Bapatla Engineering College

(*Autonomous*)

BAPATLA

B.Tech

Mechanical Engineering

Curriculum Effective from A.Y. 2014-15 (R14 Regulations)

Bapatla Engineering College:: Bapatla

(Autonomous under Acharya Nagarjuna University)

(Sponsored by Bapatla Education Society)

BAPATLA - 522102 Guntur District, A.P., India

www.becbapatla.ac.in

BAPATLA ENGINEERING COLLEGE

(*Autonomous*)

DEPARTMENT OF MECHANICAL ENGINEERING

Vision

To become a centre of Excellence in producing the graduates as professional Mechanical Engineers with a high-quality education, innovative and entrepreneurial skills to secure the society and industry needs.

Mission

- To impart high-quality education in curriculum and to build the students in their capacity and enhancing skills to make them globally competitive Mechanical Engineers.
- To prepare the students by providing exceptional academic environment, leadership, ethical guidelines and lifelong learning needed for a long professional career.
- To enhance the overall academic performance of the students gradually and thereby increasing their placement potential.
- To build the institute-industry interaction by providing the internship programs

BAPATLA ENGINEERING COLLEGE

(*Autonomous*)

DEPARTMENT OF MECHANICAL ENGINEERING

Program Educational Objectives (PEOs)

1. To provide students with a sound foundation in the mathematical, scientific and Engineering fundamentals necessary to formulate, solve and analyze engineering problems and to prepare them for graduate studies.
2. To prepare students for successful careers in an industry that meet the needs of Indian and multinational companies.
3. To develop the ability among students to synthesize data and technical concepts for application to product design.
4. To provide an opportunity for students to work as part of teams on multidisciplinary projects.
5. To promote student awareness of the life-long learning and to introduce them to professional ethics and codes of professional practice.

Programme Outcomes:

Engineering Graduates will be able to:

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**: Identity, 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 research-based 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 modelling 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 teamwork**: 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 enginee**ring 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. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes:

1. An ability to utilize the knowledge in engineering, basic sciences, and mathematics on an applied basis.
2. An ability to apply the basic principles of mechanical engineering to the analysis, design development and implementation of advanced mechanical systems.
3. An ability to apply the principles of manufacturing technology and scientific management towards improvement of product quality.

Academic Rules & Regulations for B. Tech Programme

(As Approved by The Academic Council & The Governing Body of the College)

(Amended in August 2014; Applicable to the students admitted into the First year B.Tech from the academic year 2014-2015 onwards).

1.0 EXTENT: All the rules and regulations, specified herein after, shall be read as a whole for the purpose of interpretation and when a doubt arises, the interpretation of the Chairman, Academic Council, Bapatla Engineering College (Autonomous) is final. As per the requirements of the Statutory Bodies, The Principal, Bapatla Engineering College (Autonomous), shall be the Chairman of the College Academic Council.

2.0 ADMISSIONS:

2.1 Admission into the First year of any Four Year B.Tech Programmes of study in Engineering: Admissions into the first year of B.Tech Programme of Bapatla Engineering College (Autonomous) (***Subsequently referred to as*** **B.E.C**) will be as per the norms stipulated by Acharya Nagarjuna University and the Govt. of Andhra Pradesh from time to time.

2.2 Admission into the Second year of any Four year B.Tech Programmes of study in Engineering: Admissions into the second year of B.Tech Programme of B.E.C will be as per the norms stipulated by Acharya Nagarjuna University and the Govt. of Andhra Pradesh from time to time.

2.3 Admissions with advance standing: These may arise in the following cases:

1) When a student seeks transfer from other colleges to B.E.C and intends to pursue B.Tech at B.E.C in an eligible branch of study.

2) When students of B.E.C get transferred from one regulation to another regulation or from previous syllabus to revised syllabus.

3) When a student, after long discontinuity, rejoins the college to complete his/her Programme of study for the award of the degree.

4) When a student is not able to pursue his/her existing Programme of study but intends to get transferred to another Programme of study.

These admissions may be permitted by the Academic Council of B.E.C as per the norms stipulated by the statutory bodies and the Govt. of Andhra Pradesh from time to time.

In all such cases for admission, when needed, permissions from the statutory bodies are to be obtained and the Programme of study at B.E.C will be governed by the transitory regulations stipulated in ***5.3.***

3.0 DURATION OF THE PROGRAMME AND MEDIUM OF INSTRUCTION: The duration of the B.Tech. Programme is for four academic years consisting of two semesters in each academic year. The medium of instruction and examinations is English.

SNo	Activity	Description
1.	Number of Semester in an Academic Year	Two
2.	Regular Semester duration in Weeks	19
3.	Academic Activities Schedule	
	Course Work	15 Weeks
	Examination Preparation	1 Week
	Examinations	2 Weeks
	Declaration of Results	1 Week
4.	Evaluation	Continuous Internal Evaluation (CIE) with a weightage of 40% and Semester End Examinations (SEE) with a weightage of 60% of the student's performance in course/laboratory work and other activities, if any.
5.	Other Items	The total number of working days in an academic year shall be >180;
		Academic schedules prescribed by the college shall be adhered to by all the concerned.
		Students failing in any course (s) shall register for the same again (re-register) and shall secure SEE afresh in each course(s). This shall continue until a pass grade is obtained in the said course(s).

4.0 MINIMUM No. INSTRUCTION DAYS:

Each semester shall consist of a minimum of 90 instruction days.

5.0 Programmes of study in B.Tech:

5.1 The Four year B.Tech Programme is offered in the following branches of study:

S.No.	Title of the UG Programme	Abbreviation
1.	Civil Engineering	CE
2.	Chemical Engineering	CH
3.	Computer Science & Engineering	CS
4.	Electrical & Electronics Engineering	EE
5.	Electrical & Communication Engineering	EC
6.	Electronics & Instrumentation Engineering	EI
7.	Information Technology	IT
8.	Mechanical Engineering	ME

5.2 Structure of the Programme:

5.2.1 Each Programme of a Discipline or a branch of study shall consist of:

1) General courses in Basic Sciences, Basic Engineering Sciences, Social Sciences & Humanities.
2) Interdisciplinary courses in Engineering to impart the fundamentals of Engineering to the student.
3) Compulsory core courses to impart broad based knowledge needed in the branch of study concerned.
4) Elective courses from either discipline or interdisciplinary areas to be chosen by the student based on his/her interest and specialization preferred.
5) A Term paper and a Project approved by the Department to be submitted in the fourth year of study.

Every Programme of study shall be designed to have 45-50 theory courses and 20-25 laboratory courses and the distribution of types of courses from the above is indicated in the following table.

Humanities & Social Science, Basic Science and	30 -45%
Professional Core courses	35-45%
Professional Elective and Open Elective Courses	10-15%
Major Project / Seminar, etc	5-10%

***Note**: All components prescribed in the curriculum of any Programme of study shall be conducted and evaluated.*

5.2.2 Contact hours: Depending on the complexity and volume of the course, the number of contact hours per week will be determined.

5.2.3 Credits: Credits are assigned to each course as per norms mentioned in the following table.

Subject	Credits
Theory Course (4 Periods/Week)	03
Theory Course with additional Tutorial Period	04
Laboratory Course (3 Periods/Week)	02
Term paper (2 Periods/Week)	01
Business communication & Presentation Skills Lab (2 Periods/Week)	01
Final year Project (12 Periods/Week)	10

5.3 Transitory Regulations: For students admitted under advance standing (mentioned in 2.3) these transitory regulations will provide the *modus operandi*.

At the time of such admission, based on the Programme pursued (case by case)

1) Equivalent courses completed by the student are established by the BOS concerned.
2) Marks/Credits are transferred for all such equivalent courses and treated as successfully cleared in the Programme of study prescribed by B.E.C.
3) A Programme chart of residual courses not cleared will be derived and a Programme of study with duration specified will be prescribed for pursuit at B.E.C.
4) Marks obtained in the previous system if the case be, are converted to grades and CGPA is calculated accordingly.

All other modalities and regulations governing shall be the same as those applicable to the stream of students with whom such a candidate is included into.

5.4 Curriculum for each Programme of study:

1) The Four year curriculum of any B.Tech Programme of study in any branch of engineering is formulated based on the guidelines mentioned in 5.2 and will be recommended by the Board of Studies concerned and is approved by the Academic council of the college.
2) In the case of students admitted through lateral entry, the respective regular curriculum contents from the second year onwards are to be pursued by such students.
3) In the case of students admitted under advanced standing, the Programme curriculum will be prepared by the Board of Studies concerned and the same shall be approved by the Academic Council.
4) After approval from the Academic Council, Programme curriculum for the same shall be prepared and made available to all the students along with the academic regulations.

Table below shows a typical curriculum frame work for B.Tech Degree program.

S.No.	**Subject Area**	**Average no. of credits**
1.	Humanities & Social Sciences courses	14
2.	Basic Science Courses	35
3.	Engineering Science	32
4.	Professional Core courses	96
5.	Professional Elective Courses	16
6.	Major Project / Seminar, etc.	11
7.	Open Electives	3
	TOTAL	**207**

The students admitted through the **Lateral Entry scheme** have to complete **155** credits

5.5 The Maximum duration permitted to pursue the programme and cancellation of admission:

5.5.1 The maximum duration permitted for any student to successfully complete any four year B.Tech. Programme of study shall be:

1) Eight academic years in sequence from the year of admission for a normal student admitted into the first year of any Programme,
2) Six academic years in sequence from the year of admission for a Lateral entry student admitted into the second year of any Programme, and
3) For students admitted with advanced standing, the maximum time for completion of Programme study shall be twice the period in terms of academic years in sequence, stipulated in the Programme curriculum defined at the time of admission.

5.5.2 In case, any student fails to meet the applicable conditions for the eligibility of degree in the maximum stipulated period as mentioned in ***5.5.1***, his/her admission stands cancelled.

6.0 EXAMINATION SYSTEM & EVALUATION:

6.1 The performance of the students in each semester shall be assessed course wise. All assessments will be done on absolute mark basis. However, for the purpose of reporting the performance of a candidate, letter grades and grade points will be awarded as per section ***11.0.*** The performance of a student in each course is assessed with Alternate Assessment Tests, term examinations on a continuous basis during the semester called Continuous Internal Evaluation (CIE) and a Semester End Examination (SEE) conducted at the end of the semester. For each theory, design and/or drawing course, there shall be a comprehensive Semester End Examination (SEE) of three hours duration at the end of each Semester, except where stated otherwise in the detailed Scheme of Instruction.

6.2 The distribution of marks between Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) to be conducted at the end of the semester will be as follows:

Nature of the Course	**CIE**	**SEE**
Theory subjects	40	60
Drawing	40	60
Practical	40	60
Business communication & presentation Skills Lab	20	30
Term Paper	20	30
Project work	50	100

6.3 Continuous Internal Evaluation (CIE) in Theory and Drawing subjects:

1. In each Semester there shall be two Term examinations and two tests from any of the ***Alternate Assessment Tools (AAT)*** like Home Assignment, Class Test, Problem Solving, Group Discussion, Quiz, Seminar and Field Study in every theory course. The Alternate Assessment Tool with detailed modality of evaluation for each course shall be finalized by the teacher concerned before beginning of the course with the permission of HOD concerned and the PRINCIPAL.

   The Term Examination is conducted in the regular mode according to a schedule which will be common for a particular year of study. The maximum weightage for Term Examinations, AAT and the calculation of marks for CIE in a theory course is given in the following table.

Weightage for different heads to calculate CIE for 40 marks in a Theory course			
Particulars	Term Exams (Max. 25 marks)	AAT (Max. 10 marks)	Attendance (Max.5 marks)
Better Performed exam	75% of marks obtained	50% of marks obtained	5
Other exam	25% of marks obtained	50% of marks obtained	

2. For drawing courses, there shall be only two Term examinations in a semester with no Alternate Assessment Tool. In case of such courses a maximum of 10 marks shall be given for day-to-day class work and a maximum of 25 marks shall be awarded to the Term examinations taking into account the performance of both the Term examinations giving weightage as prescribed above.

3. A maximum weightage of 5 marks will be given in the CIE for attendance in all theory and drawing courses as indicated in ***7.1.1.***

6.4 Semester End Examination (SEE) in Theory and Drawing subjects:

1) For each theory, design and/or drawing course, there shall be a comprehensive Semester End Examination (SEE) of three hours duration at the end of each Semester for 100 marks and reduced to 60 marks for the combined performance in CIE & SEE purpose, except where stated otherwise in the detailed Scheme of Instruction. Question paper setting shall be entrusted to external examiners from the panels approved by the respective Boards of Studies.

2) A minimum of 40 marks are to be secured exclusively in the Semester End Examination (SEE) of theory/drawing course which shall be reduced to 24 marks (40%) and a minimum total of 40 marks in SEE and CIE put together in a theory / drawing course is to be secured in order to be declared as passed in that course and for the award of the grade in the course.

6.5 Continuous Internal Evaluation (CIE) in laboratory courses:

1) The evaluation for Laboratory course is based on SEE and CIE. The CIE for 40 marks comprises of 20 marks for day to day laboratory work, 5 marks for record submission and 15 marks for a laboratory examination at the end of the semester.

2) In any semester, a minimum of 90 percent of prescribed number of experiments / exercises specified in the syllabi for laboratory course shall be taken up by the students. They shall complete these experiments / exercises in all respects and get the record certified by the internal lab teacher concerned and the Head of the Department concerned to be eligible to appear for the Final Examination in that laboratory course.

6.6 Semester End Examination (SEE) in laboratory courses:

1) For each laboratory course, the Semester End Examination (SEE) shall be conducted by one internal and one external examiner appointed by the Principal and the duration of the exam shall be for three hours. The SEE is for 100 marks which include 15 marks for write up, 40 marks for lab experiment/exercise, 10 marks for record, 15 marks for result analysis and 20 marks for Viva-voce. The student performance in SEE shall be reduced to 60 marks.

2) A minimum of 50 marks shall be obtained in SEE which shall be reduced to 30 marks (50%) and a minimum total of 40 marks in SEE and CIE put together in a laboratory course are to be secured in order to be declared as passed in the laboratory course and for the award of the grade in that laboratory course.

6.7. Evaluation of term paper and Business communication & Presentation Skills Lab:

1) A term paper is to be submitted by each student in the 7^{th} semester which would be a precursor to the project work to be done in the 8^{th} semester, and Business Communication & Presentation Skills Lab is to be taken up in the 7^{th} semester. The evaluation is based on CIE for 20 marks, which includes a minimum of two seminars/presentations for 10 marks and the report submitted at the end of the semester which is evaluated for 10 marks.

2) The Semester End Examination (SEE) shall be conducted for 100 marks by one internal and one external examiner appointed by the Principal. The same shall be

reduced to 30 marks. The SEE contains Viva-voce and the demonstration of the model developed or work performed as a part of the term paper.

3) A minimum of 25 marks shall be obtained in SEE which is reduced to 15 (50 %) and a minimum total of 20 marks in SEE and CIE put together in the term paper are to be secured in order to be declared as passed in the term paper and for the award of the grade in the term paper.

6.8 Evaluation of Project:

1) In case of the Project work, the evaluation shall be based on CIE and SEE. The CIE for 50 marks consists of a minimum of two Seminars/ presentations for 25 marks and the Project Report submitted at the end of the semester which is evaluated for 25 marks.

2) SEE shall be in the form of a Viva- voce and the demonstration of the thesis work for 100 marks. Viva-voce Examination in Project Work shall be conducted by one internal examiner and one external examiner to be appointed by the Principal. A minimum of 50 marks shall be obtained in SEE exclusively and a minimum total of 60 marks in SEE and CIE put together are to be secured in order to be declared as passed in the Project and for the award of the grade.

6.9 A student who could not secure a minimum of 50% aggregate marks in CIE of a semester is not eligible to appear for the Semester End Examinations conducted at the end of the semester and shall have to repeat that semester.

NOTE : A student who is absent for any Test / Exam / Seminar / Presentation as a part of Continuous Internal Evaluation (CIE), for any reason whatsoever, shall be deemed to have scored zero marks in the respective component and no provision for make-up shall be provided.

6.10 Make-up Test: A student can appear for a Make-up Test in a single theory subject of a semester to improve marks in the Continuous Internal Evaluation (CIE/Internal marks) subject to the following:

If the student becomes eligible to appear for the Semester End Examination (SEE) of a semester and is unable to secure 40% internal marks in a particular theory subject due to genuine reasons, he/she may be given an opportunity to appear for makeup test in any one subject of that semester. The makeup test will be conducted for 40 marks and the marks obtained in this test are final. However, the maximum mark awarded will be 16 only irrespective of the marks obtained in the makeup test. Such students have to apply by paying a fee prescribed by the institution and submit the application along

with a letter of request indicating the genuineness of his/her candidature to be eligible for the makeup test. Applications should be recommended by the HOD concerned and approved by the principal.

6.11 Course Repetition: The students secured less than 40% in the Continuous Internal Evaluation (CIE) and Semester End Examinations (SEE) may register for the course repetition. The students have to apply to the Principal through the respective HOD by paying prescribed fees. A student can take up a maximum of two courses in a semester immediately after the semester end examinations of that particular semester.

The HODs concerned have to allot a teacher related to that course to conduct class work. The minimum number of periods to be conducted should not be less than 50% of the total prescribed periods for that course. The classes will be conducted in the vacation period or in the weekends or in the afternoons as decided by the HOD concerned. Teacher has to evaluate the student for his performance in CIE as per the autonomous norms and students should appear for a semester end examination. The pass criteria in both CIE & SEE should be as per autonomous norms.

7.0 ATTENDANCE REGULATIONS:

7.1 Regular course of study means a minimum average attendance of 75% in all the courses of study prescribed for a semester in the curriculum, computed by considering total number of hours / periods conducted in all courses as the denominator and the total number of hours / periods actually attended by the student in all courses, as the numerator.

7.1.1 A maximum of 5 marks weightage in CIE in each theory/drawing course shall be given for those students who put in a minimum of 65% attendance in the respective theory/drawing course in a graded manner as indicated below:

Attendance of 65% and above but less than 75%	4 mark
Attendance of 75% and above but less than 80%	6 mark
Attendance of 80% and above but less than 90%	8 marks
Attendance of 90% and above	10 marks

The above marks are scaled and reduced to maximum of 5 marks for the purpose of calculating attendance weightage.

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

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

8.0 DETENTION: A student is said to have been detained and not allowed to appear for Semester End Examination (SEE) at the end of the semester when

8.1 The student does not have a minimum average 75% attendance or 65% attendance with condonation in all subjects put together in that semester or the student has not scored a minimum of 50% of marks in CIE in all the courses of that semester put together.

Such a student shall have to repeat the same semester subsequently and satisfy the above requirements afresh to become eligible to appear for the Semester End Examination (SEE), conducted at the end of the semester.

9.0 CONDITIONS FOR PROMOTION:

9.1 A student not detained in the first semester of a year of study shall be promoted to second semester of that year of study.

9.2 A student shall be eligible for promotion to II year of B.Tech. Programme, if he/she is not detained in the second semester of first year B.Tech. Programme irrespective of the number of backlog courses in I year B.Tech.

9.3 A student shall be eligible for promotion to III year of B.Tech. Programme, if he/she is not detained in the second semester of II year B.Tech. Programme and has passed all but **three** courses of I year B.Tech. (Including laboratory courses).

9.4 A student shall be eligible for promotion to IV year of B.Tech. Programme, if he/she is not detained in the second semester of III year B.Tech. Programme and has passed all but **three** courses of II B.Tech. (Including laboratory course) and all but **one** course of I B.Tech. (Including laboratory courses).

10.0 Registration: Every eligible student (not detained and promoted) has to register himself/ herself at the beginning of every semester indicating all the Courses taken up for pursuit by him/her during that Semester.

10.1 When a student is debarred for one or more semesters, his/her registration in the present semester is cancelled and the student is debarred from registering in future during the debarred period.

10.2 In any case, while re-registering in any semester, he or she will have to pay the requisite fee once again.

11.0 GRADING SYSTEM

11.1 Based on the student performance during a given semester, a final letter grade will be awarded at the end of the semester for each course. The letter grades and the corresponding grade points are as given in the Table.

Table: Grades & Grade Points

Grade	Grade Points	% of Marks
O	10	90% and above
A+	9	80% – 89%
A	8	70% – 79%
B+	7	60% – 69%
B	6	50% – 59%
C	5	40% – 49%
F	Failed, 0	Less than 40%

11.2 A student who earns a minimum of 5 grade points (C grade) in a course is declared to have successfully completed the course, and is deemed to have earned the credits assigned to that course. **However it should be noted that a pass in any course/term paper/Project shall be governed by the rules mentioned in 6.0**.

12.0 GRADE POINT AVERAGE

12.1 The Grade Point Average (GPA) will be calculated according to the formula:

$$GPA = \frac{\sum C_i G_i}{\sum C_i}$$

Where C_i = number of credits for the course *i*,

G_i = grade points obtained by the student in the course.

12.2 Semester Grade Point Average (SGPA) is awarded to candidates considering all the courses of the semester. Zero grade points are also included in this computation.

12.3 To arrive at Cumulative Grade Point Average (CGPA), the formula is used considering the student's performance in all the courses taken in all the semesters completed up to the particular point of time.

12.4 Example

Semester	Course Code.	Credits	Grade	Grade Point	Credit Points	SGPA	CGPA
I	14MA101	4	C	5	20	**7.73 (201/26)**	**7.73 (201/26)**
I	14PH102	3	B	6	18		
I	14CH103	3	A	8	24		
I	14EL104	3	O	10	30		
I	14ES105	3	A+	9	27		
I	14EG106	4	B+	7	28		
I	14CHL101	2	O	10	20		
I	14ELL102	2	A	8	16		
I	14WSL103	2	A+	9	18		
Total		**26**			**201**		
II	14MA201	4	A	8	32	**7.96 (207/26)**	**7.84 (408/52)**
II	14PH202	3	B	6	18		
II	14CH203	3	A+	9	27		
II	14EE204	3	C	5	15		
II	14EM205	4	O	10	40		
II	14CP206	3	B+	7	21		
II	14PHL201	2	A+	9	18		
II	14HWL202	2	A	8	16		
II	14CPL203	2	O	10	20		
Total		**26**			**207**		

13.0 ELIGIBILITY FOR AWARD OF B.TECH. DEGREE: A student shall be eligible for award of the B.Tech degree if he/she fulfils all the following conditions:

1) Registered and successfully completed all the components prescribed in the Programme of study to which he/she is admitted,
2) Obtained CGPA greater than or equal to 5.0 (Minimum requirements for Pass),
3) Has no dues to the Institute, hostels, Libraries, NCC/NSS etc., and
4) No disciplinary action is pending against him/her.

14.0 AWARD OF CLASS: A candidate who becomes eligible for the award of B.Tech. Degree shall be placed in one of the following Classes based on CGPA.

Table: CGPA required for award of Degree

Distinction	**≥ 8.0***
First Class	**≥ 7.0**
Second Class	**≥ 6.0**
Pass	**≥ 5.0**

* In addition to the required CGPA of 8.0, the student must have necessarily passed all the courses of every semester **in the minimum stipulated period for the Programme**.

14.1 Grade Sheet: A grade sheet (Memorandum) will be issued to each student indicating his performance in all courses taken in that semester and also indicating the Grades and SGPA.

14.2 **Transcripts**: After successful completion of the total Programme of study, a Transcript containing performance of all academic years will be issued as a final record. Duplicate transcripts will also be issued if required after the payment of requisite fee. Partial transcript will also be issued up to any point of study to any student on request and by paying the stipulated fee in force.

14.3 Candidates shall be permitted to apply for recounting/revaluation of SEE scripts within the stipulated period with payment of prescribed fee.

14.4 The Governing Body of B.E.C (Autonomous) has to approve and recommend the same to Acharya Nagarjuna University for the award of a degree to any student.

15.0 IMPROVEMENT OF CLASS:

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

However, this facility shall not be availed of by a candidate who has taken the Original Degree Certificate. Candidates shall not be permitted to reappear either for CIE in any course or for Semester End Examination (SEE) in laboratory courses (including Project Viva-voce) for the purpose of improvement.

16.0 SUPPLEMENTARY EXAMINATIONS: In addition to the Regular Final Examinations held at the end of each semester, Supplementary Final Examinations will be conducted during the academic year. Candidates taking the Regular / Supplementary examinations as Supplementary candidates may have to take more than one Final Examination per day. A student can appear for any number of supplementary examinations till he/she clears all courses which he/she could not clear in the first attempt. However the maximum stipulated period shall not be relaxed under any circumstances.

17.0 INSTANT SUPPLEMENTARY EXAMINATIONS: Candidates who fail in one theory course of 4^{th} year 2^{nd} semester can appear for Instant Supplementary Examination conducted after declaration of the revaluation results of the said exam.

18.0 MALPRACTICES:

The Principal shall refer the cases of malpractices in Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) to an Enquiry Committee constituted by him / her. The Committee will submit a report on the malpractice allegedly committed by the student to the Principal. The Principal along with the members of the Committee is authorized to award a suitable punishment, if the student is found guilty.

19.0 ADDITIONAL ACADEMIC REGULATIONS:

19.1 Any attempt to impress upon the teachers, examiners, faculty and staff of Examinations, bribing for either marks or attendance will be treated as malpractice.

19.2 When a student is absent for final examination, he/she is treated as to have appeared and obtained zero marks in that component and Grade is awarded accordingly.

19.3 When a component of Continuous Internal Evaluation (CIE) or Semester End Examination (SEE) is cancelled as a penalty, he/she is awarded zero marks in that component.

20.0 AMENDMENTS TO REGULATIONS:

The Academic Council of Bapatla Engineering College (Autonomous) reserves the right to revise, amend, change or nullify the Regulations, Schemes of Examinations, and/ or Syllabi or any other matter pertained that meets to the needs of the students, society and industry without any notice and the decision is final.

PROFORMA - I

BAPATLA ENGINEERING COLLEGE:: BAPATLA

(Autonomous)

MAL-PRACTICE CASE REPORT

1. Examination Hall : _____

2. Date of Examination : _____

3. Time of Examination : _____

4.a) Course : _____

b) Year/Semester : _____

c) Scheme : _____

5. Subject in which candidate is booked:

a) Subject Code : _____

b) Subject : _____

6. Particulars of the candidate booked:

a) Regd. No. : _____

b) Name : _____

c) Residential address : _____

: _____

: _____

1. (a) Case booked by : Invigilator / Squad Members / Surprise Check Squad / Other Invigilator / Chief superintendent / Examination officers (Strike out whichever is not applicable)

(b) Name & Designation of the Staff who booked the case : _____

(c) Name & Designation of the : _____

Other invigilators in the Hall : _____

as witness. : _____

BAPATLA ENGINEERING COLLEGE : BAPATLA (Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Mechanical Engineering

With Effective From 2014-2015 Academic Year

First Year B.Tech., (SEMESTER – I)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14MA101	Engineering Mathematics – I	4	1	0	0	5	40	60	100	4
14PH102	Engineering Physics – I	4	0	0	0	4	40	60	100	3
14CH103	Engineering Chemistry – I	4	0	0	0	4	40	60	100	3
14EL104	English Language and Communication	4	0	0	0	4	40	60	100	3
14ES105	Environmental Studies	4	0	0	0	4	40	60	100	3
14EG106	Engineering Graphics	4	0	2		6	40	60	100	4
14CHL101	Chemistry Lab	0	0	3	0	3	40	60	100	2
14ELL102	English Language Laboratory	0	0	3	0	3	40	60	100	2
14WSL103	Workshop	0	0	3	0	3	40	60	100	2
	TOTAL	24	1	11	0	36	**360**	**540**	**900**	**26**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture S: Self Study T: Tutorial P: Practical

BAPATLA ENGINEERING COLLEGE : BAPATLA*(Autonomous)*

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Mechanical Engineering

With Effective From 2014-2015 Academic Year

First Year B.Tech., (SEMESTER – II)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14MA201	Engineering Mathematics – II	4	1	0	0	5	40	60	100	4
14PH202	Engineering Physics – II	4	0	0	0	4	40	60	100	3
14CH203	Engineering Chemistry – II	4	0	0	0	4	40	60	100	3
14EE204	Basic Electrical and Electronics Engineering	4	0	0	0	4	40	60	100	3
14EM205	Engineering Mechanics	4	1	0	0	5	40	60	100	4
14CP206	Computer Programming with C	4	0	0	1	5	40	60	100	3
14PHL201	Physics lab	0	0	3	0	3	40	60	100	2
14HWL202	Hardware Lab	0	0	3	0	3	40	60	100	2
14CPL203	Computer Programming Lab.	0	0	3	0	3	40	60	100	2
	TOTAL	24	2	9	1	36	360	540	900	26

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture S: Self Study T: Tutorial P: Practical

BAPATLA ENGINEERING COLLEGE : BAPATLA*(Autonomous)*

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Mechanical Engineering

With Effective From 2014-2015 Academic Year

Second Year B.Tech., (SEMESTER – III)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14MA301	Engineering Mathematics-III	4				4	40	60	100	3
14ME302	Mechanics of Materials-I	4	1			5	40	60	100	4
14ME303	Basic Thermodynamics	4	1			5	40	60	100	4
14ME304	Fluid Mechanics	4				4	40	60	100	3
14ME305	Kinematics of Machines	4	1			5	40	60	100	4
14ME306	Machine Drawing	1		3		4	40	60	100	2
14MEL301	Fuels & Oils Lab			3		3	40	60	100	2
14MEL302	Basic CAD Lab			3		3	40	60	100	2
14CEL303	Strength of Materials Lab			3		3	40	60	100	2
	TOTAL	21	3	12		36	360	540	900	26

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture S: Self Study T: Tutorial P: Practical

BAPATLA ENGINEERING COLLEGE : BAPATLA *(Autonomous)*

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Mechanical Engineering

With Effective From 2014-2015 Academic Year

Second Year B.Tech., (SEMESTER – IV)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14MA401	Engineering Mathematics-IV	4				4	40	60	100	3
14ME402	Mechanics of Materials-II	4	1			5	40	60	100	4
14ME403	Applied Thermodynamics	4	1			5	40	60	100	4
14ME404	Hydraulic Machines	4			1	5	40	60	100	3
14ME405	Casting, Forming and Welding Technology	4				4	40	60	100	3
14ME406	Material Science &Metallurgy	4				4	40	60	100	3
14CEL401	Fluid Mechanics & Hydraulic Machines Lab			3		3	40	60	100	2
14MEL402	Computer Applications In Mechanical Engineering Lab			3		3	40	60	100	2
14MEL403	Basic Manufacturing Processes Lab			3		3	40	60	100	2
	TOTAL	24	2	9	1	36	360	540	900	26

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture S: Self Study T: Tutorial P: Practical

BAPATLA ENGINEERING COLLEGE : BAPATLA*(Autonomous)*

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Mechanical Engineering

With Effective From 2014-2015 Academic Year

Third Year B.Tech., (SEMESTER – V)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14ME501	Machine Dynamics	4	1			5	40	60	100	4
14ME502	Design of Machine Elements-I	4	1			5	40	60	100	4
14ME503	I.C.engines & Gas Turbines	4				4	40	60	100	3
14ME504	Metal Cutting and Machine Tools	4				4	40	60	100	3
14ME505	Operations Research	4			1	5	40	60	100	3
14ME506	Elective-I	4				4	40	60	100	3
14MEL501	I.C.Engines lab			3		3	40	60	100	2
14MEL502	Machine shop practice			3		3	40	60	100	2
14ELL503	Soft skills lab			3		3	40	60	100	2
	TOTAL	24	2	9	1	36	360	540	900	26

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture S: Self Study T: Tutorial P: Practical

Elective-I

A. Engineering Economics and Accountancy
B. Computer Graphics
C. Mechanics of Composite materials

BAPATLA ENGINEERING COLLEGE : BAPATLA *(Autonomous)*

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Mechanical Engineering

With Effective From 2014-2015 Academic Year

Third Year B.Tech., (SEMESTER – VI)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14ME601	AutomationTechnology	4				4	40	60	100	3
14ME602	Design of Machine Elements-II	4	1			5	40	60	100	4
14ME603	Heat transfer	4	1			5	40	60	100	4
14ME604	Finite Element Analysis	4			1	5	40	60	100	3
14ME605	Electronics& Micro processors	4				4	40	60	100	3
14ME606	Elective –II	4				4	40	60	100	3
14MEL601	H.T. lab			3		3	40	60	100	2
14MEL602	Automation lab			3		3	40	60	100	2
14ECL603	Electronics lab			3		3	40	60	100	2
	TOTAL	24	2	9	1	36	360	540	900	26

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture S: Self Study T: Tutorial P: Practical

Elective-II

A. Manufacturing Engineering
B. R&AC
C. Solar energy and Utilization

BAPATLA ENGINEERING COLLEGE : BAPATLA *(Autonomous)*
SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Mechanical Engineering
With Effective From 2014-2015 Academic Year
Final Year B.Tech., (SEMESTER – VII)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14ME701	Industrial Engineering and Enterpreneurship Development	4				4	40	60	100	3
14ME702	Design of Machine Elements-III	4	1			5	40	60	100	4
14ME703	Engineering metrology and Mechanical Measurements	4	1			5	40	60	100	4
14ME704	CAD/CAM	4				4	40	60	100	3
14ME705	Elective-III	4				4	40	60	100	3
14ME706	Open Elective	4				4	40	60	100	3
14ELL701	Business Communication & Presentation Skills Lab			2		2	20	30	50	1
14MEL702	CAD&CAE Lab			3		3	40	60	100	2
14MEL703	Design and Metrology Lab			3		3	40	60	100	2
14MEL704	Term Paper			2		2	20	30	50	1
	TOTAL	24	2	10		36	360	540	900	26

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture S: Self Study T: Tutorial P: Practical

Elective-III

A. Operations Management
B. Computational Fluid dynamics
C. Mechatronics

Open Elective

BAPATLA ENGINEERING COLLEGE : BAPATLA*(Autonomous)*

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Mechanical Engineering

With Effective From 2014-2015 Academic Year

Final Year B.Tech., (SEMESTER – VIII)

Code No.	Subject	Scheme of Instruction (Periods per week)					Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	S	Total	CIE	SEE	Total Marks	
14ME801	Professional Ethics & Human values	4				4	40	60	100	3
14ME802	Automobile Engineering	4	1			5	40	60	100	4
14ME803	Elective-IV	4				4	40	60	100	3
14ME804	Elective-V	4				4	40	60	100	3
14MEPR801	Project Work			12		12	50	100	150	10
14MEL802	CAM Lab			3		3	40	60	100	2
	TOTAL	16	1	15		32	250	400	650	25

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture S: Self Study T: Tutorial P: Practical

Elective-IV

A. Power plant Engineering
B. Optimization Techniques Planning
C. Computer Integrated Manufacturing

Elective-V

A. Robotics
B. Computer aided Process
C. Enterprise Resource Planning

Annexure-1

LIST OF OPEN ELECTIVES

DEPARTMENT	SUBJECT NAME	SUBJECT CODE
Chemical Engineering.	Industrial Pollution & Control	CH 01
	Energy Engineering	CH 02
Civil Engineering.	Air Pollution & Control	CE 01
	Remote Sensing & GIS	CE 02
Computer Science & Engineering.	Database Management Systems	CS 01
	Java Programming	CS 02
Electrical & Electronics Engineering.	Optimization Techniques	EE 01
	Non-Conventional Energy Sources	EE 02
Electronics & Communication Engineering.	Consumer Electronics	EC 01
	Embedded Systems	EC 02
Electronics & Instrumentation Engineering.	Virtual Instrumentation Using LABVIEW	EI 01
	Sensors & Transducers	EI 02
Information Technology.	Mobile Application Development	IT 01
	Web Technologies	IT 02
Mechanical Engineering.	Automobile Engineering	ME 01
	Refrigeration & Air Conditioning	ME 02
BOSCH REXROTH Centre	Automation Technology	BR 01

ENGINEERING MATHEMATICS – I

(Common for all branches)

14MA101

I Year B.Tech. (Mech) First Semester

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

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

1. Compute the rank and inverse of a matrix.
2. Solve the system of the algebraic equations.
3. Verify whether the given set of vectors form a vector space or not.
4. Determine the dimension and basis of a vector space.
5. Compute Eigen values and Eigen vectors of a given matrix.
6. Understand the geometrical interpretation of mean value theorems.
7. Compute the extreme values of a given function in two variables.
8. Describe the diagonalization of a matrix.
9. Identify the order and degree of a differential equation.
10. Know how to solve the first order ordinary differential equations.
11. Apply the first order ordinary differential equations to physical problems.

12. Compute the general solution of 2^{nd} order ordinary differential equations and apply them to solve the L-C-R circuits

Course Outcomes:

Provide students with the knowledge of

1. Modeling of certain physical phenomena into appropriate matrices and their transformations
2. Geometrical transformations using basic analytical concepts
3. Representation of certain mechanical, electrical, biological systems in terms of ordinary Differential equations and provision of effective solutions to them.
4. To learn about solving linear Differential equations with constant coefficients with the given initial conditions using Laplace transform technique

UNIT – I

Matrix Algebra: Rank of a Matrix, Linear Independence, Vector Space, Solutions of Linear Systems, Inverse of a Matrix by Gauss-Jordan Elimination, Vector Spaces, Inner Product Spaces, Linear Transformations. Eigen Values, Eigen Vectors, Some applications of Eigen value problems. Symmetric, Skew-Symmetric and Orthogonal Matrices.

UNIT – II

Matrix Algebra: Complex Matrices: Hermitian, Skew-Hermitian and Unitary.
Similarity of Matrices, Basis of Eigen Vectors, Diagonalization.
Differential Calculus: Rolle's Theorem, Lagrange's Mean Value Theorem and Taylor's Theorem (without Proofs), Taylor's and, Maclaurin's Series for functions of one variable. Maxima and Minima of functions of Two Variables, Lagrange's method of Multipliers.

UNIT - III

First Order Differential Equations: Basic concepts, Geometrical meaning, Separable Differential Equations, Exact Differential Equations, Integrating Factors, Linear Differential Equations, Bernoulli's Equation, Orthogonal Trajectories of curves, Some Engineering Applications: Growth-Decay and Newton's Law of Cooling.

UNIT - IV

Linear Differential Equations of Second Order: Homogeneous Linear Equations of Second Order, Second Order Homogeneous Equations with Constant Coefficients, Case of Complex Roots, Euler-Cauchy Equations, Non-Homogeneous Equations, Solution by Undetermined Coefficients, Solution by Variation of Parameters, Applications-Modeling of Electric Circuits.

TEXT BOOK:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 8th edition, John Wiley & Sons.

REFERENCE BOOK:

1. George B, Thomas, Jr. and Ross L. Finney, "Calculus and Analytic Geometry", Addison Wesley.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3		1									2		
CO2	2	2		1									2		
CO3	1	1		1									1		
CO4	2	2		1									2		

ENGINEERING PHYSICS – I

(Common to all branches)
14PH102

I Year B.Tech. (Mech) First Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:
1. It provides students with fundamental understanding of physics and the engineering knowledge required to work in a variety of technical positions.
2. Lab work stimulates the scientific temper and analytical capabilities in solving problems.
3. It links the core scientific theory with the practical applications of day-to-day in advance.
4. Brings awareness of social and scientific implications of physics.
5. Explains the role of the engineer in today's society.

Course Outcomes:
After successful completion of the course students will be able to
1. Understands fundamentals of physics.
2. Solve various analytical problems.
3. Connect various practical problems to theoretical problems
4. Solve various practical problems.

UNIT – I

OPTICS (11 Periods)

INTERFERENCE: Two-wave interference, coherence, cosine law, Michelson interferometer and its applications, (determination of wavelengths of monochromatic light and resolution of two nearby wavelengths).

DIFFRACTION: Fresnel &Fraunhoffer diffraction, fraunhoffer diffraction due to single slit, plane diffraction grating, dispersive and resolving power of grating.

POLARISATION: Introduction, Brewester's and Malus law, double refraction,Nicol prism, quarter wave plate, half wave plate.

UNIT – II

LASERS & FIBER OPTICS (10 Periods)

LASERS: Properties of lasers**,** Spontaneous and stimulated emission, Population inversion, active medium, Solid state (Ruby) laser, Gas(He-Ne) laser, semiconductor (Ga-As) laser, Applications.

HOLOGRAPHY: Principle, recording and reproduction of holography, Applications.

FIBER OPTICS: Structure and types of optical fibers, acceptance angle, Numerical aperture, fiber optic communication and its advantages.

UNIT – III

ELECTRICITY & MAGNETISM (10 Periods)

Gauss's law in static electricity (qualitative only), Gauss's law of magnetism, circulating charges, Cyclotron-constructing, working and limitations, Hall effect and its applications, displacement current, Maxwell's equations (qualitative treatment), E M oscillations, velocity of EM waves, energy transport and the pointing vector, radiation pressure, AC circuit containing series LCR circuit-resonance condition.

UNIT – IV

MODERN PHYSICS (11 Periods)

Dual nature of light, de-Brogli's concept of matter waves, Davison-Germer electron diffraction experiment, Heisenberg's uncertainty experiment and applications (non-existence of electron in a nucleus and finite width of spectral lines), one dimensional time- independent Schrödinger wave equation, physical significance of wave function, applications of time-independent wave equation to particle in a box(one dimensional), tunneling, the scanning tunneling microscope.

TEXT BOOKS:

1. R.K Goure and S.C. Gupta, "Engineering Physics", New Delhi.
2. Halliday, Resnik, Krane, "PHYSICS", John Wiley & Sons.

REFERENCE BOOKS:

1. "Optics", A. Ghatak (TMH).
2. "Concepts of Modern Physics", AurthurBeiser (TMG).
3. "A text book of engineering physics", M.N. Avadhanulu, P.G. Kshirasagar, S.Chand& Co.,.
4. Serway and jewett, "Physics for scientist and engineers with Modern physics", 6th edition, Tomson Brooks/Cole, Indian reprint.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2											2	2	
CO2	2	2											2	3	
CO3	3	2										1	2	2	
CO4	2	2										1	2	1	

ENGINEERING CHEMISTRY – I

(Common to all branches)

14CH103

I Year B.Tech. (Mech) First Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Outcomes:

1. With the principles of water characterization and treatment of water for potable and industrial purposes.
2. with the principles of polymer chemistry and engineering applications of polymers
3. with Industrial applications of surface chemistry
4. with the conventional and non-conventional energy sources and energy storage devices and Chemistry of engineering material

Course Objective:

Imparting sound fundamental knowledge in the principles of chemistry involving the different application oriented topics required for all engineering branches.

UNIT – I

WATER TECHNOLOGY (11 Periods)

Characteristics – alkalinity – types of alkalinity and determination – hardness – types and estimation by EDTA method (problems); Domestic water treatment – disinfection methods (Chlorination, ozonation. UV treatment) – Boiler feed water – requirements – disadvantages of using hard water in boilers: Scales, Sludges, Caustic embrittlement, boiler corrosion, Priming and foaming – internal conditioning (phosphate, calgon and carbonate conditioning methods) – external conditioning –demineralization process –Lime Soda Process-desalination of brackish water by electro dialysis and reverse osmosis.

UNIT – II

POLYMERS: (12 Periods)

Polymers: Definition, Polymerization, types, addition and condensation polymerization, free radical polymerization mechanism.

Plastics: Classification, Preparation, Properties and uses of PVC, Teflon, polycarbonate, polyurethane, nylon-6,6, PET.

Rubber: vulcanization of rubber, synthetic Rubbers: Buna-S, Buna-N and Polyurethane rubbers.

SURFACE CHEMISTRY:

Surface Chemistry: Solid surfaces, types of adsorption, Frendlich and Longmuir adsorption isotherm, BET adsorption equip. Calculation of surface area of solid & application adsorption: role of adsorbents in catalysis, ion-exchange adsorption and pollution abatement; classification of colloids, Electrical & optical properties micelles, applications of colloids in industry.

UNIT – III

RENWEBLE AND NON RENWEABLE ENERGY SOURCES (11 Periods)

Thermal and Chemical energy: Introduction to solid fuels - calorific value (lower, higher)-determination of calorific value(Bomb Calorimeter) - pulverized coal – carbonization (Bee Haive method - Otto Hoffman by product method)- Proximate and ultimate analysis of coal - Flow Chart in Thermal Power Stations.- Introduction to Geo Thermal Energy-working – applications-Introduction to Solar Cells –Solar Panels-Applications-Green House Concept - wind energy – fuel cells – hydrogen – oxygen fuel cell – batteries – alkaline batteries – lead–acid, nickel–cadmium and lithium batteries.

UNIT – IV

ENGINEERING MATERIALS (11 Periods)

Refractories – classification – acidic, basic and neutral refractories – properties: refractoriness, refractoriness under load, dimensional stability, porosity, thermal spalling – manufacture of alumina, magnesite and zirconia bricks, Abrasives – natural and synthetic abrasives – quartz, corundum, emery, garnet, diamond, silicon carbide and boron carbide.

Composites: definition, types, polymer matrix composites.

Lubricants – mechanism of lubrication, liquid lubricants - properties: viscosity index, flash and fire points, cloud and pour points, oiliness –solid lubricants – graphite and molybdenum sulphide.

Nanomaterials: Introduction to nanochemistry – preparation of few Nano materials:carbon nanotubes, Fullerenes etc – Properties of Nano materialas and their Engineering applications.

TEXT BOOKS:

1. P.C.Jain and Monica Jain, “Engineering Chemistry”, DhanpatRai Pub, Co., New Delhi (2002).
2. S.S. Dara & Mukkati K., “A text book of engineering chemistry”, S.Chand & Co.Ltd., New Delhi (2006).

3. "Text Books of Engineering Chemistry", C.P. Murthy, C.V. Agarwal, A. Naidu B.S. Publications, Hyderabad (2006).

REFERENCE BOOKS:

1. B.K.Sharma, "Engineering chemistry", Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. B. Sivasankar, "Engineering Chemistry", Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
3. "Enginering Chemistry", J.C. Kuriacase & J. Rajaram, Tata McGraw Hill co.,

   New Delhi 1. (2004).
4. "Chemistry of Engineering Meterials", R.P Mani and K.N.Mishra, CENGAGE learning.
5. "Applied Chemistry – A text for Engineering & Technology", Springar (2005).
6. "Text Book of Engineering Chemistry", ShasiChawla, DhantpatRai Publishing Company, NewDelhi (2008).

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	1			2	3					3	2	2	
CO2	3	3	2			2	2					3	1	1	
CO3	3	3	0			2	3					3		1	
CO4	3	3	2			2	1					2		1	

ENGLISH LANGUAGE AND COMMUNICATION

(Common to all branches)

14EL104

I Year B.Tech. (Mech) First Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives

The course aims

1. at enhancing the vocabulary competency of the students
2. to enable the students to demonstrate proficiency in the use of written English, including proper spelling, grammar, and punctuation
3. to enhance theoretical and conceptual understanding of the elements of grammar
4. understand and apply the conventions of academic writing in English
5. to enhance the learners' ability of communicating accurately and fluently

Course Outcomes

By the end of the course the students would be able to

1. understand how to build academic vocabulary to enrich their writing skills
2. produce accurate grammatical sentences
3. analyse the content of the text in writing
4. produce coherent and unified paragraphs with adequate support and detail

Unit – 1

Grammar: This area exposes the learners to improve the standard proficiency level, avoiding grammatical mistake in communication.

1. Tenses
2. Preposition
3. Parts of speech

Unit – 2

Writing skills: This area promotes a format and well structured sentences required in professional writing

1. Paragraph writing
2. Letter writing
3. Essay writing

Unit – 3

Vocabulary: This unit offers an extensive knowledge of words and word meaning, essential for communication and contemporary test

1. Analogies
2. Idioms and phrases and their use
3. Antonyms & Synonyms

Unit – 4

Reading skills: Reading skills enable the student to turn writing into meaning and achieve the goals of reading independently, comprehensibly and fluently

1. Reading comprehension
   i. Scanning
   ii. Skimming
   iii. Glance

TEXT BOOK:

1. "Objective English for Competitive Examination (Third edition)", Hari Mohan Prasad, Uma ReniSinha, Tata McGraw Hill.

REFFRENCE BOOKS:

1. "Effective Technical Communication", M.AshrafRizvi, Tata McGraw Hill.
2. "Cambridge Preparation Guide for TOFEL".
3. "Dictionary of Technical Terms".
4. "Cambridge Advanced Learner's Dictionary".
5. "Cambridge Idioms Dictionary".
6. "Basic Correspondence & Report Writing", Sharma, Tata McGraw Hill.
7. "Business Correspondences and Report Writing", R.C.Sharma, Krishna Mohan, Tata McGraw Hill.
8. "Dictionary of Misspelled and Easily Confused Words", David Downing, Deborah K.Williams,Tata McGraw Hill.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1								2		3	2	2	2	1	1
CO2								2		3	2	2	2	1	1
CO3								2		3	2	2	2	1	1
CO4								2		3	2	2	2	1	1

ENVIRONMENTAL STUDIES

(Common for all branches)

14ES105

I Year B.Tech. (Mech) First Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. Understand the Ecosystems and need of Biodiversity.
2. Develop an awareness and knowledge on natural resource protection and Sustainability.
3. Realize and Explore the Problems related to Environmental pollution and its Management & Acts associated with Environment.
4. To know the global environmental problems. Apply the Role of Information analyze social issues.

Course Outcomes: Students will be able to

1. Compare various ecosystems such as forest, grassland, desert, and aquatic case studies, relate to the environmental concepts & the levels of energy flow in an ecosystem, Discuss the preventive as well as remedial measures for conservation of biodiversity.
2. Integrate and analyse the various natural and manmade factors that affect forests, environment & propose alternative sources of energy to meet the growing energy needs of our population. Identify the importance of sustainable growth and developmental.
3. Evaluate the pollution case studies and propose control measures of Urban and industrial wastes. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.
4. Understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies, Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

UNIT – I

Introduction: Definition, Scope and Importance, Need for public awareness.

Ecosystems: Introduction, types, Structure and Functions of Ecosystems, Forest, Grassland, Desert, Aquatic (lakes, rivers and estuaries)

Biodiversity: Definition and levels of Biodiversity, Bio-geographical Classification of India, India as a mega diversity nation and Hot Spots of Biodiversity.

Values of Biodiversity: Consumptive use, Productive use, Social, Ethical, Aesthetic and Option values.

Threats to Biodiversity: Habitat loss, Extinction of Species, Poaching of wildlife

Conservation of Biodiversity: In-situ and Ex-situ conservation of biodiversity

UNIT – II

Natural Resources: Exploitation and Related Pollution Problems

Land: Land as a resource, causes and effects of land degradation

Forest: Use of forests, causes and effects of deforestation and conservation of forests

Water: Distribution of Water Resources, floods and drought, causes, effects and control of water pollution.

Energy: Classification of Resources, Importance of energy, causes and effects of nuclear pollution.

Causes, Effects and Control of Air Pollution and Noise Pollution.

Solid Waste Management: Urban and Industrial wastes, Composting and Vermiculture and 3 R - approach.

UNIT –III

Sustainability: Theory and Practice, Equitable use of resources for sustainable life styles. Rain water harvesting, Watershed management, Cloud Seeding, Acid rain, Ozone layer depletion, Global warming, Population Growth and its Impact on environment, Green Revolution, Resettlement and Rehabilitation program, Mining and Dams and their conflictions, Environmental Impact Assessment

UNIT –IV

Environmental acts: Water (Prevention and Control of pollution) act, Air (Prevention and Control of pollution) act, Environmental protection act, Wild life protection act, Forest Conservation act.

International Conventions: Stockholm Conference 1972, Earth Summit 1992 and Copenhagen Conference 2009

Case Studies: Chipko movement, Narmada BachaoAndolan, Silent Valley Project, Madhura Refinery and TajMahal, Chernobyl Nuclear Diaster, Ralegaon Siddhi (Anne Hazare) and Bhopal Tragedy.

Text Book:

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

Reference Books:

1. Text Book of environmental studies, ErachBharucha, UGC.
2. Environmental Studies, AnubhaKaushik and C. P. Kaushik.
3. A basic course in environmental studies, S. Deswal and A. Deswal, DhanapathRai& Co.
4. Essentials of environmental studies, Kurian Joseph and R.Nagendram, Pearson Education Pt Ltd, Delhi.
5. Environmental studies, R.Rajagopalan, Oxford University Press.
6. Environmental Pollution Control Engineering, C. S. Rao, Wiley Eastern Ltd., New Age International Ltd.,
7. Introduction to Environmental Science, Anjaneyulu Y, B S Publications
8. Principles of Environmental Studies, Manoharachary C and Jayarama Reddy P, B S Publications.
9. Comprehensive environmental studies- JP Sharma, Laxmi Publications.
10. Environmental Science, 11th Edition – Thomson Series – By G Tyler Miller, Jr.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	-	-	-	-	-	2	2	-	1	1	-	2	-	-	-
CO2	-	-	-	-	-	2	2	-	2	1	-	1	-	2	1
CO3	-	-	-	-	-	3	3	1	2	3	2	1	1	-	2
CO4	-	-	-	-	-	1	2	1	2	1	-	3	-	-	-

(Common to all branches)

14EG106

I Year B.Tech. (Mech) First Semester

Lectures	:	3 Periods/Week, Tutorial: 3	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

On completion of the study of this subject, the student should be able to

1. Understand the importance of Engineering Drawing as an engineering communication medium.
2. Learn the usage of drawing instruments to draw the objects according to the BIS code of practice.
3. Understand the geometrical construction procedures with dimensioning.
4. Construct the curves like ellipse, parabola, hyperbola, cycloid and involutes.
5. Understand orthographic projection of points and lines along with traces of lines.
6. Understand and draw the projections of plane figures and regular solids.
7. Prepare isometric projections for the given orthographic drawings.
8. Prepare an engineering drawing of a given simple engineering part in first angle projection.

Course outcomes:

On completion of this course, students will

1. Enhance their visualization skills
2. Improve the drawing communication skills
3. Read the engineering drawings
4. Implement the skills acquired in usage of Modeling software packages Prepare the engineering drawing of the component useful for industries.

UNIT – I

INTRODUCTION: Introduction to Drawing instruments and their uses, geometrical construction procedures (6)

CURVES: Conic sections – general construction methods for ellipse, parabola and hyperbola.

Other methods to construct ellipse only, cycloid, involute of a circle

(12)

UNIT – II

METHOD OF PROJECTIONS: Principles of projection - First angle and third angle projection of points. Projection of straight lines.Traces of lines. *(18)*

UNIT – III

PROJECTIONS OF PLANES : Projections of plane figures: circle, square, rhombus, rectangle, triangle, pentagon and hexagon. (12)

UNIT – IV

PROJECTIONS OF SOLIDS: Projections of Cubes, Prisms, Pyramids, Cylinders and Cones with varying positions.
(15)

UNIT – V

ISOMETRIC PROJECTIONS: Isometric Projection and conversion of Orthographic views into isometric views. (Treatment is limited to simple objects only). **(9)**

ORTHOGRAPHIC PROJECTIONS: Conversion of pictorial views into Orthographic views. (Treatment is limited to simple castings). ***(12)***

TEXT BOOK:

1. Engineering Drawing by N.D. Bhatt & V.M. Panchal. (Charotar Publishing House, Anand). (First angle projection)

REFERENCE BOOK:

1. Engineering Drawing by Dhananjay A Jolhe, Tata McGraw hill publishers
2. Engineering Drawing by Prof.K.L.Narayana& Prof. R.K.Kannaiah.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1												1	
CO2	1	1													
CO3	2														
CO4	1	1												2	

CHEMISTRY LAB – I

(*Common to all branches)*

14CHL101

I Year B.Tech. (Mech) First Semester

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:

The student will able toUnderstand the concepts of Chemistry Lab

1. Be familiar with the features of Volumetric Analysis
2. Be able to know the concept of ANALYSIS OF WATER
3. Provide an overview of BACTERIAL COUNT.
4. Be able to know the concept of construction of galvanic cell

Course Outcomes:

The student will have ability to

1. Understand and explain the fundamentals like Primary, Secondary Standard Solutions , Normality, Molarity, Molality etc and laboratory ware used,error ,accuracy, precision, Theory of indicators, use of volumetric titrations.Familiar with forms of business organization
2. Have clear idea about Estimation of acid content in un-known solution, Iron by Dichrometric method, Copper by Iodometric method, available chlorine in bleaching powder.
3. Have knowledge of TOTAL HARDNESS BY EDTA METHOD, TURBIDITY, CONDUCTIVITY, pH, TOTAL DISSOLVED SALTS, SALANITY, ALKALINITY, and DISSOLVED OXYGEN
4. The student has to get his water sample and the teacher has to explain the Analysis and the results are to be compared with the INDIAN STANDRDS.
5. Have knowledge of position of the metals in the electrochemical Series a model electrochemical Cell is constructed and the values are determined and effect of Metal ion concentration, Temperature etc. on emf are calculated

LIST OF EXPERIMENTS

1. Introduction to Chemistry Lab (the teachers are expected to teach fundamentals like Primary, Secondary Standard Solutions , Normality, Molarity, Molality etc and laboratory ware used, error ,accuracy, precision, Theory of indicators, use of volumetric titrations.

2. Volumetric Analysis:

a. Estimation of acid content in un-known solution

b. Estimation of Iron by Dichrometric method

c. Estimation of Copper by Iodometric method

d. Estimation of available chlorine in bleaching powder

3. Analysis Of Water: Estimation of :

a. TOTAL HARDNESS BY EDTA METHOD

b. TURBIDITY

c. CONDUCTIVITY

d. pH

e. TOTAL DISSOLVED SALTS

f. SALANITY

g. ALKALINITY

h. DISSOLVED OXYGEN

4. Bacterial Count: The student has to get his water sample and the teacher has to explain the analysis and the results are to be compared with the INDIAN STANDRDS.

5. Construction Of Galvanic Cell: Based on the position of the metals in the electrochemical series a model electrochemical Cell is constructed and the values are determined and effect of metal ion concentration, Temperature etc. on emf are calculated.

6. Analysis Of Water: Estimation of :

a. TOTAL HARDNESS BY EDTA METHOD

b. TURBIDITY

c. CONDUCTIVITY

d. pH

e. TOTAL DISSOLVED SALTS

f. SALANITY

g. ALKALINITY

h. DISSOLVED OXYGEN

7. Bacterial Count: The student has to get his water sample and the teacher has to explain the analysis and the results are to be compared with the INDIAN STANDRDS.

8. Construction Of Galvanic Cell: Based on the position of the metals in the electrochemical series a model electrochemical Cell is constructed and the values are determined and effect of metal ion concentration, Temperature etc. on emf are calculated.

TEXT BOOKS:

1. "Practical Engineering Chemistry", K. Mukkanti, etal, B.S. Publications, Hyderabad.

2. "Inorganic quantitative analysis", Vogel.

REFERENCE BOOKS:

1. "Text Book of engineering chemistry", R. N. Goyal and HarrmendraGoel.

2. "A text book on experiments and calculation Engg.", S.S. Dara.

3. "Instrumental methods of chemical analysis", Chatwal, Anand, Himalaya publications.

CO-PO MAPPING

Course Outcomes	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2														
CO2	2	2	2	2		2						1			
CO3	2	2	2	2		2						1			
CO4	2	2	2	2								1			
CO5												1			

ENGLISH LANGUAGE LAB

(Common to all branches)

14ELL102

I Year B.Tech. (Mech) First Semester

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

The course aims

1. to sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
2. to bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
3. to improve students' fluency in English and neutralize their mother tongue
4. to make them use effective vocabulary both in formal and informal situations

Course Outcomes:

By the end of the course the students would be able to

1. better understand the nuances of English language through audio- visual experience and group activities
2. develop neutralization of accent for intelligibility
3. build confidence to enhance their speaking skills
4. use effective vocabulary both in formal and informal situations

Introduction to communication: Difference between communication and communication skills, Types of communication, Barriers to communication.

Introduction to skills: Listening skills, writing skills, Reading skills, and Speaking skills.

Pronunciation drills: Phonetics, British English and American English.

Conversational skills: Dialogue, Telephonic Interaction.

Professional writings & skills: Resumes, Reports, Business letters and Interview skills.

Practical: Extempore Debates, Group discussion, and Oral presentation.

RECOMMENDED SOFTWARES:

Digital Language Lab - Networking Software, HiClass – Software.

English Language – Listening, Speaking Reading, Writing Skills: A lania series – English Mastery, Levels A, B (Set of 2 CDs), English Discoveries (Set 0f 12 CDs).

English Grammar / Pronunciation: Live Action English Interactive, Speech Solutions

Dictionaries: Cambridge Advanced Learner's**,** Oxford Genie & Advanced

Writing: Easy writer, Creative writing

Professional English: Telephonic English**,** English in mind

English for ETS: Barron's**,** TOEFL Mastery**,** IELTS**,** GRE

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									3	3	2	2	2	1	1
CO2									2	3	2	2	2	1	1
CO3									3	3	2	2	2	1	1
CO4									3	3	2	2	2	1	1

WORKSHOP PRACTICE
14WSL03
I Year B. Tech.Second Semester

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment	:	40	Semester End Examination (3 Hours)	:	60		

Course Objectives:

1. To impart student knowledge on various hand tools for usage in engineering applications.
2. Be able to use analytical skills for the production of components.
3. Design and model different prototypes using carpentry, sheet metal and welding.
4. Make electrical connections for daily applications.
5. To make student aware of safety rules in working environments.

Course Outcomes: After completion of this course student should be able to:

1. Make half lap joint, Dovetail joint and Mortise &Tenon joint
2. Produce Lap joint, Tee joint and Butt joint using Gas welding
3. Prepare trapezoidal tray, Funnel and T-joint using sheet metal tools
4. Make connections for controlling one lamp by a single switch, controlling two lamps by a single switch and stair case wiring.

SYLLABUS:

1. Carpentry
   a. Half Lap joint B. Dovetail joint C. Mortise &Tenon joint
2. Welding using electric arc welding process/gas welding
   a. Lap joint B.Tee joint C.Butt joint
3. Sheet metal operations with hand tools
   a. Trapezoidal tray Funnel T-joint
4. House wiring
   a. To control one lamp by a single switch
   b. To control two lamps by a single switch
   c. Stair-case wiring

TEXT BOOKS:

1. P.Kannaiah and K.L.Narayana, Workshop Manual, SciTech Publishers, 2009.
2. K. Venkata Reddy, Workshop Practice Manual, BS Publications, 2008.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		1							3	2		2		
CO2	2		1							3	2		3		
CO3	2		1							3	2		3		
CO4	2		1							3	2		2		

ENGINEERING MATHEMATICS – II

(Common for all branches)

14MA201

I Year B.Tech. (Mech) Second Semester

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:

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

1. Compute the Fourier series expansion of f(x) with period 2L.
2. Compute complex form of Fourier series.
3. Compute errors and approximations.
4. To compute Laplace transformation for different functions and their inverses.
5. Properties of Laplace transformations.
6. Compute Laplace transformation using properties.
7. Compute solution of a differential equation using Laplace transformation.
8. To evaluate double and triple integrals over a region.
9. Compute volume of solids between the surfaces.
10. Computing multiple integrals in polar form.
11. Compute normal vector of a surface and angle between the surfaces.
12. Significance of gradient.
13. Computing integration over curves and integration over surfaces.

Course Outcomes:

Provide students with the knowledge of

1. Representation of periodic functions corresponding to objects following periodic phenomena in terms of sine and cosine functions.
2. Solving engineering problems that can be modeled as ordinary differential equations without finding general solutions.
3. Transforming line integrals, double and triple integrals into one another in solving Mathematical models of some engineering applications.

4.To learn some basic properties of scalar and vector point functions and their applications to line, surface and volume integrals.

UNIT – I

Fourier Series: Periodic Functions, Trigonometric Series, Fourier Series, Functions of Any Period P = 2L, Even and Odd Functions, Half Range Expansions, Complex Fourier Series, Approximation by Trigonometric polynomials.

UNIT – II

Laplace Transforms: Laplace Transform, Inverse Transform, Linearity, Shifting, Transforms of Derivatives and Integrals, Differential Equations, Unit Step Function, Second Shifting Theorem, Dirac's Delta Function, Convolution theorem (without proof).

UNIT – III

Integral Calculus: Evaluation of double integrals (Cartesian & Polar), Changing the order of integration, Evaluation of triple integrals, Applications of triple integrals to find area and volume.

UNIT – IV

Vector calculus: Scalar and vector point functions, Gradient of a scalar field, Directional derivative, Divergence of a vector field, curl of a vector field, Line integrals, Line integrals independent of path, Green's theorem in the plane (without proof), Surface integrals, Triple integrals, Divergence theorem of Gauss (without proof), Applications to Engineering problems, Stokes theorem(without proof).

TEXT BOOK:

1. "Advanced Engineering Mathematics", Erwin Kreyszig, 8th edition, John Wiley & Sons.

REFERENCE BOOKS:

1. "Advanced Engineering Mathematics", Peter V. O'Neil, Thomsons Brooks/Cole.
2. "Advanced Calculus", Murray R Spiegel, Schaum's outline series.

Prerequisites: Elementary integral calculus, Linear differential equations of second and higher order, Elementary calculus.

Text Book:
1. "Advanced Engineering Mathematics", Erwin Kreyszig, 8th edition, John Wiley & Sons.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2		1									1		
CO2	3	2		1									2		
CO3	2	2		1									1		
CO4	2	2		1									2		

ENGINEERING PHYSICS – II

(Common to all branches)

14PH202

I Year B.Tech. (Mech) Second Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:

The student will able to

1. Understand the Torsional pendulum, platinum resistant thermometer
2. Be familiar with the features of solar cell, semiconductor
3. Be familiar with the features of ultrasonic interferometer, operating voltage.
4. Be able to know the concept of C.R.O, P-N junction diode
5. Be able to know the concept of energy gap of Si &Ge, Diode laser

Course Outcomes:

The student will have ability to
1. Students demonstrate the ability to apply the knoledge of band theory of solids and concept of energy band gap and hole

2. Classify the different types of magnetic and dielectric materials and their applications

3. understand importance of nano materials , properties and their applications.

4..To femilierise the phenomenon of superconductivity and opto-electronic devices.

5.students to understant the principle in the production and applications of ultrasonics

6.students are able to estimate the crystal structures by x-ray diffraction technique.

UNIT - I

Electron theory of solids & semiconductor physics (10 periods)

Electron theory of solids:Failure of classical free electron theory, quantum free electron theory, Fermi-Dirac distribution and its temperature dependence, Kronig-Penny model (Qualitative), effective mass of electron, concept of hole.

Semiconductor physics: Classification of semiconductors, P-N junction diode and its characteristics, carrier concentration in P and N type semiconductors, Equation of continuity.

UNIT – II

Magnetic, Dielectric and Ferro-electric materials (10 periods)

Origin of magnetic moment of an atom, Bohr magneton, Weiss theory of Ferro magnetism (Qualitative), Hysteresis curve, soft and hard magnetic materials, ferrites and its applications.

Dielectric materials, Types of polarizations, internal field (qualitative), Classius – Mossetti equation, Frequency dependence of polarization, Ferroelectrics and its applications.

UNIT – III

Advanced materials (12 periods)

Nano-materials: Introduction to nano-materials, Fabrication of nano-materials and carbon nano tubes (CVD and sol-gel), physical and chemical properties of nano materials, Applications of nano materials (Structural point, Storage of information, Strength point)

Superconductivity: Meissner effect, types of superconductors, elements of BCS theory, Applications of superconductors.

Opto-electronic devices: Working and applications of solar cell,LED, LCD, Photo Diode.

UNIT – IV

Analytical techniques (10 periods)

Nuclear techniques: Radio isotopes and its applications (Medical and Industrial), GM-counter, scintillation counter.

Ultrasonics: Properties of ultrasonics, General applications of ultrasonics.

Medical applications: Cardiology, Neurology, Ultrasonic imaging.

NDT: Pulse echo technique, cavitation effect, Time of flight diffraction technique.

Structure determination: Crystal planes, Bragg's law, structural analysis of crystal using X-Ray powder diffraction method.

TEXT BOOKS:

1. "Engineering physics",M.R.Sreenivasan, Newage International Publication.
2. "Engineering Physics", Palaniswamy, ScitechPulishers.
3. "Solid State Physics", Dekkar.

REFERENCE BOOKS:

1. "Material Science for scientists and Engineers", Srinivasan&Srivastava, TMH Publishers.
2. "A text book of engineering physics", M.N.Avadhanulu& P. Krushisagar, S.Chand Pub.
3. "Material Science", VijayaRangarajan.

CO-PO MAPPING

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	1	2	2		3									
CO2	2		2	1	1	2									
CO3	3	2	2		2	3									
CO4	3	2	2		2	3									
CO5	3	2	2	1	1	3									
CO6	3	3	2	2	3	3									

ENGINEERING CHEMISTRY – II

(Common to all branches)

14CH203

I Year B.Tech. (Mech) Second Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:

The student will able to

1. Understand the PRODUCTION OF BIODIESEL.
2. Be familiar with the estimation of properties of oil
3. Be able to know the concept of preparations, soil analysis
4. Be able to know the concept of kinetics, demonstration experiments
5. Provide an overview of food analysis

Course Outcomes:

The student will have ability to

1 Understand and explain The student has to perform the transesterfication reaction of FATTY ACID and the Biodiesel thus produced can be used for analysis

2 Familiar with Estimation of properties of oil: Acid Number, Viscosity,Saponification value Aniline point Flash and Fire point ,Pour and Cloud point

3 Have clear idea about Preparation of: Phenol –formaldehyde resin, aspirin, phenyl benzoate, soap

4 Have knowledge of pH, Determination of Zinc, Iron and Copper

UNIT – I **(11 Periods)**

ELECTROCHEMISTRY

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes –Standard Hydrogen electrode -Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance –potentiometer titrations (redox - Fe^{2+}vs dichromate and precipitation – Ag^{+} vs CI^{-}titrations) and conduct metric titrations (acid-base – HCI vs, NaOH) titrations.

UNIT - II **(11 Periods)**

CORROSION AND CORROSION CONTROL

Chemical corrosion – Pilling – Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Au) and electroless (Ni) plating.

GREEN CHEMISTRY: Introduction-concepts-Engineering Applications.

UNIT – III **(12 Periods)**

LIQUID AND GASEOUS FUELS AND COMBUSTION: Petroleum based: Petroleum processing and fractions – cracking – catalytic cracking and methods-knocking and anti-knocking Agents – octane number and cetane number – synthetic petrol – Fischer Tropsch and Bergius processes.

Gaseous fuels- water gas, producer gas, CNG and LPG, Flue gas analysis – Orsat apparatus – theoretical air for combustion.

PHASE RULE AND ALLOYS: Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

UNIT – IV **(11 periods)**

ANALYTICAL TECHNIQUES: Beer-Lambert's law (problem) – UV-visible spectroscopy and IR spectroscopy –principles – instrumentation (problem) (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. P.C.Jain, Monica Jain, "Engineering Chemistry", DhanpatRai Pub, Co., New Delhi (2002).
2. S.S.Dara, Mukkanti K.,"A text book of Engineering Chemistry", S.Chand& Co., Ltd., New Delhi (2006).

3. B. Sivasankar, “Engineering Chemistry”, Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).

REFERENCE BOOKS:

1. B.K.Sharma, “Engineering Chemistry”, Krishna Prakasan Media (P) Ltd., Meerut (2001).
2. “Enginering Chemistry”, J.C.Kuriacase&J.Rajaram, Tata McGraw Hill, New Delhi (2004).
3. “Chemistry of Engineering Materials”, R.P Mani, K.N.Mishra, CENGAGE learning.
4. “Applied Chemistry - A text for Engineering & Technology”, – Springar (2005).

CO-PO MAPPING

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	3	1			2	3					3		1	
CO2	3	3	2			2	3					3		1	1
CO3	3	3	0			3	3					3		2	
CO4	3	3	2			1	1					2			

COMPUTER PROGRAMMING WITH C

(Common to all Branches)

14CP206

I Year B.Tech. (Mech) Second Semester

Lectures	:	4 Periods/Week, Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives: students will be able to

1. Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, and Arithmetic rules.
2. Develop problem-solving skills to translate "English" described problems into programs written using C language.
3. Use Conditional Branching, Looping, and Functions.
4. Apply pointers for parameter passing, referencing and differencing and linking data structures.
5. Manipulate variables and types to change the problem state, including numeric, character, array and pointer types, as well as the use of structures and unions, File.

Course Outcomes: After completion of the course the students will be able to

1. Identify the right data representation formats for the given problem.
2. Use appropriate conditional/iterative statements to solve the problems
3. Apply the concepts of user defined functions and recursion to support reusability
4. Design an application using the concepts of array, pointer, structure, and file management to solve real world problem.

UNIT – I

Introduction:

Computer Fundamentals: Computer and it's components, hardware/software**,** algorithm, characteristics of algorithms, flowchart, symbols used in flowchart, history of C, basic structure of a C program.

C Tokens: Character set, variables, keywords, data types and sizes, type qualifiers, numeric constants and their forms of representation, character constants, string constants, declaration and initialization of variables.

Operators & Expressions: Arithmetic operators and expressions, type-conversion rules, coercion, assignment operators and expressions, increment and decrement operators, conditional operator, statements, preprocessor directives, input/ output functions and other library functions. Relational operators and expressions, boolean operators and expressions, operator precedence and associativity.

Control Statements: if-else statement, else-lf statement and switch statement.

Programming Exercises for Unit I :

C-expressions for algebraic expressions, evaluation of arithmetic and boolean expressions. Syntactic errors in a given program, output of a given program, values of variables at the end of execution of a program fragment, filling the blanks in *a* given program. Programs using Scientific and Engineering formulae.Finding the largest of the three given numbers.Computation of discount amount on different types of products with different discount percentages. Finding the class of an input character, finding the type of triangle formed with the given sides, computation of income-tax, computation of electricity bill and conversion of lower case character to its upper case.

UNIT – II

Control Statements: while loop, for loop, do while loop, nested Control statements, break and continue statements.

Arrays: One-Dimensional numeric and character arrays and Two-Dimensional numeric and character arrays.

Programming Exercises for Unit - II:

To print the sum of the digits of a given number and to display the image of a given number.To find whether a given number is prime, printing Fibonacci sequence and to find prime factors of a given number.To print graphic patterns of symbols and numbers and computation of statistical parameters of a given list of numbers.To find the length of a string, compare strings, reverse a string, copy a string and to find whether the given string is palindrome or not. Transpose of a matrix, product and sum of matrices and sorting of names using arrays.

UNIT – III

Functions: Function definition, parameter passing mechanisms and simple recursion.

Scope & extent: Scope rules and storage classes.

Pointers and Dynamic Memory Allocation: Pointer variables**,** pointer arithmetic, dynamic memory allocation, array of pointers, command line arguments, passing pointer variables as parameters to functions.

Programming Exercises for Unit - III:

Functions - Insertion sort, Linear search. Recursive functions to find factorial &GCD(Greatest Common Divisor), string operations using pointers and pointer arithmetic and dynamic memory allocation. Swapping two variable values. Sorting a list of names using array of pointers and command line arguments.

UNIT – IV

Structures: Structures, array of structures, pointers to structures, unions and difference between structure and union.

Files: File handling functions for input and output.

Programming Exercises for Unit - IV:

Operations on complex numbers, matrix operations with the matrix and the size of the matrix as a structure, sorting a list of student records on register number using array of pointers and to read an input file of marks and generate a result file.

TEXT BOOK:

1. Byron Gottfried, "Programming with C", Schaum's Outline series.

REFERENCE BOOKS:

1. Kernighan BW and Dennis Ritchie M, "C programming language", 2nded, Prentice Hall.
2. Yashavant P. Kanetkar, "Let us C", BPB Publications.
3. E.Balagurusamy, "Programming in ANSI C", 4thed, Tata Mcgraw-Hill.
4. Herbert Schildt, "C: The Complete Reference", 4th edition, Tata Mcgraw-Hill.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3		2								1		
CO2	3	3	3		2								1		
CO3	3	3	3		2								1		
CO4	3	3	3		2								1		

PHYSICS LAB – I

(Common to all branches)

14PHL201

I Year B.Tech. (Mech) Second Semester

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:

The student will able to

1. Understand the Torsional pendulum, platinum resistant thermometer
2. Be familiar with the features of solar cell, semiconductor
3. Be familiar with the features of ultrasonic interferometer, operating voltage.
4. Be able to know the concept of C.R.O, P-N junction diode
5. Be able to know the concept of energy gap of Si &Ge, Diode laser

Course Outcomes:

1. Acknowledge the important aspects of earth magnetic field, realize the use of Maxwell's equations in various magnetic applications.
2. Applications of basic principles of optics to estimate physical parameters.
3. Realization of material properties and parameters.
4. Get hands on experience in various opto-electronic devices like Solar Cell, Photo Cell and their applications

LIST OF EXPERIMENTS

1. Determination of acceleration due to gravity at a place using compound pendulum.
2. Study the variation of intensity of magnetic field along the axis of a circular coil using Stewart-Gee's apparatus.
3. Determination of thickness of thin wire using air wedge interference bands.
4. Determination of radius of curvature of a Plano convex lens by forming Newton's rings.
5. Determination of wavelengths of mercury spectrum using grating normal incidence method.
6. Determination of dispersive power of a given material of prism using prism minimum deviation method
7. Draw the resonant characteristic curves of L.C.R. series circuit and calculate the resonant frequency.
8. Draw the characteristic curves of a photocell and calculate the maximum velocity of electron.
9. Verify the laws of transverse vibration of stretched string using sonometer.
10. Determination of numerical aperture of an optical fiber.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2		1											
CO2	2	2	1												
CO3	2	2	1												
CO4	2	2	3		1										

HADWARE LAB – I

(Common to all branches)

14HWL202

I Year B.Tech. (Mech) Second Semester

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Outcomes

1. Identify the basic hardware components of computer.

2. Recognize system and application software and install/uninstall them.

LIST OF EXPERIMENTS

1. Identification and testing of various electronic components. (Resistors, Inductor, Capacitor, Transistor, ICs and Bread board)
2. Study of Oscilloscope, Function generator, Power supply and Multi meter.
3. KCL & KVL verification for simple circuits on Bread board.
4. Study of Ceiling fan.
5. Study of Florescent lamp.
6. Study of Single Phase Transformer.
7. Identifying all parts of computers.
8. Install and Uninstall system and application software.
9. Assembling a Computer.
10. Connecting computers in a network.

CO-PO MAPPING

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	1				1										1
CO2	1				1										1

COMPUTER PROGRAMMING LAB

(Common to all Branches)

14CPL203

I Year B.Tech. (Mech) Second Semester

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives: students will be able to

1. Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, and Arithmetic rules.
2. Develop problem-solving skills to translate „English" described problems into programs written using C language.
3. Use Conditional Branching, Looping, and Functions.
4. Apply pointers for parameter passing, referencing and differencing and linking data structures.
5. Manipulate variables and types to change the problem state, including numeric, character, array and pointer types, as well as the use of structures and unions, File.

Course Outcomes: After completion of the course the students will be able to

1. Identify the right data representation formats for the given problem.
2. Use appropriate conditional/iterative statements to solve the problems
3. Apply the concepts of user defined functions and recursion to support reusability
4. Design an application using the concepts of array, pointer, structure, and file management to solve real world problem.

LIST OF PROGRAMS

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

Domestic Customer:	
Consumption Units	**Rate of Charges(Rs.)**
0 – 200	0.50 per unit
201 – 400	100 plus 0.65 per unit

401 – 600	230 plus 0.80 per unit
601 and above	390 plus 1.00 per unit
Commercial Customer:	
Consumption Units	**Rate of Charges(Rs.)**
0 – 50	0.50 per unit
100 – 200	50 plus 0.6 per unit
201 – 300	100 plus 0.70 per unit
301 and above	200 plus 1.00 per unit

2. Write a C program to evaluate the following (using loops):
    a) $1 + x^2/2! + x^4 / 4!+ \ldots$upto ten terms
    b) $x + x^3/3! + x^5/5!+ \ldots$ upto 7 digit accuracy

3. Write a C program to check whether the given number is
    a) Prime or not.
    b) Perfect or Abundant or Deficient.

4. Write a C program to display statistical parameters (using one – dimensional array).
    a) Mean
    b) Mode
    c) Median
    d) Variance.

NOTE: Use functions for each subtask in the following programs

5. Write a C program to read a list of numbers and perform the following operations

a) Print the list.

b) Delete duplicates from the list.

c) Reverse the list.

6. Write a C program to read a list of numbers and search for a given number using Binary search algorithm and if found display its index otherwise display the message “Element not found in the List”.

7. Write a C program to read two matrices and compute their sum and product.

8. A menu driven program with options (using array of character pointers).

    a) To insert a student name

    b) To delete a name

    c) To print the names

9. Write a C program to read list of student names and perform the following operations

    a) To print the list of names.

    b) To sort them in ascending order.

    c) To print the list after sorting.

10. Write a C program that consists of recursive functions to

    a) Find factorial of a given number

    b) Solve towers of Hanoi with three towers (A, B & C) and three disks initially on tower A.

11. A Bookshop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book the sales person inputs the title and the author and the system

searches the list and displays whether it is available or not. If it is not an appropriate message is displayed, if it is then the system displays the book details and request for the number of copies required ,if the requested copies are available the total cost of the requested copies is displayed otherwise the message "required copies not in stock" is displayed. Write a program for the above in structures with suitable functions.

12. Write a C program to read a data file of student's records with fields(Regno, Name, M1,M2,M3,M4,M5) and write the successful students data (percentage > 40%) to a data file.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	3	3		2								1		
CO2	3	3	3		2								1		
CO3	3	3	3		2								1		
CO4	3	3	3		2								1		

ENGINEERING MATHEMATICS-III

14MA301

II Year B.Tech. (Mech) Third Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:

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

1. Obtain the Fourier integral representation of a given non periodic function over the given interval.
2. Obtain the Fourier integral transform and inverse of that transform for a given function over the given interval.
3. Use various properties of Fourier transform to obtain The Fourier transforms and their inverses in various applications.
4. Study the basic concepts and definitions of partial differential equations.
5. Apply the basic series and transform for solution to partial differential equations.
6. Provide an application oriented computation for solving wave equation, heat equation and steady state two dimensional heat flows.
7. Obtain the solution of equations by employing iteration and Newton Raphson method.
8. Construct Lagrange and Newton forward/backward difference interpolation polynomials for a given set of data.
9. State and use the formulas for bounding the error in polynomial interpolation based on derivatives, and for estimating error based on differences.
10. Fit a straight line or second degree polynomial to the given data by using method of least squares.
11. Ordinary differential equations will be dealt with using numerical computational methods.
12. Apply numerical methods to obtain the solution of elliptic partial differential equations.

Course Outcomes:

Provide students with the knowledge of

1. Modeling and solving partial differential equations corresponding to vibration and radiation phenomena
2. Scientific computing techniques to overcome common computational difficulties in engineering applications involving interpolation, integration and differential equations.
3 .Able to understand and implement numerical methods according to the problem
4. Able to calculate solutions for differential equations

UNIT-I

Fourier integrals: From Fourier series to the Fourier integral, Application of the Fourier integral, Fourier Cosine and Sine integral, Evaluation of integrals, Fourier cosine and sine Transforms: Fourier Cosine Transforms, Fourier Sine Transforms, Linearity, Transforms of Derivatives, Fourier Transform: Complex form of the Fourier integral, Fourier Transform and its inverse, Linearity. Fourier Transform of Derivatives, Convolution.

UNIT-II

Partial differential equations: Basic concepts, Modeling-Vibrating string, Wave Equation

Separation of Variables Use of Fourier series, D'Alembert's Solution of the Wave Equation, Heat Equation-Solution Fourier series, Steady-State Two-Dimensional Heat Flow

UNIT-III

Numerical Methods in general: Introduction, Solution of Equations by Iteration, Newton's Method for Solving Equations f(x) = 0, Convergence of Newton's method, Interpolation:Lagrange interpolation, Newton's divided difference interpolation, Equal spacing: Newton's forward Difference formula, Newton's Backward Difference formula, Inverse interpolation, Numerical integration and Differentiation: Trapezoidal Rule, Error Bounds and Estimate for the Trapezoidal Rule, Simpson's Rule of integration, Error of Simpson's rule

UNIT-IV

Numerical methods in linear algebra: Linear Systems: Gauss Elimination, LU Factorization, Gauss-Seidel iteration Method, Method of least Squares, Methods of First order Differential Equations: Euler's method, Runge-Kutta methods, Methods for Elliptic Partial Differential Equations: Laplace equation, Poisson equation

TEXT BOOK:

1."Advanced Engineering Mathematics", Erwin Kreyszig, 8th edition, John Wiley & Sons.

REFERENCE BOOKS:

1."Advanced Engineering Mathematics", Peter V. O'Neil, Thomsons Brooks/Cole.

CO-PO MAPPING

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1												1	
CO2	2	2													
CO3	1														
CO4	3	2												2	

MECHANICS OF MATERIALS- I

14ME302

II Year B.Tech. (Mech) Third Semester

Lectures	:	4 Periods/Week,Tutorial: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

The objective is to learn the fundamental concepts of stress, strain, and deformation of solids with applications to bars, beams, and columns. Detailed study of engineering properties of materials is also of interest. Fundamentals of applying equilibrium and force-deformation relationships to structural elements are emphasized. The course builds on the fundamental concepts of classical mechanics course. The students will:

1. Classify the stresses into various categories and define the elastic properties of Materials.
2. compute stress and strain intensities caused by applied loads in simple and compound sections and temperature changes
3. Determine the shear force and bending moment and draw the shear force and bending moment diagrams for different beams and different loads
4. Explain the structural behavior of members subjected to torque, Calculate twist and stress induced in shafts subjected to bending and torsion
5. Derive the equations for principal stress and maximum in-plane shear stress and calculate their magnitude and direction. Draw Mohr circle for plane stress system and interpret this circle.

Course Outcomes:

Students successfully completing course will have a clear and thorough understanding of the fundamental concepts of mechanics of solids and structures and basic analysis and design skills. The students will have the ability to perform stress, strain, force and deformation analysis by hand. The students will be able to or have:

1. To define stress strain diagram and various points on it and define the types of stresses.
2. To analyse the bars under axially loaded members of statically determinate and statically indeterminate members and to calculate the power transmitted by circular shafts

3. To draw the SF and BM diagrams and analyse the bending stresses and shear stresses.
4. To draw the Mohr's circle for plane stress for principal stresses and maximum shear stresses.

UNIT-I

TENSION, COMPRESSION AND SHEAR: Introduction to Mechanics of materials, normal stress and strain, stress strain diagram for mild steel, elasticity and plasticity, linear elasticity, Hooke's law and Poisson's ratio, shear stress and strain, volumetric strain and bulk modulus, allowable stresses and allowable loads. (9)
AXIALLY LOADED MEMBERS: Introduction, changes in lengths of axially loaded members, changes in lengths under non uniform conditions.
(6)

UNIT-II

STATICALLY INDETERMINATE AXIALLY LOADED MEMBERS: Statically indeterminate structures, thermal effects, misfits and pre strains, strain energy (8)
TORSION:Introduction, torsion of circular bars, non uniform torsion, relationship between E and G, transmission of power by circular shafts, strain energy in torsion. (7)

UNIT-III

SHEARING FORCE AND BENDING MOMENT: Introduction, Types of Beams, Loads and Reactions. Shearing force and bending moment, relationships between loads, Shear forces and bending moment s, S.F. and B.M. diagrams. (15)

UNIT-IV

STRESSES IN BEAMS: Introduction, normal strains and stresses in beams. Shear stresses in beams of rectangular cross section, shear stresses in beams of circular cross section. (8)
ANALYSIS OF STRESS AND STRAIN: Introduction, plane stress, principal stresses and maximum shear stresses, Mohr's circle for plane stress, Hooke's law for plane stress. (7)
Text Books:
1. 'Mechanics of Materials' by James M Gere
Reference Books:
1.'Strength of materials' by G.H. Ryder: MacMillan India Ltd. publishers.
2.'Mechanics of Materials' by Beer and Johnston
3.'Strength of Materials' by L.S.Srinath
4.'Applied strength of materials' by Robort L.Mott

CO-PO MAPPING

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1		2			1			2					3	2	
CO2	3	1	1		2	1		1					2	2	
CO3	2	3	2			2							1	2	
CO4		2	2	1									2	1	

BASIC THERMODYNAMICS
14ME303

II Year B.Tech.(Mech) Third Semester

Lectures	:	4 Periods/Week, Tutorial:1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objective:

1. The principles of thermodynamics are based on our everyday experiences and experimental observations.
2. The system-surrounding interactions involving work and heat transfer with associated property changes and the system-control volume approaches of the first law have been emphasized.
3. The second law has been elaborated upon in considerable detail. The subject of thermodynamics also referred to as thermal science, is of interest to students of all branches of engineering.
4. The subject forms the basis for the study of a vast variety of devices such as refrigerators, air conditioners, automotive engines, air crafts, locomotives, power plants e.t.c., the use of which is involved in the everyday life of almost every individual.
5. The principles of thermodynamics understanding the working of any machine which works with the heat energy, the subject knowledge or thermodynamics will also be useful to understand the concept of heat transfer.
6. To impart the knowledge of nature and role of the following thermodynamic properties of matter: internal energy, enthalpy, entropy, temperature, pressure and specific volume, Types of systems and processes, Concepts of principles of Thermometry, Idea about first , second and third law of thermodynamics, Concept of Mollier Charts, Kelvin-Planck and Clausius statements, types of cycles etc. to the student

Course Outcomes:

Upon completion of the course the Student

1. Be able to access thermodynamic property data from appropriate sources
2. Be able to chart thermodynamic processes on appropriate thermodynamic diagrams, such as a temperature-entropy or pressure-volume diagram**.**
3. Be able to represent a thermodynamic system by a control mass or control volume, distinguish the system from its surroundings, and identify work and/or heat interactions between the system and surroundings.
4. Recognize and understand the different forms of energy and restrictions imposed by the First Law of Thermodynamics on conversion from one form to another.

UNIT I

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

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

UNIT II

FIRST LAW OF THERMODYNAMICS FOR NON-FLOW SYSTEMS: First law for a system undergoing a cycle and for a change in state of system, internal energy and enthalpy, constant volume and constant pressure specific heats and their relation to internal energy and enthalpy of ideal gases. (7)

FIRST LAWOF THERMODYNAMICS FOR FLOW SYSTEMS: Control mass and control volume, first law of thermodynamics for a control volume, Steady flow energy equation and its application to engineering equipment. (8)

UNIT III

SECOND LAW OF THERMODYNAMICS: Limitations of first law, PMM of first kind**,** Heat engines and Refrigerators, Statements of Second law, PMM of second kind, reversible and irreversible processes, factors that render a process irreversible, Carnot cycle and Carnot theorems, Thermodynamic temperature scale. (6)

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

UNIT IV

GAS POWER CYCLES: Air standard Carnot cycle, Otto cycle, Diesel cycle, Dual Combustion cycle and Brayton cycle, Air standard efficiency and MEP. (7)

PURE SUBSTANCE: Definition**,** process of steam generation, P-v, T-s and h-s diagrams, properties of saturated and superheated steam, Use of Steam Tables, Mollier chart. (8)

TEXT BOOKS:

1. Engineering Thermodynamics- P.K.Nag, TMH, New Delhi.
2. Thermal Science and Engineering- D.S.kumar, S.K.Kataria publ, New Delhi.
3. Thermodynamics—Rajput, Laxmi Publ, New Delhi.

REFERENCE BOOKS:

1. Fundamentals of Engineering Thermodynamics-Rathakrishnan-PHI, New Delhi.
2. Thermodynamics -- J.P.Holman, MGH, New York.
3. Engineering Thermodynamics—Cengel & Boles, TMH

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2											1	3	
CO2	1	3											2	3	
CO3	2		3										2	1	2
CO4		1		3											2

FLUID MECHANICS

14ME304

II Year B.Tech. (Mech) Third Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objective:

1. To develop students understanding of the basic principle and fundamentals of fluid mechanics.
2. To teach students various types of flows, governing equations and their applications.
3. To enable the students to gain knowledge of flow through pipes, concept of boundary layer theorem.
4. To enable the students to gain knowledge of compressible fluid flow.

Course Outcomes:

1. Apply concept of fluid mechanics such as surface tension, compressibility and buoyancy in real time.
2. Demonstrate an ability to recognize the type of fluid flow and choose the appropriate formulae needed to analyze fluid flow situation.
3. Calculate the losses in a pipe and determine its roughness and life.
4. Explain various methods available for boundary layer separator.

UNIT I

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

FLUID STATICS: Pressure, variation of pressure in a fluid, measurement of pressure – simple and differential manometers, pressure head, Pascal's law, Total pressure and center of pressure on plane surfaces, Buoyancy and Metacentric height. (9)

UNIT II

FLUID KINEMATICS: Velocity and acceleration of fluid particle, types of fluid flow, Description of flow pattern, Rotational and irrotational flows, velocity potential, stream function, flownet, continuity equation in Cartesian coordinates. (7)

FLUID DYNAMICS: Introduction, Euler's equation of motion, Bernoulli's equation, Pitot tube, venturimeter, orifice meter, orifice- various coefficients of an orifice. (8)

UNIT III

IMPULSE MOMENTUM EQUATION: Impulse momentum Principle, Equation and Applications - Force on pipe bend, jet propulsion of orifice tanks and ships. (3)

FLOW THROUGH PIPES: Types, Reynolds experiment, laws of fluid friction, Darcy-Wiesbach equation, minor losses, hydraulic gradient & total energy lines, pipes in series and parallel, transmission of power through a pipe, water hammer, Laminar flow through a circular pipe, Hagen-Poiseulle law, emptying of tanks with uniform cross section. (12)

UNIT IV

BOUNDARY LAYER CONCEPTS: introduction, boundary layer thickness, displacement thickness, momentum thickness, energy thickness, boundary layer growth on a flat plate, separation of boundary layer. (6)

INTRODUCTION TO COMPRESSIBLE FLUID FLOW: Equation of state, Gas laws, Equation of Continuity, Equation of motion and Equation of Energy, compressible flow regimes, Mach number, Mach cone, Shock waves, Stagnation point and properties, area velocity relationship for compressible fluid flow. (9)

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Fluid Mechanics and hydraulic machines-R.K.Bansal
2. Fluid mechanics and fluid power engineering - D.S.Kumar, SK Kataria & Sons, New Delhi.
3. Fluid mechanics including Hydraulic machines - A.K.Jain.
4. Fluid Mechanics-K.L.Kumar

CO-PO MAPPING

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	2											1	2	
CO2		1		1											
CO3	2	2											1		
CO4	1	1	1										1		

KINEMATICS OF MACHINES

14ME305

II Year B.Tech. (Mech) Third Semester

Lectures	:	4 Periods/Week, Tutorial:1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To understand the fundamentals of kinematics.
2. To understand the concept of machines, mechanisms and related terminologies.
3. To calculate mobility (number of degrees-of-freedom). Enumeration of rigid links and types of joints within mechanisms.
4. To make the students become familiar and understanding of the most commonly used mechanisms (4-bar, 6-bar linkages, and cams).
5. To understand the concept of synthesis and analysis of different mechanisms.
6. To understand the Principles and working of various straight line motion mechanisms
7. To analyze a mechanism for displacement, velocity and acceleration at any point in a moving link which is prerequisite for dynamics of machines.
8. To analyze Steering gear mechanisms and working of hooks joint
9. To understand the working principles in Belt and chain drives
10. To understand the theory of gears, gear trains and cams

Course outcomes:

1. Upon Completion of the course student will be able to develop critical thinking and problem solving capacity of various mechanical engineering problems related to kinematics of machines.
2. The student should be able to employ various concepts of mechanisms like straight line motion mechanisms, Steering gear mechanisms and working principles of Gears, gear trains, Cams, Belt and Chain drives and design related problems effectively.
3. The student should be able to employ analytical, mathematical and graphical aspects of kinematics of Machines for effective design.
4. Student should be able to select and analyze the gear needed for the real life applications

UNIT I

INTRODUCTION : Mechanisms and machines, Rigid and resistant bodies, Link, Kinematic pair, Degrees of Freedom, Classifications of Kinematic pairs, kinematic-chain, Linkage, Mechanism, and structure, Classification of mechanisms, Equivalent Mechanisms, Four - Link (bar) Mechanism, Inversions of Slider - Crank Chain, Double – Slider Chain. (7)

VELOCITY ANALYSIS: Introduction, Absolute and Relative Motion, Vectors, Addition and subtraction of Vectors, Motion of a Link, Four Link Mechanism, Angular Velocity of Links, Velocity of Rubbing, Slider - Crank Mechanism, Crank and Slotted Lever Mechanism. (8)

UNIT II

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

ACCELERATION ANALYSIS : Acceleration, Four-Link Mechanism, Angular acceleration of Links, Acceleration of Intermediate and offset points, slider-Crank Mechanism, Coriolis acceleration component, Crank and slotted lever Mechanism. (10)

UNIT Ill

KINEMATIC SYNTHESIS: Stages of synthesis-Concepts of type, Number and dimensional synthesis - Tasks of dimensional synthesis, Concepts of function generation, Rigid body guidance and path generation, Freudenstein equation for function generation using three precision points. (7)

CAMS : Introduction, Types of cams, Types of Followers, Definitions, Graphical synthesis of cam profile.(Knife Edge, Roller and Flat faced Followers). (8)

UNIT IV

GEARS : Introduction, Classification gear terminology, Law of Gearing, Velocity of Sliding, Forms of Teeth, Cycloidal Profile Teeth, Involute Profile Teeth, Path of contact, Arc of contact, Number of pairs of Teeth in contact, Interference in Involute Gears, Minimum number of Teeth, Interference between Rack and Pinion, Undercutting, Comparison of Cycloidal and Involute tooth forms. (8)

GEAR TRAINS: Introduction, simple Gear Train, Compound Gear Train, Reverted Gear train, Planetary or Epicyclic Gear Train, Analysis of Epicyclic Gear Train, Torques in Epicyclic Trains. Tabular and Algebraic Methods. (7)

TEXT BOOKS:

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

REFERENCE BOOK:

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

CO-PO MAPPING

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3		2		1								3	2	2
CO2	3		2		3								3	2	
CO3	3		2		2								3	2	2
CO4	2		2		2								2	2	

MACHINE DRAWING

14ME306

II Year B.Tech. (Mech) Third Semester

Lectures	:	1 Period/Week ,Practical :3	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course outcomes:

1. Discuss the design team concept as used in the various industries to resolve design problems.
2. Identify the components of a machine drawing.
3. Explain the machine shop process.
4. Properly dimension a drawing to include determining applicable tolerances based on the type of fit.

Course Objectives:

Upon completion of the course, students will be able to understand and interpret various engineering drawings and also in a position to draw different machine components.

1. Discuss the various types of fastening devices, and prepare display drawings as well as working drawings for production purposes.
2. Perform the necessary calculations involving cutting data and layout of machine elements, and prepare respective display and working drawings.

1. Sectional views : Introduction, Full & half sectional views

(9)

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

(9)

3. Keys, Cotters and Pin joints : Saddle & sunk keys, Cotter joint with sleeve , Knuckle joint

(9)

4.Shaft couplings : Universal coupling , Protected flange coupling

(6)

5.Assembly Drawings : Stuffing box , Screw jack , Eccentric, Pipe vice

(12)

Text book :

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

Reference book :

1. Machine Drawing by K.R.Gopala Krishnan

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1												3	
CO2	2	1													
CO3	2														
CO4	3	1												3	

FUELS & OIL TESTING LAB

14MEL301
II Year B.Tech. (Mech) Third Semester

Practical's	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objective:

1. To determine the viscosity of lubricating oils using saybolts,Redwood1 and Red wood2 viscometre.
2. To determine the flash point of fuel oils using abel's and pensky-martins apparatus.
3. To determine the flash and fire points of a fuel oils using Cleveland's apparatus.
4. To determine calorific value of LPG using junkers gas caloriemetre.
5. To determine the carbon residue of the given lubricating oil using conradson's carbon residue apparatus.

Course Outcomes:

1. To learn about lubricants and oils. To know the viscosity of given oil. Variation of viscosity along with temperature.
2. To know about Flash point and Fire point and its importance in IC engines etc and to find the flash and fire points of given oil.
3. To know the higher calorific value and lower calorific value of solid and liquid fuels and to find calorific value of given solid or liquid fuel or (L.P.G) gaseous fuel.
4. To identify the quality of Grease and importance of quality of Grease in Thermal Engineering and to find the depth of penetration of standard cone into given sample of grease.

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

1. Viscosity measurement using Redwood No.I viscometer.
2. Viscosity measurement using Redwood No.II viscometer.
3. Viscosity measurement using Saybolt viscometer.
4. Viscosity measurement using Engler's viscometer.
5. Carbon residue test using Conradson's carbon residue apparatus
6. Calorific value of LPG using Junker's Gas Calorimeter
7. Calorific value of liquid fuel using Bomb Calorimeter

8. Calorific value of solid fuel using Bomb Calorimeter
9. Measurement of flash point using Abel's apparatus
10. Measurement of flash point using Pensky-Martin's apparatus
11. Measurement of flash and fire points using Cleveland's open cup apparatus
12. Grease penetration test using Penetrometer apparatus

CO-PO MAPPING

Course Outcomes	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	1	2							3				1	2	
CO2							2					2	1	2	
CO3		2			1						2			2	
CO4									2					3	2

BASIC CAD LAB

14MEL302

II Year B.Tech (Mech.) Third Semester

Practicals	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

This course is a computer-aided drafting course in which the students will learn the

1. Fundamentals of using AutoCAD software.
2. The students will learn basic CAD techniques that are used to draw and edit drawing entities; manipulate screen displays; write text; apply dimensions; and manage drawing files at the end of the program.
3. The students will be able to produce computer-aided mechanical drawings of components and assemblies of machinery parts like Pipe vice, Lathe tail stock and Swivel bearing.

Course Outcomes:

1. Students are able to draw and edit the drawing entities.
2. Students are able to manipulate the screen displays, write text.
3. Students are able to apply the dimensions and manage the drawing files.
4. Students are able to produce the computer aided mechanical drawings of the components and assemblies of the machinery parts like Pipe vice, Lathe tail stock and Swivel bearing.

1. Introduction, Basic commands-drawing, modify, editing & dimensioning. Layers, AutoCAD – screen menus.
2. Sectional views of castings
3. Assembly drawings

   a) Pipe vice b) Lathe tail stock c) Swivel bearing

Reference books:

1. AutoCAD 14 for Engineering drawing made easy by P.Nageswara Rao, TMH,
2. An Introduction to AutoCAD 2000 by A.Yarwood, Longman Publishers.
3. Machine Drawing by K.L.Narayana, P.Kannaiah, and K.Venkata Reddy, Wiley Eastern Limited, New Age International.

CO-PO MAPPING

Course Out-comes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1				1	1			1		1	1	
CO2	1		2	1			2		1			2	1	2	
CO3	2	2			1						2			2	
CO4	2	2			1						2			2	

STRENGTH OF MATERIALS LAB

14CEL303

II Year B.Tech (Mech.) Third Semester

Practicals	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objective:

To provide hands on experience with measurement of impact resistance, deformation characteristics of beams, Hardness of metal and also determination of modulus of elasticity and rigidity modulus of a material.

Course outcomes:

After completion of lab student should able to

1. Determine the impact resistance and hardness of the material
2. Determine the material constants such as modulus of elasticity and rigidity modulus from experiments.
3. Able to identify the test for hardness for the required problem.
4. Able to use UTM for the application

List of Experiments:

1. Double Shear Test
2. Spring Test
3. Rockwell hardness test
4. Brinell Hardness Test
5. Young's Modulus of given Specimen of cantilever beam
6. Young's Modulus of given Specimen of simply supported beam
7. Torsion Test
8. Charpy Impact Test
9. Stress Strain Characteristics of steel bars using by UTM

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			1									1	1	1	1
CO2	1	1										1	1		
CO3	1	1	1									1	1	1	
CO4	1	1	1	1	1							1		2	

ENGINEERING MATHEMATICS-IV

14MA401

II Year B.Tech. (Mech) Fourth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:

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

1. Determine whether a function is analytic or not using C-R equations.
2. Use laplaces equation to determine whether a real valued function is harmonic or not and find the harmonic conjugate of a harmonic function.
3. Describe how basic analytic functions act as conformal mappings of regions in the plane.
4. Evaluate a contour integral directly using the parametric representation of the contour.
5. Compute a contour integral with an integrand which has singularities lying inside or outside the simple closed contour.
6. Apply Cauchy's integral theorem and Cauchy's integral formula to evaluate contour integrals.
7. Find the Taylor series of a given function and its circle of convergence.
8. Classify zeros and singularities of an analytic function.
9. Find the Laurent series of a function and its annulus of convergence.
10. Find the residues of a function at given points or singularities and use the residue theorem for the evaluation of real (improper) integrals.
11. Solve linear differential equations by power series method.
12. To solve Legendre's and Bessel's equations using power series method.

Course Outcomes:

The course provides

1. The knowledge to understand the analytical theory behind the field and Flow problems in engineering.
2. The knowledge to develop the skills of contour integration to simplify the complex integration and to evaluate certain complicated real integrals using residue calculus.
3. The ability to apply the power series method to solve linear differential equations with variable coefficients.
4. Use special functions for the required problem.

UNIT-I

Complex numbers and functions, conformal mapping:

Introduction to Complex Numbers, Derivative. Analytic Function, Cauchy's- Riemann equations. Laplace equation.

Geometry of analytic functions: conformal mapping, linear fractional transformations

UNIT-II

Complex Integration:

Line integral in the complex plane, Cauchy's Integral Theorem, Cauchy's Integral Formula, Derivates of analytic functions.

UNIT-III

Taylor , Laurent series and Residue Integration

Taylor Series and Maclaurin series, Laurent Series, singularities and zeros. Infinity, Residue integration method, evaluation of Real Integrals.

UNIT-IV

Special Functions

Power Series method, Legendre's equation

gendre's equation, Legendre Polynomials $P_n(x)$, Bessel's equation. Bessel functions

TEXT BOOK:

1. "Advanced Engineering Mathematics", Erwin Kreyszig, 8th Edition, John Wiley,2000

REFERENCE BOOK:

1. "Theory and Problems of Complex Variables", Murray R Spiegel, Schaum's outline series

Prerequisites: Elementary calculus MA 02

Text Book:

1. "Advanced Engineering Mathematics", Erwin Kreyszig, 8th edition, John Wiley & Sons, 2000.

Reference book:

2. "Theory and Problems of Complex Variables", Murray R Spiegel, Schaum's outline series.

CO-PO MAPPING

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	2							1					3	
CO2							3					2	2	1	
CO3		2			3						1			2	
CO4									2					1	2

MECHANICS OF MATERIALS- II

14ME402

II Year B.Tech. (Mech) Fourth Semester

Lectures	:	4 Periods/Week,Tutorial:1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. Determination of deflection of statically determinate members and statically indeterminate members
2. Understand the concept of stability and derive crippling loads for columns.
3. Evaluation of the stresses in thin and thick pressure vessels.
4. Determination of the stresses in curved beams with different cross sections.
5. Understand the concept of shear centre and find the position of shear centre
6. Analyze the centrifugal stresses in rotating members.

Course Outcomes:

Aftersuccessful completion of course, a student should be able to

1. To find the deflection of statically determinate and statically indeterminate beams.
2. To find the critical load for columns with axial and eccentric axial loading
3. To calculate the stresses in thin and thick cylinders and to calculate the stresses in beams of rectangular, circular and trapezoidal cross sections.
4. To calculate the position of shear centre and to determine the centrifugal stresses in rotating disc.

UNIT I

DEFLECTIONS OF BEAMS : Introduction, Differential Equations of the Deflection Curve, Deflections by Integration of the Bending Moment Equation. Moment Area Method, Macaulay's Method. (9)

COLUMNS : Buckling and Stability, Columns with Pinned ends, Columns with other support conditions, Limitations of Euler's Formula, Rankine's Formula, Columns with eccentric Axial Loads, Secant formula. (6)

UNIT II

STATICALLY INDETERMINATE BEAMS: Statically indeterminate Beams, Analysis by the differential equations of the Deflection curve, Moment Area Method. (8)

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

(7)

UNIT III

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

(7)

CURVED BEAMS : Stresses in Beams of small and large initial curvature, The Winkler-Bach theory, Stresses in Crane Hook and C-Clamp with Rectangular, Circular and Trapezoidal cross-sections. (8)

UNIT IV

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

(6)

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

(9)

TEXT BOOK:

1. Mechanics of Materials by James M Gere.
2. Strength of materials by Sadhu Singh, Khanna Publishers

REFERANCE BOOK:

1. Advanced Solid Mechanics by L.S. Srinath

2.Strength of materials by G.H. Ryder: MacMillan India Ltd. Publishers

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO 3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3	3					1					2	1	
CO2	1	3	2			1		1					2	2	
CO3	3	2	1			2		1					2	1	
CO4	2	2	1	1		1							1	1	

APPLIED THERMODYNAMICS

14ME403

II Year B.Tech. (Mech) Fourth Semester

Lectures	:	4 Periods/Week,Tutorial:1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:

1. To make the students to understand with the basic concept of steam power plant cycles or Rankine cycle.
2. To make students aware of the working of various types of boilers and its working principle, its mountings and accessories.
3. To provide the knowledge about the importance of steam condensers in a steam power plant.
4. To understand the principle of operation of the impulse and reaction turbine and condition for the maximum efficiency of the turbine.
5. To understand the principles of refrigeration and air conditioning systems.

Course Outcomes:

After successful completion of course, a student will be able to:

1. Understand the basic concepts of steam power plant and its working principle.
2. Understand the functioning of various boilers and its mountings and accessories.
3. Create awareness of steam condensers.
4. Analyze the working and efficiencies of various turbines.

UNIT I

VAPOR POWER CYCLES: Rankine cycle, Effect of pressure and temperature on the Rankine cycle, reheat cycle, regenerative cycle. (9)

STEAM BOILERS: Function, classification, working of Babcock and Wilcox boiler, Mountings & Accessories. (6)

UNIT II

STEAM NOZZLES: Types of nozzles, isentropic flow through nozzles, Effect of friction, Nozzle efficiency, Critical pressure ratio and maximum discharge, calculation of throat and exit areas using Mollier diagram. (8)

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

(7)

UNIT III

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

(15)

UNIT IV

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

(8)

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

(7)

TEXTBOOKS:

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

REFERENCE BOOKS:

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

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	3										2	1	
CO2	1	2	3										1	2	
CO3	3	2	1										2	1	
CO4	3	2	1										2	1	

HYDRAULIC MACHINES
14ME404
II Year B.Tech. (Mech) Fourth Semester

Lectures	:	4 Periods/Week, Self study:1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives

1. To be familiar with linear momentum and angular momentum principles.
2. To study impact of jets and to evaluate the force exerted by jet on flat plates and curved vanes and radial curved vanes.
3. To study the fundamentals and working principles of impulse and reaction turbines, design of turbines, performance of turbines and governing of turbines.
4. To study the fundamentals and working principles of reciprocating and centrifugal pumps and performance of pumps.
5. To be familiar with dimensional analysis and similitude and model laws. To study the working principles of miscellaneous hydraulic machines.

Course outcomes

Student should be able to

1. Evaluate force exerted by jet on plates and vanes.

2. Understand the working of hydraulic turbines and hydroelectric power plants, performance of turbines and governing of turbines.

3. Understand the working principles of reciprocating and centrifugal pumps.

4. Understand the Buckingham's Π method of dimensional analysis, types of similarities and model laws.

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

IMPACT OF JETS: Introduction, Force exerted by a fluid jet on stationary and moving flat plate and curved vanes, flow over radial curved vanes. (10)

UNIT II
HYDRAULIC TURBINES: Elements of hydroelectric power plants, Heads and efficiencies of a turbine, Classification of turbines, Pelton, Francis and Kaplan turbines- Working, proportions of turbines, Numerical problems. Draft tube theory, Oil pressure Governing. (8)

PERFORMANCE OF TURBINES: Performance under unit quantities, Performance under specific conditions - Specific speed . Selection of turbines. Performance characteristics curves, Water hammer, Cavitation in turbines- Thoma's cavitation factor (7)

UNIT Ill

RECIPROCATING PUMPS: Types, Working principle, Power required by a Reciprocating pump, Coefficient of discharge, Slip and negative slip, Effect of Acceleration of piston on velocity and pressure in suction and delivery pipes, Indicator diagram, Maximum speed of a reciprocating pump. Air vessels. Work saved against friction by fitting air vessel. (8)

CENTRIFUGAL PUMPS: Types, Working, Reciprocating vs. Centrifugal pump, Work done by impeller, Head of a pump, losses and efficiencies, Minimum starting speed, Specific speed, Multistage pumps, Pumps in parallel, Performance characteristic curves, limitation of suction lift, NPSH, Cavitation. (7)

UNIT IV

DIMENSIONAL ANALYSIS & MODEL SIMILITUDE: Introduction, Buckingham's PI theorem, Types of similarities, Force ratios, Dimensionless numbers, Model Laws-Reynolds and Froude law, Types of models, Scale effect.(Qualitative treatment only) (10)

MISCELLANEOUS HYDRAULIC EQUIPMENT: Hydraulic accumulator (simple and differential type), Hydraulic intensifier, Hydraulic press, Hydraulic crane Hydraulic lift, Hydraulic ram. (5)

TEXT BOOK:

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

REFERENCE BOOKS:

1. Fluid Mechanics & Fluid Power Engineering - D.S.Kumar, SK Kataria &sons, New Delhi.
2. Fluid Mechanics & Hydraulic Machines - R.K.Bansal

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3				2			2			2		2	2	
CO2	2				3			1					1	3	
CO3	1				2			2					2	1	
CO4	2				3			2					3	2	

CASTING, FORMING AND WELDING TECHNOLOGY

14ME405

II Year B.Tech. (Mech) Fourth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objective:

To impart knowledge about various production and fabrication processes to fulfill the

day to day needs in domestic and industrial sectors.

1. To understand the casting terms such as patterns, materials, allowances ,moulds and gating systems.
2. Study the different types of casting process.
3. To understand about Gas welding, Arc welding and resistance welding.
4. To understand about the fabrication process.

Course outcomes:

On completion of this subject the student should be able to:

1. Learned about casting terms and gating systems design.
2. Choose casting methodology which will give sound castings.
3. Select proper welding technique depending on given materials
4. Describe the necessity of metal working processes.

UNIT I

METAL CASTING: Introduction, advantages of Casting method, pattern types, materials and allowances. Sand moulding procedure, Moulding materials and equipment. Preparation, control and testing of moulding sands, Cores, Cupola: Description, operation and zones. (15)

UNIT II

GATING DESIGN: Design Considerations

SPECIAL CASTING METHODS: Permanent Mould Casting, Die Casting, Centrifugal casting, Investment casting, shell moulding, CO_2 process and continuous casting. Fettling of castings, casting defects: causes, remedies and testing. (15)

UNIT III

WELDING: Gas and arc welding - Principles of oxy-acetylene welding, oxyacetylene flame cutting, MMAW (Manual metal arc welding), TIG, MIG, submerged arc welding. Resistance welding principles - Butt welding, Spot welding, Seam welding. Thermit Welding, Electro slag welding. Laser beam welding. Brazing & Soldering, welding defects - causes and remedies. (15)

UNIT IV

METAL WORKING PROCESSES: Introduction, Hot and Cold working of metals. Rolling, Forging, Extrusion, Tube making, Swaging, Spinning, Coining, Embossing and Wire drawing. (6)

SHEET METAL WORKING OPERATIONS: Introduction, Types of Sheet metal working operations, Blanking and Punching operations, Clearance and shear as applied to Punching/Blanking operations, Simple related problems, High energy rate forming of metals, Bending, deep drawing. (9)

TEXT BOOKS:

1. Manufacturing Technology-Vol- I by PN Rao, TMH
2. Workshop Technology Vol.1 by S.K.Hazra Chowdary. Khanna Publishers
3. A course in Work shop technology, Vol-I by B.S.Raghuvanshi, Dhanpatrai & sons.

REFERENCE BOOKS:

1. Welding Technology by Little, TMH
2. Principles of Metal Casting by Heine, Loper, Rosenthal, TMH.
3. Manufacturing Engineering & Technology, Kalpakjian, Pearson Education / PHI

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	1	1							1	2		2	2	1
CO2	2		1	2				2		1	1		3	1	
CO3	3	2	1							1			2		2
CO4	3		2					1		2			2	2	

MATERIAL SCIENCE & METALLURGY
14ME406
II Year B.Tech. (Mech) Fourth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Outcomes:

The objectives of the course are to enable students to:

1. Apply the "Central Paradigm of Materials Science and Engineering", to the relationships between processing, structure, properties and performance, to the development and application of various classes of solids Apply principles of mathematics, physics and chemistry to the study of iron-based (ferrous) materials in particular and non-ferrous materials in general.
2. Apply principles of mathematics, physics and chemistry to the understanding of the thermodynamics and kinetics of the phase transformations in steels and heat treatment of steels.
3. Understand the basic concepts of strengthening mechanisms in materials and composite materails technology
4. Understand the basic principles of powder metallurgy, advanced materials and their properties and applications.

Course Objectives : After completing the subject the student can be able to

1. Learn basic concepts of bonds in solids, how metals are formed and various properties of metals, various crystal systems & Various crystal defects
2. Understand the process of solidification of metals, the effect of various parameters in formation of grains and their effect on mechanical properties of metals
3. Gets an idea of why to go for alloying of metals and different types of solid solutions in different alloys & different rules that determine the extent to which solid solution is possible.
4. Basic concepts of phase diagrams, and the different methods to construct various type of phase diagrams
5. Know the importance of Iron-Iron carbide diagram in industries and to know various phases existing in Iron-Carbon alloys
6. Know different types of cast irons, their microstructures , mechanical properties and applications.

7. Know different types of steels, their microstructures , mechanical properties and applications different types of steels
8. Know how different alloying elements affect the Fe-Fe3C diagram
9. To know the basic concepts of heat treatment of steels & importance of TTT diagrams and its applications in hardening process.
10. Know the basic concepts of harden ability and methods to measure the hardenability of given steels & different surface hardening methods and their practical applications
11. Understand the microstructure, properties and applications of various non- ferrous metals and their alloys
12. Know different types of ceramic materials, their structures, properties and applications in day to day life.

UNIT I

CRYSTALLOGRAPHY: Classification of crystals – Bravi's lattices – Miller Indices – Packing factor in cubic systems – coordination number – crystal imperfections – crystal deformation – Slip and Twinning. (8)

PHASE DIAGRAMS: Binary phase diagrams – Phase rule – one component system, two component system, isomorphous, eutectic, eutectoid, peritectic and peritectoid systems. (8)

UNIT II

HEAT TREATMENT OF STEELS: Iron–Iron carbide equilibrium diagram, TTT diagrams for eutectoid, hypo and hyper eutectoid steels, martensite and bainitic transformation.(8)

HEAT TREATMENT: Annealing, normalizing, hardening, tempering, surface hardening, age hardening, austempering, martempering and hardenability concept and experimental determination. (8)

UNIT III

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

(6)

COMPOSITE MATERIALS:

Properties and applications of Particulate-reinforced composites, fibre reinforced composites, Laminar composites and metal matrix composites. (7)

UNIT – IV

POWDER METALLURGY: Powder metallurgy process, preparation of powders, characteristics of metal powders, mixing, compacting, sintering, Applications of Powder Metallurgy.

(8)

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

Nano materials – Introduction and Applications (7)

TEXT BOOKS:

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

REFERENCE BOOK:

1.Material Science and Metallurgy - Dr.V.D.Kodgire, Everest Publishers
2.Nano materials – J.Dutta & H.Hofman

3.Manufacturing Engineering & Technology – Kalpak Jain & Schmid, Pearson / PHI

CO-PO MAPPING

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	3	1	2		1			1			2		3		1
CO2	2		3		2			2			1		1	2	
CO3	2	1	2		1			1			1		2		1
CO4	3		2					2					2		1

FLUID MECHANICS AND HYDRAULIC MACHINES LAB

14CEL401

II Year B.Tech (Mech.) Fourth Semester

Practicals	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objective:

Strengthen and broaden the students' knowledge of fluid mechanics. To provide hands on experience with measurement of losses in pipes, coefficient of discharge using notch, venture meter and orifice meter than are typically studied in a lecture course. Provide the practical knowledge of performance of hydraulic machines viz. turbines and pumps to the students.

Course outcomes:

After completion of lab student should able to

1. Estimate minor and major losses in the pipe lines.
2. Measure the coefficient of discharge through various devices
3. Asses the performance of turbines and pumps.
4. Give probable reasons for variation of experimental results with theoretical values

List of Experiments:

1. Mouth pieces: determination of coefficient of discharge
2. Determination of friction factor for pipes of different materials
3. Verification of Bernoulli’s theorem
4. Reynolds experiment
5. Venturimeter: Determination of coefficient of discharge
6. Orifice: Determination of coefficient of discharge
7. Impact of jets
8. Performance studies on single acting reciprocating pump
9. Performance studies on single stage centrifugal pump
10. Performance study on Pelton turbine

CO-PO MAPPING

Course Outcomes	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO11**	**PO12**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	1	1											1	1	
CO2	1	2	2										1	1	
CO3	1	2	2										1	1	
CO4		1	1										1		

COMPUTER APPLICATIONS IN MECHANICAL ENGINEERING LAB
14MEL402
II Year B.Tech. (Mech) Fourth Semester

Practicals	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To develop and improve the computer application skills of the students in Mechanical Engineering using C-language.
2. To simulate the kinematic mechanisms in C-language.
3. To understand the usage of application packages in Mechanical engineering field.

Course Outcomes:

1. The students are able to simulate four bar mechanism and Slider Crank Mechanism.
2. The students are able to execute programs like Two dimensional stress analysis, 1D heat transfer, Analysis of beams, cylinder subjected to internal pressure, Queuing theory and Simpson's $3/8^{th}$ rule using C-language .
3. The students are able to understand the basic function and application of LINGO software for solving Operation research problems.
4. The students are able to write the program for 2 dimensional mechanisms

The students are capable of applying C-language to any application in Mechanical Engineering

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

I .SIMULATION EXERCISE: [Any TWO]

1.Hart Mechanism

2.Paucellier Mechanism

3.Robert Mechanism

4.Scott Russel Mechanism

5.Watt Mechanism

6.Pantograph Mechanism

7.Four Bar Mechanism

8.Slider Crank Mechanism

9.Tchibicheff Mechanism

II.COMPUTER APPLICATIONS: [ANY FOUR]

1.Numerical Methods

2.Differential Equation solution

3.Gauss elimination: General Matrix and skyline.

4.Two dimensional stress analysis

5.Cylinder subjected to internal pressure.

6.1D Heat Transfer (conduction)

7. Analysis of beams

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

III. APPLICATIONS PACKAGES: [ANY ONE]

1. Simple packages for Fluid flow like fluent, Star CD etc.,

2.O.R. Packages like TORA, LINDO, PRIMAERA ,Etc.,

3.MAT Lab.

4.Any application package in Mechanical Engineering.

CO-PO MAPPING

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	1	1											1	1	
CO2	1	2	2										1	1	
CO3	1	2	2										1	1	
CO4		1	1										1		

BASIC MANUFACTURING PROCESSES LAB
14MEL403
II Year B.Tech. (Mech) Fourth Semester

Practicals	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objective:

Lab is having foundry, patternmaking, fitting and lathe operations. Preparation of wooden pattern using carpentry tools and making sand mold using pattern enables the student to know the necessity of pattern, mold during the preparation of casting.

Course Outcomes:

The student will

1. Have an idea to write steps involved in making casting by considering practical aspects into account.
2. Have an idea about lathe operations like as Facing, turning, threading and knurling
3. Knows the importance of operations in fitting and about several fits.
4. Know how to prepare pattern by considering several allowances and know the difference between wooden pattern and metal pattern.

MOULDING: Stepped cone pulley, Hand wheel, Bush.

FITTING: Four Standard Exercises

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

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1			1									1	1	1	1
CO2	1	1										1	1		
CO3	1	1	1									1	1	1	
CO4	1	1	1	1	1							1		2	

MACHINE DYNAMICS
14ME501

III Year B.Tech. (Mech) Fifth Semester

Lectures	:	4 Periods/Week,Tutorials:1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. Various forces involved and their relation with motion parameters in dynamic systems
2. Understand the working principles and performance of various governors
3. Know the importance of balancing and the procedures for balancing various machines
4. Understand and analyse the effects of gyroscopic couples on vehicles
5. Analyse free and forced vibrations with and without damping

Course outcomes:

By the end of the course, a successful student should be able to

1. Develop expressions for parameters of motion and find the dynamic forces in a slider-crank mechanism &relate the working parameters of the governors.
2. Find the gyroscopic effect on naval ships, aeroplanes and two wheelers & balance rotating and reciprocating masses.
3. Find the parameters of free vibration of undamped and damped systems with single DOF.
4. Find the parameters of forced vibration with single DOF subjected to harmonic excitation & understand the working of vibrations measuring equipment.

UNIT I

DYNAMIC FORCE ANALYSIS : Introduction, D'Alembert's Principle, Equivalent Offset Inertia Force, Dynamic Analysis of Slider - Crank mechanism (Using Analytical method) Velocity and Acceleration of piston, Angular velocity and Angular Acceleration of Connecting Rod, Piston Effort (Effective Driving Force), Crank Effort. Turning Moment on Crankshaft, Inertia of connecting Rod. (8)

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

(7)

UNIT II

BALANCING : Introduction, Static balancing, Dynamic balancing, Transferring of a Force from one plane to another, Balancing of Several Masses in Different planes, Primary & Secondary Balancing of Reciprocating Mass , Balancing of In- line Engines, Balancing of V-Engines. (10)

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

UNIT III

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

(2)

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

(6)

DAMPED FREE VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS:- Introduction, Different types of damping, Free vibrations with viscous damping, Logarithmic Decrement, Viscous dampers, Coulomb damping. (7)

UNIT IV

FORCED VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEMS:-

Introduction, Forced vibrations with constant Harmonic excitation, Forced vibration with rotating and reciprocating unbalance, forced vibrations due to excitation of the support, Critical speed of a light shaft having a single disc without damping, critical speed of a light shaft having a single disc with damping, Vibration, isolation and transmissibility, vibration measuring instruments. (15)

TEXT BOOKS:

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

REFERENCE BOOKS:

1.Theory of Machines by T. Bevan
2.Theory of Mechanisms and Machines by A. Ghosh and A.K. Mallik.
3.Theory of Machines and Mechanisms by Jagadish Lal
4.Mechanical Vibrations – W.T.Thomson
5.Mechanical Vibration – S.S.Rao

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2										1	3	2	
CO2	3	2										1	2	3	
CO3	3	2										1	3	3	
CO4	3	2										1	3	3	

DESIGN OF MACHINE ELEMENTS-I
14ME502
III Year B.Tech. (Mech) Fifth Semester

Lectures	:	4 Periods/Week,Tutorials:1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:

- To design simple machine elements subjected to static and dynamic loads using the concepts of stress analysis and theories of failure.
- To reinforce the basic concepts of mechanics of materials
- To introduce fatigue and its role in design
- To increase the student's confidence in his or her ability to perform original design.

Course outcomes:

1. Able to select the suitable material and manufacturing considerations and to analyze the stress strain of mechanical components under static strength.
2. Able to apply the design procedure for mechanical components subjected to cyclic load for finite and infinite life.
3. Able to apply the design procedure for riveted joints and welded joints.
4. Able to design screw threaded joints and Screw Jack design.

UNIT I

BASICS: Basic procedure of machine design, requirements and design of machine elements, traditional design methods. Design synthesis, use of standards in design, manufacturing considerations in machine design, preferred numbers and significance. (5)

MATERIALS & THEIR PROPERTIES : Mechanical properties of materials, Common engineering materials and their properties. (4)

DESIGN FOR STATIC STRENGTH : Simple Stresses , Combined stresses , Torsional and Bending stresses, stress strain relation, various theories of failure , Factor of safety and its importance in design. (6)

UNIT II

DESIGN FOR FATIGUE STRENGTH : Stress concentration, stress concentration factors, reduction of stress concentration, fluctuating stresses, fatigue failure, endurance limit, low cycle and high cycle fatigue, notch sensitivity, endurance limit approximate estimation method, reversed stresses ,design for finite and infinite life, cumulative damage in fatigue, Soderberg and Goodman lines, modified Goodman diagrams, Gerber equation. (13)

COTTER JOINTS: Socket & Spigot cotter joints. (2)

UNIT Ill

RIVETED JOINTS: Types of riveted joints, Failures of riveted joints, Design of Boiler Joints & Lozenge Joint, Design of joints under eccentric loading.(8)

WELDED JOINTS: Types of welded joints, Design of butt and fillet welded joints, eccentrically loaded welded joints. Welded joints subjected to fluctuating loads. (7)

UNIT IV

THREADED JOINTS – basic types, bolt of uniform strength, materials and manufacture, eccentrically loaded bolted joints in shear, eccentric load perpendicular to axis of bolt, eccentric load on circular base. (7)

POWER SCREWS: Types - Mechanics of power screws, efficiency, Design of Screw Jack.(8)

TEXT BOOKS:

1.Design of machine elements by Bhandari, Tata McGraw Hill book Co.

2.Machine Design by P.C. Sharma & D.K. Agarwal.

HAND BOOKS TO BE ALLOWED IN UNIVERSITY EXAMINATION:

1.Design data book, P.S.G. College of Technology, Coimbatore

2.Design data book, Mahadevan & Balaveera Reddy - CBS Pub

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	3										1	2	1
CO2	3	2	2										1	2	2
CO3	2	3	1										3	2	1
CO4	1	3	2										2	1	1

I.C. ENGINES & GAS TURBINES
14ME503
III Year B.Tech. (Mech) Fifth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Objectives

1. To introduce the students to the working of S.I and C.I engines
2. To introduce students to the recent trends in IC engines like MPFI, CRDI, EFI
3. To introduce the students to the working principles of compressors, gas turbines, Jet propulsive engines and to study the performance of the above

Out comes

Student will be able to

1. Determine performance and combustion characteristics of S.I and C.I engines
2. Demonstrate the ability to enhance the efficiency and performance of I.C engines
3. Understand the working of various types of compressors
4. Understand the working principles and performance evaluation of gas turbines and jet propulsion systems.

UNIT I

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

(7)

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

(4)

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

(4)

UNIT II

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

(3)

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

(4)

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

(8)

UNIT III

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

(7)

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

UNIT IV

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

(8)

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

(7)

TEXT BOOKS:

1.Treatise on heat Engineering - Vasandani & Kumar-Metropolitan Book Company, New Delhi
2.Thermal Engineering- Rajput-Laxmi Pub, New Delhi
3. Internal Combustion Engines - V.Ganeshan , Tata McGraw – Hill Publishing Company Ltd..

REFERENCE BOOKS:

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

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		1			2	3	1					1	2	
CO2	2	1	1	1			1						2	1	
CO3	2	1				1							1	1	
CO4	2	2				1	1						1	2	

METAL CUTTING AND MACHINE TOOLS
14ME504
III Year B.Tech. (Mech) Fifth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To describe the primary and auxiliary motions in machine tools and parameters defining them.
2. To provide fundamental knowledge regarding working principle, classification, parts, mechanisms and operations performed on various machine tools.
3. To provide basic information regarding formation of chip and its types in metal cutting.
4. To establish relation between shear angle, chip thickness ratio, stress and strain in the chip and cutting forces.
5. To provide information about heat generation, temperature distribution and application of cutting fluids in metal cutting.

Course Outcomes:

At the end of the course, the student will be able to:

1. Describe the parts, mechanisms, selection of cutting parameters and operations that can be done on a lathe machine.
2. Describe the parts, mechanisms and operations that can be done on drilling, shaping, planing and grinding machines.
3. Explain the construction, types and operations that can be done on a milling machine. Also discuss about milling cutters and methods of indexing.
4. Discuss about tool geometry, chip formation and heat generation in metal cutting. Also calculate shear angle, stress, strain, velocities and cutting forces in metal cutting.

UNIT I

MACHINING PROCESSES AND MACHINE TOOLS:

Introduction, Primary and Auxiliary Motions in Machine Tools, Parameters defining working motions of a Machine Tool. (3)

LATHE :

Constructional details, specifications, classification of lathes**.**

Lathe Mechanisms: Spindle speed Mechanisms in Belt driven and All Geared Head stock, Apron and Half-nut mechanisms. Lathe accessories – various work holding devices. Lathe operations including taper turning and thread cutting and related problems. (12)

UNIT II

DRILLING MACHINES:

Types and specifications, spindle feed mechanism, drilling operations, drilling time. (4)

SHAPING AND PLANING:

Constructional details, types of shapers and planers, specifications, Quick Return Mechanism and automatic feed mechanisms. (4)

GRINDING MACHINES:

General Principles, Wheel materials, Selection and specification of grinding wheels, Truing and Dressing of grinding wheels, types of grinding machines. (7)

UNIT III

SURFACEFINISHING OPERATIONS: Honing and Lapping operations (3)

MILLING MACHINES:

Working Principle, Size and Specification, Up and Down Milling, Types of milling machines, Description and working of Universal Milling machine, Milling operations, Milling cutters, Indexing methods and Indexing Head, related problems. (12)

UNIT IV

THEORY OF METAL CUTTING:

Introduction, Basic elements of machining, Nomenclature of single point cutting tool, Tool Geometry, Mechanics of chip formation, Types of chips. Determination of shear angle and chip thickness ratio, stress and strain in the chip, velocity relations, Merchant's theory of orthogonal cutting forces, related simple problems. (6)

Tool wear, Tool life and Tool life criteria (3)

Heat Generation and temperature distribution in metal cutting , cutting fluids- types and required characteristics. (3)

CUTTING TOOL MATERIALS: Requirements of Tool materials and types, economics of machining. (3)

TEXT BOOKS:

1.Workshop Technology Vol. II by Hazra Chowdary

2.Production Engineering by P.C. Sharma, S.Chand & Co.

REFERENCE BOOKS:

1.Materials and Processes in Manufacturing by E.Paul De Garmo, J.T.Black and Ronald A.Kohser.

2.Machining and machining process by PN.Rao, TMH.

3.Manufacturing Science by Ghosh & Mallick

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1			1		1							
CO2	2	1	1			1		1							
CO3	2	1	1			1		1							
CO4	2	1	1	1	1	1		1							

OPERATIONS REASERCH
14ME505
III Year B.Tech. (Mech) Fifth Semester

Lectures	:	4 Periods/Week, Self Study:1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. The purpose of this course is to provide an in depth coverage and applications of Operations Research to real-world systems.
2. To understand the concepts of formulation of LPP and its solution.
3. Familiarize the student to solve the LPP by Graphical method, simplex method
4. Expose to different OR models such as Transportation Problems, Assignment Problems, Simulation problems, Queuing problems, Network problems and dynamic problems.
5. To enable the students apply mathematical, computational, communication skills needed for the practical utility of Operations Research.

Course outcomes:

1. Students should be acquainted with the formulation of linear programming problem and its solution.
2. Student will be in a position to interpret different O.R techniques to solve any typical problem related to transportation, Assignment, Queuing and problems.
3. Student will be able to apply mathematical, computational, communication skills needed for the practical utility of Operations Research
4. Student will be able to carry out project management with network analysis techniques like PERT and CPM.

UNIT-I

LINEAR PROGRAMMING: Definition, Scope of Operations Research, Mathematical formulation of the problem, Graphical method, Simplex method, Artificial variables techniques: Two–phase method, Big-M method, Duality Principle, Dual Simplex method.

(15)

UNIT-II

TRANSPORTATION PROBLEM: Introduction, Formulation, Optimal solution, Unbalanced transportation problem, Degeneracy. (8)

ASSIGNMENT PROBLEM: Formulation, Optimal solution, Variants of Assignment Problem, (7)

UNIT-III

QUEUING THEORY: Introduction, Characteristics of Queuing models, Single Channel Queuing Theory models with Poisson arrivals and exponential service times with infinite population. (15)

UNIT-IV

PERT AND CPM: Project management, network modeling-probabilistic model, various types of activity times estimation-Programme Evaluation Review Techniques- Critical Path-probability of completing the project, Critical Path Method (CPM)-critical path calculation. (15)

TEXT BOOKS:

1. Operations Research / H.A. Taha
2. Operations Research / S.D.Sharma-Kedarnath Ramnath

REFERENCES :

1. O.R /A.M.Natarajan, P.Balasubramani, A.Tamilarasi/Pearson Education.
2. O.R / Premkumar Gupta & D.S.Hira / S.Chand & Company Ltd.
3. Operations Research / Wagner/ PHI Publications.
4. Operation Research /J.K.Sharma/MacMilan.
5. Introduction to O.R / Hiller & Libermann (TMH).
6. Operations Research, P Shankara Iyer

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1		2		3			2		3		1	3	1	
CO2			2							3					
CO3		1			1							1	3	1	
CO4	2		2		1					1		2			

ENGINEERING ECONOMICS AND ACCOUNTANCY
14ME506/A
III Year B.Tech. (Mech) Fifth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To know the importance of Economics and law of demand.
2. To acquire the knowledge of different types of business organization and costing methods.
3. To learn implementing the concepts of break-even analysis and depreciation.
4. To prepare accountancy of an organization with trading account and profit and loss statement.

Course Outcomes:

Upon successful completion of this course, students will acquire the skills to apply the basics of economics and cost analysis to engineering and take economically sound decisions in order to be able to

1. Identify and articulate how economy contributes to the achievement of an organization's strategic objectives. Critically evaluate the operations in law of demand.
2. Understand the role of different types of business organization and costing methods.
3. Understand the break-even analysis and depreciation concepts.
4. Analyze the accountancy of an organization and prepare trading account and profit and loss statement.

UNIT-I

Economics: Utility, Value, Wealth, Consumption, Wants – Necessaries, Comforts andLuxuries. (7)

Demand: Laws of Demand, Elasticity of Demand – Price Elasticity of Demand, Factors affecting Elasticity of Demand. (8)

UNIT-II

Forms of Business organization: Single Trader, Partnership and Public Limited Company. (5)

Costing: Cost Concepts, Elements of Cost, Methods of Distribution of Overhead Costs. Unit Costing, Job Costing and Process Costing. (10)

UNIT-III

Break-Even Analysis: Assumptions, Break – Even Charts, Simple problems. (7)

Depreciation: Definition, causes of depreciation, Methods ofDepreciation. (8)

UNIT-IV

Accountancy: Double-Entry Book Keeping, Journal, Ledger, Final Accounts: Preparation of Trading Account, Profit &Loss account and Balance sheet. (15)

Text Books:

1. Aryasri: Managerial Economics and Financial Analysis, TMH.
2. S. A. Siddiqui & A. S. Siddiqui, Managerial Economics & Financial Analysis, New age International Space Publications.

Reference Books:

1. Narayanaswamy: Financial Accounting—A Managerial Perspective, PHI.
2. M.Mahajan- Industrial Engineering and Production Management, Dhanpatrai & Sons.

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1				1	2	1			2	1	2		1
CO2	2	1				3	1	1			1	1	2		2
CO3	3	2				1	2	2			3	1	2		2
CO4	2	3				3	1	3			3	2	2		2

COMPUTER GRAPHICS
14ME506/B
III Year B.Tech. (Mech) Fifth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To understand the geometry of lines, line segments and different combination of orientations of lines.
2. To know how a picture is displayed from frame buffer
3. To know the importance of normalization of device coordinates in order to display the images
4. To understand the concept of line generation algorithms for generating line segments
5. To know about various display devices to study the graphical images.
6. To know how to generate the polygons using various techniques
7. To understand the basic transformations required in order to modify/ view the created object
8. To understand the concept of windowing and clipping in order to what is to be viewed and where it is to be displayed

Course Outcome:

On successful completion the students will be able

1. To describe the geometry of lines, line segments and different combination of orientations of lines, also Describe the different types of display devices
2. Write the programme to generate basic primitives like, lines, circle.
3. To describe the methods to generate the polygons using various techniques, also perform the basic transformations required in order to modify/ view the created object
4. To describe the concept of windowing and clipping in order to view and object and display it in a selected location.

UNIT I

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

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

(15)

UNIT II

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

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

(15)

UNIT III

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

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

(15)

UNIT IV

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

WINDOWING AND CLIPPING: Introduction, The Viewing Transformation, Viewing transformation implementation, Clipping, The Cohen-Sutherland Algorithm, Clipping of Polygons. (15)

TEXT BOOK:

Computer Graphics by Steven Harrington.

REFERENCE BOOKS:

1. Procedural elements for Computer Graphics by Rogers.
2. Principles of Interactive Graphics by Newman and Sproull.

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1			1			1	1		1		1	1	
CO2	1								1				1		
CO3	1				1			1	1				1		
CO4	1				1			1	1				1		

MECHANICS OF COMPOSITE MATERIALS
14ME506/C
III Year B.Tech. (Mech) Fifth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To make the students to know the advantages of composite materials and different Composite materials.
2. To make the students to know basics and characteristics of composite materials
3. To know the strength and elastic behavior of unidirectional lamina and laminate
4. To find the bending and buckling of composite plates
5. To understand the manufacturing process of composite materials

Course Outcomes:

After completion of the course, students will be able to

1. know the advantages of the composite materials
2. design the composite structure
3. find the bending and buckling of composite plates
4. recommend the suitable manufacturing process to produce the composite structures

UNIT I

INTRODUCTION: Classification and characteristics of composite materials -mechanical behavior of isotropic and orthotropic materials - terminology of laminated fibre reinforced composite materials – current and potential usage of composites. (5)

MECHANICAL BEHAVIOUR OF A LAMINA: Engineering constants for orthotropic materials – stress, strains, relation for plane stress in an orthotropic material and in a lamina of arbitrary orientation – strength of an orthotropic laminates – Basic strength theories – Determination of engineering constants – mechanics of materials approach. (10)

UNIT II

MACHANICAL BEHAVIOUR OF A LAMINATE: Classical lamination theory – lamina stress - strain behavior – Resultant forces and moment in a laminate – Types of laminates – Strength and Stiffness of laminates - Interlaminar stress in laminates. (15)

UNIT III

LAMINATED PLATES AND BEAMS: Types of laminated plates and beams – elementary mechanical behavior - Bending and buckling of laminated plates – forces and moments – Stress and Deflection under different boundary conditions. (15)

UNIT IV

PRODUCTION OF COMPOSITE MATERIALS & PRODUCTS: Matrix and their role – Principal types of fibre and matrix materials - Basic principle of production of composite materials & products - Advantages and Limitations of different processes. (6)

MOULDING AND FORMING OF COMPOSITES: Layup and curing – open and closed mould process hand layup techniques – filament winding – Pultrusion – Pulforming – Thermoforming – Injection moulding - blow moulding. (6)

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	1
CO2	1	1	3	1	2	2	3	1	1	3	2	2	1	3	3
CO3	3	3	3	2	2	1	1	1	1	3	3	3	3	3	3
CO4	1	1	1	1	3	3	3	2	1	3	3	3	2	3	3

I.C ENGINES LAB
14MEL501
III Year B.Tech. (Mech) Fifth Semester

Practicals	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Objectives:

1. To enable the students to understand the principles, working and performance of I.C engines

2. To introduce the students the working of reciprocating air compressor and blower.

Outcomes

Student will be able to

1. Understand the complete operation of 2 stroke and 4 stroke I.C engines through Valve Timing and Port Timing Diagrams.
2. Analyze the performance of blower and compressor.
3. Determine the performance of the S.I. Engines (both single and multi cylinder) by using load test and heat balance test.
4. Evaluate the performance of the C.I. Engines (both single and multi cylinder) by using load test and heat balance test.

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

1. Valve timing diagrams on 4-stroke single cylinder petrol and diesel engine models.
2. Port Timing diagram on 2 stroke single cylinder petrol engine model.
3. Air compressor- to determine volumetric and isothermal efficiencies
4. Blower test rig- to determine overall efficiency
5. Two stroke single cylinder petrol engine – load test
6. Four stroke single cylinder petrol engine - load test & motoring test
7. Four stroke four cylinder petrol engine – load test
8. Four stroke four cylinder petrol engine – heat balance test
9. Four stroke four cylinder petrol engine – Morse test
10. Four stroke four cylinder diesel engine – load test
11. Four stroke four cylinder diesel engine – heat balance test
12. Four stroke single cylinder petrol engine – variable compression ratio test

13. Computer interfaced single cylinder Four stroke petrol engine – load test

14. Computer interfaced single cylinder Four stroke diesel engine – load test

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**1**	**2**		**1**						**1**		**1**	**2**	**2**	
CO2	**3**	**2**		**1**						**1**		**1**	**2**	**2**	
CO3	**2**	**2**	**1**	**1**	**1**					**1**		**1**	**2**	**2**	
CO4	**2**	**2**	**1**	**1**	**1**					**1**		**1**	**2**	**2**	

MACHINE SHOP PRACTICE
14MEL502
III Year B.Tech. (Mech) Fifth Semester

Practicals	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

The objective of this course is to make each student to aware the various manufacturing operations in order to meet the current industrial need. For the designed course the students will learn the following objectives.

1. To know the students how to make various types of external threads and other cutting operations like drilling and internal thread cutting by using Lathe
2. To know the procedure how to drill holes and make internal threads by using drilling machine and hand taps respectively.
3. To train each student various parts of milling machine and know the procedure how to perform different milling operations like key-way cutting, spur and helical gear cutting
4. To know how to make gear specimens using gear hobbing machine
5. To know how to produce flat surfaces/stepped surfaces and slant surfaces by using shaping machine
6. To know how to make operations on large work pieces by using planing machine and slotting machine
7. To know the various components of surface grinder/ tool and cutter grinder and to know how to perform grinding operations on work pieces/ single point cutting tools

Course Outcomes:

Upon completion of the course the students will be able to

1. Perform various operations like drilling, boring, external and internal thread cutting operations on lathe machine, also perform drilling and tapping on drilling machine.
2. Produce spur, helical gears on milling machine.
3. Produce flat surface, stepped surface, dovetail surfaces on shaping machine.
4. Operate gear hobbing, slotting, planning and grinding machines.

Syllabus:

TURNING :
L.H & R.H Threading, Multi-start threading, Drilling, Boring and Internal threading

DRILLING & TAPPING :
Drilling and Tapping of Different threads

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

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

PLANING AND SLOTTING :
Working on Planing and Slotting Machines

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

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2		1				1	1				1		
CO2		2		1				1	1				1		
CO3		2		1				1	1				1		
CO4		2		1				1	1				1		

SOFT SKILLS LAB

14ELL503
III Year B.Tech. (Mech) Fifth Semester

Practicals	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

Student will learn how to do the following:

1. Able to realize the effects of Effective Non verbal communication;
2. Learn to mange emotions for positive communication and negotiation;
3. Developing Creative & Lateral Thinking skills to solve work life issues;
4. Able to be a part of productive team that leverages one's social Skills; and
5. Empowered with employability proficiency to be job ready.
1. Perform effectively in numerous rhetorical situations;
2. Learn to research and critically analyze issues to write critically and coherently;
3. Communicate pleasantly in kinds of Interpersonal Interactions;
4. Understand dynamics of Telephone Conversations through practice; and
5. Become familiar with the Pronunciation rules and application.
6. **Course outcomes:**

On Completing this course students will

1.Learn usage of Communicative aspects of English Sentences.
2.Be able to write Technical Reports.
3.Acquire considerable flair in using broad range of functional elements of English.
4. Able to communicate with all classes of people using good english

Prerequisites: Basic knowledge in English Usage in various Contexts, Intermediary Speaking, writing, and Reading Skills.

1. NON-VERBAL COMMUNICATION

- **a.** Voluntary & Involuntary Body Language.
- **b.** Facial Expressions.
- **c.** Kinesics.
- **d.** Oculesics.
- **e.** Haptics.
- **f.** Proxemics.
- **g.** Chronemics.

h. Para Linguistics.

2. LIFE SKILLS

a. Good Attitude & Self Motivation.

b.Social Behaviour &Social Norms.

c. Ethics, Values and Positive Work Ethics.

d.Desire to Learn and Responsibility**.**

3. EMOTIONAL INTELLIGENCE

a. Self Awareness.

b. Self Control.

c. Self Motivation.

d. Empathy.

e. Relationship Skills.

f. Self Esteem.

4. PEOPLE SKILLS

a. Effective Listening.

b. Managing Stress.

c. Persuading Techniques.

d. Questioning Techniques – Close End, Open End Questions and Answers.

e. Role Perception.

5. COGNITIVE SKILLS

a. Situational Analysis.

b. Critical Thinking.

c. Lateral Thinking.

d. Creative Thinking.

6. EMPLOYABILITY

a. Corporate Information.

b. Group Discussion.

c. Team Building.

d. Conflict Management.

e. Negotiating Skills.

f. Interview Techniques.

Material Required: The Definitive Book of Body Language by Allan & Barbara Pease

You Can Win by Shiv Khera.How to Prepare For Group Discussions and Interview by Hari MohanPrasad & Rajnish Mohan by 2nd Edition, TMH.Business Correspondences and Report Writing", R.C.Sharma, KrishnaMohan, Tata McGraw Hill Better English pronunciation JD O' Connor (CUP) English Pronouncing Dictionary Daniel Jones

RFFERENCE BOOKS:

1. "The Definitive Book Of Body Language", Allan & Barbara Pease
2. "You Can Win", Shiv Khera.
3. ""Lateral Thinking", Edward De Bono.
4. "How To Prepare For Group Discussions And Interview", Hari Mohan Prasad, Rajnish Mohan, 2nd Edition, TMH.
5. "Emotional Intelligence", Daniel Goleman.
6. " The 7 Habits Of Highly Effective People", Stephen R. Covey
7. "Working in Teams", Sandy Pokras.

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2		1						1				2	3	
CO2	2		1						1				2	3	
CO3	2		1						1				2	3	
CO4	2		1						1				2	3	

AUTOMATION TECHNOLOGY
14ME601
III Year B.Tech. (Mech) Sixth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To familiarize the basic concepts of automation technologies used in the manufacturing industry.
2. To create strong programming skills to develop CNC programs.
3. To give sound knowledge on using computer assisted and integrated systems in manufacturing processes
4. To familiarize the advanced concepts of process planning and automated inspection systems.

Course Outcomes:

Upon successful completion of the course, the student will be able to

1. Understand and describe the available automated technologies to improve quality and productivity in the manufacturing industry
2. Implement and analyze valves and actuators needed for real life applications
3. Able to select required sensor and understand its working according to the problem
4. Prepare PLC designs and understand case studies to implement newer applications

UNIT-I

FUNDAMENTAL PRINCIPLES

Industrial prime movers - A brief system comparison: An electrical system, A hydraulic system, A pneumatic system, A comparison - Definition of terms: Mass and force, Pressure, Work, energy and power, Torque - Pascal's law - Gas laws.

HYDRAULIC PUMPS AND PRESSURE REGULATION

Pressure regulation - Pump types: Gear pumps, Vane pumps - Loading valves - Filters.

AIR COMPRESSORS, AIR TREATMENT AND PRESSURE REGULATION

Piston compressors - Air receivers and compressor control - Stages of air treatment - Pressure regulation: Relief valves, Non-relieving pressure regulators and Relieving pressure regulators - Service units.

UNIT -II

CONTROL VALVES

Graphic symbols - Types of control valve: Poppet valves, Spool valves, Rotary valves - Pilot-operated valves - Check valves: Pilot-operated check valves, Restriction check valves - Shuttle and fast exhaust valves - Sequence valves - Time delay valves

ACTUATORS

Linear actuators - Mounting arrangements and Cylinder dynamics - Seals - Rotary actuators: Constructional details - Applications: Speed control, Actuator synchronization, Regeneration, Counter balance and dynamic braking, Pilot-operated check valves, Pre-fill and compression relief.

UNIT-III

SENSORS

Sensors and Transducers - Performance Terminology – Sensors: Displacement, Position, and Proximity - Velocity and Motion - Force - Fluid Pressure - Liquid Flow - Liquid level - Temperature - Light Sensors - Selection of Sensors - Inputting data by switches.

UNIT-IV

PROGRAMMABLE LOGIC CONTROLLER

Programmable - Basic PLC structure - Input / Output Processing - Ladder Programming - Instruction lists - Latching and internal relays - Sequencing - Timers and Counters - Shift registers - Master and Jump Controls - Data Handling - Analog input / output.

MECHATRONIC SYSTEMS: Mechatronic designs, Case studies: Timed switch, A pick-and-place robot and Car park barriers.

Text Books:

1. Andrew Parr, Hydraulics and Pneumatics - A Technician’s and Engineer’s Guide, Jaico Publishing House, 2005

2. W. Bolton, Mechatronics, Fourth Edition, Pearson Education, 2010

Reference Books:

1. Anthony Esposito, Fluid Power with Applications, Fifth Edition, Pearson Education, 2005
2. W. Bolton, Pneumatic and Hydraulic Systems, Butterworth Heinemann, 1997
3. Ernest. O. Doebelin, Measurement Systems - Applications and Design, Fifth Edition, TMH
4. Gary Dunning, Introduction to Programmable Logic Controllers, 3rd Edition, 2007

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2			2							2		2
CO2	3														
CO3		2	2			3							2		2
CO4	3		2		2										

DESIGN OF MACHINE ELEMENTS-II

14ME602

III Year B.Tech. (Mech) Sixth Semester

Lectures	:	4 Periods/Week, Tutorial:1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:

The prerequisite for this course is the students are well practiced with the design of machine elements procedure, application of theories of failure.

1. To impart the knowledge on the design of shafts, keys and couplings for various practical applications bearing under combined loading condition
2. To accustom each student in the design of journal bearing as well as in the selection of ball and roller bearings for different applications.
3. To understand the students about the importance of transmission systems and their design like belt drives and chain drives , based on center distance, i/p and o/p speeds and power to be transmitted.
4. To impart the knowledge on gear tooth failure, force analysis and design of Spur gear, Helical Gear, Bevel gears and Worm gears.

Course outcomes:

After completion of the course

1. Each student will be able to design safely shafts, keys and couplings
2. The students are able to find the dimensions of journal bearings for particular application and they are able to select the required ball/roller bearing to support various loads.
3. The students are able to select a suitable transmission system and can complete the dimensions of transmission system elements.
4. The student should able to find module and other design parameters of different types of Gears i.e Spur gear, Helical gear, Bevel gear and Worm gear

UNIT I

SHAFTS: Design of solid and hollow shafts for strength – For Bending, Torsion, Combined bending and torsion and combined bending, torsion and axial loads

KEYS: Introduction, Design of square and flat keys

SHAFT COUPLINGS: Rigid couplings: Muff Coupling, Clamp or compression coupling ,Flange coupling, Bushed pin flexible coupling. Oldham coupling , universal coupling (15)

UNIT II

BEARINGS AND LUBRICATION: Lubrication, Types of lubrications, types of lubricants, properties of lubricants, types of Bearings, Bearing materials, Journal bearing design (using Mckee's equation and Raymond and Boyd charts & tables)

BALL AND ROLLER BEARINGS: Static load, Dynamic load, Equivalent radial load, selection of ball and roller bearings (15)

UNIT III

BELT DRIVES: Flat and V-belts, Belt constructions, Geometrical relationships, Analysis of belt tensions, condition for maximum power, Selection of Flat-belts, Selection of V-belts, Selection of Pulleys.

CHAIN DRIVES: Introduction, Chain drives, Advantages of chain drives over belt drives, Polygonal effect, Selection of roller chains. (15)

UNIT IV

SPUR GEARS : Classification of gears, Terminology of spur gear, standard systems of Gear Tooth, Force analysis, Gear tooth failures, Selection of material, Beam Strength of gear teeth, lubrication, Lewis Equation.

HELICAL GEARS: Terminology of helical gears, virtual number of teeth, Tooth proportions, force analysis, Beam Strength of helical gears, effective load on gear tooth, wear strength of helical gears. Lewis Equation.

BEVEL GEARS: Terminology, force analysis, Beam Strength of bevel gears, wear strength. Lewis Equation.

WORM GEARS: Terminology, Force analysis, Strength rating of worm gears, Wear rating of worm gears. (15)

TEXT BOOKS:

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

HAND BOOKS TO BE ALLOWED IN UNIVERSITY EXAMINATION:

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

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	2	3										2	3	2
CO2	2	2	3										2	3	2
CO3	1	2	2										1	2	2
CO4	2	2	3										2	3	2

HEAT TRANSFER

14ME603

III Year B.Tech. (Mech) Sixth Semester

Lectures	:	4 Periods/Week,Tutorial:1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives.

To make the students to

1. Demonstrate one dimensional heat conduction.
2. Discuss fundamentals of forced convection heat transfer along with boundary layer theory.
3. Study fundamentals of free convection, heat exchangers, LMTD and NTU methods of heat exchanger analysis.
4. Illustrate fundamentals of radiation heat transfer. To evaluate shape factors and to evaluate radiation heat exchange between two bodies either black or grey.

Course outcomes

After completion of the course student should be able to understand, apply and solve numerical problems on

1. the basic concepts of conduction, convection and radiation heat transfer. Understand how to formulate and be able to solve one dimensional conduction heat transfer.
2. the fundamentals of the relationship between fluid flows and convection heat transfer. Apply empirical correlations for force convection to determine values for the convection heat transfer coefficient
3. the empirical correlations for free convection to determine values for the convection heat transfer coefficient. Design a heat exchanger using either LMTD method or NTU method
4. the basic concepts of radiation heat transfer which include both black body and grey body radiation. Able to evaluate radiation shape factors using tables and shape factor algebra

UNIT I

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

(4)

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

(7)

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

(4)

UNIT II

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

(3)

FORCED CONVECTION: Introduction, Principles of convection, Mass, Momentum and Energy equations for boundary layer, Hydrodynamic and thermal boundary layers and their thicknesses, Correlations for heat transfer in Laminar and Turbulent flows over a flat plate, and in pipes, relation between fluid friction and heat transfer in laminar & turbulent flows – Reynolds-Colburn Analogy. (12)

UNIT III

NATURAL CONVECTION: Approximate analysis for laminar film on a vertical plate, Correlations for vertical plates, horizontal plates, vertical and horizontal cylinders, inclined surfaces. (7)

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

(8)

UNIT IV

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

(7)

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

TEXT BOOKS:

1. Heat and Mass Transfer – Sachdeva, New Age India, New Delhi
2. Heat Transfer—Rajput, Laxmipubl, New Delhi.

REFERENCE BOOKS:

1. Heat transfer - J.P.Holman, MGH, New York.
2. Heat transfer - S.P.Sukhatme, TMH.
3. Heat Transfer – Cengel and Boles, TMH, New Delhi

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	2		1		1					1	2	
CO2	2	1	2	2		1		1					1	2	
CO3	2	2	2	2		1		1					1	2	
CO4	2	1	2	2		1		1					1	2	

FINITE ELEMENT ANALYSIS
14ME604

IVYear B.Tech. (Mech) Seventh Semester

Lectures	:	4 Periods/Week,Tutorial:1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To provide the basics of 3D stress analysis and functional derivation for various types of problems
2. To provide the students, analysis of 1D problems using finite element method
3. To provide the basic knowledge of trusses and beam analysis using FEM
4. To provide the students 2dimensional problems using triangular elements, general method to derive the element stress and load vectors using potential energy method
5. To provide the students about axi symmetric problems using triangular elements

Course Outcomes:

1. Students will demonstrate an ability to derive element matrix equation by different methods by applying basic laws in mechanics and integration by parts
2. Students will demonstrate an ability to apply the steps required for FEM solution to variety of physical systems and obtain engineering design quantities.
3. Students will demonstrate an ability to determine engineering design quantities(deformation, force, strain, stress) for truss and beam
4. Students will demonstrate an ability to determine the deformations, stress and stains in 2D plates using triangular elements

UNIT - I

FUNDAMENTAL CONCEPTS: Introduction, historical background, Analysis of 3-D stresses & strains, stress-strain relations, stress cubic, principal stress caliculations, temperature effects, potential energy and equilibrium, the Rayleigh-Ritz method, Weighted Residual Method, Galerkin's method, Saint venant's principle, Von Mises stress. (15)

UNIT- II

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

(8)

ANALYSIS OF PLANE TRUSSES : Introduction, ***Plane Trusses:*** Local and Global Coordinate systems, Element Stiffness Matrix, Stress Calculations, Example of plane Truss with three members. (7)

UNIT- III

TWO DIMENSIONAL PROBLEMS : Introduction, Plane Stress and Plane Strain, Finite Element Modeling, Constant Strain Triangle (CST); Iso-parametric representation, Potential Energy Approach, Element Stiffness, Force terms, Galerkin Approach, Stress calculation, Problem modeling and boundary conditions, Examples of plane Stress and plane Strain problems with three degrees of freedom using CST Element (15)

UNIT- IV

Axi-Symmetric solids subjected to Axi-Symmetric loading : Introduction, Axi-Symmetric formulation, FEM using triangular element,Strain displacement relation,load vector calculations. (5)

Scalar Field Problems : Introduction, steady-state heat transfer, one-dimensional heat conduction, governing equation, boundary conditions, the one dimensional element, functional approach for heat conduction. (10)

Text Books:

1.Introduction to Finite Elements in Engineering by Chandrupatla & Belegundu, PHI.
2. Finite Element Analysis by P.Seshu, PHI publications

References:

1. Finite Element Analysis by C.S.Krishna Moorthy.
2. Finite Element Analysis by L.J.Segerlind.
3. Cook, Robert Davis et al, "Concepts and Applications of Finite Element Analysis" , Wiley, John & Sons,1999
4. George R Buchanan, "Schaum's Outline of Finite Element Analysis", McGraw Hill Company, 1994.
5. David V. Hutton, “Fundamentals of Finite Element Analysis “Mc Graw Hill Company.

CO-PO MAPPING

CO’S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	3	3										1	2	1
CO2	3	2	2										1	2	2
CO3	2	2	1										3	2	1
CO4	1	2	2										2	1	1

ELECTRONICS & MICRO-PROCESSORS

14ME605

III Year B.Tech. (Mech) Sixth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

Electronic Devices & Integrated Circuits: (unit1&2)

The course provides a comprehensive understanding of the basic theory of semiconductors and devices made out of it like 'p-n' junction diodes, FET and BJT etc. Starting by explaining the fundamentals of semiconductors like energy band formation, electron and hole concepts, effect of electric and magnetic fields on charge carriers, the course helps in developing the understanding about excess carriers in semiconductors. In-depth study on 'junctions' prepares the students for even a detailed study on devices to be studied later like FET and BJT viz. commonly employed in Integrated Circuit (IC) technology for implementation of virtually any requirement.

Digital Electronics & Microprocessors: (unit 3&4)

The course aims at introducing the fundamentals of digital electronics, microprocessor architecture and programming (8085). It deals with the basic Digital Concepts of Digital Electronics & makes the students familiar with the basic building blocks of Digital Electronics and logic design. Gradually enhances their knowledge of the design of Complex digital systems (I.C). The study introduces the students to an introduction to the Microprocessor architecture including its addressing modes & basic programming.

Course Outcomes:

By the end of this course, students should be able to:

1. Analyse the current voltage characteristics of various semiconductor devices.

2. Understand the fundamentals and areas of applications in integrated circuits.

3.Acquire the basic knowledge of digital logic levels and application of knowledge to understand digital electronic circuits.

4. Illustrate 8085 Architecture including its addressing modes and basic programming.

UNIT I

BASIC ELECTRONIC DEVICES:

PN junction diode: Principle, characteristics: Zenerdiode : Principle, characteristics, Rectifiers: Definition, Half wave rectifier, Full wave rectifier; BJT: Principle & operation, Input,& output characteristics, Transistor as a switch, Transistor as an amplifier.

FET: Principle & operation, characteristics of JFET, & MOSFET & of JEET., its characteristics.

(15)

UNIT II

ANALOG ELECTRONICS: Operation amplifiers: Definition of op-Amplifiers, Block diagram of op –Amp, details of op – Amp characteristics, Op – Amp Configurations:Inverting configuration, Non- Inverting configuration.

OP AMPLIFIERS APPLICATIONS: Summing Amplifier, Difference Amplifier, Integrator, Differentiator, Instrumentation amplifier, Comparator, Schmitt trigger.

(15)

UNIT III

DIGITAL ELECTRONICS: Number systems: Decimal, Binary Octal, Hexa – decimal number systems, Number system conversions.
Codes: BCD Code, Excess – 3 code.

Boolean Algebra &LogicGates: Boolean Logic Postulates. Basic logic gates, Universal Logic gates, Boolean expression simplification using K – Map Method up to 4 variables.

Combinational Logic Circuits: Definition, Combinational circuit design Procedure, Design of Combinational Circuits: half – Adder, Full – adder, Half Sub tractor, Full Sub tractor, Decoder, Encoder, Multiplexer, De – Multiplexer.

SEQUENTIAL LOGIC CIRCUITS: Definition, Flip – flops: SR, JK, T, D., Race around condition, Master – slave J.K.Flip - flop, Counters: Asynchronous versus synchronous counters, Design of ripple counters, shift registers.

UNIT IV

INTRODUCTION MICROPROCESSORS: Intel 8085 architecture, Pin diagram, Instruction set OF 8085, Addressing Modes, Development of simple assembly language Programs. (15)

TEXT BOOKS:

1. Microprocer& Architectures, Programming & applications with the 8085/8080 A by Gaoneker. for Unit - IV
2. Digital Logic and Computer Design by M.Morrismano, PHI for unit – 3.
3. Semiconductor devices & Circuits by B.P. Singh for chapter – 2 of Unit – I (DhanpatiRai)

   Linear integrated circuits by D.RoyChaudary&S.Jain(New - age international).

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	3											**3**		
CO2	3												**2**		
CO3	3												**3**		
CO4	2	3											**2**		

MANUFACTURING ENGINEERING

14ME606/A

III Year B.Tech. (Mech) Sixth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To describe about the design principles and study of different types of jigs and fixtures.
2. To provide information about gear hobbing, gear shaping and gear finishing methods.
3. To provide information about thread manufacturing methods like, thread rolling, thread milling, thread grinding.
4. To explain about the principle, working, advantages, limitations and applications of different unconventional machining processes.
5. To describe about various sheet metal working operations like punching, blanking, drawing and bending operations.
6. To classify different types of CMM, and describe operation and programming of CMM, also describe about different stages of machine vision process, and applications.

Course Outcomes:

After completion of the course, students will be able to

1. Discuss about design principles of jigs and fixtures, gear hobbing and gear shaping and gear finishing operations.
2. Describe the principle and working of different unconventional manufacturing processes.
3. Describe the sheet metal working operations like punching, blanking, drawing and bending and also design tooling for above operations and calculate the forces required.
4. Discuss the types and working of CMM, and stages of Machine vision system.

UNIT – I

JIGS & FIXTURES : Introduction, design considerations in jigs & fixtures. The principle of six point location, locating pins. Clamping and clamping devices. A few examples of drilling jigs like box type, template jig, Inverted jig, indexing jig, fixtures – Lathe, milling (8)

GEAR MANFUACTURING : Introduction to various gear manufacturing methods, gear shaping, gear hobbing, bevel gear generation - principles and methods, gear finishing methods. (5)

THREAD MANUFACTURING PROCESSES : Thread rolling, thread milling, thread grinding. (2)

UNIT – II

UNCONVENTIONAL MACHINING PROCESSES : Introduction, principles of operation, equipment and applications of AJM, USM, WJM, EDM, ECM, CHM, EBM, LBM and PAM (15)

UNIT – III

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

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

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

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

UNIT – IV

COMPUTER AIDED INSPECTION : Types of CMM (Coordinate Measuring Machines), CMM construction, CMM operation and programming, CMM software, Flexible inspection systems, CMM applications and benefits. (8)

Machine vision, principle and introduction to stages in machine vision, image acquisition and digitization, image processing and analysis, interpretation, machine vision applications. (7)

Text Books:

1.A Text book of Production Engineering by P.C.Sharma, S.Chand & Co.

2.Manufacturing Science by Ghosh & Mallik,

Reference Books:

1.Manufacturing engineering & technology by Kalpakjian, Pearson Education / PHI

2.Engineering metrology by R.K.Jain, Dhanpathrai & Sons

3.Automation, production systems & CIM by M.P.Groover, Pearson Education / PHI

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1				1			1	1				2	2	
CO2	1				1			1	1				1	1	
CO3	1				1			1	1				2	2	
CO4	1				1			1	1				2	2	

REFRIGERATION AND AIR CONDITIONING
14ME606/B

III Year B.Tech. (Mech) Sixth Semester

Lectures	:	4 Periods/Week, Self study: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objective:

1. To know the necessity, applications and concept of refrigeration and air air refrigeration systems.
2. To understand the working principle and components of vapour compression and to study the influence of various parameters on the performance of the system
3. To interpret the working principles of vapour absorption system and non-conventional refrigeration systems.
4. To understand the requirement of air conditioning for human comfort and industrial air conditioning applications

Course outcomes:

After the completion of the course, the students will be able to

1. Describe the applications of refrigeration and air refrigeration systems.
2. Explain the working of vapour compression refrigeration system and their components.
3. Demonstrate the working of vapour absorption refrigeration system and non-conventional refrigeration systems.
4. Describe the various air conditioning systems and human comfort.

UNIT I

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

(6)

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

(9)

UNIT II

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

(8)

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

(7)

UNIT III

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

(10)

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

(2)

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

(3)

UNIT IV

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

(9)

AIR CONDITIONING SYSTEMS: Classification of equipment, cooling, heating, humidification and dehumidification, filters, grills and registers, deodorants, fans and blowers, heat pump, heat sources, different heat pump circuits, application. (6)

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1				2	1						2	1	2
CO2	2	1		1		2	1						2	1	2
CO3	2	2	2	1		1	2						2	1	2
CO4	2	1	2	2		1	2						1	2	2

SOLAR ENERGY AND UTILIZATION
14ME606/C
III Year B.Tech. (Mech) Sixth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Outcomes:

1. To enable students to understand the potential of solar energy and characteristics and performance of various kinds of solar energy systems
2. To introduce students to solar flat plat collectors and solar concentrators
3. To teach students about solar power generation
4. To enable the students to understand solar radiation received on the earth and fundamentals of solar thermal engineering

Course Objectives:

Student will be able to

1. Estimate solar radiation received on a surface
2. Predict and analyse the performance of solar devices
3. Analyze the thermal conversion of solar energy with respect to different surfaces.

UNIT I
Introduction, Energy alternative, Devices for thermal collection and storage, Thermal applications.
Solar radiation: Instruments for measuring solar radiation, Solar radiation geometry, Empirical equations for prediction of availability of solar radiation, Solar radiation on tilted surfaces.

UNIT II
Liquid flat- Plate Collectors: General performance analysis, Transmissivity, absorptivity, product and overall loss coefficient and heat transfer correlations, Collector efficiency factor, Numerical. Analysis of collectors similar to the conventional collector. Testing procedures, Alternatives to the conventional collector,Numerical.
Solar Air Heaters: Performance analysis of a conventional air heater, Other types of air heaters.
Concentrating Collectors: Flat plate collectors with plane reflectors, Cylindrical parabolic collector,compound parabolic dish collector ,central receiver collector, numerical.

UNIT III
Thermal energy storage: Sensible heat storage, Latent heat Storage, Thermochemical storage .Solar

distillation: Introduction, working principal of solar distillation, Thermal efficiency of distiller unit, External heat transfer, Top loss coefficient, Bottom and side loss coefficient, Internal heat transfer, Radioactive loss coefficient, connective loss coefficient, Evaporative loss coefficient, Overall heat Evaluation of distillation output, Passive solar stills, Conventional solar still, Basin construction, Thermal analysis of conventional solar still.

UNIT IV

Photovoltaic Systems: Introduction, doping Fermi level, P-N junction characteristics, Photovoltaic effect, Photovoltaic material, Module, Cell temperature, Numerical. Economic analysis: Introduction, cost analysis.

TEXT BOOK:

1. Solar Energy: Thermal Processes, by Duffie John A, and Beckman W.A, john Wiley and Sons.

2.Solar Energy, by S.P Sukhatme, Tata Mc Graw Hill.

3.Treatise on Solar Energy, by H.P Garg, john Wiley and Sons.

4. For more details : visit http://www.uktech.in

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2			1			2					3	2	
CO2	3	1	1		2	1		1					2	2	
CO3	2	3	2			2							1	2	
CO4		2	2	1									2	1	

HEAT TRANSFER LAB
14MEL601

III Year B.Tech. (Mech) Sixth Semester

Practicals	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Objectives:

1. To understand the fundamentals of heat transfer mechanisms both in fluids and solids.
2. To measure the modes of heat transfer through various heat transfer equipment.
3. To understand the working of refrigeration and air conditioning systems.

Outcomes:

Student will be able to

1. Determine the thermal conductivity of insulating powder, composite wall, metal bar and lagged pipe
2. Estimate the rate of heat transfer for Natural and Forced convection apparatus
3. Analyze the performance of parallel and counter flow heat exchangers
4. Evaluate the performance of refrigeration and air conditioning systems

.

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

1. Refrigeration Test Rig
2. Air Conditioning Test Rig
3. Heat Exchanger – Parallel Flow
4. Heat Exchanger – Counter Flow
5. Composite Slab / Metal Rod
6. Critical Heat flux Apparatus
7. Emissivity Apparatus
8. Pin fin – Natural Convection
9. Pin fin – Forced Convection
10. Insulating powder Apparatus

11. Drop wise and film wise condensation Apparatus
12. Forced Convection Apparatus
13. Stefan – Boltzmann's Apparatus
14. Lagged pipe Apparatus

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2		2		1				1			2	2	
CO2	3	2		2		1				1			2	2	
CO3	2	2		2		1				1			2	2	
CO4	2	2		2		1	1			1			2	2	

AUTOMATION LAB

14MEL602

III Year B. Tech. (Mech) Sixth Semester

Lectures	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

To provide the student with knowledge and application of hydraulic&pneumatic drives and their control using sensors and PLC as used in automation industry

Course Outcomes:

Upon successful completion of this laboratory course student will be able to:

1. Understand the main components of hydraulic and pneumatic systems.
2. Buildhydraulic and pneumatic circuits to transmit and control energy conversion.
3. Understand the working and usage of various sensors.
4. Write PLC programs for applications in automation.

LIST OF EXPERIMENTS

Hydraulics

1. Pressure intensification and flow characteristics of a single rod cylinder
2. Characteristics of a Hydraulic motor
3. Application of a check valve with manual and pilot operations
4. Working of an adjustable throttle valve

Pneumatics

1. Direct control, indirect control and speed regulation of a double acting cylinder.
2. Displacement, pressure and time dependent control of a double acting cylinder.
3. Basic circuits with AND function, OR function and electric latching.
4. Sequential control of 2 double-acting cylinders with impulse valves and signals overlapping.

Sensorics

1. Behaviour of inductive, capacitive and magnetic sensors.
2. Behaviour of through beam, reflex photoelectric and ultrasonic sensors.
3. Operating range, hysteresis and response curve of the inductive sensor.
4. Operating range, hysteresis and response curve of the capacitive sensor.

PLC

1. Write a PLC program for Tank filling device simulator
2. Write a PLC program for Supervise equipment
3. Write a PLC program for Pump control
4. Write a PLC program for Star-Delta starting up

References:

1. Andrew Parr, “Pneumatics and Hydraulics", Jaico Publishing House, 1999.
2. Antony Esposito, "Fluid power with Applications", Sixth edition- Pearson education, 2000
3. W. Bolton, Mechatronics, Fourth Edition, Pearson Education, 2010

CO-PO MAPPING

CO’S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1					1					1	2	1	1
CO2	2	2	2	2	2							2	2	2	3
CO3	2		1		1							2	2	2	3
CO4	2	2	2	1	2							2	2	2	3

ELECTRONICS LAB
14ECL603

III Year B.Tech. (Mech) Sixth Semester

Practicals	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

COURSE OBJECTIVES

1.The course provides a experimental understanding of semiconductor devices like 'p-n' junction diode, Zener diode, HWR, BJT etc.

2. The course deals with the experimental understanding of basic logic gates, different combinational and sequential logic circuits.

3.The course also deals with basic programming of 8085.

COURSE OUTCOMES

By the end of this course, students should be able to:

1. Plot the characteristics of electronic devices to understand their behavior.
2. Design various combinational and sequential logic circuits.
3. Able to use code convertors
4. Write basic Programming of 8085.

(Any Ten Experiments)

1. VI characteristics of PN junction diode
2. VI characteristics of Zener diode
3. Half wave rectifier with and without filter
4. Common emitter configurations (BJT)
5. Characteristics of JFET
6. Characteristics of UJT

7. Logic gates using discrete components
8. Logic gates using universal gate (NAND gate)
9. Combinational Circuits (half adder, full adder, half subtractor)
10. Verification of Flip-Flop (JK & D etc.,)
11. Code converters (Gray to Binary & Binary to Gray)
12. Multiplexer and Demultiplexer
13. Addition of two numbers using 8085 Microprocessor
14. Subtraction of two numbers using 8085 Microprocessor
15. Addition of n-numbers using 8085 Microprocessor

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3								3				2		
CO2	2	2	3						2				3		
CO3	2								2				2		
CO4	3								2				2		

INDUSTRIAL ENGINEERING AND ENTREPRENEURSHIP DEVELOPMENT
14ME701

IVYear B.Tech. (Mech) Seventh Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To provide students an insight into the concepts of industrial engineering and organization
2. To familiarize the students with principles of work study, Method study and motion study
3. To introduce students to various aspects of plant design and materials planning
4. To introduce students to entrepreneurial functions, objectives

Course Outcomes:

Student will be able to

1. Optimize the resources of an organization and improve productivity
2. Acquire managerial skills and marketing skills of a product
3. Understand various job evaluation and merit ratings methods.
4. Acquire entrepreneurial skills to start his own venture/firm/organization.

UNIT-I

Management: Introduction, levels of management, evolution of management thought: Taylor's Scientific Management, Henry Fayol's Principles of Management, Functions of management (5)

Organization: Introduction, principles and types of organization structures (5)

Marketing: Introduction, marketing vs selling, marketing mix, distribution channels, product life cycle. (5)

UNIT-II

Productivity: Introduction, methods to measure productivity, measures to improve productivity. (3)

Work study - Introduction, objectives, method study - objectives, steps involved, various types of associated charts, difference between micro-motion and memo-motion studies, Work measurement - techniques, time study - steps involved, equipment, different methods of performance rating- allowances, standard time calculation. (12)

UNIT-III

Statistical Quality Control: Introduction, techniques, variable control charts – mean chart and range charts, attribute control charts: p charts and c charts, Acceptance sampling: single sampling and double sampling plans, OC Curves. (7)

Human Resource Management: Introduction, functions of HRM, Job Evaluation, different types of evaluation methods. Job description, merit Rating, difference with job evaluation, different methods of merit ratings. (5)

Wage Incentives Plans: Introduction, different types of wage incentive plans with merits and demerits (3)

UNIT-IV

Entrepreneur Development: Introduction, Entrepreneurial characteristics, Functions of an Entrepreneur; Factors affecting entrepreneurship; Role of communication in entrepreneurship; Entrepreneurial Development-Objectives, Need of Training for enterprises; Finance for the enterprises; Product, Process and Plant Design- Product analysis and Product Design process. Steps in process design and plant design. (15)

TEXTBOOKS:

1. Manufacturing Organization and Management / Amrine / Pearson Education
2. Industrial Engineering and Management / O.P. Khanna / Dhanpat Rai.
3. Principles of Motion and Time Study / Ralph Barnes
4. Work study / ILO

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1									2	2	3	2			3
CO2									2	2	3	2			3
CO3									1	2	2	2			2
CO4									2	2	2	2			2

DESIGN OF MACHINE ELEMENTS-III
14ME702

IV Year B.Tech. (Mech) Seventh Semester

Lectures	:	4 Periods/Week, Tutorial :1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:

1. To reinforce the design philosophy that real engineering problems are open ended.
2. To impart application-oriented knowledge to students in designing springs, brakes and clutches.
3. To aware the students in the mechanical design of elements like piston, connecting rod and crankshaft etc.,
4. To know each student the importance of optimization and its procedure applied to various machine elements.

Course Outcomes:

Student will be able to

1. Design and Analyze springs subjected to loads.
2. Understand working principles and determine design parameters for different Brakes and Clutches.
3. Describe the working principle and design the flywheels
4. Design the piston and connecting rod and implement the optimization techniques for design.

UNIT – I

SPRINGS: Introduction, Materials, Types of springs, Helical springs under axial load, Fatigue loading, Torsion springs, Spiral springs, leaf springs. (15)

UNIT – II

BRAKES AND CLUTCHES: - Introduction to Brakes, Types, Analysis and design of block brakes, band brakes, Internal shoe brakes, external shoe brakes, pivoted shoe brakes, Temperature rise, Friction materials, Clutches, Analysis and design of simple and multiple disc clutches, cone clutches and centrifugal clutches, friction materials, comparison of brakes and clutches. (15)

UNIT – III

FLYWHEEL: Introduction, construction, Torque analysis, solid flywheel, Rimmed flywheel, stresses in rimmed flywheel, Design of flywheel. (15)

UNIT – IV

I.C. ENGINE COMPONENTS: Introduction, Design of trunk type piston, connecting rod and crankshaft. (10)

OPTIMUM DESIGN: Optimization functions of single variable and multi variables, optimization techniques, Interval halving and Golden section methods. (5)

TEXT BOOKS:

1.Design of machine elements by Bhandari, Tata McGraw Hill book Co.

2.Machine Design by Sharma & Purohit.

HANDBOOKS TO BE ALLOWED IN UNIVERSITY EXAMINATION:

1.Design data book, P.S.G. College of Tech, Coimbatore

2.Design data book, Mahadevan &Balaveera Reddy - CBS Pub.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		2		3								3	2	
CO2	3		2		3								3	2	
CO3	3		2		3								3	2	
CO4	3		2		2								3	2	

ENGINEERING METROLOGY & MECHANICAL MEASUREMENTS

14ME703

IVYear B.Tech. (Mech) Seventh Semester

Lectures	:	4 Periods/Week, Tutorial:1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. Know the measurement science and metrology.
2. Design a gauge or select the suitable comparator or instrument based on the geometrical features of the component.
3. Conduct the test on machine tool to ensure the condition of the machine for getting the correct part within the specified tolerance limits.
4. Identify various parts and components of measuring instrument and select the correct measuring instrument for various physical quantities depending upon application.

Course Outcomes:

After completion of this subject the student should be able to:

1. Explain the basics of standards of measurement, limits, fits & tolerances industrial applications.
2. Identify the uses of gauges and comparators.
3. Understand the significance of measurement system, errors, transducers intermediate modifying and terminating devices.
4. Select different measuring instruments for measuring different physical quantities.

METROLOGY :

UNIT - I

INTRODUCTION: Elements of engineering measurements, standards of length, end and line standards. Theory of limits, Fits, Tolerances and their selection, Hole Basis and shaft basis system, IS system of limits & fits, simple problems. Interchangeability, Selective Assembly,

GAUGES: Limit gauges, Taylor's Principle of limit gauging, plug gauges, Ring gauges and design of plain cylindrical plug and ring gauges. Slip gauges, angle gauges, sine bars, spirit levels. (15)

UNIT – II

COMPARATORS:
Sigma comparator, Solex pneumatic gauge, electrical & electronic comparator, projectors, Tool Maker's Microscope, Auto collimator, bore gauges, straight edges, angle plates.
MEASUREMENT OF SURFACE FINISH: Surface texture, roughness , waviness, Indian standard terminology, Various methods of measuring surface finish, Tomilson surface meter and Taylor Hobson Talysurf.
MEASUREMENT OF SCREW THREADS: Introduction-Types of threads-Measurement of outside diameter,inner diameter,effective diameters.
MACHINE TOOL PERFORMANCE TESTS: Static and Dynamic alignment tests-Alignment tests on Lathe, Universal Milling Machine and Pillar Drilling Machines.
(15)

MEASUREMENTS:
UNIT - III
BASIC CONCEPTS: Introduction, Measurement system elements, Definition of terms: Calibration, standards, Accuracy, Precision, Sensitivity, Resolution. (3)
STRAIN MEASUREMENT:
Introduction, electrical resistance strain gauges principle, Method of fixing and bridge circuits for measuring strain changes, Gauge factor, Temperature compensation strain gauge. Rosette, Strain gauge applications. (6)
FLOW MEASUREMENT:
Introduction. Variable head flow meters, orifice, Pitot tube, variable area flow meters, Hot-wire anemometer. Flow visualization methods.
(6)

UNIT - IV
PRESSURE MEASUREMENT:
Introduction, pressure measurement terms, Pressure units, Bourdon tube pressure gauge, Diaphragm and Bellows, Bridgeman gauge, Low pressure measurement: McLeod gauge, thermal conductivity gauge.
(6)
TEMPERATURE MEASUREMENT:
Introduction, Liquid in glass thermometers, Bi-metallic thermometers, Thermo-Resistive elements, Thermocouples, Thermisters and Pyrometers. (4)
FORCE AND TORQUE MEASUREMENT: Introduction, Elastic force meters, Load cells. Dynamometers, Mechanical ,Electrical & Transmission Dynamometers. (5)

TEXT BOOKS:
1. Metrology - R.K.Jain , Khanna publishers
2. Mechanical Measurements & Control - by D.S. Kumar ,

REFERENCE BOOKS:

1 Engg.Metrology – D.M.Antony
2. A text book of Engg.Metrology – I.C.Gupta.
3. Mechanical Measurements - by T.G. Beckwith & N.L.Buck
4. Experimental Methods for Engineers by J.P.Hollman, TMH.

CO-PO MAPPING

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1			1	2										3	
CO2			2		1										
CO3			2											1	
CO4		3	2	3											

CAD/CAM
14ME704

IVYear B.Tech. (Mech) Seventh Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

The objectives of the course are to enable students

1. To visualize the use of computer graphics in Engineering
2. Understand the role of CAD in Engineering design.
3. To discover the knowledge about the G-codes; M-codes; NC Programming and CNC Programming.
4. Familiarize about the technologies like GT, CAPP, and FMS

Course Outcomes:

After successful completing the course, the student should be able to

1. Relate the computer graphics to the Engineering applications
2. Summarize the role and applications of CAD in Engineering design.
3. Write the simple part programs for turning and milling.
4. Analyze the benefits of various technologies like GT, CAPP, and FMS

UNIT I-INTRODUCTION

Origin of computer graphics – interactive graphics display – display devices – pixels– algorithms for line and circle – Bresenham's algorithm – 2D and 3D transformations – translation, rotation, scaling– concatenation. Practical: Simple programs in C – drawing line & Circle – transformations. (15)

UNIT II-SPECIAL CURVES and VOLUME MODELING

Curve representation – Bezier, cubic spline, B-spline,

Volume modeling: boundary representation, CSG, hybrid - viewing transformations – techniques for visual realism: clipping, hidden line removal, algorithms for shading and rendering. (15)

UNIT – III

NUMERICAL CONTROL: Introduction, basic components of an NC system, classifications of NC systems, nomenclature of NC machine axes, interpolation methods, features of CNC, the machine control unit for CNC, direct numerical control, distributed numerical control, applications of NC, advantages and disadvantages of NC. (7)

NC PART PROGRAMMING: NC coding systems, manual part programming, simple examples on milling and turning operations, computer assisted part programming, part programming with APT language, simple examples in milling operations. (8)

UNIT – IV

GROUP TECHNOLOGY & CELLULAR MANUFACTURING: Introduction, part families,

parts classification and coding, features of parts classification of coding system, selecting a coding system, developing coding system in an industry OPITZ, MICLASS, Product Flow Analysis, composite part concept, machine cell design, applications. (6)

COMPUTER AIDED PROCESS PLANNING: Introduction, retrieval CAPP system, generative CAPP systems, benefits of CAPP. (3)

FLEXIBLE MANUFACTURING SYSTEMS: Introduction, types of FMS, components, FMS layout configurations, computer control system, human resources, applications and benefits. (4)
Introduction to Computer Integrated Manufacturing. (2)

TEXTBOOKS:

1. CAD/CAM by M.P.Groover and E.W.Zimmers, Pearson Education / PHI.
2. Ibrahim Zeid“ CAD/Cam Theory and Practice”, McGraw Hill, International Edition, 1998

REFERENCE BOOKS:

1. Automation, Production systems and Computer Integrated Manufacturing by M.P.Groover, Pearson Education / PHI.
2. CAD/CAM by P.N.Rao, TMH
3. Rogers. D.F., “Procedural Elements for Computer Graphics”, McGraw Hill, 1985.
4. Newman, William M., &Sproull, Robert F., “Principles of Interactive Computer graphics”, 2nd Ed., McGraw Hill, 1981.
5. Harington, Stevan, “Computer Graphics: A Programming Approach”,McGraw Hill, 1983.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	2	1	1				1	2		2	1	1	1
CO2	2	2	1		2	1	1		1	2	1	2	2	1	1
CO3	3	2	2		2	1			1	3		2	2	2	1
CO4	2	2	2		2	1			1	2		2	2	2	1

OPERATIONS MANAGEMENT

14ME705/A

III Year B.Tech. (Mech) Sixth Semester

Lectures	:	4 Periods/Week, Self-Study: 1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:

The student will be able to

1. Understand the concepts of Forecasting, production systems, Plant layout
2. Be familiar with the features of Materials management, Inventory management
3. Be familiar with the features of Material requirement Planning
4. Be able to know the concept of Aggregate planning, Line balancing
5. have an overview of scheduling, contemporary management techniques

Course Outcomes:

The student will be able to:

1. Understand the Forecasting techniques and problems, Types of production systems, Types of Plant layout
2. Be familiar with functions of materials management, types of inventories, ABC analysis, ED analysis, P-system and Q-system, problems
3. Have clear idea about MRP inputs, outputs and logic
4. Have knowledge of aggregate planning methods, line balancing methods

UNIT-I

Forecasting: Introduction, types of forecasting and their uses, General principles of forecasting, forecasting techniques: qualitative and quantitative methods of Forecasting. (7)

Production Systems: Types of production systems: job, batch, mass and flow type production. (3)

Plant Location: Factors affecting the plant location, comparison of rural and urban sites (2)

Plant Layout: Introduction, principles of plant layout, types of plant layouts (3)

UNIT-II

Materials Management: Introduction, functions of materials management, inventory, inventory management, types of inventories, Selective inventory control techniques: ABC analysis, VED analysis.

Material Requirement Planning: Introduction, Inputs, outputs and MRP logic.

(15)

UNIT-III

Aggregate Planning: Introduction, aggregate planning strategies, aggregate planning methods mathematical planning models, heuristic and computer search models, problems. (10)

Scheduling: Introduction, difference with loading, scheduling policies, techniques, standard scheduling methods. (5)

UNIT-IV

Inventory Control: Deterministic models, safety stock inventory control systems (10)

Contemporary management techniques: Introduction to MRP-II, JIT, ERP and Supply chain management.

(5)

TEXT BOOKS:

1. Operations Management -Joseph. G.Monks, International (3rd) Edition
2. Elements of Production Planning and Control / Samuel Eilon.
3. Modern Production/ operation managements / Baffa & Rakesh Sarin

REFERENCES:

1. Operations Management – S.N. Chary.
2. Inventory Control Theory and Practice / Martin K. Starr and David W. Miller.
3. Production And Operation Management / MartandTelsang
4. Production Control A Quantitative Approach / John E. Biegel.
5. Production Control / Moore.

Course Outcomes	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO1 1**	**PO1 2**	**PSO 1**	**PSO 2**	**PSO 3**
CO1	1	1	1	2		3		2			2	1	3	1	1
CO2	1	2	2	2	3	3		2		1	1	1	2	1	3
CO3	1	3	3	1		1		1		1	2	1	2		1
CO4	3	2	2		1	2				2	1	1	3		1

COMPUTATIONAL FLUID DYNAMICS
14ME705/B

IVYear B.Tech. (Mech) Seventh Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To develop an understanding of the major approaches and methodologies used in CFD, the interplay of physics and numeric's, the methods and results of numerical analysis
2. To gain experience in the actual implementation methods and understanding the boundary conditions etc
3. To increase skills in implementing and using basic CFD methods ,computer use and programming debugging.

Course Outcomes:

1. Provide the student with a significant level of experience in the use of modern CFD software for the analysis of complex fluid-flow systems.

   1.1 The student will demonstrate the ability to use modern CFD software tools to build flow geometries, generate an adequate mesh for an accurate solution, select appropriate solvers to obtain a flow solution, and visualize the resulting flow field.

   1.2 The student will demonstrate the ability to analyze a flow field to determine various quantities of interest, such as flow rates, heat fluxes, pressure drops, losses, etc., using flow visualization and analysis tools.

2. Improve the student's understanding of the basic principles of fluid mechanics.

   2.1 The student will demonstrate an ability to recognize the type of fluid flow that is occurring in a particular physical system and to use the appropriate model equations to investigate the flow.

   2.2 The student will demonstrate an ability to describe various flow features in terms of appropriate fluid mechanical principles and force balances.

3. Provide the student with a basic understanding of the theory, principles, and practice of the finite element method.

   a. The student will demonstrate an understanding of the basic theory behind the approximations used in the finite element method.

4. The student will write his/her own MATLAB program to numerically solve a simple second-order ordinary differential equation using the finite element method.

UNIT I

INTRODUCTION:-CFD as a design tool**,** as a research tool, impact of CFD, Applications. (3)

GOVERNING EQUATIONS: - Continuity, Momentum and Energy equations in3 Dimensions, Navier-Stokes equations, Single Generic Integral form equations for Continuity, Momentum and Energy. (12)

UNIT II

DISCRETIZATION:-Basic aspects of discretization, Techniques used--Finite Difference, Finite Volume and Finite Element, comparison of methods, difference equations, Explicit and Implicit approaches. (15)

UNIT Ill

GRID GENERATION AND TRANSFORMATION:-Generation of grid, Transformation of non- uniform grids, General transformation of equations, form of governing equations suitable for CFD, Compressed grids, Boundary filled coordinate systems—Elliptic grid generation, Adaptive grids, Modern developments in grid generation. (15)

UNIT IV

CFD TECHNIQUES:-Introduction, LAX-WENDORFF technique, MACCORMICK technique, CRANK-NICHOLSON technique, Relaxation technique, ADI technique, suitability for different conditions. Aspects of numerical dissipation and dispersion.
(15)

TEXT BOOKS:

1. Computational Fluid Dynamics, Basics with Applications—ANDERSON Jr.-MGH, 1995
2. Numerical Heat Transfer and Fluid Flow—PATANKAR-Hemisphere, NY, 1980

REFERENCE BOOK:

1. Computational Fluid Dynamics for Engineering—HOFFMAN K.A. - Engineering Education System, Austin, TX, 1989

CO-PO MAPPINGS

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2			1			2					3	2	
CO2	3	1	1		2	1		1					2	2	
CO3	2	3	2			2							1	2	
CO4		2	2	1									2	1	

MECHATRONICS

14ME705/C
IVYear B.Tech. (Mech) Seventh Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To impart the knowledge of fundamentals of mechatronics.
2. To make aware of various sensors and transducers.
3. To make aware of various actuation systems (electrical, pneumatic, hydraulic, mechanical, thermal).
4. To provide basic introduction to various system modeling concept.
5. To make understand of various closed loop controllers.
6. To instruct basic concepts of PLC and programming.

Course Outcomes:

After successful completion of course, a student should be able to

1. Have the basic knowledge of mechatronics, various elements of mechatronics system.
2. Understand various actuation systems, their merits and demerits.
3. Understand the basic concept of control system modeling and various control modes
4. Know the role and importance of PLC and Actuating systems.

UNIT – I

INTRODUCTION TO MECHATRONICS, sensors & transducers: Introduction, performance terminology, classification of sensors, selection of sensors.

Signal Conditioning: Introduction data acquisition – Quantizing theory, analog to digital conversion, digital to analog conversion.

Data Presentation Systems: Data presentation elements magnetic displays, data acquisition systems, systems measurement, testing and calibration. 15

UNIT – II

ACTUATION SYSTEMS: Pneumatic and hydraulic actuation systems, stepper motors.

System Models: Modeling of one and two degrees of freedom mechanical, electrical, fluid and thermal systems. Block diagram representations for these systems.

15

UNIT– III

DYNAMIC RESPONSE of systems zero order, First order and second order systems. Block diagram representation, Transfer function. Systems in series, Systems with feedback loops.

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

15

UNIT – IV

PLC: Introduction, basic structure, I/P, O/P, processing, programming, ladder diagrams, timers, internal relays and counters, data handling, analogue input and output selection of PLC.

DESIGN: Designing mechatronics systems, possible design solutions, case studies of mechatronics systems – pick and place robot.

15

Textbook:

1. W.Bolton., "Mechatronics-Electronic control systems in Mechanical and Electrical Engineering", 4th edition, Pearson Education Limited, New Delhi.

REFERENCE BOOKS:

1.David G.Alciatore, Michael B.Histand, "Introduction to Mechatronics and Measurement systems", Special Indian Edition 2007, Tata McGraw-Hill publishing Company Limited, New Delhi.

2.K.P.Ramachandran, G.K.Vijaya Raghavan, M.S.Balasundaram, "Mechatronics- Integrated Mechanical Electronic systems", 1st edition, Wiley India Pvt Limited, New Delhi.

3.Devdas Shetty, Richard A.Kolk, "Mechatronics System Design", 2nd Indian reprint, Thomson India edition (Cengage Learing (India) Pvt Limited.

4.M.D.Singh, J.G.Joshi, "Mechatronics" 2nd printing, PHI Learning Private Limited, New Delhi.

5.Godfey C.Onwubolu, "Mechatronics- Principles and Applications", First printed in India 2006, Elsevier India Private Limited.

6.Newton C.Braga, "Mechatronics Source book", First Indian reprint 2009, Cengage Learing (India) Pvt Limited.

7.Nitaigour PremchandMahalik, "Mechatronics- Principles, Concepts and Applications", Second reprint 2006, Tata McGraw-Hill publishing Company Limited, New Delhi.

8.W.Bolton, "Programmable logic controllers" Fourth edition, Newnens-An Imprint of Elsevier 2009.

CO-PO MAPPINGS

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1													
CO2	1	1													
CO3	1	1													
CO4	1				2										

OPEN ELECTIVE

INDUSTRIAL POLLUTION & CONTROL

14OE706/CH01

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Man & Environment, Types of Pollution, Pollution control aspects, Industrial emissions-Liquids, Gases, Environmental Legislation, Water quality management in India, Air (Prevention & Control of Pollution) Act.

UNIT – II

Removal of BOD, Biological oxidation, Anaerobic treatment, Removal of Chromium, Removal of Mercury, Removal of Ammonia, Urea, Treatment of Phenallic effluents.

UNIT – III

Removal of Particulate matter, Removal of Sulfur Oxides, Removal of Oxides of Nitrogen, Removal of Organic vapors from Effluent.

UNIT – IV

Pollution control in Chemical Industries, General considerations, pollution control aspects of Fertilizer industries, Pollution control in Petroleum Refineries and Petrochemical units, Pollution control in Pulp and Paper Industries.

TEXT BOOK:

1. Pollution control in Process Industries, S.P .Mahajan, Tata McGraw Hill Publishing Company Ltd, New Delhi

REFERENCE BOOKS:

1. Environmental Pollution Control Engineering, C.S.Rao, Wiley Eastern Ltd., New Age International Ltd.,
2. Air pollution, M.N.Rao, H.V.N.Rao, Tata McGrawhill.
3. Water Pollution control, W.Wesley Eckenfelder Jr.Industrial, Tata McGrawHill.

OPEN ELECTIVE

ENERGY ENGINEERING

14OE706/CH02

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

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

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

UNIT – II

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

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

UNIT – III

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

Bio gas products, bio-mass, wind energy, hydrogen energy, geothermal and ocean thermal energy, fuel cells.

UNIT – IV

Energy storage, mechanical energy storage, water storage, solar pond, phase change storage, chemical storage.

Energy Conservation: Conservation methods in process industries, Theoretical analysis, practical limitations, equipment for energy saving / recovery.

TEXT BOOKS:

1. Conventional Energy technology, S.B.Pandy, Tata McGraw Hill

2. Fuel Science, Harker and Allen, Oliver & Boyd.

3. Energy conversion, Culp, Mc Graw Hill.

OPEN ELECTIVE
AIR POLLUTION AND CONTROL
14OE706/CE 01

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT –I

Air Pollution –Definitions, AirPollutants–Classifications –NaturalandArtificial– Primaryand Secondary,pointandNon-Point,Line and ArealSourcesofairpollution-stationaryand mobilesources.
EffectsofAirpollutantsonman,materialand vegetation:Globaleffects ofairpollution – Green Houseeffect,HeatIslands, Acid Rains,Ozone Holesetc.

UNIT –II

Meteorology and plumeDispersion;properties of atmosphere;Heat,Pressure, Windforces,MoistureandrelativeHumidity, Influence of Meteorologicalphenomenaon Air Quality-windrosediagrams.

UNIT – III

Lapse Rates,PressureSystems,Windsandmoistureplume behaviorandplumeRiseModels; GaussianModelfor Plume Dispersion.
Control ofparticulates –Control at Sources,Process Changes,Equipmentmodifications,Design andoperation ofcontrol. Equipment's–SettlingChambers, Centrifugalseparators, filtersDryand Wetscrubbers,Electrostatic precipitators.

UNIT – IV

GeneralMethodsofControl ofNOxandSox emissions–In-plantControl Measures, processchanges,dryand wetmethods ofremovaland recycling.
Air QualityManagement–Monitoring ofSPM,SO;NOand COEmission Standards.

NOTE:
Two questions of 12 marks each will be given from each unit out of which one is to be answered. Twelve questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXTBOOKS:
1.Air pollutionByM.N.Raoand H.V.N.Rao –Tata Mc.GrawHillCompany.
2.Air pollutionbyWarkand Warner.-Harper&Row,NewYork.

REFERENCE BOOK:
1.An introductiontoAirpollution by R.K.Trivedy andP.K.Goel,B.S.Publications.

ELECTIVE

REMOTE SENSING AND GIS

14OE706/CE 02

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Concepts and Foundations of Remote Sensing: Introduction, Energy sources and radiation principles, Energy interactions in the atmosphere, Energy interactions with Earth surface features, an ideal remote sensing system, characteristics of remote sensing systems, application of remote sensing .

UNIT – II

Visual Image Interpretation: Introduction, Fundamentals of visual image interpretation, basic visual image interpretation equipment, land use and land cover mapping, geologic and soil mapping, agricultural applications, forestry applications, water resources applications, urban and regional planning applications.

UNIT – III

Digital Image Processing: Introduction, Image rectification and restoration, Image enhancement, contrast manipulation, spatial feature manipulation, Image Classification, Supervised classification, the classification stage, the training stage, Un-supervised classification, Classification accuracy assessment.

UNIT – IV

Geo-graphical Information Systems (GIS):Introduction, spatial information system: an overview, conceptual model of spatial information, concept of databases, digitizing, editing, and structuring map data, data quality and sources of errors in GIS, spatial data analysis (vector based), spatial data analysis (raster based), Fundamental concepts of GPS, Types of GPS, GPS satellite, Application of GPS in resource surveys, mapping and navigation.

TEXT BOOKS:

1. Lillisand.T.M, Keifer.R.W, and Chipman.J.WRemotesensind Image interpretation, 2004, John Wlley and Sons.
2. Chrisman, N.R. (1997), Exploring Geographic Information systems, John Willey and sons
3. Remote Sensing and its applications by LRA Narayana University Press 1999.
4. Principals of Geo physical Information Systems - Peter ABurragh and Rachael A. Me Donnell, Oxford Publishers 2004.

REFERENCE BOOKS:

1. Concepts & Techniques of GIS by C.P.Lo Albert, K.W. Yonng, Prentice Hall (India) Publications.
2. Remote Sensing and Geographical Information systems by M.Anji Reddy JNTU Hyderabad 2001,
3. B.S.Publications.GIS by Kang - tsungchang, TMH Publications & Co.
4. Basics of Remote sensing & GIS by S.Kumar, Laxmi Publications.
5. Fundamental of GIS by Mechanical designs John Wiley & Sons.

OPEN ELECTIVE

DATABASE MANAGEMENT SYSTEMS
14OE706/CS01

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

(17 Periods)

Databases and Database Users: Introduction - An Example - Characteristics of the Database Approach - Actors on the Scene - Workers behind the Scene - Advantages of Using the DBMS Approach - A Brief History of Database Applications - When Not to Use a DBMS.

Database System Concepts and Architecture: Data Models, Schemas, and Instances - Three-Schema Architecture and Data Independence - Database Languages and Interfaces - The Database System Environment - Centralized and Client/Server Architectures for DBMSs - Classification of Database Management Systems.

Data Modeling Using the Entity-Relationship (ER) Model: Using High-Level Conceptual Data Models for Database Design - An Example Database Application - Entity Types, Entity Sets, Attributes, and Keys - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types - Refining the ER Design for the COMPANY Database - ER Diagrams, Naming Conventions, and Design Issues.

UNIT – II

(15 Periods)

The Relational Data Model and Relational Database Constraints: Relational Model Concepts - Relational Model Constraints and Relational Database Schemas - Update Operations, Transactions, and Dealing with Constraint Violations - Relational Database Design Using ER-to-Relational Mapping.

SQL-99: Schema Definition, Constraints, Queries, and Views: SQL Data Definition and Data Types - Specifying Constraints in SQL - Schema Change Statements in SQL - Basic Queries in SQL - More Complex SQL Queries - INSERT, DELETE, and UPDATE Statements in SQL - Views (Virtual Tables) in SQL.

UNIT – III

(16 Periods)

Functional Dependencies and Normalization for Relational Databases: Informal Design Guidelines for Relation Schemas - Functional Dependencies - Normal Forms Based on Primary Keys - General Definitions of Second and Third Normal Forms, Boyce-Codd Normal Form.

Relational Database Design Algorithms and Further Dependencies: Properties of Relational Decompositions - Algorithms for Relational Database Schema Design – Multivalued Dependencies and Fourth Normal Form - Join Dependencies and Fifth Normal Form.

UNIT – IV

(16 Periods)

Introduction to Transaction Processing Concepts and Theory: Introduction to Transaction Processing - Transaction and System Concepts - Desirable Properties of Transactions - Characterizing Schedules Based on Recoverability - Characterizing Schedules Based on serializability.

Concurrency Control Techniques: Two-Phase Locking Techniques for Concurrency Control - Concurrency Control Based on Timestamp Ordering – Multiversion Concurrency Control Techniques - Validation (Optimistic) Concurrency Control Techniques - Granularity of Data Items and Multiple Granularity Locking.

TEXT BOOK:

1. "Fundamentals of Database Systems", RamezElmasri and Navate Pearson Education, 5th edition.

REFERENCE BOOKS:

1. "Introduction to Database Systems", C.J.Date Pearson Education.
2. "Data Base Management Systems", Raghurama Krishnan, Johannes Gehrke, TATA McGrawHill, 3rdEdition.
3. "Data base System Concepts", Silberschatz, Korth, McGraw hill, 5th edition.

OPEN ELECTIVE

JAVA PROGRAMMING
14OE706/CS02

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT - I

(16 Periods)

Introduction: Introduction to java, data types, dynamic initialization, scope and life time, operators, control statements, arrays, type conversion and casting, finals & blank finals.

Classes and Objects : Concepts, methods, constructors, usage of static, access control, this key word, garbage collection, overloading, parameter passing mechanisms, nested classes and inner classes.

Inheritance: Basic concepts, access specifires, usage of super key word, method overriding, final methods and classes, abstract classes, dynamic method dispatch, Object class.

Interfaces: Differences between classes and interfaces, defining an interface, implementing interface, variables in interface and extending interfaces.

Packages: Creating a Package, setting CLASSPATH, Access control protection, importing packages.

Strings: Exploring the String class, String buffer class, Command-line arguments.

UNIT – II

(15 Periods)

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

Multithreading: Concepts of Multithreading, differences between process and thread, thread life cycle, Thread class, Runnable interface, creating multiplethreads, Synchronization, thread priorities.

Applets: Concepts of Applets, life cycle of an applet, creating applets, passing parameters to applets, accessing remote applet, Color class and Graphics

UNIT-III

(16 Periods)

Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling events.

AWT: AWT Components, windows, canvas, panel, File Dialog boxes, Layout Managers, Event handling model of AWT, Adapter classes, Menu, Menubar.

UNIT-IV

(17 Periods)

Swing-I – swings introduction, JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons.

JDBC Connectivity: Jdbc connectivity, types of Jdbc Drivers, connecting to the database, Jdbc Statements, Jdbc Exceptions, Manipulations on the database, Metadata.

TEXT BOOKS:

1. "The Complete Reference Java J2SE", 7th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi.
2. "Big Java", 2nd Edition, Cay Horstmann, John Wiley and Sons, Pearson Education.

REFERENCE BOOKS:

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

OPEN ELECTIVE

OPTIMIZATION TECHNIQUES

14OE706/EE01

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Linear Programming: Introduction and formulation of models – Convexity - simplex method - Bid method - two phase method – degeneracy – nonexistent and unbounded solutions - duality in L.P. - dual simplex method - sensitivity analysis - revised simplex method - transportation and assignment problems.

UNIT – II

Non-linear Programming: Classical optimization methods - equality and inequality constraints - Lagrange multipliers and Kuhn-Tucker conditions - quadratic forms - quadratic programming and Bessel's method.

UNIT – III

Search Methods: One dimensional optimization - sequential search - Fibonacci search - multi dimensional search method - Univariate search - gradient methods - steepest descent / ascent methods - conjugate gradient method -Fletcher – Reeves method - penalty function approach.

UNIT – IV

Dynamic Programming: Principle of optimality recursive relation - solution of linear programming problem - simple examples

TEXT BOOKS:

1. Engineering Optimization: Theory and Practice by S.S. Rao, 3rd Ed., New Age International, 1998
2. Optimization Methods in Operations Research and Systems Analysis by K.V. Mittal and C. Mohan, 3rd Ed, New Age International, 1996.

REFERENCE BOOKS:

1. Non-linear Programming by P.L. Mangassarian.
2. Operations Research by S.D. Sharma.
3. Operations Research: An introduction by H.A. Taha, 6th Edition, PHI.
4. Linear Programming by G. Hadley.

ELECTIVE

NON-CONVENTIONAL ENERGY SOURCES

14OE706/EE02

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Principle of Renewable Energy: Comparison of renewable and conventional energy sources - Ultimate energy sources - natural energy currents on earth - primary supply to end use - Spaghetti & Pie diagrams - energy planning - energy efficiency and management.

UNIT – II

Solar Radiation: Extra terrestrial solar radiation - terrestrial solar radiation - solar thermal conversion - solar thermal central receiver systems - photovoltaic energy conversion - solar cells – 4 models.

UNIT – III

Wind energy: Planetary and local winds - vertical axis and horizontal axis wind mills - principles of wind power - maximum power - actual power - wind turbine operation - electrical generator.

UNIT – IV

Energy from Oceans: Ocean temperature differences - principles of OTEC plant operations - wave energy - devices for energy extraction – tides - simple single pool tidal system.

Geothermal energy: Origin and types - Bio fuels – classification - direct combustion for heat and electricity generator - anaerotic digestion for biogas - biogas digester - power generation.

TEXT BOOK:

1. Renewable Energy Sources by John Twidell& Toney Weir : E&F.N. Spon.

REFERENCE BOOKS:

1. Power plant technology by EL-Wakil, McGraw-Hill.
2. Non-Conventional Energy Sources by G.D.Rai, Khanna Pub.

OPEN ELECTIVE

CONSUMER ELECTRONICS

14OE706/EC01

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Microphones, Headphones and Headsets, Loud Speakers, Disc Recording and Reproduction, Amplifying Systems Equalizers and Mixers, Electronic Music Synthesizers.

UNIT – II

Commercial Sound, Theatre Sound System, Audio Systems , Color TV standards and Systems, Remote Controls, Video Systems.

UNIT – III

Electronic Gadgets and

Home Appliances:

Telecommunication Systems, Switching Systems, Modulation Techniques, Carrier Systems, Fibre Optics

UNIT – IV

Data Services, Mobile Systems, Facsimile fax, Xerography

TEXT BOOK:

1.Consumer Electronics by S.P.Bali, Pearson Education, ISBN: 9788131717592.

REFERENCE BOOKS:

1. Consumer Electronics for Engineers by Philip Herbert Hoff, Cambridge University Press (July 28, 1998), **ISBN-10:** 0521582075
2. Digital Consumer Electronics Handbook by RonadlK.Jurgen, (Editor) by McGraw Hill Professional Publishing, 1997. **ISBN-10:** 0070341435.

OPEN ELECTIVE

EMBEDDED SYSTEMS

14OE706/EC02

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Introduction to embedded systems, design challenges, processor technology, IC technology, design technology, tradeoffs, single purpose processor, RT level combinational logic, sequential logic (RT level) custom single purpose processor design, optimizing custom single purpose processors. General purpose processors: basic architecture, pipelining, programmers view, development environment, ASIPS, microcontrollers and digital signal processors

UNIT – II

State machine and concurrent process models: models vs. languages, FSMD, using state machines, PSMM, concurrent process model, concurrent processes, communication and synchronization among processes, data flow model and real time systems. Need for communication interfaces, RS232/UART, RS422/RS485, USB, Infrared, IEEE 802.11, and Bluetooth.

UNIT – III

Embedded system and RTOS concepts: Architecture of kernel, tasks and task scheduler, interrupt service routines, semaphores, mutex. Mail boxes, message queues, event registers, pipes and signals.

UNIT – IV

Embedded system and RTOS concepts: Timers, memory management, priority inversion problem, embedded OS and real time OS, RT Linux, and Handheld OS. Design technology: Introduction, automation, synthesis, parallel evolution of compilation and synthesis, logic synthesis, RT synthesis, behavioural synthesis, system synthesis, HW / SW co- design, verification, and co-simulation.

TEXT BOOKS:

1. Frank Vahid, Tony D Givargis, Embedded system design – A unified HW/ SW Introduction, John Wily & sons, 2002.
2. KVKK Prasad, Embedded and real time systems, Dreemtech Press, 2005.

REFERENCE BOOKS:

1. Raj Kamal, Embedded system architecture, programming and design, TMH edition.
2. Mohammad Ali Mazidi, Janice G., The 8051 microcontroller and embedded systems, Pearson edition.
3. Jonathan W Valvano, Embedded Microcomputer Systems, Brooks/cole, Thompson Learning.
4. David E. Simon, An Embedded Software Primer, Pearson edition.

OPEN ELECTIVE

VIRTUAL INSTRUMENTATION USING LABVIEW

14OE706/EI01

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

REVIEW OF VIRTUAL INSTRUMENTATION: Historical perspective, Need of VI, Advantages of VI, Define VI, block diagram & architecture of VI, data flow techniques, graphical programming in data flow, comparison with conventional programming.

PROGRAMMING TECHNIQUES: VIS and sub-VIS, loops & charts, arrays, clusters, graphs, case & sequence structures, formula modes, local and global variable, string & file input. Graphical programming in data flow, comparison with conventional programming.

UNIT – II

DATA ACQUISITION BASICS: ADC, DAC, DIO, Counters & timers, PC Hardware structure, timing, interrupts, DMA, Software and Hardware Installation. GPIB/IEEE 488 concepts, and embedded system buses - PCI, EISA, CPCI, and USB & VXI. A

UNIT – III

COMMON INSTRUMENT INTERFACES: Current loop, RS 232C/RS 485, GPIB, System basics, interface basics: USB, PCMCIA, VXI, SCXI, PXI etc, networking basics for office & industrial application VISA & IVI, image acquisition & processing, Motion Control. ADC, DAC, DIO, DMM, waveform generator.

UNIT – IV

USE OF ANALYSIS TOOLS AND APPLICATION OF VI: Fourier transforms Power spectrum, Correlation methods, windowing & flittering. Application in Process Control projects, Major equipments- Oscilloscope, Digital Multimeter, Pentium Computers, temperature data acquisition system, motion control employing stepper motor.

TEXT BOOKS:

1. Gary Johnson, LABVIEW Graphical Programming , 2nd Edition, McGraw Hill, 1997.
2. Lisa K. Wells and Jeffrey Travis, LABVIEW for Everyone , PHI, 1997.
3. Skolkoff, Basic concepts of LABVIEW 4 , PHI, 1998.

REFERENCE BOOKS:

1. S. Gupta, J.P. Gupta, *PC Interfacing for Data Acquisition and Process Control*, ISA, 2nd Edition, 1994.
2. Technical Manuals for *DAS Modules of Advantech* and National Instruments.
3. L.T. Amy, *Automation System for Control and Data Acquisition*, ISA, 1992.

OPEN ELECTIVE

SENSORS and TRANSDUCERS

14OE706/EI02

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Introduction: Definition related to measurements /instrumentation, static and dynamic characteristics of instruments, classification of transducers.

UNIT – II

Displacement Measurement: Variable resistance devices, variable inductance devices, variable capacitance devices, digital displacement transducers.

Strain measurement: Stress-strain relations, resistance strain gauges, types of strain gauges, strain gauge measurement techniques, static measurements ,dynamic measurements. Calibration of strain gauge, strain gauge load cell, force and torque measurements using strain gauge.

UNIT – III

Pressure measurement: Diaphragm, Bellows, Bourdon tubes, Resistive inductive and capacitive transducers, piezo-electric transducers.

Low pressure measurement: McLeod gauge, Knudson gauge, Ionization gauge.

Temperature measurement: RTD, Thermocouple and thermistor.

UNIT – IV

Flow measurement: Head type flow meters, Rotometer, Electromagnetic flow meter.

Measurement of liquid level, viscocity, humidity and moisture.

TEXT BOOKS:

1. A.K.Ghosh, Introduction to Instrumentation and Control, PHI.
2. BC Nakra, KK Chaudhry, Instrumentation measurement and analysis, TMH, New Delhi second edition.

REFERENCE BOOKS:

1. PatranabisD,"Sensors and transducers", second edition, PHI, New Delhi 2003.
   Ernest O Doeblin, "Measurement Systems Application and Design", TMH.

OPEN ELECTIVE

MOBILE APPLICATION DEVELOPMENT

14OE706/IT01

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Introduction: Introduction to java, data types, dynamic initialization, scope and life time, operators, control statements, arrays, type conversion and casting, finals & blank finals.

Classes and Objects : Concepts, methods, constructors, usage of static, access control, this key word, garbage collection, overloading, parameter passing mechanisms, nested classes and inner classes.

Inheritance: Basic concepts, access specifiers, usage of super key word, method overriding, final methods and classes, abstract classes, dynamic method dispatch, Object class.

Interfaces: Differences between classes and interfaces, defining an interface, implementing interface, variables in interface and extending interfaces.

UNIT – II

Packages: Creating a Package, setting CLASSPATH, Access control protection, importing packages.
Strings: Exploring the String class.
Exception Handling: Concepts of Exception handling, types of exceptions, usage of try, catch, throw, throws and finally keywords, Built-in exceptions, creating own exception sub classes.
I/O Streams: Streams, Byte streams, Character streams, File class, File streams.
Event Handling: Events, Event sources, Event classes, Event Listeners, Delegation event model, handling events.

UNIT – III

Introduction: Introduction to Mobile Application Development, Constraints and requirements of mobile Apps, Understanding the available mobile platforms

Overview of Android: Introduction to Android OS, History of Android, Versions of Android, Android Architecture.

Understanding the development Environment: Developing Android applications using Eclipse, creating the first Android application, Anatomy of the Android Application, Working with the emulators.

Application Components: Activities, Services, Content Providers, Broadcast Receivers, Understanding Activity, Activity's Life Cycle and Intents.

Creating UI for Android: Android Views and View Groups, Android Layouts, Basic Views, Picker views, List views, Additional views (Image Views, Gallery view and Image Switcher) and working with menus. Understanding and working with screen Orientation.

UNIT – IV

Data Persistence: Shared Preferences, Working with Files, Working with databases (SQLite).

Content Providers: Accessing the Contacts using Content Providers.

Messaging &Email: Sending SMS, Sending e-mails.

Working with Location: Obtaining the location of mobile using GPS and A-GPS, Displaying the Location on Maps.

Services and Broadcast Receivers: Working with Services and broadcast receivers.

Publishing Apps: Preparing for publishing and deploying the APK file.

TEXT BOOK:

1. "The Complete Reference Java J2SE", 7th Edition, Herbert Schildt, TMH Publishing Company Ltd, New Delhi (for UNIT – I)
2. Beginning Android application development, Wei-Meng Lee, Wiley Publishing Inc.(for UNIT – II)

REFERENCE BOOKS:

1. "Java How to Program", Sixth Edition, H.M.Dietel and P.J.Dietel, Pearson Education/PHI.
2. Learn JAVA for Android Development, Jeff Friesen, Apress Publications.

ELECTIVE

WEB TECHNOLOGIES

14OE706/IT02

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

UNIT – I

Introduction to XHTML, Cascading Style Sheets (CSS), JavaScript: Introduction to Scripting, Control Statements, Part 1, Control Statements, Part 2, Functions, Arrays, Objects.

UNIT - II

Dynamic HTML: Object Model and Collections, Dynamic HTML: Event Model, XML, RSS (Really Simple Syndication).

UNIT – III

Building Ajax-Enabled Web Applications, Web Servers (IIS and Apache).

UNIT - IV

Servlets and Java Server Pages.

TEXT BOOK:

1. Harvey M. Deitel and Paul J. Deitel,"Internet & World Wide Web How to Program", 4/e,Pearson Education.

REFERENCE BOOKS:

1. Jason Cranford Teague, "Visual Quick Start Guide CSS, DHTML &AJAX", 4e, Pearson Education.
2. Tom NerinoDoli smith, "JavaScript & AJAX for the web", Pearson Education 2007.
3. Joshua Elchorn, "Understanding AJAX", Prentice Hall 2006.

Marty Hall, Larry Brown, "Core Servlets and JavaServer Pages™: Volume 1: Core Technologies", 2nd Edition, Prentice Hall.

OPEN ELECTIVE

AUTOMOBILE ENGINEERING

14OE706/ME01

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

To make the students to

1. Familiarize the fundamentals of Engine Components, Chassis and suspension system, braking and transmission system, and cooling and lubrication system.
2. Develop a strong base for understanding future developments like hybrid and electric vehicles in the automobile industry.

Course Outcomes:

After successful completion of this course, student will be able to:

1. List different types of Vehicles and their applications
2. Define working of Automobile Engine cooling and lubrication system.
3. Describe functioning of Ignition system and its accessories.
4. Describe functioning of Transmission, Steering, Braking and Suspension system.

UNIT I

INTRODUCTION: Classification of vehicles – applications, options of prime movers, transmission and arrangements. (4)

ENGINE: Engine Classifications - number of strokes, cylinders, types of combustion chambers for petrol and diesel engines, valves, valve arrangements and operating Mechanisms, Piston - design basis, types, piston rings, firing order; Crankshafts, Flywheel. (7)

ASSORTED EQUIPMENT: Fuel supply pumps, Mechanical and Electrical type Diaphragm pumps, Air and Fuel Filters, super chargers, Mufflers. (4)

UNIT II

COOLING SYSTEMS: Need for cooling system, Air and water cooling. (3)

LUBRICATING SYSTEMS: Various lubricating systems for I.C. Engines. (3)

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

UNIT III

CHASSIS & TRANSMISSION SYSTEMS: Introduction to Chassis & Transmission, Clutches – Single-plate and Multi-plate clutches, Centrifugal clutches, wet and dry type, actuating mechanisms. (7)

TRANSMISSION: Gear Box - Theory, Four speed and Five Speed Sliding Mesh, Constant mesh & synchromesh type, selector mechanism, automatic transmission, overdrive, propeller shaft, differential - principle of working. (8)

UNIT IV

SUSPENSION SYSTEMS: Need for suspension systems, springs, shock absorbers, axles – front and rear, different methods of floating rear axle, front axle and wheel alignment. (8)

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

TEXT BOOKS:

1. Automobile Engineering - G.B.S.Narang.
2. Automobile Engineering -R.B.Gupta
3. Automobile Engineering - Vol I & II - Kirpal Singh

REFERENCE BOOKS:

1. Automotive Mechanics - Joseph Heitner
2. Automobile Engineering -S.Srinivasan

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	2										2	1		
CO2	3	2	1		2	2		2		3		2	2	2	
CO3	3	2	2	1						2		2	2	1	1
CO4	2	3	3	2	2	2	3		1		1	2	2	2	3

OPEN ELECTIVE

REFRIGERATION AND AIR CONDITIONING
14OE706/ME02

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Note: Qualitative treatment

Course objective:

1. To know the necessity, applications and concept of refrigeration and air air refrigeration systems.
2. To understand the working principle and components of vapour compression and to study the influence of various parameters on the performance of the system
3. To interpret the working principles of vapour absorption system and non-conventional refrigeration systems.
4. To understand the requirement of air conditioning for human comfort and industrial air conditioning applications

Course outcomes:

After the completion of the course, the students will be able to

1. Describe the applications of refrigeration and air refrigeration systems.
2. Explain the working of vapour compression refrigeration system and their components.
3. Demonstrate the working of vapour absorption refrigeration system and non-conventional refrigeration systems.
4. Describe the various air conditioning systems and human comfort.

UNIT I

INTRODUCTION TO REFRIGERATION: Necessity and applications, unit of refrigeration and C.O.P, mechanical refrigeration, types of ideal cycle of refrigeration, Refrigerants- desirable properties, commonly used refrigerants, nomenclature. (6)

AIR REFRIGERATION: Bell Coleman cycle and Brayton cycle, Open and Dense air systems, Actual refrigeration system, refrigeration needs of aircrafts, adoption of air refrigeration, Justification, types of systems (9)

UNIT II

VAPOUR COMPRESSION REFRIGERATION: Working principle, essential components of plant, simple vapor compression refrigeration cycle, Multi pressure systems – multistage compression, multi evaporator system, Cascade system, use of p – h charts (8)

SYSTEM COMPONENTS: Compressors- general classification, comparison, advantages and disadvantages, Condensers - classification, working, Evaporators - classification, working, Expansion devices - types, working. (7)

UNIT III

VAPOUR ABSORPTION SYSTEM: Calculation of max COP, description and working of NH_3 - water system, Li - Br, H_2O system, principle of operation of three fluid absorption system and salient features. (10)

STEAM JET REFRIGERATION: Principle of working, application, merits and demerits. (2)

NON-CONVENTIONAL REFRIGERATION METHODS: Principle and operation of thermoelectric refrigerator and Vortex tube or Hirsch tube. (3)

UNIT IV

INTRODUCTION TO AIR CONDITIONING: Psychrometric properties and processes, sensible and latent heat loads, need for ventilation, infiltration, concepts of RSHF, ASHF, ESHF & ADP, concept of human comfort and effective temperature, comfort air conditioning, industrial air conditioning requirements, air conditioning load calculations. (9)

AIR CONDITIONING SYSTEMS: Classification of equipment, cooling, heating, humidification and dehumidification, filters, grills and registers, deodorants, fans and blowers, heat pump, heat sources, different heat pump circuits, application. (6)

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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

CO-PO MAPPING

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1				2	1						2	1	2
CO2	2	1		1		2	1						2	1	2
CO3	2	2	2	1		1	2						2	1	2
CO4	2	1	2	2		1	2						1	2	2

OPEN ELECTIVE

AUTOMATION TECHNOLOGY

14OE706/BR 01

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

5. To familiarize the basic concepts of automation technologies used in the manufacturing industry.
6. To create strong programming skills to develop CNC programs.
7. To give sound knowledge on using computer assisted and integrated systems in manufacturing processes
8. To familiarize the advanced concepts of process planning and automated inspection systems.

Course Outcomes:

Upon successful completion of the course, the student will be able to

5. Understand and describe the available automated technologies to improve quality and productivity in the manufacturing industry
6. Implement and analyze valves and actuators needed for real life applications
7. Able to select required sensor and understand its working according to the problem
8. Prepare PLC designs and understand case studies to implement newer applications

UNIT-I

FUNDAMENTAL PRINCIPLES

Industrial prime movers - A brief system comparison: An electrical system, A hydraulic system, A pneumatic system, A comparison - Definition of terms: Mass and force, Pressure, Work, energy and power, Torque - Pascal's law - Gas laws.

HYDRAULIC PUMPS AND PRESSURE REGULATION

Pressure regulation - Pump types: Gear pumps, Vane pumps - Loading valves - Filters.

AIR COMPRESSORS, AIR TREATMENT AND PRESSURE REGULATION

Piston compressors - Air receivers and compressor control - Stages of air treatment - Pressure regulation: Relief valves, Non-relieving pressure regulators and Relieving pressure regulators - Service units.

UNIT -II

CONTROL VALVES

Graphic symbols - Types of control valve: Poppet valves, Spool valves, Rotary valves - Pilot-operated valves - Check valves: Pilot-operated check valves, Restriction check valves - Shuttle and fast exhaust valves - Sequence valves - Time delay valves

ACTUATORS

Linear actuators - Mounting arrangements and Cylinder dynamics - Seals - Rotary actuators: Constructional details - Applications: Speed control, Actuator synchronization, Regeneration, Counter balance and dynamic braking, Pilot-operated check valves, Pre-fill and compression relief.

UNIT-III

SENSORS

Sensors and Transducers - Performance Terminology – Sensors: Displacement, Position, and Proximity - Velocity and Motion - Force - Fluid Pressure - Liquid Flow - Liquid level - Temperature - Light Sensors - Selection of Sensors - Inputting data by switches.

UNIT-IV

PROGRAMMABLE LOGIC CONTROLLER

Programmable - Basic PLC structure - Input / Output Processing - Ladder Programming - Instruction lists - Latching and internal relays - Sequencing - Timers and Counters - Shift registers - Master and Jump Controls - Data Handling - Analog input / output.

MECHATRONIC SYSTEMS: Mechatronic designs, Case studies: Timed switch, A pick-and-place robot and Car park barriers.

Text Books:

1. Andrew Parr, Hydraulics and Pneumatics - A Technician’s and Engineer’s Guide, Jaico Publishing House, 2005

2. W. Bolton, Mechatronics, Fourth Edition, Pearson Education, 2010

Reference Books:

1. Anthony Esposito, Fluid Power with Applications, Fifth Edition, Pearson Education, 2005
2. W. Bolton, Pneumatic and Hydraulic Systems, Butterworth Heinemann, 1997
3. Ernest. O. Doebelin, Measurement Systems - Applications and Design, Fifth Edition, TMH
4. Gary Dunning, Introduction to Programmable Logic Controllers, 3rd Edition, 2007

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	2			2							2		2
CO2	3														
CO3		2	2			3							2		2
CO4	3		2		2										

BUSINESS COMMUNICATION & PRESENTATION SKILLS LAB
14ELL701
IV Year B.Tech. (Mech) Seventh Semester

Practicals	:	2 Periods/Week	Continuous Assessment	:	20
Final Exam	:	3 hours	Final Exam Marks	:	30

Course Objectives

The course aims

1. to make the engineering students aware of the importance, the role and the content of soft skills through instruction, knowledge acquisition, demonstration and practice.
2. to know the importance of interpersonal and intrapersonal skills in an employability setting
3. actively participate in group discussions / interviews and prepare & deliver presentations
4. function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, stress management and leadership quality

Course Outcomes

By the end of the course the students would be able to

1. use appropriate body language in social and professional contexts
2. demonstrate different strategies in presenting themselves in professional contexts
3. analyze and develop their own strategies of facing the interviews successfully
4. develop team coordinating skills as well leadership qualities

Unit-I

Identity Management Communication:– Face to Face Impression Management & Mediated Communication (Self Introduction & Self Promoting– Over Stating And Under Stating – Strategies to Overcome Communicative Inhibitions – Creating Positive Self image through words - Appearance- Verbal and Non Verbal Manners) – Giving Polite Yet Assertive Responses – Responsive strategies to handle criticism - Accepting Failure and Declaring Success.

Unit-II

Business Presentations:– Oral and Power Point Presentations; Preparing Successful Presentations; Assessing Audience, Making Effective Use of Visual Aids, Delivering Presentation, Using Prompts, Handling With Questions and Interruptions, Mock Presentations.

Unit-III

Oratory Skills: – Group Discussion, Extempore, Mock Parliament and Mock Press.

Unit-IV

Interview Management: – Resume Preparation, Types of Interviews, Preparing For Interviews, Facing Interviews, Handling Tough & Tricky Questions, Reviewing Performance, Participating In Mock Interviews

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1								1	2	3	1	2	2	1	1
CO2								1	1	3	1	2	2	1	1
CO3								1	1	3	1	2	2	1	1
CO4								1	3	3	1	3	2	1	1

CAD&CAE LAB
14MEL702
IVYear B.Tech. (Mech) Seventh Semester

Practicals	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

After this course, students should be able to do:

1. Static analysis on 2D structures with various loading, 3D structures with various loading, 2D structures with different materials and analysis of plate with holes.
2. Modal analysis of a beam.
3. Steady state heat transfer.
4. To make the students capable of analyzing any complicated part effectively using ANSYS Software.

Course Outcomes:

1. The students are able to use the ANSYS software.
2. Students are able to do static analysis on 2D-Truss, 3D-Truss and Beams.
3. Students are able to do static analysis on 2D structures with various loading, 3D structures with various loading, 2D structures with different materials and analysis of plate with holes.
4. Students are able to do modal analysis of a beam.

Computer Aided Design lab:

3D modelling using any of the modelling packages like CATIA, Pro/ENGINEER, Uni-Graphics, Solid Works, Ideas, AutoDesk Inventor etc.

List of Modules to be Covered:

Sketcher

Part Modelling

Assembly Modelling Of Screw Jack

Parts and Assemblies can be chosen from

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

Computer Aided Engineering lab:

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

1. STATIC ANALYSIS: TRUSS AND FRAME STRUCTURES

2-D truss
3-D truss
Beam analysis

2. STATIC ANALYSIS: TWO DIMENSIONAL PROBLEMS

2-D structure with various loadings
2-D structures with different materials
Plate with hole

3. Analysis of 3D geometry subjected to structural and thermal loads.

REFERENCES:

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

CO-PO MAPPINGS

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		2	1	1											
CO2			1												
CO3					1									1	
CO4											3		1		

DESIGN & METROLOGY LAB
14MEL703
IVYear B.Tech. (Mech) Seventh Semester

Practical	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To impart knowledge about usage of linear dimension measurement devices Vernier caliper, Micrometer, Bore dial gauge and Gear tooth vernier in measurement of External diameters, Internal diameters, Thickness and Gear tooth profile
2. To provide the knowledge about Sine bar, Bevel protractor, taper plug gauge in measurement of angles between the surfaces, and external and internal taper angles of circular shafts
3. To impart the knowledge about Tool makers microscope, Profile projector and wire methods in measurement of pitch, depth and angles of Threads

Course outcomes:

At the end of the course the students will be able to:

1. Measure angle between surfaces, chordal width, chordal height of gear using metrology instruments.
2. Draw X-bar and R-charts for the given work piece lots.
3. Measure internal diameter, internal taper and external taper - pitch, depth, angle of given pitch gauge and elements of thread.
4. Demonstrate the applications on balancing machine, wear & Friction measurement, journal bearing apparatus, fatigue testing machine and photo elasticity bench set up.

List of Experiments

1. Angle measurement by Bevel Protractor.

2. Angle and taper measurement by sine bar.

3. Measuring effective dia. of thread using 3 - wire method.

4. Measuring gear tooth thickness using gear tooth vernier.

5. Measuring internal diameter using bore dial gauge.
6. Measuring external diameters using Micrometer & Plotting $\bar{X}$& R Charts
7. Measuring different parameters of a thread / gear tooth using profile projector
8. Measuring different parameters of a thread / gear tooth using Tool Makers Microscope.
9. Measurement of external diameter and thickness using Dial caliper.
10. Measurement of taper angle using taper plug gauge

CO-PO MAPPINGS

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2													2	
CO2	3		2		2									2	
CO3	2													2	
CO4	2													3	

PROFESSIONAL ETHICS AND HUMAN VALUES
14ME801

IV Year B.Tech. (Mech) Eighth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:

The student will able to

1. Understand the Engineering Ethics and uses of ethical theories
2. Understand social responsibilities and rights
3. Familiar with Global issues like Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership Sample Code of Ethics Like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of Electronics and Telecommunication Engineers (IETE), India Etc.
4. Familiar with Morals, Human values and Ethics.

CourseOutcomes:

After completion the student will be able to

1. Familiar with Morals, Human values and Ethics.
2. Understand the Engineering Ethics and uses of ethical theories
3. Understand social responsibilities and rights
4. Familiar with Global issues like Multinational Corporations-Environmental, Computer Ethics

UNIT – I

Human Values: Morals, Values and Ethics, Integrity, Work Ethic, Service Learning, Civic Virtue, Respect for others, Living peacefully, Caring, Sharing, Honesty, Courage, Valuing time Co-Operation, Commitment, Empathy, Self Confidence, Character, Spirituality (14)

UNIT -II

Engineering Ethics: Senses Of 'Engineering Ethics, Variety of Moral Issues, Types of Inquiry, Moral Dilemmas, Moral Autonomy, Kohlberg's Theory,

Gilligan's Theory, Consensus and controversy, Professions and Professionalism, Professional Ideals and Virtues, Theories about Right Action, Self-interest, Customs and religion, Uses of Ethical Theories.

(14)

UNIT – III

Engineering as Social Experimentation: Engineering as Experimentation, Engineers as Responsible Experimenters, Codes of Ethics, Balanced Outlook on law

Safety, Responsibility and Rights: Safety and Risk – Assessment of Safety and Risk, Risk Benefit Analysis and Reducing Risk.

Collegiality and Loyalty, Respect for Authority, Collective Bargaining, Confidentiality, Conflicts Of Interest, Occupational Crime, Professional Rights, Employee Rights, Intellectual property rights (IPR), Discrimination.

(20)

UNIT – IV

Global Issues:

Multinational Corporations, Environmental Ethics, Computer Ethics, Weapon Development, Engineers as Managers, Consulting Engineering, Engineering as Expert Witnesses and Advisors, Moral leadership, Sample codes of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian institute of material management, Institution of Electronics and Telecommunication Engineers (IETE),India etc., (12)

Text Books:

1. Govindarajan. M, Natarajan. S, Senthilkimar. V. S, Engineering Ethics, Phi, 2004.
2. Mike Martin and Roland Scherzinger, Ethics in Engineering, Mc Graw Hill, New York 1996.
3. M.P. Raghavan, Professional Ethics and Human Values, SciTech Publications (India) Pvt.ltd.,2009.

Reference Books:

1.Charles D Fleddermann, Engineering Ethics, Prentice Hall, New Jersey, 2004.
2.Charles E Harris, Michael S Pritchard and Michael J Robins, Engineering Ethics Concepts and Cases, Thomson Learning, United States, 2000.
3.John R Boatright, Ethics and The Conduct of Business, Phi, New Delhi, 2003.

4.Edmund G See Bauer and Robert L Barry, Fundamentals of Ethics for Scientists and Engineering, Oxford University Press, 2001.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1				2		3	2	1	2	2				1	1
CO2	2	2	1			3	2	2	1	2			2	3	2
CO3	2	3	1	2		3	1	2	3	2			1	2	2
CO4	1	3	1	2		3	2	2	2	2			2	1	2

AUTOMOBILE ENGINEERING
14ME802
IVYear B.Tech. (Mech) Eighth Semester

Lectures	:	4 Periods/Week Self-study:1	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

The objectives of the course are to enable students to

1. Identify the basic types of automobiles and their classification.
2. Know the construction, working and functions of Automobile Systems.
3. Visualize the need and working of transmission system of an automobile
4. Sketch the construction, working and functions of Automobile control systems such as steering, braking and suspension.

Course Outcomes:

After completing the subject, the student should be able to

1. Describe different types of automobiles
2. Sketch the construction, working and functions of automobile systems

3. Write about theneed and working of transmission system of an automobile
4. Relate the construction, working and functions automobile steering, braking and suspension and transmission systems.

UNIT I
INTRODUCTION: Classification of vehicles – applications, options of prime movers, transmission, and arrangements. (4)

ENGINE: Engine Classifications - number of strokes, cylinders, types of combustion chambers for petrol and diesel engines, valves, valve arrangements and operating Mechanisms, Piston - design basis, types, piston rings, firing order; Crankshafts, Flywheel. (7)

ASSORTED EQUIPMENT: Fuel supply pumps, Mechanical and Electrical type Diaphragm pumps, Air and Fuel Filters, super chargers, Mufflers. (4)

UNIT II
COOLING SYSTEMS: Need for cooling system, Air, and water cooling. (3)
LUBRICATING SYSTEMS: Various lubricating systems for I.C. Engines. (3)

ELECTRICAL SYSTEM: Ignition system, Spark plugs, Distributor, Electronic Ignition, Alternator, cutout, Current and voltage regulators, charging circuit, starting motors, lighting,

instruments, and accessories. (9)

UNIT III

CHASSIS & TRANSMISSION SYSTEMS: Introduction to Chassis & Transmission, Clutches – Single-plate and multi-plate clutches, Centrifugal clutches, wet and dry type, actuating mechanisms. (7)

TRANSMISSION: Gear Box - Theory, four speed and Five Speed Sliding Mesh, Constant mesh & synchromesh type, selector mechanism, automatic transmission, overdrive, propeller shaft, differential - principle of working. (8)

UNIT IV

SUSPENSION SYSTEMS: Need for suspension systems, springs, shock absorbers, axles – front and rear, different methods of floating rear axle, front axle and wheel alignment. (8)

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

TEXTBOOKS:

1. Automobile Engineering - G.B.S.Narang.
2. Automobile Engineering - R.B.Gupta
3. Automobile Engineering - Vol I & II - Kirpal Singh

REFERENCE BOOKS:

1. Automotive Mechanics - Joseph Heitner
2. Automobile Engineering -S.Srinivasan

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1			1	1	2					1	1		
CO2	2	2		1	1	2	2			2		1	1	1	
CO3	3	2		1	1	2	2			3		1	1	1	
CO4	2	2		1	1	2	2			2		1	1	1	1

POWER PLANT ENGINEERING
14ME803/A
IV Year B.Tech. (Mech) Eighth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To study the power generation scenario, the components of hydroelectric, Diesel and gas turbine power plant
2. To study layout, various components of thermal power plant
3. To study components, types of nuclear reactors and basics of economics of power generation
4. To study the working principle, construction of power generation from non-conventional sources of energy.

Course Outcomes:

Student will be able to

1. Recognize the layouts, componentsdetails of hydroelectric,Diesel and Gas turbine power plants
2. Describe the layout and components of thermal power plant
3. List the types of nuclear reactors and review the economics of power plants as well as pollution aspects
4. Emphasize the fundamentals of non-conventional power plants

UNIT I

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

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

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

UNIT II

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

UNIT III

NUCLEAR POWER PLANTS: Nuclear Fission, Nuclear Fuels, Components of Reactor, types of Nuclear Reactors, Breeding, Fast Breeder Reactor, Radiation shields, nuclear waste disposal. (7)

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

POWER PLANT ECONOMICS: Fixed costs, operating costs, cost per kWh, comparison of fixed and operating costs of hydro, thermal, nuclear plants, power tariffs. (3)
POLLUTION AND CONTROL: Introduction, particulate and gaseous pollutants, thermal pollution and solid waste pollution, methods to control pollution - brief description. (2)

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

WIND POWER: Basic principle, different types of windmills, wind energy conversion systems, other applications. (3)
GEOTHERMAL POWER: sources, energy conversion system. (2)

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

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

TEXTBOOKS:
1. Power Plant Engineering - G.R. Nagpal, Khanna publ, New Delhi
2. Power Plant Engineering –P.K.Nag, TMH
3. Non-Conventional Energy Sources - G.D. Rai, Khanna publ, New Delhi.

REFERENCE BOOKS:
1. Power Plant Technology - M.M. El Wakil, MGH, New York.
2. Principles of Energy Conversion - A.W.Culp, MGH, New York.

CO-PO MAPPING

CO'S	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1					1	2			2		1	1		
CO2	1					1	2			2		1	1		
CO3	1	2	2	1		1	2			2		1	1		
CO4	1						2			2		2	1		

OPTIMIZATION TECHNIQUES
14ME803/B
IVYear B.Tech. (Mech) Eighth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To impart the concepts of characteristics of mechanical elements, principles of optimization and classification of optimization problems.
2. Learning various optimization techniques(golden section, random, pattern, gradient search methods)
3. Learning various optimization techniques for equality and inequality constraints.
4. Study various engineering applications by using optimization techniques.

Course Outcomes:

After successful completion of course, a student should be able to

1. Understand principles of optimization, classification of optimization problems.
2. Solve single variable and multi variable problems by using optimization techniques.
3. Solve various problems on equality and inequality constrains by using optimization techniques
4. Apply optimization techniques on various engineering applications(structural applications, design applications, dynamic applications, application in mechanism)

UNIT - I

INTRODUCTION

General Characteristics of mechanical elements, adequate and optimum design, principles of optimization, formulation of objective function, design constraints -Classification of optimization problems. (15)

UNIT - II

OPTIMIZATION TECHNIQUES

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

UNIT - III

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

UNIT - IV

ENGINEERING APPLICATIONS

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

TEXT BOOKS:

1.Singeresu S. Rao, "Engineering Optimization - Theory and Practice" New Age Intl. Ltd.Publishers, 2000

REFERENCES:

1.Johnson Ray, C., "Optimum design of mechanical elements", John Wiley & Sons, 1981

2.Goldberg, D.E., "Genetic algorithms in search, optimization and machine learning", Addison-Wesley, NewYork, 1989

3.Kalyanamoy Deb, "Optimization for Engineering design algorithms and Examples", Prentice Hall of India, 1995

CO-PO MAPPING

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	1												2	2
CO2	2	1													
CO3	1	2													
CO4	1	2				3				2				2	2

COMPUTER INTEGRATED MANUFACTURING
14ME803/C
IVYear B.Tech. (Mech) Eighth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To impart the basic concepts of CIM and manufacturing automation.
2. To instruct the role of group technology and its advantages in manufacturing.
3. To learn various types of computer aided process planning techniques.
4. To teach the role and importance of integrated production planning and control.
5. To make aware of concepts like MPS, MRP, CRP etc.
6. To learn the benefits and importance of CAQ control.
7. To impart the knowledge of various CIM systems.

Course Outcomes:

After successful completion of course, a student should be able to

1. Understand the importance and advantages of integration in manufacturing.
2. Identify difference between conventional and group technology manufacturing.
3. Differentiate the conventional PPC and integrated PPC.
4. Recognize various CIM systems like material handling systems and FMS.

UNIT – I

INTRODUCTION: Scope of computer integrated manufacturing, Product cycle, Production automation.

GROUP TECHNOLOGY: Role of group technology in CAD/CAM,Integration, methods for developing part families, classification and codling, Examples of coding systems, Facility design using group technology.

UNIT – II

COMPUTER AIDED PROCESS PLANNING: Approaches to process planning – Manual, variant, Generative approach, Process planning systems – CAPP, DCLASS,CMPP, Criteria for selecting a CAPP system, Part feature recognition.

UNIT – III

INTEGRATIVE MANUFACTURING PLANNING AND CONTROL: Role of integrative manufacturing in CAD/CAM integration, overview of production control – Forecasting, Master production schedule, rough cut capacity planning, M.R.P., order release, shop floor control, Quality assurance, Planning and control systems, Cellular manufacturing.

UNIT – IV

COMPUTER AIDED QUALITY CONTROL: Terminology in quality control, contact inspection methods, non – Contact inspection methods, computer Aided Testing, Integration of CAQC with CAD/CAM.

COMPUTER INTEGRATED MANUFACTURING SYSTEMS: Type of manufacturing systems, Machine tools and related equipment, Material handling systems, Computer control systems, FMS.

TEXTBOOKS:

1. Mikel P.Graoover, Emery W. Zimmer ,"CAD/CAM PHI Ltd.,
2. David D.Bed.worth , Mark R.Henderson, Philip M. Woife, "Computer aided design and Manufacturing ",McGraw Hill Publishers.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1		3		2		3	2							2	3
CO2		3		2		3	2							2	1
CO3				3		3	2							2	1
CO4				3		2	2							3	2

ROBOTICS
14ME804/A
IVYear B.Tech. (Mech) Eighth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:

The objective of the course is to enable students to

1. Understand robot configuration, basic components
2. To have a overview on the generations of robots.
3. Get acquainted with the kinematics of the robot
4. Learn about various sensors, actuators
5. Understand robot programming
6. Solve Applications in trajectory planning
7. Understand the present &future applications of a robot

Course outcomes:

Upon completion of this course the students will be able to

1. Acquire knowledge on basic of robots
2. Understand the end effectors
3. Plan and execute sensors used in robots
4. Solvetransformation and kinematic problems of robots

UNIT – I

Introduction to Robotics, major components of a robot, robotic like devices, classification of robots – Classification by coordinate system and by control method, Specifications of robots, fixed versus flexible automation, economic analysis, overview of robot application. 15

UNIT – II

Robot end Effectors : Introduction, end effectors, interfacing, types of end effectors, grippers and tools, considerations in the selection and design of remote centered devices. 15

UNIT – III

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

Proximity sensors : Contact type , non contact type – reflected light scanning laser sensors.

Touch & slip sensors : Touch sensors – proximity rod & photo detector sensors, slip sensors – Forced oscillation slip sensor, interrupted type slip sensors, force and torque sensors. 15

UNIT – IV

Transformations and Kinematics: Objectives, homogenous coordinates, basic transformation operations, forward solution – DenavitHartenberg procedure. Simple problems involving planar manipulators, inverse or backward solution – problems involved, techniques.
Introduction to Trajectory Planning, the manipulator jacobian. 15

TEXT BOOKS :

1.Robotic Engineering by Richard D.Klafter
2.Industrial Robotics by Mikell P.Groover

REFERENCE BOOKS :

1.Introduction to Robotics – John J.Craig
2.Robotics – K.S.Fu, Gonzalez & Lee
3.Robotics for Enginers by Yoram Koren.
4. Robotics Technology and Flexible Automation by S.R.Deb
5. Robotics by Saeed.B.Niku

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3		1	1								2	2	1	
CO2	3	1	2									2	2		
CO3	3		2		1							2	1	2	
CO4	2	3	2	2								3	2		

COMPUTER AIDED PROCESS PLANNING

14ME804/B
IVYear B.Tech. (Mech) Eighth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:

1. Understand therole of process planning in manufacturing cycle.
2. Learn the concept of part design and representation.
3. Represeting the process knowledge
4. Understand various computer process planning systems

CourseOutcomes:
After this course, the student should be able to:
1. Understand role of process planning in manufacturing cycle.
2. Illustrate the concept of part design representation.
3. Represent the process engineering knowledge.
4. Explain different CAPP systems.

UNIT I
INTRODUCTION

The Place of Process Planning in the Manufacturing cycle-Process planning and production Planning-Process planning and Concurrent Engineering, CAPP, Group Technology 1**5**

UNIT II
PART DESIGN REPRESENTATION

Design Drafting-Dimensioning-Conventional Tolerance- Geometric Tolerance-CAD-input/output devices-Topology- Geometric transformation-Perspective transformation-Data Structure-Geometric modeling for process planning--GT Coding-The OPITZ system-The MICLASS System **15**

UNIT III
PROCESS ENGINEERING AND PROCESS PLANNING

Experience based planning-Decision table and Decision trees-Process capability analysis-Process planning-Variant process planning-Generative approach-Forward and backward planning, Input format, AI **15**

UNIT IV

COMPUTER AIDED PROCESS PLANNING SYSTEMS

Logical Design of process planning-Implementation considerations-Manufacturing system components, Production Volume, No. of production families - CAM-I, CAPP, MIPLAN, APPAS, AUTOPLAN and PRO, CPPP **15**

References:

1. Gideon Halevi and Roland D. Weill, "Principle of process planning- A Logical Approach", Chapman & Hall, 1995
2. –Chang T. C. & Richard A.Wysk, "An Introduction to automated process planning systems", PrenticeHall1985
3. Chang,T.C., "An Expert Process Planning System", Prentice Hall,1985
4. Nanua Singh, "Systems Approach to Computer Intergrated Design and Manufacturing", John Wiley &Sons,1996
5. Rao P.N., "Computer Aided Manufacturing", Tata McGraw Hill Publishing Co., 2000.

Web References:

1. http://claymore.engineer.gusu.edu/jackh/eod/automate/capp/capp.htm

2. http://Estraj.ute.sk/journal/engl-027/027.htm

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1												1		
CO2	3												2		
CO3	2												2		
CO4	2												2		

ENTERPRISE RESOURCE PLANNING

14ME804/C
IVYear B.Tech. (Mech) Eighth Semester

Lectures	:	4 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course objectives:
The student will

1. Understand the characteristics and functions of manufacturing industry.
2. Be familiar with the features of sales purchase, inventory control concepts
3. Be able to know the concept of manufacturing, financial and cost accounting
4. Provide an overview of ERP software, distribution module
5. Be able to know the concept of manufacturing module, finance module

Course Outcomes:
The student will have ability to

1. Understand the manufacturing industry along with sales, purchase and inventory control techniques.
2. Be familiar with the features on manufacturing planning along with financial and cost accounting
3. Provide an overview of ERP software with its distribution module
4. Be able to know the concept of manufacturing module, finance module

UNIT I

MANUFACTURING INDUSTRY: Management characteristics and Information Requirements. Industry classification, Product , Market, Process characteristics, Manufacturing Planning, and control, Techniques ERP ,Concept & Evaluation History: MRP -1 , MRP – 2, Advancement, Client survivor Technology, RDBMS.

SALES PURCHASE, INVENTRORY CONTROL, CONCEPTS: Classifications, coding of Material, Finished goods, sales, Enquires, Quotation, Order , Invoices, Delivery, Finished good valuation, Purchase requisition, Enquiry, Supplier, Quotation, Purchase order, Material Receipts, Material issues, Methods of issue, valuation (FIFO/LIFO, Weighted Average cost/ std.Cost). Returns, From operations, Returns to supplier, Stock Adjustments, Physical stock verification, ABC Analysis, Lot and Locations, Controls, Replenishment order control (Safety, stocks, Report paint, Economic order quantity). (15)

UNIT II

MANUFACTURING: product configuration, Bill of material, Master production Scheduling, Material. Requirement Planning, Capacity, Requirement Planning, Loading and Scheduling. An overview of manpower planning and customer manufacturing planning.

FINANCIAL AND COST ACCOUNTING:

Basic accounting principles, Daybook, cash, journal, purchase and sales, Ledgers, - general, supplier , customer, Advances. etc., Bank Reconciliation, Trial Balance, Profit, & Loss, Income & Expenditure. Account and Balance sheet. Fixed assets and depreciation Budgeting – Revenue, Capital cash, Cost. Elements – Direct materials, Direct Labor, Direct expenses, and over heads. Margin of Cost and Break-even analysis standard costing. Activity based costing. (15)

UNIT III

INTRODUCTION TO A TYPICAL ERP SOFTWARE: Overview of ERP modules and tools of a software like BaaN.

DISTRIBUTION MODULE: Module architecture, an overview, Item data, Purchase orderings/ Control, sales, Ordering, Control, Replenishment order Control, Electronic Data Interchange. (15)

UNIT IV

MANUFACTURING MODULE: Module architecture – an overview, capacity Requirement Planning. Engineering Change Control, Engineering data management, Master Production. Scheduling, Materials Requirement planning, Product classification / Configuration, Production Planning and Control, Repetitive Manufacturing,.

FINANCE MODULE: Module architecture an overview, accounts payable, Accounts receivable, General Ledger, cost allocation, cash management, Activity based costing, Fixed assets, Financial, Budgeting system. (15)

TEXT BOOKS:

Joseph or Ticks", Materials Requirement Planning the New Way in Production, and Inventory Management (McGraw Hill Books company New Delhi1975.,

Reference Book:

BaaN –Student Manuals BaaN Education Books.Hyderabad.1990.

CO-PO MAPPING

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	3	2	1	1				2		1		1	3	2	1
CO2	3	2	2	1				2		1		1	3	2	1
CO3	3	1	1	1				1		1		1	2	2	1
CO4	3	2	1	1				1		2		1	2	2	1

PROJECT WORK
14MEPR801
IVYear B.Tech. (Mech) Eighth Semester

Practicals	:	12 Periods/Week	Continuous Assessment	:	50
Final Exam	:	3 hours	Final Exam Marks	:	100

The Project Report has to be submitted at the end of the semester and marks will be awarded based on the Viva-voce examination

CAM Lab

14MEL802

IV Year B.Tech. (Mech), Eighth Semester

Practicals	:	3 Periods/Week	Continuous Assessment	:	40
Final Exam	:	3 hours	Final Exam Marks	:	60

Course Objectives:

1. To write manual part programs for different operations on CNC Lathe.
2. To write manual part programs for different operations on CNC Machining centre.
3. To check the part programs using FANUC Simulation software.
4. Demonstration of parts and operation of CNC Lathe and CNC Machining centre.
5. Modelling of simple parts and generation of part program using MASTER CAM software.

Course Outcomes:

At the end of the course, the student will be able to:

1. Write part programs using canned cycles and subprograms for step turning, taper turning, profile turning, external and internal threading.
2. Write part programs for slot milling, profile milling and drilling, understand cutter radius and length compensation.
3. Simulate the above programs using FANUC Simulation software.
4. Explain the operation of CNC lathe and Machining centre to produce simple components.

I. Manual Part Programming and tool path simulation using offline simulation software on CNC Lathe for the following operations.

1) Step turning,

2) Taper turning,

3) Profile turning

4) External threading

5) Drilling, boring and internal threading

II. Manual Part Programming and tool path simulation using offline simulation software on CNC Machining Centre for the following operations.

1) Slot milling.
2) Step milling
3) Diagonal milling.
4) Profile milling.
5) Hexagon milling & drilling.

III. Modeling, Part Program generation and tool path simulation using Master CAM software.

IV. Demo on working of CNC Lathe and CNC Machining Centre.

CO-PO MAPPING

Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	2	2			2			1	1		2		1		1
CO2	2	2			2			1	1		2		1		1
CO3			1		1			1	1		2			2	1
CO4			1		1			1	1		2			2	1