integrity Constraints in SQL; Triggers and Active Data bases. (Ramakrishnan)

UNIT-IV

Schema Refinement and Normal Forms: Problems Caused by Redundancy, Decompositions, Problem related to Decomposition; Functional Dependencies; Reasoning about FDS; FIRST, SECOND, THIRD Normal Forms, BCNF; Properties of Decompositions: Lossless join Decomposition, Dependency preserving Decomposition; Schema refinement in Database Design. (Ramakrishnan).

Transaction Concept; Transaction State; Implementation of Atomicity and Durability; Concurrent Executions; Serializability; Recoverability; Lock –Based Protocols :Locks, Granting of locks,2PL,implementation of locking ; Timestamp Based Protocols. (Korth).

UNIT-V

Recovery System :Failure classification; Log – Based Recovery; Shadow Paging; Recovery with Concurrent Transactions ; Buffer Management; Failure with loss of nonvolatile storage; (Korth)

Data on External Storage; File Organization and Indexing: Cluster Indexes, Primary and Secondary Indexes; Index Data Structures: Hash Based Indexing, Tree based Indexing; Comparison of File Organizations; B+ Trees: A Dynamic Index Structure (Ramakrishnan)

TEXT BOOKS:

1. Raghurama Krishnan, Johannes Gehrke: Database Management Systems.TATA McGrawHill, 3rd Edition.
2. Silberschatz, Korth : Database System Concepts. McGraw hill, 5th Edition.

REFERENCE BOOKS:

1. Peter Rob, Carlos Coronel: Data base Systems design Implementation and Management. Cengage Learning, 7th Edition.
2. Elmasri, Navrate:Fundamentals of Database Systems. Pearson Education, 6th Edition C.J. Date: Introduction to Database Systems. Pearson Education, 4th Edition.
   https:// www. coursera.org/course/db.

POWER PLANT ENGINEERING

Subject Code : 16ME4039 **Internal Marks: 30**
Credits: 3.0 **External Marks: 70**

COURSE OBJECTIVES:

- Know various power plants & their applications.
- Explain construction & working of Steam power plants.
- Apply fundamental concepts of Gas turbine power Plants.
- Understand various types of Hydro-Electrical and Nuclear Power stations working.
- Calculate and measure capital cost, operational cost and general power distribution by using power plant economics.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Describe various conventional and non-conventional sources of energy. Various direct energy conversion methods.
- Explain construction & working of steam power plants along with its major subsystems, mountings and accessories including combustion of coal.
- Describe diesel and gas turbine power plants with auxiliary systems.
- Describe construction and working of hydro-electrical and nuclear power plants.
- Assess the power plant economy and cost analysis.

UNIT-I

Introduction to the Sources of Energy and Non-Conventional Sources: Utilization of Solar-Collectors- Principle of Working, Wind Energy – types – HAWT, VAWT -Tidal Energy.
Direct Energy Conversion: Solar energy, Fuel cells, Thermo electric and Thermo ionic, MHD generation.

UNIT-II

Steam Power Plant: Plant Layout, Working of different Circuits, Fuel and handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, and Ash handling systems.
Combustion Process: Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors

UNIT-III

Diesel Power Plant: Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging.
Gas Turbine Plant: Introduction – classification - construction – Layout with auxiliaries – Principles of working of closed and open cycle gas turbines. Combined cycle Power Plants.

UNIT-IV

Hydro Electric Power Plant: Water power –Hydrographs – storage and Pondage – classification of dams and spill ways.
Nuclear Power Station: Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation. Types of Reactors, Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.

UNIT-V

Power Plant Economics and Environmental Considerations: Capital cost, investment of fixed charges, operating costs, general arrangement of power distribution, load curves, load duration curve. Definitions of connected load, Maximum demand, demand factor, average load, load factor, diversity factor – related exercises.

TEXT BOOKS:

1. Power plant engineering, P. K. Nag, Tata McGraw-Hill Pub.
2. Power Plant Engineering, Manoj Kumar Gupta, PHI Pub.

REFERENCE BOOKS:

1. Thermal Engineering, P. L. Ballaney, Khanna Pub.
2. Thermodynamics, Spolding and Cole.
3. A Text Book of Power Plant Engineering, R.K. Rajput, Laxmi Pub.

IV Year B. Tech., II Semester

INTERNSHIP

Subject Code : 16ME4203 **Internal Mark: 25**
Credits: 1.0 **External Marks: 50**

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IV Year B. Tech., II Semester

PROJECT WORK

Subject Code : 16ME4204 **Internal Marks: 60**
Credits: 6.0 **External Marks: 140**

PROJECT COURSE OUTCOMES

- **CO1:** Select relevant information from various sources including internet, library, journals, mechanical engineering magazines to define the problem.
- **CO2:** Comprehend principles pertaining to mechanical engineering that enables him to complete the project.
- **CO3:** Gain technology implementation skills by applying them to a new problem in design and manufacturing through research investigation using state of the art tools.
- **CO4:** Work as an individual and as a team including division of tasks, scheduling and monitoring the progress.
- **CO5:** Adhere to professional standards and ethics.
- **CO6:** Research various avenues for solving issues that arise during project implementation thereby inculcate lifelong learning.
- **CO7:** Write effective technical reports and demonstrate his/her work.

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