1st, 2nd & 3rd YEAR B. TECH.

COURSE STRUCTURE AND SYLLABUS
FOR
MECHANICAL ENGINEERING
(AR18)

(Applicable for the batches admitted from 2018-19)

DEPARTMENT OF MECHANICAL ENGINEERING

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION AFFILIATED TO JNTUK, KAKINADA)

Approved By AICTE, New Delhi, Accredited By NBA, AICTE & NAAC, UGC, New Delhi, Listed Under 2(F) & 12(B), UGC, New Delhi, TEQIP Participated College.

K.KOTTURU, TEKKALI,- 532 201, SRIKAKULAM DIST., AP

VISION OF THE INSTITUTE

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

MISSION OF THE INSTITUTE

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

DEPARTMENT OF MECHANICAL ENGINEERING

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

The Department of Mechanical Engineering received NBA accreditation in 2013 for 2 years and in 2017 for 3 years. This Institution is also accredited by NAAC. The college received TEQIP funds in Phase-II under sub-component 1.1. These two important additions surely enhance the prestige of the institution; and in turn help students to improve their academic standards. Both the B. Tech and M. Tech programs are duly approved by the AICTE and Govt. of A.P. and affiliated to JNTUK.

VISION OF THE DEPARTMENT

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

MISSION OF THE DEPARTMENT

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

PROGRAM EDUCATIONAL OBJECTIVES

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

PROGRAM OUTCOMES

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

PROGRAM SPECIFIC OUTCOMES (PSO):

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

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

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

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT (AUTONOMOUS)
Approved by AICTE, Accredited by NBA & NAAC, Recognized under 2(f) and 12(b) of UGC
Permanently Affiliated to JNTUK, Kakinada.
K.Kotturu, Tekkali, Srikakulam-532201, Andhra Pradesh

Academic Regulations 2018 for B. Tech.

(Effective for the students admitted into I year from the **Academic Year 2018-2019** and onwards)

1. Award of B.Tech. Degree

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

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

(b) Registered for **160** credits and he/she must secure total **160** credits.

2. Students, who fail to complete their Four years Course of study within **8** years or fail to acquire the 160 Credits for the award of the degree within **8** academic years from the year of their admission, shall forfeit their seat in B. Tech course and their admission shall stand cancelled.

3. Courses of study

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

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

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

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

Sl. No	Course	Credits
1	**Theory Course**	**2/3/4**
2	**Inter-Disciplinary Elective s**	**02**
3	**Laboratory Course**	**1.5**
4	**Internship**	**1.5**
5	**Employability skills**	**1.5**
6	**Mini Project**	**2/3**
7	**Project**	**07**

5. Inter-Disciplinary Elective s:

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

6. MOOCs:

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

7. Evaluation Methodology:

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

7.1Theory course:

For theory courses the distribution shall be **40** marks for internal midterm evaluation and **60** marks for the External End - Examinations.

Out of 40 internal midterm marks – **25** marks are allotted for descriptive exam, **10** marks for two assignments or one case study (group wise), and 5 marks for objective test.

(i) Pattern for Internal Midterm Examinations (30 marks):

For theory courses of each semester, there shall be **2** Midterm exams. Each descriptive exam is to be held for **30** marks with the duration of **90** minutes.

For final calculation of internal marks, weightage of 70% will be given to the student who performed well either in first Mid or second Mid and 30% weightage will be given to other Midterm examinations.

Mid paper contains three descriptive type questions with internal choice. Each question carries 10 marks (3×10=30M) and scale down to 25 marks.The first Midterm examination to be conducted usually after 8 weeks of instruction or after completion of 50 percent syllabus, the second Midterm examination to be conducted usually at the end of instruction after completion of remaining 50 percent syllabus.

(ii) Pattern for External End Examinations (60 marks):

The question paper shall have descriptive type questions for 60 marks. There shall be one question from each unit with internal choice. Each question carries 12 marks. Each course shall consist of five units of syllabus. The student should answer total 5 questions. (5x12M=60M)

7.2. Laboratory Course:

(i) For practical subjects there shall be continuous evaluation during the semester for **40** internal marks and **60** semester end examination marks. Out of the **40** marks for internal: **25** marks for day to day work, **5** marks for record and **10** marks to be awarded by conducting an internal laboratory test. The end examination shall be conducted by the teacher concerned and external examiner from outside the college.

(ii.) For the course Engineering Graphics and Design, the distribution shall be 40 marks for internal evaluation (20 marks for day–to–day work, and 20 marks for internal tests) and 60 marks for end examination.

For award of marks for internal tests weightage of 70% will be given to the student who performed well either in first test or second test and 30% weightage will be given to other test.

7.3 Minor Project:

Out of a total of 100 marks for the minor project work 40 marks shall be for internal evaluation and 60 marks for end semester examination. The end semester examination (Viva-Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the dept and supervisor of the project. The internal evaluation shall be made on the basis of seminar given by each student on the topic of his/her project, which was evaluated by internal committee. Out of 40 internal marks -10 marks allotted for literature survey, 15 marks for results and analysis and 15 marks for seminar.

7.4 Project Work:

Out of a total of 200 marks for the project work, **80** marks shall be for Project Internal Evaluation and **120** marks for the End Semester Examination. The End Semester Examination (Viva – Voce) shall be conducted by the committee. The committee consists of an external examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be made at the end of the IV year. The Internal Evaluation shall be made on the basis of two seminars given by each student on the topic of his project which was evaluated by an internal committee. Out of 80 internal marks -20 marks allotted for literature survey, 30 marks for results and analysis, 15 marks for first seminar (usually after 8 weeks) and 15 marks for second seminar (at the end of semester).

7.5 Mandatory Courses:

Mandatory course is one among the compulsory courses and does not carry any Credits. The list of mandatory courses is shown below:

i) Induction Program
ii) Constitution of India
iii) Environmental sciences

7.6 Employability Skills:

Employability skills shall be evaluated for **100** marks. **40** marks for day-to-day evaluation and **60** marks on the basis of end (internal) examination. There is no external examination for employability skills. It will be evaluated in IV-I semester.

7.7 Internship:

All he students shall undergo the internship period minimum of **4** weeks and the students have an option of choosing their own industry which may be related to their respective branch. A self study report for the internship shall be submitted and evaluated during the IV year II-Semester and will be evaluated for a total of **100** marks consists of **40** marks for internal assessment and **60** marks for end examination.

Internal assessment for **40** marks shall be done by the internship supervisor. Semester end examination (Viva – Voce) for **60** marks shall be conducted by committee consists of Head of the Department, internal supervisor and an external examiner.

For a few merit students, internship for six months will be allowed based on their performance in academics. Those who want to go for internship for six months are required to intimate the same to the college through proper channel at the end of III-II semester and they require completing all the subjects of IV B.Tech., either in IV-I Semester or IV-II Semester. However, project work will be evaluated only in IV-II Semester.

8. Attendance Requirements:

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

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

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

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

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

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

9. Minimum Academic Requirements:

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

a) A candidate shall be declared to have passed in individual course if he/she secures a minimum of 40% aggregate marks i.e 40 out of 100 (Internal & Semester end examination marks put together), subject to a minimum of 35% marks i.e 21 marks out of 60 in semester end examination.

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

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

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

Table: Grading System for B.Tech. Programme

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

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

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

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

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

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

The CGPA is calculated as below:

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

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

Table: Award of Divisions

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

9.4.1 Equivalence percentage = (CGPA -0.5) × 10 %

9.5 Supplementary Examinations:

Supplementary examinations will be conducted in every semester.

9.6 Conditions for Promotion:

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

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

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

10. Course pattern:

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

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

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

11. Minimum Instruction Days:

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

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

13. **General:**

(i.) Where the words "he" "him" "his", occur in the regulations, they include "she", "her", "hers".

(ii.) The academic regulation should be read as a whole for the purpose of any interpretation.

(iii.) In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the principal is final.

(iv.) The College may change or amend the academic regulations or syllabi at any time and the changes or amendments made shall be applicable to all the students with effect from the dates notified by the college.

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ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT: TEKKALI
SRIKAKULAM-532201, Andhra Pradesh (India)
Academic Regulations 2018 (AR18) for B. Tech. (Lateral Entry Scheme)

(Effective for the students getting admitted into II year from the Academic Year 2018- 2019 and onwards)

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

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

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

(b) Registered for all the credits of 2^{nd}, 3^{rd} and 4^{th} year of respective branches and he/she must secure total credits of 2^{nd}, 3^{rd} and 4^{th} year of respective branches. .

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

3. **Promotion Rule:**

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

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

4. Minimum Academic Requirements:

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

a) A candidate shall be declared to have passed in individual course if he/she secures a minimum of 40% aggregate marks i.e 40 out of 100 (Internal & Semester end examination marks put together), subject to a minimum of 35% marks i.e 21 marks out of 60 in semester end examination.

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

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

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

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< 40%	0	F (Fail)

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

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

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

Where CR = Credits of a Course

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*SGPA is calculated for the candidates who passed all the courses in that semester.

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

The CGPA is calculated as below:

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

Where CR = Credits of a course

GP = Grade points awarded for a course

Table: Award of Divisions

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

4.4.1 Equivalence percentage = (CGPA -0.5) × 10 %

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

DISCIPLINARY ACTION FOR MALPRACTICES / IMPROPER CONDUCT IN EXAMINATIONS

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

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

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

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKALI
(An Autonomous Institution)

MECHANICAL ENGINEERING

COURSE STRUCTURE (AR18)

I Year – I Semester

S. No.	Subject Code	Subject	L	T	P	Credits
1.	18MCT101	Induction Program	3 weeks			0
2.	18BST107	Engineering Physics	3	1	0	4
3.	18BST101	Linear Algebra and Calculus	3	1	0	4
4.	18EST101	Basic Electrical Engineering	3	1	0	4
5.	18EST104	Elements of Workshop Technology	2	0	0	2
6.	18ESL103	Workshop and Manufacturing Practice	0	0	3	1.5
7.	18BSL101	Physics Lab	0	0	3	1.5
8.	18ESL101	Basic Electrical Engineering Lab	0	0	3	1.5
Total			**11**	**3**	**9**	**18.5**

I Year – II Semester

S. No.	Subject Code	Subject	L	T	P	Credits
1.	18MCT102	Environmental Science	3	0	0	0
2.	18HST101	English	2	0	0	2
3.	18BST108	Chemistry	3	1	0	4
4.	18BST103	Differential Equations	3	1	0	4
5.	18EST102	Programming for Problem Solving	3	0	0	3
6.	18EST105	Basic Electronics	2	0	0	2
7.	18ESL104	Engineering Graphics and Design	0	0	4	2
8.	18BSL102	Chemistry Lab	0	0	3	1.5
9.	18ESL102	Programming for Problem Solving Lab	0	0	3	1.5
10.	18HSL101	Language Proficiency Lab	0	0	3	1.5
Total			**16**	**2**	**13**	**21.5**

AR18 – B. Tech. - ME

II Year – I Semester

S. No.	Subject Code	Subject	L	T	P	Credits
1.	18MCT203	Constitution of India/Essence of Indian Traditional Knowledge	3	0	0	0
2.	18BST204	Complex Variables and statistical Methods	3	0	0	3
3.	18EST203	Engineering Mechanics	3	1	0	4
4.	18MET201	Thermodynamics	3	1	0	4
5.	18MET202	Materials Engineering	3	0	0	3
6.	18MET203	Fluid Mechanics and Hydraulic Machines	3	0	0	3
7.	18MEL201	Fluid Mechanics and Hydraulic Machines Lab	0	0	3	1.5
8.	18MEL202	Computer Aided Drafting Lab	0	0	3	1.5
Total			**18**	**2**	**6**	**20**

II Year – II Semester

S. No.	Subject Code	Subject	L	T	P	Credits
1.	18BST209	Biology	3	0	0	3
2.	18MET204	Strength of Materials	3	1	0	4
3.	18MET205	IC Engines	3	0	0	3
4.	18MET206	Manufacturing Technology -I	3	0	0	3
5.	18MET207	Instrumentation and Control	3	0	0	3
6.	xxxx	**Inter-Disciplinary Elective – I**	2	0	0	2
7.	18MEL203	Strength of Materials /Materials Lab	0	0	3	1.5
8.	18MEL204	Thermal Engineering Lab	0	0	3	1.5
9.	18MEL205	Production Technology Lab	0	0	3	1.5
Total			**17**	**1**	**9**	**22.5**

Subject Code	Offered by Dept.	Inter-Disciplinary Elective – I	Offered for Dept
18IET211	BS&H	Transform Theory	MECH/CIVIL
18IET212	BS&H	Numerical Methods	ECE/EE
18IET213	BS&H	Computational Number Theory	CSE/IT
18IET214	CIVIL	Water Shed Management	MECH
18IET215	CIVIL	Computer Aided Engineering Drawing	ECE/EEE/CSE/IT
18IET216	EEE	Introduction to Mathematical Simulation and Modeling	ECE/MECH/CIVIL/CSE/IT
18IET217	MECH	Fundamentals of Material Science	ECE/EEE/CIVIL
18IET218	MECH	Engineering Optimization Techniques	CSE/IT
18IET219	ECE	Introduction to Electronic Measurements	EEE/MECH/CIVIL/CSE/IT
18IET21A	CSE	UNIX Utilities	ECE/EEE/MECH/CIVIL/IT
18IET21B	IT	IT systems Management	ECE/EEE/MECH/CIVIL/CSE

III Year – I Semester

S. No.	Subject Code	Subject	L	T	P	Credits
1.	18MET308	Heat and Mass Transfer (HMT)	3	0	0	3
2.	18MET309	Design of Machine Members - I	3	0	0	3
3.	18MET310	Kinematics & Dynamics of Machines	3	0	0	3
4.	18MET311	Manufacturing Technology -II	3	0	0	3
5.	18MET312	Applied Thermodynamics	3	0	0	3
6.	xxxx	**Inter-Disciplinary Elective – II**	2	0	0	2
7.	18MEP301	Minor Project – I	0	0	4	2
8.	18MEL306	Machine Tools & Metrology Lab	0	0	3	1.5
9.	18MEL307	Heat Transfer Lab	0	0	3	1.5
Total			**16**	**0**	**10**	**22**

Subject Code	Offered by Dept.	Inter-Disciplinary Elective – II	Offered for Dept
18IET321	BS&H	Fundamentals of Fuzzy Logic	All
18IET322	CIVIL	Fundamentals of Building Planning	MECH
18IET323	CIVIL	Remote Sensing	ECE/EEE/CSE/IT
18IET324	EEE	Renewable Energy Sources	ECE/MECH/CIVIL/CSE/IT
18IET325	MECH	Principles of Mechanical Measurements	ECE/EEE/CIVIL
18IET326	MECH	Linear Programming and its Applications	CSE/IT
18IET327	ECE	Principles of communications	EEE/MECH/CIVIL/CSE/IT
18IET328	CSE	Introduction to JAVA	ECE/EEE/MECH/CIVIL
18IET329	IT	Introduction to PYTHON	ECE/EEE/MECH/CIVIL/CSE
18IET330	TPC	Competitive Programming-I	ECE/EEE/MECH/CIVIL

III Year – II Semester

S. No.	Subject Code	Subject	L	T	P	Credits
1.	18MET313	CAD/CAM	2	0	0	2
2.	18MET314	Design of Machine Members - II	3	0	0	3
3.	18MET315	Dynamic Systems & Mechanical Vibrations	3	0	0	3
4.	xxxx	Professional Elective –I	3	0	0	3
5.	xxxx	**Inter-Disciplinary Elective – III**	2	0	0	2
6.	18MEP302	Minor Project – II	0	0	6	3
7.	18MEL308	3D Modeling Lab	0	0	3	1.5
8.	18MEL309	Dynamics Lab	0	0	3	1.5
9.	18HSL302	Professional Communication Skills Lab	0	0	3	1.5
Total			**14**	**0**	**15**	**20.5**

Subject Code	Professional Elective – I
18MEE311	Robotics
18MEE312	Tool Design
18MEE313	Tribology

Subject Code	Offered by Dept.	Inter-Disciplinary Elective – III	Offered for Dept
18IET331	MBA	HRD & Organizational Behavior	All
18IET332	CIVIL	Environmental Impact Assessment	ECE/EEE/MECH
18IET333	CIVIL	GPS & Survey Methods	CSE/IT
18IET334	EEE	Energy Audit Conservation and Management	ECE/EEE/MECH/CSE/IT
18IET335	MECH	Elements of Workshop Technology	ECE/EEE/CIVIL/CSE/IT
18IET336	ECE	Introduction to Signal Processing	EEE/MECH/CIVIL
18IET337	ECE	Fundamentals of Signals & Systems	CSE/IT
18IET338	CSE	Simulation and Modeling	ECE/EEE/MECH/CIVIL/IT
18IET339	IT	Fundamentals of Computer Graphics	ECE/EEE/MECH/CIVIL/CSE
18IET340	TPC	Competitive Programming-II	ECE/EEE/MECH/CIVIL

IV Year – I Semester

S. No.	Subject Code	Subject	L	T	P	Credits
1.	18HST403	Managerial Economics and Financial Analysis	2	0	0	2
2.	18MET416	Finite Element Methods	3	0	0	3
3.	xxxx	Professional Elective – II	3	0	0	3
4.	xxxx	Professional Elective – III	3	0	0	3
5.	xxxx	Professional Elective – IV	3	0	0	3
6.	xxxx	**Inter-Disciplinary Elective – IV**	2	0	0	2
7.	18HSL406	Employability Skills	0	0	3	1.5
8.	18MEL410	Computer Aided Engineering Lab	0	0	3	1.5
9.	18MEL411	Fluid Control Systems Lab	0	0	3	1.5
Total			**16**	**0**	**6**	**20.5**

Subject Code	Professional Elective – II
18MEE421	Project Management and Operation Research
18MEE422	Computational Fluid Dynamics
18MEE423	Nano Technology
Subject Code	**Professional Elective – III**
18MEE431	Refrigeration & Air Conditioning
18MEE432	Fracture Mechanics
18MEE433	Manufacturing Process and Product life cycle Management
Subject Code	**Professional Elective – IV**
18MEE441	Automobile Engineering
18MEE442	Condition Monitoring
18MEE443	Industrial Hydraulics and Pneumatics

Subject Code	Offered by Dept.	Inter-Disciplinary Elective – IV	Offered for Dept
18IET441	MBA	Project Management	ECE/EEE/CIVIL/CSE/IT
18IET442	MBA	Industrial Engineering and Management	MECH
18IET443	MBA	Entrepreneurial Development	ECE/EEE/MECH/ CIVIL/ CSE/IT
18IET444	CIVIL	Geographical Information Systems	ECE/EEE/MECH/ CSE/IT
18IET445	EEE	Power quality management	ECE/MECH/ CIVIL/CSE/IT
18IET446	MECH	Fundamentals of ROBOTICS	ECE/EEE/ CIVIL/CSE/IT
18IET447	ECE	Basics of Mobile Communications	EEE/MECH/ CIVIL
18IET448	ECE	Introduction to Wireless Networks	CSE/IT
18IET449	CSE	Introduction to Cloud Computing	ECE/EEE/MECH/ CIVIL/IT
18IET44A	IT	Introduction to DBMS	ECE/EEE/MECH/ CIVIL
18IET44B	IT	Embedded Systems	CSE

IV Year – II Semester

S. No.	Subject Code	Subject	L	T	P	Credits
1.	xxxx	Professional Elective – V	3	0	0	3
2.	xxxx	Professional Elective – VI	3	0	0	3
3.	18MEP403	Internship				1.5
4.	18MEP404	Project				7
Total			**6**	**0**	**0**	**14.5**

Subject Code	Professional Elective – V
18MEE451	Automation in Manufacturing
18MEE452	Mechatronics
18MEE453	Thermal Systems Design
Subject Code	**Professional Elective – VI**
18MEE461	Power Plant Engineering
18MEE462	Un Conventional Machining Processes
18MEE463	Mechanics of Composite Materials

Total credits: 160

NOTE: **L: Lecture** **T: Tutorial** **P: Practical**

HSMC: **Humanities and Social Sciences including Management courses**
BS: **Basic Science courses**
ES: **Engineering Science courses**
PC: **Professional core courses**
PE: **Professional Elective**
OE: **Inter-Disciplinary Elective s**
Project: **Project work, Seminar, Internship etc**

I Year B. Tech., I Semester

ENGINEERING PHYSICS
(Common for MECHANICAL & CIVIL ENGINEERING)

Subject Code: 18BST107 **Internal Marks: 40**
Credits: 4.0 **External Marks: 60**

COURSE DESCRIPTION:
This course encompass Fundamental Concepts of Physics that include

- Waves and Oscillations
- Wave Optics
- Lasers
- Fiber Optics
- Materials Science

that are inevitable for any Engineering student so that these prerequisites aid the student to readily understand Day to Day Engineering Problems with Pragmatic Approach.

COURSE OBJECTIVES:

- To realize the nature of Oscillation in terms of energy exchange by giving various examples.
- To realize the principles of optics in designing optical devices
- To comprehend the Principles of Lasers
- To comprehend the Principles of Fiber Optics
- To possess an insight on Magnetic properties and Superconducting properties pertaining to material fabrication

COURSE OUTCOME:
On completion of this course, students should be able to:
CO 1. Interpret the knowledge of Oscillation in terms of energy exchange by giving various examples
CO 2. Apply the principles of optics in designing optical devices
CO 3. Outline the Principles of Lasers.
CO 4. Outline the Principles of Fiber Optics.
CO 5. Interpret the knowledge of Magnetic properties and Superconducting properties in material fabrication.

UNIT- I : WAVES & OSCILLATIONS
Damped Oscillations: Harmonic oscillator; Differential Equation of Wave Motion, Over-Damped, Critically Damped and Under-Damped Oscillations
Forced oscillations: Resonance & Quality Factor

UNIT- II : WAVE OPTICS
Interference - Introduction, Huygen's Principle, Principle of Superposition of Waves, Interference of Light by Division of Wavefront – Young's Double Slit Experiment, Interference of Light by Division of Amplitude - Newton's Rings under Reflected Light

Diffraction - Introduction, Fraunhofer Diffraction due to Single Slit – Fraunhofer Diffraction due to Double Slit, Diffraction Grating

UNIT-III: Lasers

Lasers - Introduction, Characteristics of Lasers- Principle of Laser – Absorption, Spontaneous and Stimulated Emission, Einstein Coefficients, Population Inversion, Optical Resonator and Lasing Action.

Types of Lasers - Nd-YAG Laser, Helium-Neon Laser, Semiconductor Laser, Applications of Lasers.

UNIT-IV: Fiber Optics

Principles of Optical Fiber - Optical Fiber Construction, Total Internal Reflection, Numerical Aperture and Acceptance Angle

Types of Fibers - Differences between Step Index Fibers and Graded Index Fibers, Differences between Single Mode Fibers and Multimode Fibers, Fiber Optic Communication System and Applications

UNIT-V : Materials Science

Magnetic Materials: Types of Magnetic Materials (Dia, Para, Ferro, Ferri & Antiferro), Hysteresis, Weiss Theory of Ferromagnetism, Soft and Hard Magnetic Materials, Ferrites & its Applications.

Superconductivity: Introduction, Meissner Effect, Type-I & Type-II Superconductors, Applications

TEXTS BOOKS:

1. A Textbook of Engineering Physics, M N Avadhanulu & P G Kshirsagar, S.Chand Publishers
2. Fundamentals of Physics by Resnick, Halliday and Walker

REFERENCES BOOKS:

1. University Physics by Young and Freedman
2. Solid State Physics by S. O. Pillai, New Age International Pubishers
3. Engineering Physics, Volume-I&II, P.K.Palani Swamy, Scitech Publications Hyderabad
4. Engineering Physics Volume I&II Dr.K.Vijaykumar, S.Chand Publishing Company, New Delhi
5. Engineering Physics Dr. S. Mani Naidu, Pearson Publications Chennai

I Year B. Tech., I Semester

LINEAR ALGEBRA AND CALCULUS
(Common to all)

Subject Code: 18BST101 **Internal Marks: 40**
Credits: 4.0 **External Marks: 60**

COURSE OBJECTIVES:

- The application of the essential tool of matrices and linear algebra including linear transformation, eigen values, diagonalization and orthogonalization.
- The application of Taylor's and Maclaurin's series to calculate maxima and minima of two variable functions.
- The application of integration to length, surface area and volume.
- The mathematical tools needed in evaluating multiple integrals and their usage.
- The essential tool of vector differentiation to calculate gradient, divergence, curl and apply Green's, Stokes and Gauss Divergence theorems in converting one integral form to another.

COURSE OUTCOME:

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

CO 1. To calculate rank, eigen values, eigen vectors of matrices, solve linear system of equations including diagonalization and orthogonalization.
CO 2. To estimate maxima and minima of functions of two variables
CO 3. To apply single integrals to estimate length, surface area and volume.
CO 4. To evaluate multiple integral in both Cartesian and polar coordinates and estimate area and volume.
CO 5. To calculate gradient, divergence, curl of a scalar and vector point functions; line, surface and volume integrals and apply Green's, Stokes and Gauss Divergence theorems to convert from single to double or double to triple integrals.

UNIT-I:

Matrices: Matrices – Rank - Systems of linear equations - linear dependence and independence – Eigen values, eigenvectors, symmetric, skew-symmetric, orthogonal matrices -Diagonalization.
Vector Space – Basis - Dimension, rank and nullity - Inner product spaces- Gram-Schmidt orthogonalization.

UNIT-II:

Differential Calculus: Functions of single Variables: Rolle's, Lagrange's, Cauchy's mean value theorems (without proof) - Taylor's and Maclaurin's Series.
Functions of several Variables: Limits and continuity for two variables - Partial derivative - Total derivative- Taylor's and Maclaurin's Series (without proof) - Maxima, minima of functions without constraints and functions with constraints (Lagrange method of undetermined multipliers).

UNIT-II:

Single Integrals:Definite Integrals, Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates.

UNIT-IV:

Multiple Integrals: Double integral (Cartesian and polar form) -Change of order of integration - Change of variables (Cartesian to polar) - area by double integration. Triple integrals – Change of variables (Cartesian to spherical/cylindrical) - Volume by triple integration.

UNIT-V:

Vector Calculus: Scalar and vector point functions- Vector differentiation - Directional derivatives - Gradient, Curl and Divergence –Vector Integration -Line, Surface, Volume Integrals - Green, Stokes and Gauss divergence theorems (without proofs) .

TEXTS BOOKS:

1. B.V. Ramana, Higher Engineering Mathematics, 44th Edition, Tata McGraw Hill New Delhi, 2014.
2. Dr. B.S. Grewal, Higher Engineering Mathematics, 43nd Edition, Khanna Publishers, 2015.

REFERENCES BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. **G.B. Thomas and R.L. Finney**, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
3. **Veerarajan T**., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. **D. Poole**, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
5. **N.P. Bali and Manish Goyal**, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

BASIC ELECTRICAL ENGINEERIG
(Common for all Branches – Semester I / II)

Subject Code: 18EST101 **Internal Marks: 40**
Credits: 4.0 **External Marks: 60**

COURSE OBJECTIVES:

- To introduce the basic knowledge of electric circuits
- To illustrate knowledge with AC circuits.
- To become familiar with DC Machines.
- To understand the concept of transformers.
- To provide knowledge on three phase induction motors.

COURSE OUTCOMES:

CO 1. Able to summarize different electrical circuits.
CO 2. Able to outline the basics of AC circuits.
CO 3. Able to examine DC Machines.
CO 4. Able to demonstrate working of transformers.
CO 5. Able to generalize three phase induction motors.

UNIT –I:

Introduction to Electric Circuits: Basic definitions, Electrical circuit elements (R, L and C), Ohm's Law, voltage and current sources, Series & Parallel circuits, Kirchhoff's Laws, Star-delta and delta-star transformations, simple problems with dc excitation.

UNIT-II:

AC Circuits: Representation of sinusoidal waveforms, peak and rms values, phasor representation, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series only), real power, reactive power, apparent power, power factor, sample problems.

UNIT-III:

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

UNIT-IV:

Transformers: Operation of a Single Phase Transformer, EMF equation, losses, Regulation and Efficiency of a single phase transformer, O.C and S.C Tests. sample problems.

UNIT-V:

Three Phase induction Motor: Principle of Operation of 3-Φ induction motor, power and torque equations, Speed-Torque Characteristics of 3- Φ induction Motor.

TEXT BOOKS:

1. Principles of Electrical and Electronics Engineering by V.K.Mehta, S.Chand& Co.
2. Introduction to Electrical Engineering – M.S Naidu and S. Kamakshaiah, TMH Publ.

REFERENCE BOOKS:

1. Basic Electrical Engineering Dr.K.B.Madhu Sahu scitech publications (india) pvt.ltd.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill,2010.

I Year B. Tech., I Semester

ELEMENTS OF WORKSHOP TECHNOLOGY

Subject Code: 18EST104 **Internal Marks: 40**
Credits: 2.0 **External Marks: 60**

COURSEOBJECTIVE:

- To provide knowledge about the different manufacturing processes
- To impart knowledge on carpentry tools, operations and joints
- To understand the fitting tools, operations and joints
- To impart knowledge on sheet metal work tools, operations and joints
- To provide knowledge on forging tools, operations and joints

COURSE OUTCOMES:

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

CO 1. Comprehend different manufacturing processes.
CO 2. Explain the carpentry tools and applications of carpentry joints.
CO 3. Explain the fitting tools and operations.
CO 4. Explain the sheet metal tools and operations and applications.
CO 5. Explain the for ging tools and operations.

UNIT – I:

Introduction to manufacturing processes, Definition of manufacturing, materials in manufacturing classification of manufacturing process, basic workshop processes, carpentry, fitting, hand forging, sheet metalwork.

UNIT – II:

Carpentry: Introduction to carpentry tools, Marking & measuring tools, Cutting Tools, Planing tools Boring Tools, Striking tools, Holding devices, Carpentry joints: Halflap joint, Mortise and Tenon joint.

UNIT – III:

Fitting: Introduction to fitting, tools Marking & measuring tools, Holding tools, Cutting tools: striking tools, checking and measuring tools and miscellaneous tools and Fitting Operations: Chipping, filing, scraping, grinding, sawing, marking, drilling, reaming, tapping, dieing.

UNIT – IV:

Sheetmetalwork: Metals used for sheet metal work, Sheet metal hand tools: snips, stakes, hand hammers, Mallets and Sheet Metal Operations: Shearing, bending, drawing, squeezing

UNIT – V:

Forging: Hand forging – Hand tools: Anvil, swage block, Tongs, hand hammers, Chisels, Swages, Fullers, flatters, set hammer, punches, Forging operations: Upsetting, drawing down, setting down, punching and drifting, bending, welding, cutting, swaging, fullering and flattening.

TEXT BOOKS:

1. Elements of Workshop Technology S.K. Hajra Choudhury, A.K. Hajra Choudhury.
2. Workshop Technology B.S. Raghuwanshi Dhanpat Rai & Co.,

REFERENCES BOOKS:

1. Workshop Technology by Virender Narula Pub: S.K.Kataria & Sons.
2. Manufacturing Processes by S. K. Sharma, Savita Sharma.

I Year B. Tech., I Semester

WORKSHOP AND MANUFACTURING PRACTICE
(Common for all Branches – Semester I / II)

Subject Code: 18ESL103 **Internal Marks: 40**
Credits: 1.5 **External Marks: 60**

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

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

CO 1. Make half-lap, mortise & tenon, corner dovetail or bridle wooden joints.
CO 2. Develop sheet metal into objects like square tray, taper side tray, conical funnel or elbow pipe.
CO 3. Forge MS rod from round to square cross-section, or into L- or S- bend.
CO 4. Fabricate MS pieces into either a straight, square, dovetail or V-fit.
CO 5. Connect a staircase or a tube light house-wiring electrical circuit.

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

Tasks to be performed:

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

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

Tasks to be performed:

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

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

Tasks to be performed:

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

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

Tasks to be performed:

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

V.HOUSE WIRING

1) Tube light connection
2) Staircase connection

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

I Year B. Tech., I Semester

PHYSICS LAB
(Common for all Branches – Semester I / II)

Subject Code: 18BSL101 **Internal Marks: 40**
Credits: 1.5 **External Marks: 60**

COURSE DESCRIPTION:

This Laboratory course is intended to apply the scientific method to expedite experiments the include

- Error analysis
- Waves Fundamentals
- Wave Optics
- Lasers and Fiber Optics
- Semiconductor devices

So that student can verify theoretical ideas and concepts covered in lecture through host of analytical techniques, statistical analysis and graphical analysis.

COURSE OBJECTIVES:

- To operate optical systems and design Instrumentation with precision measurements to estimate error for targeted accuracy
- To Interpret the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum
- To understand the phenomenon of Interference and Diffraction using Travelling Microscope and Spectrometer.
- To attain ability to use Techniques and Skills associated with Modern Engineering Tools such as Lasers and Fiber Optics
- To characterize semiconducting material devices.

COURSE OUTCOMES:

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

CO 1. Demonstrate the ability to measure properties of optical systems and design instrumentation with precision measurements to estimate error for targeted accuracy

CO 2. Infer the results of mechanical parameters such as modulus of elasticity and acceleration due to gravity through simple oscillatory experiments using torsional pendulum or physical pendulum

CO 3. Apply the knowledge of Optics to calculate geometrical parameters of thickness of thin object and radius of curvature of a lens

CO 4. Illustrate techniques and skills associated with Modern Engineering Tools such as Lasers and Fiber Optics

CO 5. Evaluate characteristics of semiconducting material devices.

LIST OF EXPERIMENTS:

1. Precision Measurements and Instruments
2. Error Analysis and Graph Drawing
3. Determination of Rigidity Modulus of the Material of Wire using Torsional Pendulum
4. Determination of Acceleration due to Gravity (g) using Compound Pendulum
5. Newton's Rings – Determination of the Radius of Curvature of a given Plano Convex Lens
6. Determination of Thickness of Thin Object using Wedge Method
7. Determination of Wavelength of Monochromatic Source using LASER Diffraction
8. Determination of width of a single slit using LASER
9. Determination of Numerical Aperture and Bending Loss of an Optical Fiber
10. Determination of Energy Band Gap using the given Semiconductor

MANUAL / RECORD BOOK:

1. Manual cum Record for Engineering Physics Lab, by Prof. M. Rama Rao, Acme Learning.
2. Lab Manual of Engineering Physics by Dr.Y. Aparna and Dr. K. Venkateswara Rao (VGS books links, Vijayawada)

I Year B. Tech., I Semester

BASIC ELECTRICAL ENGINEERIG LAB
(Common for all Branches – Semester I / II)

Subject Code: 18ESL101 **Internal Marks: 40**
Credits: 1.5 **External Marks: 60**

COURSE OBJECTIVE:

- To introduce the student to study different electrical components and to verify the basic laws related to electrical engineering, Speed control of D.C. motor, testing of transformer, electrical wiring system through study, practice, and experiments.

COURSE OUTCOMES:

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

CO 1. Label various types of electrical components.
CO 2. Demonstrate various basic electrical laws.
CO 3. Demonstrate speed control DC motor & testing of transformer.
CO 4. Experiment with lamps.
CO 5. Examine electrical wiring system

LIST OF EXPERIMENTS:

1. Study of electrical components.
2. To verify Ohm's law.
3. To verify (a) Kirchhoff's current law (b) Kirchhoff's voltage law.
4. To verify the total resistance of the series and parallel connected circuits.
5. Find armature resistance, field resistance and filament Lamp Resistance using V-I method.
6. Speed control of D.C. Shunt motor by a) Armature Voltage control b) Field flux control method
7. OC and SC tests on single phase transformer.
8. Fluorescent tube connection.
9. (a) One way control of lamp
   (b) Two way control of lamp
10. Fan wiring.

ADDITIONAL EXPERIMENTS:

11. Soldering and bread board precautions.
12. To find voltage current relationship for series RL circuit and determine power factor.

I Year B. Tech., II Semester

ENVIRONMENTAL SCIENCE
(Common for all Branches – Semester I / II)

Subject Code: 18MCT102 **Internal Marks: 0**
Credits: 0 **External Marks: 0**

COURSE OBJECTIVES:

- Memorize the knowledge of environment and status of different resources on earth.
- Identify the significance, arrangement, causes of annihilation and conservation of ecosystems and biodiversity.
- Discriminate causes, effects of a variety of pollutions and suitable control methods.
- Identify the hurdles of sustainable development; evaluate the different environmental management and legal issues.
- Describe the population growths, health problems and evaluate the environmental assets.

COURSE OUTCOMES:

By Studying this Course Student will

CO 1. Recognize and speaks well again on the general issues of environment and know how to conserve resources for better usage.
CO 2. Explain and demonstrate the ecosystems setup, assess the magnitude of diversity to upkeep.
CO 3. Examine a range of pollution problems along with control and their eco-friendly disposal methods.
CO 4. Translate the sustainable development practice through clean development mechanisms.
CO 5. Evaluate the changing trends of world population and compile the information in order to document the environmental assets.

UNIT – I: (6 Hours):

Importance of Environmental Studies and Natural Resources: Definition of Environment – Importance - Need for Public Awareness

Forest Resources - Use and over exploitation - deforestation – consequences – case study

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

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

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

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

UNIT – II: (6 Hours):

Ecosystems: Definition – Structure of ecosystem: producers - consumers – decomposers. Functions of ecosystem: Food chains - food webs - ecological pyramids - Energy flow – Nutrient cycles (Carbon cycle and Nitrogen cycle). Ecological succession

Biodiversity and its conservation: Definition of Biodiversity - Values of biodiversity - Bio-geographical classification of India - Hot Spots of India - Endangered and endemic species of India – Threats to biodiversity - Conservation of biodiversity

UNIT – III: (6 Hours):

Environmental Pollution: Definition – causes - effects - control measures of Air pollution - Water pollution - Noise pollution - Nuclear hazards

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

Disaster management: floods – earthquakes – cyclones

UNIT – IV: (6 Hours):

Social Issues and the Environment: Concept of Unsustainable and Sustainable development – Water conservation: Rain water harvesting - Watershed management - Global environmental challenges: climate change - global warming – acid rains - ozone layer depletion - World summits on environment: Stockholm conference – Rio-earth summit – Kyoto protocol – EIA - definition – significance - scope – stages of EIA – Environment (Protection) Act - Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act - Wildlife (Protection) Act - Forest (Conservation) Act

UNIT – V: (4 Hours)

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

Field work: Visit to local area to document environmental assets - River/ forest/ grassland/ Visit to local polluted sites Urban/ Rural/ industrial/ Agricultural

TEXT BOOKS:

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

REFERENCE BOOKS:

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

I Year B. Tech., II Semester

ENGLISH
(Common for all Branches – Semester I / II)

Subject Code: 18HST101 **Internal Marks: 40**
Credits: 2.0 **External Marks: 60**

COURSE OBJECTIVES:

- To enable students build vocabulary appropriate to their levels and to make students understand printed texts of different genres
- To enhance basic writing skills of the students in different forms of written communication
- To assist students implicitly synthesize the rules of grammar for the production of accurate sentences
- To aid students acquire appropriate and adequate letter writing skills
- To get students produce written texts using appropriate vocabulary and expression, coherence devices and logical arguments

COURSE OUTCOMES:

CO 1. Students will be able to comprehend printed texts of different genres more easily and they will be able to make appropriate word choice.
CO 2. Students will be able to write short texts masterly.
CO 3. Students will be able to construct grammatically correct sentences.
CO 4. Students will be able to communicate through letters and emails effectively.
CO 5. Students will be able to comprehend unfamiliar passages, and will be able to write précis and essays.

Course Syllabus:

UNIT–I:
Father's Help by R K Narayan: Vocabulary Building: Word Formation—Root Words—Prefixes and Suffixes— Synonyms and Antonyms—Idioms —Phrasal Verbs—One-word Substitutes—Standard Abbreviations

UNIT–II:
My Early Days by A P J Abdul Kalam: Basic Writing Skills: Tense— Voice— Reported Speech—Degrees of Comparison —If Clauses— Simple, Compound, Complex Sentences—Punctuation—Correction of Sentences

UNIT–III:
Politics and the English Language by George Orwell: Identifying Common Errors in Writing: Subject-Verb Agreement—Noun-Pronoun Agreement—Misplaced modifiers—Articles—Prepositions—Redundancies—Clichés

UNIT–IV:
Sacrifice by Rabindranath Tagore: Writing Practice: Letter Writing—Email Writing

UNIT–V:
Stopping by Woods on a Snowy Evening by Robert Frost: Writing Practice: Comprehension—*Précis Writing*— Essay Writing

SUGGESTED READINGS:

1. On Writing Well. William Zinsser. Harper Resource Book. 2001
2. Practical English Usage. Michael Swan. Oxford University Press. 1995.
3. Remedial English Grammar. F.T. Wood. Macmillan. 2007.
4. Step by Step. K. Nirupa Rani and others. Pearson. Delhi. 2013.
5. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.

I Year B. Tech., II Semester

CHEMISTRY
(Common for all Branches – Semester I / II)

Subject Code: 18BST108 **Internal Marks: 40**
Credits: 4.0 **External Marks: 60**

COURSE OBJECTIVES:
The students will become familiar and understand about:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalise reference electrodes and science of corrosion.
- Rationalise organic reactions such as addition, substitution, elimination, rearrangement reactions and polymerization.
- Distinguish Renewable & Non-Renewable energy resources and rationalise about green chemistry, batteries.

COURSE OUTCOMES:
The course will enable the student to:

CO 1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
CO 2. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
CO 3. Rationalise reference electrodes and science of corrosion.
CO 4. Rationalise organic reactions such as addition, substitution, elimination, rearrangement reactions and polymerization.
CO 5. Distinguish Renewable & Non-Renewable energy resources and rationalise about green chemistry, batteries.

UNIT-I:
Atomic Structure and Chemical Bonding: Types of Hybridisation-valency shell electron pair repulsion theory (VSEPR) -Molecular orbital theory(MOT) –Energy Level diagrams of diatomic molecules (O_2, CO) - Atomic and ionic sizes - ionization energies - electron affinity and electronegativity – variable oxidation states - coordination numbers and geometries.

UNIT-II:
Spectroscopy: Spectroscopy - Electronic spectroscopy-types of Electronic transitions and selection rules – Definition of Chromophore – Definition of Auxochrome – Absorption and intensity shifts. Principle of Fluorescence and Phosphorescence. Introduction to I.R. Spectroscopy –Fingerprint region–I.R.Values for Functional groups (-Carbonyl, -alcohol, -nitryle, -amino)- Introduction to NMR – Principle - equivalent and non-equivalent protons - Chemical shift& Splitting – Coupling Constant

UNIT-II:

Electrochemistry & Corrosion: Introduction to Electrochemistry - EMF of the cell or Cell potential-Electrochemical series and its importance–Reference electrodes (SHE and Calomel electrode).

Corrosion (chemical and electrochemical theory of corrosion) –Galvanic series. Factors effecting the rate of corrosion – Controlling of corrosion (Proper designing, Modifying the environment, Cathodic protections – Sacrificial Anodic and Impressed Current Cathodic Protection).

UNIT-IV:

Organic Reactions& Introduction to Polymers: Types of Organic reactions: Addition - electrophilic, nucleophilic and free radical - Substitution - electrophilic, nucleophilic (SN^1 and SN^2) and free radical – Elimination(E_1 and E_2) (E_{CB}- Examples) – Rearrangement Reactions (Claisen, Pinacol pinacolone rearrangement) – Diels-Alder reaction - Isomerism (Cis- Trans)

Definition of Polymer - Polymerisation(Addition and Condensation) – Functionality – Degree of Polymerisation–Classification of Polymers – Zeiglar Natta Catalysis.

UNIT-V:

Green Chemistry & Energy: Introduction to green chemistry – Definition and 12 principles of green chemistry. Types of energy sources – Renewable & Non-Renewable - Introduction to solar energy – harnessing of solar energy – photo voltaic cells – Concentrated Solar power plants.

Introduction of Energy storage devices: Principle& mechanism of Batteries&Supercapacitors, Types of Batteries (Alkaline & Lead-Acid) - Difference between Batteries and Supercapacitors.

TEXT BOOKS:

1. University chemistry, by B. H. Mahan
2. Elementary organic spectroscopy: principles and applications, by Y. R. Sharma
3. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane
4. "Engineering Chemistry", P. C. Jain and Monica Jain, Dhanpat Rai Publications, Co., New Delhi, 2004, 16th Edition

REFERENCE BOOKS:

1. Fundamentals of Molecular Spectroscopy, by C. N. Banwell
2. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
3. Physical Chemistry, by P. W. Atkins
4. Organic Chemistry: Structure and Function by K. P. C. Volhardt and N. E. Schore, 5th Edition.
5. Concise Inorganic Chemistry: Fifth Edition by J.D. Lee

DIFFERENTIAL EQUATIIONS
(Common for MECH, CSE, CIVIL& IT)

Subject Code: 18BST103 **Internal Marks: 40**
Credits: 4.0 **External Marks: 60**

COURSE OBJECTIVES:

- To solve the first order Ordinary Differential equations and apply to Orthogonal trajectories, Newton's Law of Cooling and Law of Growth (Decay).
- To solve second and higher order ordinary differential equations.
- To develop series solutions to Legendre's and Bessel's differential equations including properties.
- The effective mathematical tool for the solution of first order linear Partial differential equation and non-linear Partial differential equation (standard types).
- The effective mathematical tool for the solution of homogeneous and non-homogeneous Partial differential equations of higher order with constant coefficients.

COURSE OUTCOMES:

The course will enable the student to:

CO 1. Apply the mathematical tool for the solution of Ordinary Differential equations, Orthogonal trajectories, Newton's Law of Cooling and Law of Growth (Decay).

CO 2. Evaluate higher order homogenous and non-homogenous linear differential equations with constant coefficients.

CO 3. Estimate power series solutions for Legendre's and Bessel's differential equations including the recurrence relations.

CO 4. Frame Partial differential equation and evaluate first order linear and non-linear Partial differential equation (standard types).

CO 5. Apply mathematical tool for the solution of homogeneous and non-homogeneous Partial differential equation of higher order with constant coefficients.

UNIT-I:

Ordinary differential equations of first order: Linear - Bernoulli–Exact - Equations reducible to exact.- Orthogonal Trajectories-Newton's law of cooling - Law of Growth and Decay.

UNIT-II:

Ordinary differential equations of higher order: Higher order homogenous and non-homogenous linear differential equations with constant coefficients- Particular integrals for the functions of type $\sin(ax+b)/\cos(ax+b)$, x^m, e^{ax} , e^{ax} $V(x)$ - Method of variation of parameters.

UNIT-III:

Special Functions: Legendre's and Bessel's Differential equations – Solutions in power series – Orthogonality property and recurrence relations.

UNIT-IV:

Partial Differential Equations of first order: Partial differential Equations - Formation of partial differential equations – solutions of first order linear (Lagrange) equation and non-linear (standard type) equations.

UNIT-V:

Partial Differential Equations of higher Order: Homogenous and non homogeneous partial differential equations of higher order with constant coefficients - Particular integrals for the functions of type e^{ax+by}, sin(ax+by)/cos(ax+by), $x^m y^n$,, e^{ax+by} .V(x,y).

TEXT BOOKS:

1. B.V. Ramana, Higher Engineering Mathematics, 44th Edition, Tata McGraw Hill New Delhi,2014.
2. Dr. B.S. Grewal, Higher Engineering Mathematics, 43nd Edition, Khanna Publishers, 2015.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.

I Year B. Tech., II Semester

PROGRAMMING FOR PROBLEM SOLVING
(Common for all Branches – Semester I / II)

Subject Code: 18EST102 **Internal Marks: 40**
Credits: 3.0 **External Marks: 60**

COURSE OBJECTIVE:

- The course is designed to provide complete knowledge of C language. Students will be able to develop logics which will help them to create programs, applications in C. Also by learning the basic programming constructs they can easily switch over to any other language in future.

COURSE OUTCOMES:

The course will enable the student to:

CO 1. Understand the fundamentals of C programming
CO 2. Choose the loops and decision making statements to solve the problem
CO 3. Make use of pointers to access arrays, strings and implements different operations on arrays, and work with textual information, characters and strings.
CO 4. Apply programming to write modular programs, user defined functions to solve real time problems and allocate memory using dynamic memory management functions.
CO 5. Create user defined data types including structures and unions to solve problems and implement file operations in C programming for a given application.

UNIT – I:

Introduction to Programming : Introduction to components of Computer system, Algorithm, Flow chart, Program development steps, C Tokens, Structure of C program, Basic I/O statements, Operators, Operator precedence.

UNIT – II:

Control Structures: Decision statements: if, if-else, nested if and switch,
Iterative statements: for, while, do while and nested loops **Branching:** Break, continue, goto.

UNIT – III:

Arrays: Definition, Types: 1D, Multi Dimensional arrays, declaration, initialization, accessing elements, Matrix operations and String Handling.
Functions: Definitions, Declaration, Types of Functions, Parameter passing, Passing Arrays to functions, Recursion, library functions and Storage classes,

UNIT – IV:

Pointers: Definition, Declaration, Initialization, Pointer arithmetic, Pointer to pointer, functions and pointers, arrays and pointers, Dynamic memory allocation

UNIT – V:

Structures: Definition, Declaration, Accessing the structure elements, Array of structures, Arrays with in structures, pointer to structure, passing structure to function, nested structures, and unions.
Files: Definition, types of files, Opening modes, file IO Functions, Random access functions, Preprocessor directives.

TEXT BOOKS:

1. B. W Kernighan, Dennis M. Ritchie. The C – Programming Language. 2nd Edition, PHI.
2. A Structured Approach Using C by Behrouz A. Forouzan, Richard F. Gilberg 3rd Edition

REFERENCES BOOKS:

1. Yashwant Kantikar. 2012. Let Us C, 8th Ed. PBP Publications.
2. E. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.
3. https://www.tutorialspoint.com › Cprogramming › C – Home
4. https://www.programiz.com/c-programming

I Year B. Tech., II Semester

BASIC ELECTRONICS

Subject Code: 18EST105 **Internal Marks: 40**
Credits: 2.0 **External Marks: 60**

COURSE OBJECTIVES:

- To understand the operation, working, characteristics of semiconductor diode and zener diode.
- To explain the operation, working and characteristics of BJT & FET for different configurations.
- To know the amplifier operation and identify the capacitance effect.
- To study the advantages and disadvantages of feedback amplifier and also know the function of the various oscillators.
- To study the characteristics of operation amplifier.

COURSE OUTCOMES:

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

CO 1. Use the diode as a switch in rectifiers.
CO 2. Describe the BJT characteristics for various configurations.
CO 3. Explain the amplifier operations and identify the capacitance effect.
CO 4. Remember the advantage and disadvantages of feedback amplifiers and function of the various oscillators.
CO 5. Illustrate the various characteristics of the operation amplifier.

UNIT-I:

Diodes and Applications: Semiconductor Diode - Ideal versus Practical, Resistance Levels, Diode Equivalent Circuits, Diode as a Switch, Diode as a Rectifier, Half Wave and Full Wave Rectifiers, Breakdown Mechanisms, Zener Diode – Operation and Applications.

UNIT- II:

Transistor Characteristics: Bipolar Junction Transistor (BJT) – Construction, Operation, Amplifying Action, Common Base, Common Emitter and Common Collector Configurations, Field Effect Transistor (FET) – Construction, Characteristics of Junction FET.

UNIT-III:

Transistor Amplifiers: Classification, Small Signal Amplifiers – Basic Features, Common Emitter Amplifier, Coupling and Bypass Capacitors, Distortion, AC Equivalent Circuit.

UNIT- IV:

Feedback Amplifiers: Principle, Advantages of Negative Feedback, Topologies, Current Series and Voltage Series Feedback Amplifiers;
Oscillators: Classification, RC Phase Shift, Wien Bridge, LC oscillators.

UNIT-V:

Operational Amplifiers and Applications: Introduction to Op-Amp, Differential Amplifier Configurations, CMRR, PSRR, Slew Rate; Block Diagram, Pin Configuration of 741 Op-Amp, Characteristics of Ideal OpAmp, Concept of Virtual Ground.

TEXT BOOKS:

1. Integrated Electronics – Jacob Millman, Chritos C. Halkies, Tata Mc-Graw Hill, 2009.
2. Electronic Devices - FLOYD 5th Edition, Pearson Education.
3. Linear Integrated Circuits – D. Roy Chowdhury, New Age International (p) Ltd, 2003.

REFERENCE BOOKS:

1. Electronic Devices and Circuits – J. Millman, C.C. Halkias, Tata Mc-Graw Hill.
2. Electronic Devices and Circuits – R.L. Boylestad and Louis Nashelsky, Pearson/Prentice Hall, 9thEdition, 2006.
3. Op-Amps and Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.

I Year B. Tech., II Semester

ENGINEERING GRAPHICS AND DESIGN
(Common for all Branches – Semester I / II)

Subject Code: 18ESL104 **Internal Marks: 40**
Credits: 2.0 **External Marks: 60**

COURSE OBJECTIVES:

- Able to develop drawing skills.
- To draw orthographic views from the given isometric view and vice verse
- To understand the fundamentals of computer aided design and drafting

COURSE OUTCOMES:

CO 1. Draw projection of points and straight lines in first angle projection.
CO 2. Project plane surfaces and simple solids inclined to one reference plane.
CO 3. Convert orthographic views into isometric projections and vice-versa.
CO 4. Draw basic lines and profiles with commonly used operations in drafting software.
CO 5. Generate 2D drawings along with dimensioning in drafting software.

LIST OF EXERCISES:

PART-A: Conventional Engineering drawing

1 Projections of points
2 Projections of straight lines inclined to one reference plane only.
3 Projections of planes inclined to one reference plane only.
4 Projections of simple solids inclined to one reference plane only.
5 Conversion of isometric views into orthographic views
6 Conversion of orthographic views into isometric views.

PART-B: Basic Computer aided engineering drawing (2-D drawings)

1. Commands – Axes, Coordinate points, Creation of lines, Polylines, Square, Rectangle, Polygons, Spines, Circles, Ellipse, Text.
2. Move, Copy, Offset, Mirror, Rotate, Trim, Extend, Break, Chamfer, Fillet, Curves.

Note: Six Exercises are to be completed by using AutoCAD software

TEXT BOOKS:

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

REFERENCE BOOKS:

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

I Year B. Tech., II Semester

CHEMISTRY LAB
(Common for all Branches – Semester I / II)

Subject Code: 18BSL102 **Internal Marks: 40**
Credits: 1.5 **External Marks: 60**

COURSE OBJECTIVES:

The students will become familiar and understand about:

- Measure molecular/system properties such as kinematic viscosity, acid number of lubricating oil, etc
- Measure molecular/system properties such as surface tension, viscosity, pH, conductance of solutions, redox potentials, etc
- Measure molecular/system properties such as chloride content, hardness of water, dissolved oxygen, iron by colurimeter etc.
- Synthesize a small polymer molecule and analyze a salt sample.
- Estimate iron (by colurimeter), partition coefficient, adsorption of acetic acid by charcoal etc.

COURSE OUTCOMES:

The students will learn to:

CO 1. Measure molecular/system properties such as kinematic viscosity, acid number of lubricating oil, etc.
CO 2. Measure molecular/system properties such as surface tension, viscosity, pH, conductance of solutions, redox potentials, etc
CO 3. Measure molecular/system properties such as chloride content, hardness of water, dissolved oxygen, iron by colurimeter etc.
CO 4. Synthesize a small polymer molecule and analyze a salt sample.
CO 5. Estimate iron (by colurimeter), partition coefficient, adsorption of acetic acid by charcoal etc.

LIST OF EXPERIMENTS: Choice of 10-12 experiments from the following:

1. Determination of surface tension and viscosity
2. Determination of Hardness of water sample by EDTA Method.
3. Conductometric estimation of Acid by Base.
4. Conductometric estimation of mixture of acids by base.
5. Potentiometric Titrations.
6. Synthesis of a polymer/drug.
7. Determination of acid value of an oil
8. Chemical analysis of a salt
9. Determination of Dissolved Oxygen present in the given water sample by Modern Winkler's Method
10. Colurimetric estimation of iron
11. pH metric titrations
12. Determination of the partition coefficient of a substance between two immiscible liquids
13. Adsorption of acetic acid by charcoal Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg
14. Thin layer chromatography.
15. Determination of Chloride content present in given water sample.
16. Determination of kinematic viscosity of given lubricating oil.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

PROGRAMMING FOR PROBLEM SOLVING LAB
(Common for all Branches – Semester I / II)

Subject Code: 18ESL102 **Internal Marks: 40**
Credits: 1.5 **External Marks: 60**

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

At the end of the course students will be able to

CO 1. Solve the given problem using the syntactical structures of C language.
CO 2. Design programs involving decision structures and loops.
CO 3. Apply programming to solve different operations on arrays and strings.
CO 4. Develop modularity concept using functions and write programs for allocating memory dynamically.
CO 5. Construct C program that uses structures and unions and implement file operations on given application.

List of Experiments

1. Write the C programs to calculate the following
    a) Area of triangle when sides are given.
    b) Program for Type Casting.
    c) Interchanging values of two variables.

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

3. Write C programs for the following using decision making statements
    a) Program to find roots of quadratic equation.
    b) Find the Largest among 3 values.
    c) Calculate the grades of a student.

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

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

6. Implement the following using arrays
    a) Largest and smallest from a list of elements.
    b) Program for Linear Search.
    c) Program for Bubble Sort.

7. Implement the following using arrays
    a) Matrix addition.
    b) Matrix Multiplication.
    c) Program using string handling functions.

8. Implement C Program using any Numerical methods

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

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

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

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

TEXT BOOKS:

1. B. W Kernighan, Dennis M. Ritchie. The C – Programming Language. 2nd Edition, PHI.
2. A Structured Approach Using C by Behrouz A. Forouzan, Richard F. Gilberg 3rd Edition

REFERENCES BOOKS:

1. Yashwant Kantikar. 2012. Let Us C, 8th Ed.. PBP Publications.
2. E. Balagurusamy. 2011. C Programming. Tata Mc Graw Hills, New Delhi, India.
3. https://www.tutorialspoint.com › Cprogramming › C – Home
4. https://www.programiz.com/c-programming

I Year B. Tech., II Semester

LANGUAGE PRFICIENCY LAB
(Common to all Branches I/II Sem.)

Subject Code: 18HSL101 **Internal Marks: 40**
Credits: 1.5 **External Marks: 60**

COURSE OBJECTIVES:

- To enable students develop neutralized accent
- To assist students utter words intelligibly
- To help students converse aptly as the context demands
- To get students acquire perceptive abilities in professional conversations
- To aid students grasp and interpret information provided in graphs and tables

COURSE OUTCOMES:

CO 1. Students will be able to recognize differences among various accents and speak with neutralized accent.
CO 2. Students will be able to pronounce words accurately with the knowledge of speech sounds and use appropriate rhythm and intonation patterns in speech.
CO 3. Students will be able to generate dialogues for various situations.
CO 4. Students will be able to communicate perceptively and concisely.
CO 5. Students will be able to comprehend and interpret data provided in graphs and tables.

COURSE SYLLABUS:

UNIT-I:
Listening Comprehension of Audio and Video clips of different accents

UNIT-II:
Pronunciation—Intonation—Stress—Rhythm

UNIT-III:
Situational Dialogues

UNIT-IV:
Poster Presentation

UNIT-V:
Interpretation of Data in Graphs and Tables

REFERENCES BOOKS:

1. Communication Skills. Sanjay Kumar and Pushpa Lata. OUP. 2011.
2. Practical English Usage. Michael Swan. OUP. 1995.
3. Speak Well. K. Nirupa Rani. Orient Blackswan, Hyderabad. 2012.
4. Strengthen Your Communication Skills. M. Hari Prasad. Maruthi Publications, Hyd. 2014.
5. Strengthen Your Steps. M. Hari Prasad. Maruthi Publications, Hyderabad. 2012.
6. Technical Communication. Meenakshi and Sangeetha. OUP. New Delhi. 2013.

II Year B. Tech., I Semester

CONSTITUTION OF INDIA/ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE
(Common for EEE, ECE & MECH)

Subject Code: 18MCT203 **Internal Marks: 0**
Credits: 0.0 **External Marks: 0**

COURSE OBJECTIVES:

- To help Students regulate their behavior in a social environment as Engineering Professionals.
- To make students aware of the impact of taking social, legal and Administrative decisions about their profession.
- To understand the political and constitutional parameters in work environment.
- To understand the need and strengths of our nation and adopt their knowledge for future career.

COURSE OUTCOMES:

By the end of this course the student will be able to:

CO 1. Realize the rigidness of our Indian Politics and Administrative aspects.
CO 2. A Student can understand our nation federalism.
CO 3. Can assess different types of risks involved in misadministration.
CO 4. Can create competitive advantage.
CO 5. Summarizes the legal, Administrative, Political and Financial aspects for betterment of the National building.

UNIT - I

Introduction: historical perspective of the constitution of India - Salient features of the Indian Constitution - Amendment Procedure of The Indian Constitution. 42nd amendment (Mini Constitution) - 44th amendment (1978 – Janatha Govt.)

UNIT – II

Important features of constitution: Fundamental Rights(Article 12 to 35), Duties (51 A – 1976 emergency) and Directive principles (Article 36 to 51) of State Policy - Articles 14 to 18 - Articles 19 - Article 21.

UNIT – III

Parlimentary form of govt. in India: President of India - Emergency provisions -National Emergency – Article 352 President Rules – Article 356 - Financial Emergency – Article 360, Prime Minister and Cabinet - Supreme Court of India (Indian Judiciary)

UNIT – IV

Indian federalism: Union – State relations; - Legislative , Administrative and Financial relations. Local self Govt. – Constitutional Schemes in India (73 & 74 Constitutional amendments)

UNIT – V

Parlimentary Committees: Public Accounts Committee - Estimates Committee - Committee on Public Undertakings. - Election commission of India (Article -324) - Comptrollar and Auditor General (CAG) of India (Article – 148 to 150) - Finance Commission (Article – 280) - Neethi Aayog (Planning Commission) and - Political Parties.

TEXT BOOKS:

1. D.D Basu – Indian Constitution.
2. Dr. D. Surannaidu – Indian Political System.
3. Madhav Khosla – The Indian Constitution.

II Year B. Tech., I Semester

COMPLEX VARIABLES AND STATISTICAL METHODS
(Common for CIVIL, ME, ECE & EEE (II Year I&II Sem) Branches)

Subject Code: 18BST204 **Internal Marks: 40**
Credits: 3.0 **External Marks: 60**

COURSE OBJECTIVES:

- Test if a function is analytic, harmonic and then construct a harmonic conjugate function.
- Evaluate integrals using the Cauchy Integral theorem and identify singular points of a function then calculate residues using Residue Theorem.
- Understand the concept of sampling theory and perform t –test, z test, Chi-square test.
- Analyze the testing of hypothesis by t-test, z-test, Chi-square test. .
- Understand curve fitting and calculations of correlation coefficients and regression coefficients

COURSE OUTCOMES:

On completion of this course, students will be able to

CO 1. Construct a harmonic and conjugate harmonic function.
CO 2. Evaluate integrals using the Cauchy Integral formulae and identify singular points of a function then calculate residues using Residue Theorem.
CO 3. Execute Central limit theorem for Sampling Distributions and perform t –test, z test, Chi-square test.
CO 4. Test for sampling distributions of one mean, two means and their difference at α level of significance.
CO 5. Estimate a curve for the give data, calculate correlation coefficients and regression coefficients.

UNIT-I

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

UNIT-II

Complex Integral formula and Residues: Cauchy's integral theorem (without proof)-Cauchy's integral formula (without proof)-Generalized Cauchy's integral formula (without proof).
Laurent's Theorem (without proof), Singularity-types of singularity (isolated, essential, removable pole) – residue –calculation of residues – residue theorem (without proof) and its applications.

UNIT-III

Sampling Theory: *Discrete Random Variables- *Binomial –Possion's distributions – Continuous random variable – Normal distribution.
Introduction to Sampling Theory -Population and Samples –Sampling distribution of means (σ known and σ unknown)- central limit theorem- t –test, z-test, Chi-square test.

* Not to be examined

UNIT-IV

Tests of Hypothesis: Hypothesis-null and alternative hypothesis – type-I and type-II error –level of significance –one tail and two tail test – testing concerning one mean, two means, their differences.

UNIT-V

Curve fitting and Correlation: Curve fitting: Straight line, 2^{nd} degree parabola, power curve ($y=ax^b$), exponential curves($y= ab^x$, $y = ae^{bx}$).

Concept of correlation–types of correlation-Karl-Pearson correlation coefficient method and its properties-Rank Correlation coefficient. Regression-Linear regression and its properties

TEXT BOOKS:

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

REFERENCE BOOKS:

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

II Year B. Tech., I Semester

ENGINEERING MECHANICS
(Common to ME, EEE, ECE (II Year I&II Sem) Branches)

Subject Code: 18EST203 **Internal Marks: 40**
Credits: 4.0 **External Marks: 60**

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO 1. Determine the resultant of a planar force system using resolution of force and principle of moments.
CO 2. Draw free-body diagrams of given rigid bodies and compute unknown forces using equations of equilibrium of a planar force system by graphical and analytical methods.
CO 3. Comprehend the effect of friction on equilibrium of rigid bodies. Analyze the plane trusses by calculating axial forces in the members using method of joints.
CO 4. Calculate centroid and moment of inertia of plane figures of triangular, rectangular and circular cross sections.
CO 5. Demonstrate an understanding of the principles of kinematics and kinetics of particles and planar rigid bodies.

UNIT- I

Systems of forces: Introduction – parallelogram law – Forces and components - Resultant of coplanar concurrent forces - vector notation – moment of force – principle of moments – couples - Resultant of planar force systems.

UNIT II

Equilibrium of force systems: Equilibrium – free body diagrams – Equations of equilibrium – equilibrium of planar systems – graphical methods and analytical methods for equilibrium of planar systems – Moment of a Force and its applications, Varignon's theorem

UNIT- III

Friction: Introduction, limiting friction – types of friction and friction laws – application of friction - Inclined plane, wedge friction.
TRUSSES: Analysis of Plane trusses using method of joints.

UNIT- IV

Centroids and centre of gravity: Centre of gravity – centroids of area and lines – determination of centroids by integration – centroids of composite figures – theorems of Pappus.
Area moment of inertia : Moment of inertia – polar moment of Inertia – Radius of gyration - Transfer theorem for moment of Inertia – Moment of inertia of composite areas. Concept of mass moment of inertia.

UNIT- V

Kinematics: Rectilinear motion-curvilinear motion – Rectangular components of curvilinear motion - Normal and Tangential components of acceleration, Kinematics of rigid bodies - angular motion – fixed axis rotation – Definition and analysis of plane motion.

Kinetics: Kinetics of rigid bodies – equation of plane motion – fixed axis rotation – rolling bodies (simple examples) - general plane motion (Simple examples).

TEXT BOOKS:

1. I.B. Prasad: Applied Mechanics, Khanna Publishers, 19th Edition, 2009.
2. Ferdinand L. Singer: Engineering Mechanics, Harper Collins Publishers India, 3rd Edition, 2008.
3. A.K. Tayal: Engineering Mechanics, Umesh Publishers, 13th Edition, 2008.

REFERENCES BOOKS:

1. Irving. H. Shames: Engineering Mechanics, PHI Publishers, 4th Edition, 2008.
2. Timoshenko & Young: Engineering Mechanics, MGH Publishers, 4th Edition, 2010.
3. K.L. Kumar, Engineering Mechanics, TMH Publishers, 3rd Edition, 2009.
4. Engineering Mechanics by S. Timoshenko and D.H.Young, McGraw-Hill.
5. Engg. Mechanics / S.S. Bhavikati & J.G. Rajasekharappa.

II Year B. Tech., I Semester

THERMODYNAMICS

Subject Code: 18MET201 **Internal Marks: 40**
Credits: 4.0 **External Marks: 60**

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

On completion of this course, students should be able to

CO 1. Apply basic concepts, zeroth law and first law to non-flow processes of thermodynamics.

CO 2. Apply steady flow energy equation to flow systems, and second law and entropy calculations to thermodynamic components.

CO 3. Calculate available and unavailable energies, and apply Maxwell's equations. Determine energy transferred using equations and Mollier charts for pure substances.

CO 4. Determine properties of mixtures from the properties of its constituents and composition.

CO 5. Derive thermal efficiency and mean effective pressures for various thermodynamic cycles and compare their performances.

UNIT-I

Introduction and Zeroth Law:

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

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

UNIT-II

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

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

UNIT-III

Availability and Irreversibility: Energy and available energy – Helmholtz function and Gibbs function – Availability in steady flow and non-flow processes – Maxwell's Equations.

Pure Substances: Introduction, P-V-T surfaces, T-S & H-S diagrams, Mollier charts, Phase transformations – Dryness fraction – Various thermodynamic processes and energy transfer.

UNIT-IV

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

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

UNIT-V

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

TEXT BOOKS:

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

REFERENCES BOOKS:

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

II Year B. Tech., I Semester

MATERIALS ENGINEERING

Subject Code: 18MET202 **Internal Marks: 40**
Credits: 3.0 **External Marks: 60**

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

On completion of this course, students should be able to

CO 1. Gain thorough knowledge in engineering materials and their structures.
CO 2. Understand necessity of alloying and effect of alloying element on properties of materials.
CO 3. Understand thoroughly Iron carbon equilibrium diagram.
CO 4. Describe different types of cast irons and steels.
CO 5. Gain knowledge of heat treatment processes and powder metallurgy.

UNIT-I

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

UNIT-II

Constitution of Alloys: Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.
Phase Diagrams : Experimental methods of construction of equilibrium phase diagrams, Isomorphous alloy systems, Lever rule, Study of Iron and Iron carbide phase diagram.

UNIT-III

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

UNIT-IV

Heat treatment of steels: Stages of heat treatment and cooling methods. Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability, surface - hardening methods.
Powder Metallurgy: Definition, Methods of production of metal powders, Stages in powder metallurgical components preparation, Design considerations.

UNIT-V

Aluminum and Titanium: Classifications, Structure and properties.
Mechanical Properties and Testing: Types of properties, Hardness Testing: -Rockwell, Brinell and Vickers, Toughness Testing: Charpy V-Notch, Izod tests, creep, fatigue tests.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

II Year B. Tech., I Semester

FLUID MECHANICS AND HYDRAULIC MACHINES

Subject Code: 18MET203 **Internal Marks: 40**
Credits: 3.0 **External Marks: 60**

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

COURSE OUTCOMES:
On completion of this course, students should be able to
CO 1. Define various physical properties of fluids, and understand how manometers are used to measure fluid pressure. List various flow classifications.
CO 2. Derive and solve problems based on continuity equation. Apply Euler, Bernoulli, Navier-Stokes, Impulse-momentum equations to solve practical fluid flow problems.
CO 3. Compute losses in fluid flow using Darcy Weisbach equation. Explain and solve problems based on various flow measurement devices.
CO 4. Illustrate mechanism and construction of various Hydraulic Turbines like Pelton wheel, Kaplan and Francis. Compute efficiencies and select suitable turbine using characteristic curves, governing and cavitation.
CO 5. Calculate efficiency and performance characteristics of centrifugal and reciprocating pumps.

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

UNIT-II
Fluid Kinematics: Description of fluid flow: Path line, Stream line, Streak line, Stream tube, Velocity & Acceleration – Classification of fluid flows: Steady & Unsteady, Uniform &Nonuniform, Rotational &Irrationalflows, Continuity equation for 1D, 2D and 3D flows,Stream function, Velocity potential function
Fluid dynamics: Surface and Body forces – Euler's and Bernoulli's equations for flow along a stream line for 3D flow – Navier-Stokes equations (Explanation only) – Momentum equation and its applications: Force on pipe bend

UNIT-III
Measurement of flow: Pitot tube, Venturimeter and Orifice meter,
Closed Conduit Flow: Darcy Weisbach equation – Minor losses in pipes: Pipes in series and pipes in parallel – Total energy line and Hydraulic gradient line
Impact of jet on vanes: Inclined & Curved vanes (Stationary & Movable), Impact of jet on series of curved vanes

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

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

UNIT-V

Centrifugal pumps: Classification, working, and work done – Manometric head – Losses and Efficiencies – Specific speed – Pumps in series and parallel – Performance curves – NPSH **Reciprocating pumps:** Working, Discharge, Slip and indicator diagrams

TEXT BOOKS:

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

REFERENCE BOOKS:

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

II Year B. Tech., I Semester

FLUID MECHANICS AND HYDRAULIC MACHINES LAB

Subject Code: 18MEL201 **Internal Marks: 40**
Credits: 1.5 **External Marks: 60**

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

On completion of this course, students should be able to

CO 1. Conduct impact of jet on vanes, and performance test on Pelton wheel.
CO 2. Conduct performance tests on Francis turbine and Kaplan turbine.
CO 3. Conduct performance tests on single-stage and multi-stage centrifugal pump and reciprocating pump.
CO 4. Calibrate Venturimeter and orifice meter.
CO 5. Determine head loss and friction factor for a given pipeline.

List of Experiments

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

Note: conduct any 10 experiments from the given list.

II Year B. Tech., I Semester

COMPUTER AIDED DRAFTING LAB

Subject Code: 18MEL202 **Internal Marks: 40**
Credits: 1.5 **External Marks: 60**

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

On completion of this course, students should be able to

CO 1. Draw basic lines and profiles with commonly used operations in drafting software.
CO 2. Generate 2D drawings along with dimensioning in drafting software.
CO 3. Apply constraints, use layering concepts, and create assembly drawings.
CO 4. Create isometric drawings of the given orthographic views.
CO 5. Generate various orthographic views of a given model.

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

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

AUTOCAD/MECHANICAL DESKTOP PRACTICE:

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

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

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

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

BIOLOGY

(The Course is offered to CE, CSE and IT in 2nd Year 1st Semester; to EEE and ME in 2nd Year 2nd Semester and to ECE in 3rd Year 2nd Semester)

Subject Code: 18BST209 **Internal Marks: 40**
Credits: 3.0 **External Marks: 60**

COURSE OBJECTIVES:

COURSE OUTCOMES:

After studying the course, the student will be able to:

- **CO 1.** Describe how biological observations of 18th Century lead to major discoveries in the contemporary world.
- **CO 2.** Convey the classification of biology with respect to morphological, biochemical and ecological aspects, Identify and classify microorganisms.
- **CO 3.** Highlight the basic principles of Mendel's experiments during the passage of genetic material, Convey that all forms of life have the same building blocks though the manifestations are diverse and Identify DNA as a genetic material in the molecular basis of information transfer.
- **CO 4.** Classify enzymes and differentiate different mechanisms of enzyme action, Analyze biological processes at the simpler level.
- **CO 5.** Apply thermodynamic principles to biological systems.

UNIT-I

Introduction: Fundamental differences between science and engineering using live examples (Eye and Camera, Bird fly and Air craft etc.). Exciting and contemporary aspects of biology as an independent scientific discipline. Why we need to study biology? Discuss how biological observations of 18th Century that lead to major discoveries. Examples of Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor

UNIT-II

Classification of organisms and Microbiology: Introduction-Discuss classification based on (a) Cellularity - Unicellular or multicellular (b) Ultra structure- prokaryotes or eukaryotes (c) Energy and Carbon utilization - Autotrophs, heterotrophs, litho tropes (d) Ammonia excretion – aminotelic, uricotelic, ureotelic (e) Habitat - aquatic or terrestrial (f) Molecular taxonomy - three major kingdoms of life.

Concept of single celled organisms, Concept of species and strains, Identification and classification of microorganisms, Microscopy, Ecological aspects of single celled organisms, Sterilization and media compositions, Growth kinetics.

UNIT-III

Genetics, Bio-molecules and Information Transfer: Mendel's laws-Concept of segregation and independent assortment-Concept of allele-Gene mapping-Gene interaction-Epistasis, Meiosis and Mitosis, Concepts of recessiveness and dominance, Concept of mapping of phenotype to genes, Discuss about the single gene disorders in humans. Discuss the concept of complementation using human genetics.

Molecules of life-monomeric units and polymeric structures, Discuss about sugars-starch and cellulose, Amino acids- Proteins and lipids, Nucleotides and DNA/RNA.

Molecular basis of information transfer-DNA as a genetic material, Hierarchy of DNA structure-from single stranded to double helix to nucleosomes, Concept of genetic code, Genetic recombination.

UNIT-IV

Enzymes and Macromolecular analysis: Enzymology-Enzyme classification, General properties of Enzymes, Mechanism of enzyme action-examples, Enzyme kinetics and kinetic parameters

Protein Functions, Hierarchy in protein structure-Primary, secondary, tertiary and quaternary, Proteins as enzymes-transporters-receptors and structural elements

UNIT-V

Metabolism: Thermodynamics as applied to biological systems. Exothermic and endothermic versus endergonic and exergoinc reactions, ATP as an energy currency-breakdown of glucose to CO2 + H2O (Glycolysis and Krebs cycle) and synthesis of glucose from CO2 and H2O (Photosynthesis), Energy yielding and energy consuming reactions

TEXT BOOKS:

1. Biology: A global approach: Campbell, N. A.; Reece, J. B.; Urry, Lisa; Cain, M, L.; Wasserman, S. A.; Minorsky, P. V.; Jackson, R. B. Pearson Education Ltd.
2. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology: P. S. Verma; V. K. Agarwal, S Chand and CO. Ltd, New Delhi-55.
3. A Text Book of Animal Physiology: A. K. Berry, EMKAY Publications, New Delhi-51.

REFERENCES BOOKS:

1. Outlines of Biochemistry, Conn, E.E; Stumpf, P.K; Bruening, G; Doi, R.H., John Wiley and Sons.
2. Principles of Biochemistry (V Edition), By Nelson, D. L.; and Cox, M. M.W.H. Freeman and Company.
3. Molecular Genetics (Second edition), Stent, G. S.; and Calender, R.W.H. Freeman and company, Distributed by Satish Kumar Jain for CBS Publisher.
4. Microbiology, Prescott, L.M J.P. Harley and C.A. Klein 1995. 2nd edition Wm, C. Brown Publishers.

II Year B. Tech., II Semester

STRENGTH OF MATERIALS

Subject Code: 18MET204 **Internal Marks: 40**
Credits: 4.0 **External Marks: 60**

COURSE OBJECTIVES:

- To compute stress and strain by analysis of solids and structures.
- To plot shear force and bending moment distribution diagrams.
- To determine shear stresses and bending stresses in beams of circular, rectangular I and T cross sections.
- To determine torsional shear stresses in shafts and calculate crippling load for columns
- To compute deflection of beams

COURSE OUTCOMES:

On completion of this course, students should be able to

- Compute normal and shear stresses and strains in bars of varying sections and composite bars subjected to external forces and temperature changes.
- Calculate shear force and bending moments for statically determinate cantilever or simply-supported beams subjected to various loads and determine stresses and strains in thin cylinders.
- Determine flexural stresses and shear stresses in beams of circular, rectangular I, T and channel cross sections.
- Determine torsional shear stresses in circular and hollow circular shafts and calculate the crippling load for a column.
- Compute deflections of cantilever and simply supported beams using double integration and moment-area methods.

UNIT-I

SIMPLE STRESSES & STRAINS:

Types of stresses and strains, Hooke's law, Stress-strain diagram for mild steel, Working stress, Factor of safety, Lateral strain, Poisson's ratio, Bars of varying section – Composite bars – Temperature stresses, Elastic Constants and relationship between them.

UNIT-II

THIN CYLINDERS:

Thin seamless cylindrical shells - Derivation of formula for longitudinal and circumferential stresses - hoop, longitudinal and Volumetric strains - changes in diameter and volume of thin cylinders.

SHEAR FORCE AND BENDING MOMENT:

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

UNIT-III

FLEXURAL STRESSES:

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

SHEAR STRESSES:
Governing equation for shear stress – Shear stress distribution across cross sections like rectangular, circular, I, T and Channel.

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

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

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

TEXT BOOKS:
1. Strength of Materials, S.S. Bhavikatti, Lakshmi Publications,
2. Strength of Materials, R.K. Rajput, S. Chand Publications,

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

II Year B. Tech., II Semester

IC ENGINES

Subject Code: 18MET205 **Internal Marks: 40**
Credits: 3.0 **External Marks: 60**

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

On completion of this course, students should be able to

CO 1. Analyze air standard, fuel air and actual air cycles in terms of various losses. Understand construction, working and mechanism of engine subsystems.
CO 2. Describe combustion processes occurring in SI and CI engines. Identify the factors affecting flame speed, ignition lag, flame propagation and knocking.
CO 3. Calculate engine performance using various parameters and heat balance sheet.
CO 4. Determine exhaust gas emissions from SI and CI engines.
CO 5 Explain operating and working principles of rotary, reciprocating and axial flow compressors.

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UNIT-I

CLASSIFICATION OF IC ENGINES: Classification based on fuel, working cycle, method of fuel supply. Ignition and Governing. Scavenging of two stroke engines. Fuel – air cycles & actual air cycles and their analysis.

FUELS: Calculation of Calorific value of fuels, Stoichiometric air required – Conversion of volumetric to mass analysis and vice-versa – Flue gas analysis, ORSAT apparatus.

UNIT-II

Spark Ignition Engines: Flame speed-effect of turbulence and other parameters. Normal and abnormal combustion. Auto ignition and Pre ignition. Fuel requirements, knock ratings, combustion chambers. Carburetion-mixture strength requirements. Simple carburettor-limitations, compensating arrangements. Gasoline injection systems.

Compression Ignition Systems: Low and high speed types.Air utilization and output. Combustion process-Ignition delay. Knocking and effect of variables. Fuel requirements and rating. Combustion chambers. Fuel injection systems. Wankel engine.

UNIT-III

Performance of IC Engines: Measurement of engine power, analysis of engine performance. Factors effecting efficiency and power, heat loss, pumping loss. Geometry, Speed, Air/Fuel ratio. Heat balance test. BIS standards for testing and rating.

UNIT-IV

SI and CI engine emissions. Harmful effects. Emissions measurement methods. Methods for controlling emissions. EURO and BHARAT emission norms.

Alternate Fuels For IC Engines: Need for use of alternate fuels. Use of alcohol fuels. Biodiesel. Biogas and Hydrogen in engines.

II Year B. Tech., II Semester

UNIT-V

AIR COMPRESSORS:

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

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

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

TEXT BOOKS:

1. Ganesan,V., Internal Combustion Engines, Tata McGraw Hill Publishing Company, 2007.
2. Mathur, M.L., and Sharma, R.P., A Course in Internal Combustion Engines, Dhanpat Rai and Sons, 2008.

REFERENCE BOOKS:

1. Thermal Engineering, P.L.Ballaney, Khanna Publications,
2. Internal Combustion Engine Fundamentals, John B Heywood, McGraw Hill Publications,
3. A Course in Thermal Engineering, S.C. Arora, S. Domukundwar, Dhanpat Rai Publications,
4. John, B.H., Internal Combustion Engine Fundamentals, McGraw Hill, 1988.

II Year B. Tech., II Semester

MANUFACTURING TECHNOLOGY -I

Subject Code: 18MET206 **Internal Marks: 40**
Credits: 3.0 **External Marks: 60**

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

On completion of this course, students should be able to

CO 1. Outline functions, types and design considerations of various elements of casting process including patterns, molding materials especially of sand, gating, riser, runner and melting furnaces.
CO 2. Comprehend the working of different welding processes including arc, gas, resistance and other weldings, along with their subtypes of welding.
CO 3. Calculate rolling process parameters, and understand both forming and rolling processes.
CO 4. Explain principles of various kinds of extrusion, drawing, forging and sheet metal working processes.
CO 5. Explain various high velocity forming processes and plastic injection and blow molding processes.

UNIT-I

Foundry: Introduction to casting process, Process steps, Advantages, Applications, Pattern types and pattern allowances – Molding materials, Importance of constituents, Molding tools and equipment.
Molding Sands: Sand molding types: Types of sands – CO_2 molding – Shell molding.
Melting and Casting: Melting furnaces, Cupola, Electrical, Induction furnaces, casting defects, Remedies.
Gating system: Elements of gating system, Gating system design, Calculation of gating system dimensions for simple objects, Riser design, chills and chaplets, solidification of casting.

UNIT-II

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

UNIT-III

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

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

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

UNIT-IV

Forging: Fundamentals, Types of forging operations, Smith, Press, Drop forging.types of forging dies

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

UNIT-V

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

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

II Year B. Tech., II Semester

INSTRUMENTATION AND CONTROL

Subject Code: 18MET207 **Internal Marks: 40**
Credits: 3.0 **External Marks: 60**

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

On completion of this course, students should be able to

CO 1. Define basic principles of measurement systems, and describe dynamic performance characteristics and sources of error
CO 2. Explain various displacement, acceleration measuring instruments
CO 3. Explain various force, torque, power and speed measuring instruments
CO 4. Explain various non-electrical quantities measuring instruments.
CO 5. Explain various control system methods and pid controllers application

UNIT-I

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

Displacement measurement: Resistive, inductive and capacitive transducers to measure linear and angular displacement.
Measurement of acceleration: principles of seismic instruments, seismic instrument based capacitive and inductive accelerometer and vibrometer.

UNIT-II

Force, load, torque and speed measurements: elastic force meters, strain gauge load cell, electrical and strain gauge torsion meters and stroboscope speed measurement.
Strain measurement: Electrical resistance strain gauges, Gauge factor and measurement of tensile and compressive strains

UNIT-III

Pressure measurement: Thermal conductivity gauge, Ionization type pressure gauges, McLeod pressure gauge, Bourdon tubes, Bellows, Diaphragm gauges.
Temperature measurement: Expansion, Resistive, Thermocouples, Pyrometers.

UNIT-IV

Flow measurement: Rota meter, Turbine flow meter, Hot-wire anemometer, Magnetic flow meter, Ultrasonic flow meters
Humidity: Sling Psychrometer, Recording Type Psychrometer and Absorption Hygrometer.
Moisture: Dew point meter**.**

UNIT – V

Control system and controllers: Introduction, Importance, Classification, Open and closed systems with examples. Control system terminology, P, PI, PID Control Algorithms.
RH Stability Criterion, Introduction to Bode Plots.

TEXT BOOKS:

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

REFERENCES BOOKS:

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

II Year B. Tech., II Semester

STRENGTH OF MATERIALS / MATERIALS LAB

Subject Code: 18MEL203 **Internal Marks: 40**
Credits: 1.5 **External Marks: 60**

COURSE OBJECTIVES:

- To understand metallographic structures.
- To understand different material testing techniques.
- To find hardness, tension and compression strength of given specimens.

COURSE OUTCOMES:

On completion of this course, students should be able to

CO 1. Determine metallographic structure for pure metals, cast irons, mild steels, alloys.
CO 2. Interpret effect of heat treatment on hardness of steels measured using Jominy End Quench Test.
CO 3. Test mechanical properties of given specimen using tension test, compression test, bending test, shear test on universal testing machine.
CO 4. Grade the specimen by conducting Izod and Charpy impact strength, Brinell and Rockwell hardness tests.
CO 5. Compute spring stiffness by measuring spring deformations for applied loads.

STRENGTH OF MATERIALS LAB

LIST OF EXPERIMENTS:

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

MATERIALS LAB

LIST OF EXPERIMENTS:

1. Preparation of any one specimen and metallographic observation of pure metals copper and aluminum.
2. Preparation of any one specimen and metallographic observation of white cast iron, grey cast iron, nodular iron.
3. Preparation of any one specimen and metallographic observation of mild steel, low carbon steel, medium carbon steel, high carbon steel and high speed steel.
4. Preparation of any one specimen and metallographic observation of Al-Si alloys, Al-Bronze alloy, Pb-Tin soldering alloy, Pb-Tin antimony alloy.
5. Verify the effect of heat treatment on hardness of steels.
6. Hardenability measurement by Jominy End Quench test.

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

II Year B. Tech., II Semester

THERMAL ENGINEERING LAB

Subject Code: 18MEL204 **Internal Marks: 40**
Credits: 1.5 **External Marks: 60**

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

On completion of this course, students should be able to

CO 1. Measure and draw valve and port timing diagrams on IC engines.
CO 2. Determine engine frictional power by motoring, retardation and Morse tests.
CO 3. Conduct economical speed test and heat balance test on an engine.
CO 4. Conduct performance tests on 4-stroke diesel, 2-stroke petrol engines.
CO 5. Conduct performance test on multi-stage reciprocating air compressor. Study various types of boilers with its mountings and accessories.

LIST OF EXPERIMENTS:

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

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

II Year B. Tech., II Semester

PRODUCTION TECHNOLOGY LAB

Subject Code: 18MEL205 **Internal Marks: 40**
Credits: 1.5 **External Marks: 60**

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

On completion of this course, students should be able to

CO 1. Prepare green sand mold for single-piece and multi-piece patterns.
CO 2. Create joints using electric arc, spot, gas welding techniques.
CO 3. Outline practical procedure for TIG and MIG welding.
CO 4. Form plastic parts using injection and blow molding.
CO 5. Fabricate a pipe bend and a washer using hydraulic and mechanical press.

LIST OF EXPERIMENTS:

I. MOLDING PRACTICE:

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

II. WELDING PRACTICE:

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

III. PLASTIC MOLDING:

Injection Molding:

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

Blow Molding:

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

IV. MECHANICAL PRESSES:

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

II Year B. Tech., II Semester

TRANSFORM THEORY
(Interdisciplinary Elective – I)

Subject Code: 18IET211 **Internal Marks: 40**
Credits: 2.0 **External Marks: 60**

COURSE OBJECTIVES:

- To study the Laplace transform of different basic functions and its properties.
- To apply Inverse Laplace transforms to solve differential equations.
- To expand a function in Fourier series/ half range series valid for different intervals.
- To acquire knowledge of Fourier transform and its properties.
- To evaluate a partial differential equations.

COURSE OUTCOMES:

The student will be able to:

CO 1. evaluate the Laplace transform of different functions utilizing different properties.
CO 2. apply Laplace transforms to solve differential equations.
CO 3. expand a function in Fourier series/ half range series valid for different intervals.
CO 4. evaluate Fourier transform of different functions using its properties.
CO 5. solve 1-D wave equation and 1-D Heat equation by method of separation of Variables.

UNIT-I

Laplace Transforms: Laplace Transform - Properties - Laplace transform of derivative, integrals, multiplication by t^n and division by t.

UNIT-II

Inverse Laplace Transforms: Inverse Laplace Transform –Evaluation by partial fractions, convolution theorem, applications to ordinary differential equations.

UNIT-III

Fourier Series: Fourier Series -Even and odd functions– Fourier series of functions defined in the interval $(0, 2\pi)$, $(-\pi, \pi)$, $(0, 2c)$,$(-c,c)$ - Half – range Fourier sine and cosine series.

UNIT-IV

Fourier Transforms: Fourier Integral Theorem (without proof)- Fourier sine and cosine integrals – Fourier transform – Fourier sine and cosine transforms – Inverse Fourier, sine and cosine transforms.

UNIT-V

Applications of Partial Differential Equations: Method of Separation of variables –One dimensional wave equation - one dimensional heat equation.

TEXT BOOKS:

1. B.V.Ramana, Higher Engineering Mathematics, 44th Edition, Tata McGraw Hill New Delhi,2014.
2. Dr.B.S.Grewal, Higher Engineering Mathematics, 43nd Edition, Khanna Publishers, 2015.

REFERENCE BOOKS:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
3. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008

II Year B. Tech., II Semester

WATER SHED MANAGEMENT
(Interdisciplinary Elective – I)

Subject Code: 18IET214 **Internal Marks: 40**
Credits: 2.0 **External Marks: 60**

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO 1. Describe concepts and characteristics of watershed management .
CO 2. Explain principles of erosion and various measures to control erosion.
CO 3. Describe about rain water harvesting and its structures.
CO 4. Describe about land management.
CO 5. Describe about ecosystem management.

UNIT-I

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

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

UNIT-II

Principles of erosion: Types of erosion, factors affecting erosion, effects of erosion on land fertility and land capability, estimation of soil loss due to erosion, Universal soil loss equation.

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

UNIT-III

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

UNIT-IV

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

UNIT-V

Ecosystem management: Role of Ecosystem, soil enrichment, cropping pattern, sustainable agriculture, dry land agriculture, social forestry and afforestation.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

INTRODUCTION TO MATHEMATICAL SIMULATION AND MODELING
(Interdisciplinary Elective – I)

Subject Code: 18IET216 **Internal Marks: 40**
Credits: 2.0 **External Marks: 60**

COURSE OBJECTIVES:

- By the end of this course, students in this class will understand the basic principles of programming and implementing mathematical concepts in MATLAB. Specifically, they will be able to write numerical algorithms and evaluate the computational results using graphical representations. The ultimate goal is to motivate the students for their profession and for future courses in curriculum.

COURSE OUTCOMES:

CO 1. Translate mathematical methods to MATLAB code.
CO 2. Generalize results and represent data visually.
CO 3. Apply computer methods for solving a wide range of engineering problems.
CO 4. Utilize computer skills to enhance learning and performance in other engineering and science courses.
CO 5. Demonstrate professionalism in interactions with industry.

UNIT- I:

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

UNIT –II:

Data and Data Flow in MATLAB: Vectors, Matrix Operations & Operators, Reshaping Matrices, Arrays, Colon Notations, Functions.

UNIT- III:

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

UNIT- IV:

Matlab Advanced: Plotting graphs, Creating Plot & Editing Plot, MATLAB-Algebra, Calculus, Differential, Integration, Polynomials, solving a system of linear equations.

UNIT-V:

Simulink: Introduction, Importance, Model Based Design, Tools, Mathematical Modeling, Converting Mathematical Model into Simulink Model, Running Simulink Models, Introduction to scilab.

TEXT BOOKS:

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

REFERENCE BOOKS:

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

II Year B. Tech., II Semester

FUNDAMENTALS OF MATERIAL SCIENCE
(Interdisciplinary Elective – I)

Subject Code: 18IET217 **Internal Marks: 40**
Credits: 2.0 **External Marks: 60**

COURSE OBJECTIVES:

- To understand different engineering materials and their structures.

COURSE OUTCOMES:

On completion of this course, students should be able

CO 1. To gain thorough knowledge in engineering materials and their structures.
CO 2. To gain thorough knowledge in deformation in different engineering materials.
CO 3. Understand necessity of hot and cold working methods.
CO 4. Understand thoroughly mechanical properties.
CO 5. Describe different types material failures.

UNIT-I

Introduction: Introduction, classification of materials, crystal defects.

UNIT-II

Plastic deformation of single crystals: Plastic deformation of single crystals. Deformation by slip,. Deformation of single crystal. Deformation by twinning.

UNIT-III

hot working, cold working. Recovery, recrystallization and grain growth. Solidification mechanism.

UNIT-IV

Mechanical properties: Mechanical properties. Tensile stress-strain diagrams, proof stress, yield stress diagrams, modules of elasticity. Hardness Testing: -Rockwell, Brinell and Vickers.

UNIT-V

Impact toughness, Charpy V-Notch, fracture, ductile, brittle, Griffith criteria for brittle failure, creep, creep mechanisms, fatigue-mechanism-factors to improve fatigue resistance

TEXT BOOKS:

1. An introduction to material Science – V Raghavan.
2. Mechanical Metallurgy – GE Dieter.
3. Material Science – Callister.

REFERENCE BOOKS:

1. Material Science for Engineers – Vanvlack.
2. Material Science for Engineers – Schakleford.

II Year B. Tech., II Semester

ENGINEERING OPTIMIZATION TECHNIQUES
(Interdisciplinary Elective – I)

Subject Code: 18IET218 **Internal Marks: 40**
Credits: 2.0 **External Marks: 60**

COURSE OBJECTIVES:

- To formulate linear programming problem and solve linear programming problem by using graphical procedure.
- To understand computational procedure of simplex method and artificial variable technique.
- To understand the step wise procedure in obtaining optimum solution to transportation problem and Hungarian method for assignment problem.

COURSE OUTCOMES:

On completion of this course, students should be able to

CO 1. Formulate and solve linear programming problem by using graphical method.
CO 2. Solve the linear programming problem using simplex method and artificial variable technique.
CO 3. Solve both balanced and unbalanced transportation problem.
CO 4. Solve both balanced and unbalanced assignment problems.
CO 5. Solve single variable and multi variable optimization problems using classical optimization techniques.

UNIT-I

Linear programming: Formation of linear programming problem, Graphical solution to linear programming problem, simplex method, Big-M method.

UNIT-II

Transportation Problem: Formulation, Optimal solution, unbalanced transportation problems

UNIT-III

Assignment Problem: Formulation, Optimal solution, Traveling salesman problem.

UNIT-IV

Network Models: Project network, CPM and PERT, Critical path scheduling, Cost considerations in project scheduling.

UNIT-V

One dimensional Optimization methods: Fibonacci, Golden Section methods, Gradient of a function, steepest descent method

Genetic algorithm: working principle, reproduction, crossover, mutation, draw backs of GA.

TEXT BOOKS:

1. Introduction to Operations Research by V. K. Kapoor, S. Chand Publishers
2. Operations Research, S.D. Sharma, Kedarnath Ramanadh Pub.
3. Optimization for Engineering Design by K.Deb, PHI

REFERENCES BOOKS:

1. Operations Research, J.K. Sharma, MacMilan Pub.
2. Operations Research by P. Rama Murthy, New Age Pub.
3. CPM & PERT, L.S. Srinath, Affiliated East West Press

II Year B. Tech., II Semester

INTRODUCTION TO ELECTRONIC MEASUREMENTS
(Interdisciplinary Elective – I)

Subject Code: 18IET219 **Internal Marks: 40**
Credits: 2.0 **External Marks: 60**

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO 1. Identify electronic instruments, their Characteristics and use.
CO 2. Describe various signal generators, wave analyzers for distortion measurements.
CO 3. Measure Amplitude, Frequency and Phase of various signals using different types of CRO's.
CO 4. Design the AC bridges for measurement of resistance, inductance, capacitance for frequency changes.
CO 5. Explain various types of transducers and their applications for measuring non- electrical parameters.

UNIT I

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

UNIT II

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

UNIT III

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

UNIT IV

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

UNIT V

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

II Year B. Tech., II Semester

UNIX UTILITIES
(Interdisciplinary Elective – I)
(for ECE/EEE/MECH/CIVIL/IT)

Subject Code: 18IET21A **Internal Marks: 40**
Credits: 2.0 **External Marks: 60**

COURSE OUTCOMES:

1. Understands UNIX Architecture and Functions of OS
2. Effectively use the UNIX system to accomplish typical personal, office, technical, and software development tasks.
3. Effectively use software development tools including libraries, pre-processors, compilers, linkers, and make files.
4. Prepare simple readable user documentation using shell scripts.
5. Develop shell scripts to perform more complex tasks.

UNIT – I
History:- System structure – User perspective – Operating system services – Assumptions about hardware. Introduction to the Kernel: Architecture of the UNIX operating system – Introduction to system concepts – Kernel data structures – System administration.

UNIT – II
Introduction to Unix:- Architecture of Unix, Features of Unix , Unix Command - man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip.

UNIT – III
Unix Utilities:- Introduction to unix file system, vi editor, file handling utilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, Text processing utilities and backup utilities , detailed commands to be covered are tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, comm, cmp, diff, tr.

UNIT – IV
Introduction to Shells: Unix Session, Standard Streams, Redirection, Pipes, Tee Command, Command Execution, Command-Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization.

UNIT – V
Shell Programming: Basic Script concepts, Expressions, Decisions: Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

TEXT BOOKS:
1. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg.Thomson
2. Your Unix the ultimate guide, Sumitabha Das, TMH. 2nd Edition.
3. Unix for programmers and users, 3rd edition, Graham Glass, King Ables, Pearson Education.
4. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
5. Beginning shell scripting, E. Foster – Johnson & other, Wile Y- India.

IT SYSTEMS MANAGEMENT
(Interdisciplinary Elective – I)
(Common for ECE/EEE/MECH/CIVIL/CSE)

Subject Code: 18IET21B **Internal Marks: 40**
Credits: 2.0 **External Marks: 60**

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

CO 1. Describe the business value and processes of ICT services in an organization and apply that knowledge and skill with initiative to a workplace scenario.
CO 2. Analyze and evaluate the impact of new and current ICT services to an organization.
CO 3. Describe how effective IT Infrastructure Management requires strategic planning with alignment from both the IT and business perspectives in an organization.
CO 4. Characteristics of the network Security that affect user operations.
CO 5. Define, track, and maintain data and data resources and recent trends in IT.

UNIT - I

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

UNIT - II

Software Management: SDLC, The Waterfall Model, Advantages, Disadvantages, Conventional Software Management performance, Software Economics.

UNIT - III

Current computing environment: Complexity of current computing, multiple technologies. IT system Management: Common tasks in IT system management, approaches for organization IT management systems context diagram, patterns for IT system Management, Service level management, Financial Management, Capacity Management, availability management.

UNIT - IV

Security Management: Computer Security , Internet Security , Physical Security , Identity Management , Access control System, Intrusion Detection. Emerging trends in IT: E-commerce, GSM.

UNIT - V

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

TEXT BOOKS:

1. IT Infrastructure & Its Management, By Phalguni Gupta, Tata McGraw-Hill Education. (Unit 1,3,4,5)
2. Software Project Management , Walker Royce: pearson Education,2005.(Unit 2)

REFERANCE BOOKS:

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

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKLAI
(AUTONOMOUS)
B. Tech (Mechanical Engineering)

HEAT AND MASS TRANSFER

Subject Code: 18MET308 **Credits: 2**
III Year B. Tech., I Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:

- To bring the awareness on the importance and applications of the heat transfer analysis knowledge
- To transfer the knowledge on heat transfer mechanisms viz., conduction, convection and radiation
- To transfer the knowledge on design of heat transfer equipment viz., fins and heat exchangers
- To transfer the knowledge on method of reducing radiation heat transfer

COURSE OUTCOMES:

On completion of this course, students would be able to

- Identify the heat transfer mechanism and analyse the composite wall of Cartesian, cylindrical and spherical coordinate systems
- Analyse the unsteady heat conduction through lumped heat parameter analysis and using Heisler charts.
- Evaluate the proper length of the fin, effectiveness and efficiency of heat transfer
- Evaluate the natural and forced heat transfer coefficient for laminar & turbulent flow over the flat plate and laminar & turbulent flow through pipe
- Compute shape factors for radiative bodies of different configurations and evaluate the radiation heat exchange between two or more bodies through electrical analogy
- Design the heat exchanger by applying LMTD and effective NTU methods

UNIT-I

Modes of Heat Transfer: Mechanisms of heat transfer: Conduction, Convection, and Radiation.
Conduction-I: Fourier law of heat conduction – General heat conduction equation in Cartesian, cylindrical and spherical coordinates –Steady heat Conduction through plane walls, cylinders and spherical systems – Composite systems, Critical radius of insulation.

UNIT-II

Conduction-II: Heat Transfer from Extended Surfaces – Efficiency and Effectiveness, Transient Heat Conduction – Lumped System and infinite body analysis - Heisler's Charts

UNIT-III

Forced Convection: External Forced convection–Laminar and Turbulent flow over plates, Internal Forced convection - Laminar and Turbulent flow through pipes, Heat transfer coefficients.
Natural Convection: Mechanism of Free convection – Nusselt number, Velocity and Thermal boundary layer formation – Grashof Number, Prandtl Number and Reynolds Number, Flow over Horizontal and vertical plates

UNIT-IV

Heat Exchangers: Types of heat exchangers – Nature of heat exchange, direction of flow, mechanical design, physical state of fluid, Overall heat transfer coefficient –Fouling factor, Heat exchanger analysis: LMTD method & Effectiveness NTU method

UNIT-V

Radiation: Classification of radiative bodies, Laws of radiation: Wein's law, Stefan-Boltzman law, Kirchoffs law – Black body radiation, Shape factor – Radiation heat exchange between Gray bodies – Electrical analogy, Methods reducing Radiation - Reflective coating and Radiation shields.

Mass Transfer: Basic Concepts – Diffusion Mass Transfer – Fick's Law of Diffusion – Steady state Molecular Diffusion – Convective Mass Transfer – Momentum, Heat and Mass Transfer Analogy – Convective Mass Transfer Correlations

TEXT BOOKS:

1. Heat and Mass Transfer_ *Fundamentals and applications*, Yunus A. Cengel and A.J. Ghajar, McGraw Hill Education
2. Fundamentals of Engineering Heat and Mass Transfer, R.C. Sachdeva, New Age Pub.
3. Heat Transfer Databook, C.P. Kothandaraman, New Age Pub. (**Permitted for Exams)**

REFERENCE BOOKS:

1. Heat and Mass Transfer, D.K. Dixit, McGraw Hill Education
2. Heat and Mass Transfer, P.K. Nag, McGraw Hill Education
3. Heat Transfer, Jack P. Holman, McGraw Hill Education

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKLAI
(AUTONOMOUS)
B. Tech (Mechanical Engineering)

DESIGN OF MACHINE MEMBERS – I

Subject Code: 18MET309 **Credits: 3**
III Year B. Tech., I Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:

- To compute Principal stresses in members subjected to combined loading and determine the dimensions of a mechanical component subjected to static loads using theories of elastic failure.
- To compute the dimensions of a component subjected to fatigue loads for finite and infinite life and calculate the dimensions of a bolted joint subjected to eccentric loading.
- To Design the size of a rivet and weld bead in riveted and welded joints subjected to axial and eccentric loads.
- To Design the diameter of a shaft supporting gears and pulleys and compute the dimensions of keys and shaft couplings subjected to torsional loading.
- To Design helical springs and leaf springs for static and fatigue loadings and analyze cotter joints and knuckle joint subject ted to axial loading.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Compute Principal stresses in members subjected to combined loading and determine the dimensions of a mechanical component subjected to static loads using theories of elastic failure.
- Compute the dimensions of a component subjected to fatigue loads for finite and infinite life and calculate the dimensions of a bolted joint subjected to eccentric loading.
- Design the size of a rivet and weld bead in riveted and welded joints subjected to axial and eccentric loads.
- Design a shaft subjected to combined bending and torsion and compute the dimensions of keys and shaft couplings subjected to torsion.
- Design helical springs and leaf springs for static and fatigue loadings and analyze cotter joints and knuckle joint subject ted to axial loading.

UNIT – I

INTRODUCTION: General considerations in machine design, Design process, types of machine design.

PRINCIPAL STRESSES AND COMBINED LOADING IN MACHINE MEMBERS:
Stresses on an oblique plane when a member subjected to combination of tensile, compressive and shear loads. Principal planes and principal stresses for general stress system. Mohr's circle construction for like stresses, unlike stresses and two perpendicular direct stresses along with simple shear. Combined Torsional and bending stresses, theories of elastic failure, Design for strength and rigidity – Preferred numbers.

UNIT – II

Design against Fatigue load:

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

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

UNIT – III

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

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

UNIT – IV

SHAFTS: Design of solid and hollow shafts for strength and rigidity, Design of shafts for combined torsion, bending and axial loads.

KEYS AND SHAFT COUPLINGS: Design of Sunk key, Rigid couplings: Muff, Split-muff and flange couplings – Flexible couplings, Flange coupling (modified).

UNIT – V

COTTERS AND KNUCKLE JOINTS: – Cotter joints: Spigot and socket, Sleeve and cotter – Knuckle joints.

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

TEXT BOOKS:

1. Machine Design, V.B. Bhandari, Tata McGraw Hill Publications,
2. Machine Design, R.S. Khurmi, J.K. Gupta, S. Chand Publications,
3. Shigley's Mechanical Engineering Design, Joseph E Shigley, Tata McGraw Hill Publications,
4. Machine Design Data Book, V.B. Bhandari, Tata McGraw Hill Publications, (**Permitted for Exam).**

REFERENCES BOOKS:

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

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKLAI
(AUTONOMOUS)
B. Tech (Mechanical Engineering)

KINEMATICS & DYNAMICS OF MACHINERY

Subject Code: 18MET310 **Credits: 3**
III Year B. Tech., I Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:

- To differentiate Kinematic link, pair, mechanism, machine, inversions of a slider crank mechanism and straight line motion mechanisms.
- To determine the velocity and acceleration of various links in simple planar mechanisms using graphical methods.
- To Solve dynamic analysis of Slider crank Mechanism and determine the effect of gyroscopic couple on ships, automobiles and airplanes.
- To determine the interference, contact ratio, angle of action, sliding velocity of involute gears and calculate the train value of simple, compound and epicyclic gear trains.
- To determine the coefficient of fluctuation of speed in flywheels and Explain working principles of different governors.

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

- Differentiate Kinematic link, pair, mechanism, machine, inversions of a slider crank mechanism and straight line motion mechanisms.
- Determine the velocity and acceleration of links in simple planar mechanisms using graphical methods.
- Determine the interference, contact ratio, angle of action, sliding velocity of involute gears and calculate the train value of simple, compound and epicyclic gear trains.
- Solve dynamic analysis of Slider crank Mechanism and determine the effect of gyroscopic couple on ships, automobiles and airplanes.
- Determine the coefficient of fluctuation of speed in flywheels and Explain working principles of different governors.

UNIT – I
MECHANISMS: Kinematic Link, Classification: Rigid Link, Flexible and Fluid link, Constrained motion: Completely, Partially or successfully constrained, incompletely constrained, classification of kinematic pairs, Kinematic chain, Mechanism and machine, Inversions of Single slider crank chain.
Straight Line Motion Mechanisms: Exact and approximate - Peaucellier, Hart and Scott Russel mechanisms.

UNIT-II

VELOCITY AND ACCELERATION ANALYSIS OF MECHANISMS: Velocity and acceleration analysis of four bar, single slider crank, crank and slotted lever quick return motion mechanisms- Corioli's component of acceleration.

INSTANTANEOUS CENTRE METHOD: Kennedy's theorem –Determination of instantaneous centre, determination of angular velocity of various links in a four bar and slider crank mechanisms.

UNIT-III

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

GEAR TRAIN: Introduction, Train value, Types – Methods of finding train value or velocity ratio for simple, compound, reverted and epicyclic gear train.

UNIT-IV

STATIC & DYNAMIC FORCE ANALYSIS: Static and dynamic force analysis of slider crank mechanism.

GYROSCOPES: Gyroscopic forces and torques – Gyroscopic stabilization – Gyroscopic effects in airplane, naval ship and four wheeled automobile.

UNIT-V

FLYWHEELS AND THEIR DESIGN: Turning moment, Crank effort, turning moment diagrams – Determination of coefficient of fluctuation of energy and fluctuation of speed.

GOVERNERS: Watt, Porter, Proell and Hartnell governors - Sensitiveness, isochronism and hunting.

TEXT BOOKS:

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

REFERENCES BOOKS:

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

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKLAI
(AUTONOMOUS)
B. Tech (Mechanical Engineering)

MANUFACTURING TECHNOLOGY - II

Subject Code: 18MET311 **Credits: 3**
III Year B. Tech., I Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

On completion of this course, students should be able to

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

UNIT-I

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

UNIT-II

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

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

UNIT-III

RECIPROCATING MACHINE TOOLS: Shaper, Planer and Slotter.

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

UNIT-IV

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

UNIT-V

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

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

TEXT BOOKS:

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

REFERENCES BOOKS:

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

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKLAI
(AUTONOMOUS)
B. Tech (Mechanical Engineering)

APPLIED THERMODYNAMICS

Subject Code: 18MET312 **Credits: 3**
III Year B. Tech., I Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:

- To provide knowledge of steam turbines, steam nozzles and steam condensers.
- To provide knowledge on gas turbines and jet propulsions.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Calculate thermal efficiency of Rankine cycle with and without reheating and regeneration. Determine stoichiometric air required after converting from volumetric to mass analysis and vice-versa.
- Describe the function and working of various types of boilers along with its mountings and accessories. Calculate the boiler efficiency, chimney height for natural draught, and power to drive the fans.
- Design a nozzle for given requirements and calculate its efficiency. Understand the working of various types of steam condensers along with determining mass of cooling water required.
- Determine the performance of simple and compounded, impulse and multi-stage reaction turbines by drawing velocity diagrams and computing various efficiencies.
- Calculate efficiency of Brayton cycle along with reheating, regeneration and intercooler used in gas turbines. Describe the working principles of Ramjet, Pulsejet, Turbojet and Turboprop engines.

UNIT-I

PROPERIES OF STEAM – use of steam tables and Mollier chart – Separating and Throttling Calorimeter –properties of mixtures of steam and atmospheric air.

RANKINE CYCLE - schematic layout of the steam power plant, thermodynamic analysis of Rankine cycle, modified Rankine cycle Methods to improve cycle performance – Regeneration – Reheating – Binary-vapor cycles.

UNIT-II

BOILERS: Classification, Working and sketches of: Fire-tube boilers – Cochran, Cornish, Locomotive; Water-tube boilers – Bobcock and Wilcox, Stirling; High-pressure boilers – LaMont, Loeffler, Benson, Velox.

Boiler mountings and accessories. Natural draught chimney height, Condition for maximum discharge through chimney, Power required to drive forced-draught and induced-draught fans.

UNIT-III

STEAM NOZZLES: Function of a nozzle – applications - types, Thermodynamic analysis, Area-velocity relationship, flow through nozzles, Condition for maximum discharge, choking of nozzles, Critical pressure ratio, super saturated flow and Wilson line.

STEAM CONDENSERS – purpose of a condenser in a steam power plant – surface and mixing condensers, vacuum and condenser efficiency, Different types of modern wet and dry cooling towers.

UNIT-IV

IMPULSE TURBINES: Compounding methods: Velocity, Pressure, Pressure-velocity – Velocity diagrams, Power developed, Axial thrust, Blade or diagram efficiency, Condition for maximum efficiency.

REACTION TURBINES: Degree of reaction, Parson reaction turbine, Condition for maximum efficiency, Calculation of blade height.

UNIT-V

GAS TURBINES: Simple gas turbine plant – Ideal cycle, Essential components, Parameters of performance – Actual cycle, regeneration, intercooling and reheating – Closed and semi-closed cycles – Merits and demerits

JET PROPULSION: Working and schematic of Ramjet, pulsejet, turbojet and turboprop engines – Thrust power and propulsive efficiency for a turbojet engine, introduction to Rocket engines.

TEXT BOOKS:

1. Thermal Engineering by R.K. Rajput, S.Chand Publications,
2. Thermodynamics and Heat Engines- R.Yadav- Central book depot.
3. A Course in Thermal Engineering, S.C. Arora, V. Domukundwar, Dhanpat Rai Publications,

REFERENCES BOOKS:

1. Thermal Engineering, P.L. Ballaney, Khanna Publications,
2. Thermal Engineering, R.S. Khurmi, J.K. Gupta, S. Chand Publications,
3. Gas Turbines and Propulsive Systems, P.R. Kajuria, S.P. Dubey, Dhanpat Rai Publications,

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKLAI
(AUTONOMOUS)
B. Tech (Mechanical Engineering)

(INTER-DISCIPLINARY ELECTIVE – II)
PRINCIPLES OF MECHANICAL MEASUREMENTS
(for ECE/EEE/CIVIL)

Subject Code: 18OET325 **Credits: 2**
III Year B. Tech., I Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:

- To provide knowledge on static, dynamic behavior of measuring instruments and get the concepts of physical quantity measurement like pressure.
- To provide knowledge on measuring techniques for physical Quantity like pressure and flow.
- To provide knowledge on measuring techniques for temperature.
- To provide knowledge on measuring techniques for displacement.
- To provide knowledge on measuring techniques for mechanical quantities.

COURSE OUTCOMES:
At the end of the course the student will be able to:

- Define basic principles of measurement systems, and describe dynamic performance characteristics and sources of error.
- Measure pressure and flow using appropriate instruments
- Measure temperature using different transducers.
- Measure Displacement and Acceleration using appropriate devices.
- Measure force, torque speed and power using suitable instruments

UNIT- I
INTRODUCTION TO MEASUREMENTS: Basic functional descriptions of measuring instrument with examples, static and dynamic characteristics of measuring instrument.

UNIT- II
PRESSURE: classification of mechanical pressure gauges, working principles.
FLOW: Rota meter, magnetic flow meter, hot-wire anemometer, ultrasonic flow meter.

UNIT- III
TEMPERATURE: classification of temperature measuring methods according to their range of operation, working principles low temperature measurement and high temperature measurement techniques.

UNIT- IV
DISPLACEMENT: principle and operation of resistive, inductive, capacitive displacement transducers.

UNIT- V

FORCE, TORQUE, POWER, SPEED: Elastic force meter, load cells, Torsion meter, dynamo meter, stroboscope

TEXT BOOKS:

1. Measurement Systems: Applications & design by D.S Kumar.
2. Mechanical Measurements / BeckWith, Marangoni,Linehard, PHI / PE

REFERENCE BOOKS:

1. Measurement systems: Application and design, Doblin Earnest. O. Adaptation by Manik and Dhanesh/ TMH
2. Instrumentation and Control systems/ S.Bhaskar/ Anuradha Agencies.
3. Mechanical and Industrial Measurements / R.K. Jain/ Khanna Publishers.

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKLAI
(AUTONOMOUS)
B. Tech (Mechanical Engineering)

(INTER-DISCIPLINARY ELECTIVE – II)
LINEAR PROGRAMMING AND ITS APPLICATIONS
(for CSE/IT)

Subject Code: 18OET326 **Credits: 2**
III Year B. Tech., I Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:

- To formulate linear programming problem and solve linear programming problem by using graphical procedure.
- To understand computational procedure of simplex method and artificial variable
- technique.
- To understand the step wise procedure in obtaining optimum solution to transportation problem and Hungarian method for assignment problem.

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

- Formulate and solve linear programming problem by using graphical method.
- Solve the linear programming problem using simplex method and artificial variable technique.
- Solve the linear programming problem using dual simplex method.
- Solve both balanced and unbalanced transportation problem.
- Solve both balanced and unbalanced assignment problems.

UNIT I
Formation of linear programming problem, Graphical solution to linear programming problem.

UNIT II
Simplex method artificial variable techniques.

UNIT III
Introduction to Dual Simplex method problems.

UNIT IV
Transportation Problem:
Formulation, Optimal solution, unbalanced transportation problems

UNIT V
Assignment Problem:
Formulation, Optimal solution, Traveling salesman problem.

TEXT BOOKS:

1. Introduction to Operations Research by V. K. Kapoor, S. Chand Publishers
2. Operations Research, S.D.Sharma, Kedarnath Ramanadh Pub.

REFERENCES BOOKS:

1. Operations Research, J.K. Sharma, MacMilan Pub.
2. Operations Research by P. Rama Murthy, New Age Pub.
3. CPM & PERT, L.S. Srinath, Affiliated East West Press Pub.

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKLAI
(AUTONOMOUS)
B. Tech (Mechanical Engineering)

MINOR PROJECT - I

Subject Code: 18MEP301 **Credits: 2**
III Year B. Tech., I Semester **Internal Marks: 40**
External Marks: 60

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKLAI
(AUTONOMOUS)
B. Tech (Mechanical Engineering)

MACHINE TOOLS & METROLOGY LAB

Subject Code: 18MEL306 **Credits: 1.5**
III Year B. Tech., I Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:

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

COURSE OUTCOMES:

On completion of this course, students should be able to

- Generate plain and tapered steps using turning operations on lathe machine.
- Develop threads and knurled surfaces by using lathe machine.
- Perform drilling, Tapping slotting, shaping, Planning operations using respective machines.
- Operate milling machine and produce various milled surfaces.
- Create smooth surface by using surface grinding machine.
- Measure length, diameter, bore, angle, taper, flatness using various instruments.
- Measure gears and thread by mechanical methods. Use toolmakers microscope for optical measurements.

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MACHINE TOOLS LAB

LIST OF EXPERIMENTS:

1. Introduction of general purpose machines – Lathe, Drilling machine, Shaper, Paining machine and grinding machine. Slotting machine, Cylindrical Grinder, Surface grinder, Tool and Cutter grinder.
2. Step turning, taper turning on lathe machine.
3. Thread cutting and Knurling on lathe machine.
4. Drilling and Tapping.
5. Shaping and Planning.
6. Slotting.
7. Milling.
8. Cylindrical surface grinding.

METROLOGY LAB

LIST OF EXPERIMENTS:

1. Measurement of lengths, heights, diameters by vernier calipers micrometers.
2. Measurement of bores by internal micrometers and dial bore indicators.
3. Use of gear teeth, vernier calipers and checking chordal addendum and chordal height of spur gear.
4. Tool makers microscope and its application.
5. Angle and taper measurements by Bevel protractor, Sine bars.
6. Use of spirit level in finding the flatness of surface plate.

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKLAI
(AUTONOMOUS)
B. Tech (Mechanical Engineering)

HEAT TRANSFER LAB

Subject Code: 18MEL307 **Credits: 1.5**
III Year B. Tech., I Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:
The course content enables students to:

- Impart experimental experience in Heat Transfer Lab those support Mechanical Engineering.
- Provide students with an opportunity of direct experience of doing Heat Transfer Lab calculation so that they can understand the base of the principles and able to make a critical assessment of industrial environment.
- Teach the students fundamentals in element of Heat Transfer & its applications. So as to identify, formulate and solve the problems of Heat Transfer device designs.
- Develop an idea about how to measure heat transfer coefficients/constant like h, emissivity, Stefan Boltzmann constants for devices like metal rod, lagged pipe, etc.,
- Encourage the students to understand importance energy conversation and make them to experience with practical applications in Heat Transfer Lab.

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

- Evaluate heat transfer through lagged pipe, Insulating powder.
- Determine the Thermal conductivity of a given metal Rod and overall heat transfer coefficient for a composite slab.
- To Measure the Heat transfer coefficient for Pin Fin, Forced convection, Natural Convection, and Drop and Film wise condensation.
- Determine heat transfer in parallel-flow and counter-flow heat exchanger.
- Determine radiation heat transfer using Stefan-Boltzman and emissivity apparatus.

List of Experiments:

1. Composite Slab Apparatus – Overall heat transfer co-efficient.
2. Heat transfer through lagged pipe.
3. Heat Transfer through a Concentric Sphere
4. Determination of thermal conductivity of metal rod
5. Determination of temperature distribution, efficiency and effectiveness of the fin working in forced convection environment
6. Determination of transient thermal history of a metal
7. Determination of heat transfer coefficient in forced convection apparatus.
8. Determination of heat transfer coefficient in free convection apparatus.
9. Determination of LMTD and effectiveness of Parallel and Counter flow heat exchanger (concentric tube heat exchanger).
10. Determination of emissivity of specimen (emissivity apparatus)
11. To verify the Stefen-Boltzmann constant for thermal radiation.
12. Heat transfer in drop and film wise condensation.
13. Demonstration of finding critical thickness of insulation of a material
14. Demonstration of near isothermal characteristic exhibited by a heat pipe in comparison to stainless steel and copper pipes.

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKLAI
(AUTONOMOUS)
B. Tech (Mechanical Engineering)

CAD/CAM

Subject Code: 18MET313 **Credits: 3**
III Year B. Tech., II Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:

- To develop basic knowledge on computer aided drafting and modeling.
- To provide knowledge on computerized numerical control, process planning & manufacturing systems.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Describe CAD devices and software, graphic standards. Apply 2D & 3D transformations and inverse transformations.
- Develop mathematically synthetic curves and surfaces including Bezier curves and NURBS. Understand Boundary Representation (B-rep) and Constructive Solid Geometry (CSG) solid modeling methodologies.
- Describe computer aided manufacturing processes and write simple CNC programs to perform different operations like turning and milling.
- Explain group technology concepts in production to facilitate cellular manufacturing and develop automated process plans using variant and generative approaches.
- Differentiate steps involved in migrating from conventional manufacturing to FMS.

UNIT-I

PRODUCT LIFE CYCLE: CAD tools, CAD systems, Benefits of CAD – Working and Screen coordinate systems, Image drawing techniques, Stroke writing, Raster scan graphical user interface, Graphics standards.

2D AND 3D TRANSFORMATIONS: Geometric Transformations, Transformations of geometric models.

UNIT-II

GEOMETRIC MODELING: Wireframe models, Types and mathematical parametric representation of analytic and synthetic curves – Surface models, Types and mathematical parametric representation of analytic and synthetic surfaces – Solid models, Solid entities, Solid representation, Fundamentals of solid modeling, Introduction to Boundary Representation and Constructive Solid Geometry.

UNIT-III

NC/CNC: Definition of NC,CNC & DNC, Basic components of NC systems, Types of NC control systems, Applications of NC, NC part programming methods, Simple CNC part programming.

CAM: Definition of CAM, Tool Path Simulation and CNC program generation procedure in CAM.

UNIT-IV

GROUP TECHNOLOGY: History of Group Technology (GT), Role of GT in CAD/CAM integration, Part families, Classification and coding: MICLASS and OPITZ coding systems – Benefits of GT – Cellular manufacturing, Rank Order Clustering (ROC) method.

PROCESS PLANNING: Role of process planning in CAD/CAM integration, Approaches to computer aided process planning, Variant approach and generative approaches.

UNIT-V

FLEXIBLE MANUFACTURING SYSTEMS: Definition of FMS, Components, Classification, Work station types, Functions of material handling and storage systems, FMS layout configuration, Computer control system and its functions, Economic justification of FMS, Applications and benefits.

TEXT BOOKS:

1. CAD/CAM Theory and Practice, Ibrahim Zeid, Tata McGraw Hill Pub.
2. CAD/CAM Principles & Applications, P. N. Rao, Tata McGraw Hill Pub.
3. Automation, Production Systems & Computer Integrated Manufacturing, M.P. Groover, PHI Pub.
4. Introduction to Computer Graphics – Adams Rogers

REFERENCES BOOKS:

1. CAD/CAM, M.P. Groover, Emory Zimmers, Prentice Hall India Pub.
2. Computer Integrated Manufacturing System, Yorem Koren, McGraw Hill Pub.
3. CAD/CAM/CIM, P. Radhakrishnan, S. Subramanyan, V. Raju, New Age Pub.

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKLAI
(AUTONOMOUS)
B. Tech (Mechanical Engineering)

DESIGN OF MACHINE MEMBERS - II

Subject Code: 18MET314 **Credits: 3**
III Year B. Tech., II Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:

- To design piston and cylinder for IC engine and analyze stresses in thick cylindrical shells.
- To design the dimensions of connecting rod and crankshaft that can sustain various loads.
- To design power transmission components like flat & v-belts, ropes, pulleys for belt and rope drives.
- To design major dimensions of spur and helical gears for dynamic loads, bending strength, compressive strength and wear.
- To design journal, ball and roller bearings with adequate bearing life and heat dissipation.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Design piston and cylinder for IC engine and analyze stresses in thick cylindrical shells.
- Design the dimensions of connecting rod and crankshaft that can sustain various loads.
- Design power transmission components like flat & v-belts, ropes, pulleys for belt and rope drives.
- Design major dimensions of spur and helical gears for dynamic loads, bending strength, compressive strength and wear.
- Design journal, ball and roller bearings with adequate bearing life and heat dissipation.

UNIT-I

DESIGN OF THICK PRESSURE VESSELS: Thick cylinders-Prin- Lame's equation, Cylinders with external pressure, compound cylinders, Thickness of cylindrical shells.

DESIGN OF CYLINDER AND PISTON: Cylinder wall, Cylinder head, Studs for cylinder head, Piston head, piston ribs and cup, piston rings, Piston barrel, Piston skirt and Piston pin.

UNIT-II

DESIGN OF CONNECTING ROD: Buckling of connecting rod, cross-section of connecting rod, Big and small end bearings, Big end cap and bolts, check for whipping stress.

DESIGN OF CRANKSHAFT: Centre crankshaft at TDC position, Centre crankshaft at angle of maximum torque, Side crankshaft at TDC position, Side crankshaft at angle of maximum torque.

UNIT-III

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

DESIGN OF BELT AND ROPE DRIVES: Selection of flat belts, Pulleys for flat belts, Arms of cast iron pulley, Selection of V-belts and V-grooved pulley, Construction of wire rope, Stresses in wire ropes, Rope sheaves and drums.

UNIT-IV

DESIGN OF SPUR GEAR DRIVES: Force analysis on spur gear tooth, Gear blank design, module and face width, Beam strength of gear tooth, Effective load on gear tooth, Estimation of module based on beam strength, Wear strength of gear tooth, Estimation of module based on wear strength,

DESIGN OF HELICAL GEAR DRIVES: Force analysis on helical gear tooth, Beam strength of helical gears, Effective load on gear tooth and Wear strength of helical gears.

UNIT-V

BEARINGS : Types of Journal bearings - Lubrication - Bearing Modulus - Full and partial bearings -Clearance ratio - Heat dissipation of bearings, bearing materials - journal bearing design, Petroff equation - Ball and roller bearings - Static loading of ball & roller bearings, Bearing life.

TEXT BOOKS:

1. Machine Design, V.B. Bhandari, Tata McGraw Hill Publications,
2. Machine Design, R.S. Khurmi, S. Chand Publications,
3. Machine Design Data Book, S. Md. Jalaluddin, Anuradha Publications, (**Permitted for Exam**)
4. Machine Design Data Book, V.B. Bhandari, Tata McGraw Hill Publications, (**Permitted for Exam**)

REFERENCES BOOKS:

1. Machine Design, Schaum Series, Tata McGraw Hill Publications,
2. Machine Design, Joseph E. Shigley, McGraw Hill Publications,
3. Machine Design, N.C. Pandya and C.S. Shaw, Charotar Publications,
4. Machine Design, S.Md. Jalaluddin, Anuradha Publications,

ADITYA INSTITUTE OF TECHNOLOGY AND MANAGEMENT, TEKKLAI
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DYNAMIC SYSTEMS & MECHANICAL VIBRATIONS

Subject Code: 18MET315 **Credits: 3**
III Year B. Tech., II Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:

- To draw the CAM profile for the given follower motion which include uniform velocity, uniform acceleration/retardation and simple harmonic motions.
- To evaluate various cases of balancing of rotating masses and reciprocating masses using graphical or analytical method.
- To determine natural frequencies of free and forced, undamped and damped, single degree of freedom system which include longitudinal vibrating spring mass systems.
- To determine the whirling speed, transmissibility of single degree of freedom vibrating system and also determine natural frequencies of free and forced two degree of freedom spring mass systems.
- To compute natural frequencies of torsional vibrating spring mass systems and explain modal analysis.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Draw the CAM profile for the given follower motion which include uniform velocity, uniform acceleration/retardation and simple harmonic motions.
- Evaluate various cases of balancing of rotating masses and reciprocating masses using graphical or analytical method.
- Determine natural frequencies of free and forced, undamped and damped, single degree of freedom system which include longitudinal vibrating spring mass systems.
- Determine the whirling speed, transmissibility of single degree of freedom vibrating system and also determine natural frequencies of free and forced two degree of freedom spring mass systems.
- Compute natural frequencies of torsional vibrating spring mass systems and explain modal analysis.

UNIT-I

CAMS: Definitions of cam and followers, Uses, Types of followers and cams, Terminology, Types of follower motion: Uniform velocity, Uniform acceleration, Simple harmonic – Maximum velocity and maximum acceleration during outward and return strokes in the above 3 cases.

ANALYSIS OF MOTION OF FOLLOWERS: Roller follower, circular cam with straight and curved flanks.

UNIT-II

BALANCING OF ROTATING MASSES: single and multiple masses in single and different planes.

BALANCING OF RECIPROCATING MASSES: Primary, Secondary and higher balancing of reciprocating masses – Analytical and graphical methods – Locomotive balancing – Hammer blow, Swaying couple, Variation of tractive efforts -Unbalanced forces and couples.

UNIT-III

VIBRATIONS OF SINGLE DEGREE OF FREEDOM SYSTEM:

Introduction to Vibrations - Free vibration of single-degree-of-freedom systems - Free Vibration of mass attached to vertical spring & Damper, Harmonically excited vibration.

UNIT-IV

TRANSVERSE VIBRATIONS & VIBRATION ISOLATION AND TRANSMISSIBILITY:

Vibration under general forcing conditions -Transverse loads, Vibrations of beams with concentrated and distributed loads – Dunkerley's methods, Raleigh's method – Whirling of shafts, Critical speeds Vibration Isolation & Transmissibility of single degree of freedom systems

VIBRATIONS OF TWO DEGREE OF FREEDOM SYSTEM:

Free vibration of two degree-of-freedom systems - Free Vibration of mass attached to vertical spring & Damper, harmonically excited vibration.

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UNIT-V

TORSIONAL VIBRATIONS: Two and Three rotor systems.

Vibration of Multi-Degree-of-Freedom Systems under Free Vibration- Natural Frequencies and mode shapes – Eigen Value problems.

TEXT BOOKS:

1. Theory of Machines and Mechanisms, S.S. Rattan, Tata McGraw Hill Publications.
2. Theory of Machines, R.S Khurmi, J.K Gupta, S. Chand Publications.
3. Mechanical Vibrations, V.P.Singh, Dhanpatrai & Co. Publications.

REFERENCES BOOKS:

1. Mechanical Vibrations, Rao, S.S., Addison Wesley Longman, PHI Publications.
2. Textbook of Mechanical Vibrations, V. Rao, Srinivas, J. Dukkipati, 2nd Edition, PHI Publications.

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B. Tech (Mechanical Engineering)

(PROFESSIONAL ELECTIVE-I)
ROBOTICS

Subject Code: 18MEE311 **Credits: 2**
III Year B. Tech., II Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:

- This subject gives the knowledge about the fundamentals of the robotics technology and its wide area of applications in various fields.
- This gives the knowledge about the kinematic and dynamic aspects of the robot construction and designing aspects of the robots.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Describe commonly used robot configurations, end effectors, drives along with robotics history and applications.
- Describe working principles of various sensors and actuators commonly used in a robot.
- Solve forward and inverse kinematic problems of common robot configurations. Solve dynamic problems using Lagrange-Euler and Newton-Euler formulations.
- Develop robot trajectory planning avoiding obstacles. Program robot motions for simple robot applications.
- Discuss robot cell design and manufacturing & non-manufacturing applications of robots.

UNIT-I: Introduction to Robotics and Drive systems

Fundamentals of Robotics: Introduction to Robotics & Overview – Historical development of Robotics – Robotics & Automation- Terminology-DOF- Classification of Robots based on Configuration & Control –- Components of Industrial Robots – End-effectors.

Drive systems – Classification of actuators, Electric, Pneumatic and Hydraulic actuators.

UNIT-II: Transformations and Robot Kinematics

Transformations: Introduction – Fundamental transformations – Properties – Homogeneous transformations – Applicable to both 2D & 3D in robotics & Problems

Forward & Inverse kinematic models: Denavit - Hartenburg (D-H) representation for rotational joints – Applicable to forward kinematics & simple Problems – Applicable to Inverse kinematics.

UNIT-III: Trajectory Planning and Robot Dynamics

Trajectory planning: Introduction – Terminology – Steps in trajectory planning – Trajectory generation & types of trajectory-cubic polynomial and linear trajectory.

Robot Dynamics: – Differential transformations – Jacobian – Singularities – Lagrange- Euler (LE) formulation – Newton-Euler (NE) formulation

UNIT-IV Sensors and Robot Programming

Sensing systems – Overview of sensing – Functions of sensing – Types – position sensors: potentiometer, encoders, LVDT - Force and Torque sensors – Optical, Range sensors & Proximity sensors.

Programming: Introduction to robot programming – methods of programming – programming languages.

UNIT-V: Robot Motion planning and Applications:

Robot Motion planning: Types of motions planning schemes– Obstacle avoidance of various graph based approaches like visibility graph, varonol diagram, cell decomposition, tangent graph and accessibility graph.

Applications: Applications of robot in Material handling, machine loading/unloading, Assembly and inspection. Advantages and disadvantages of robots.

TEXT BOOKS:

1. Industrial Robotics, M. P. Groover, Pearson Education Publications,
2. Robotics & Control, R. K. Mittal, I. J. Nagarath, Tata McGraw Hill Publications,

REFERENCE BOOKS:

1. Robotics, K. S. Fu, Lee, McGraw Hill Publications,
2. An Introduction to Robot Technology, P. Coiffet, M. Chaironze, Kogam Page Publications, London.
3. Robotic Engineering, Richard D. Klafter, Prentice Hall Publications,
4. Robot Analysis and Intelligence, Asada, Slow time, Wiley Inter-Science Publications,
5. Introduction to Robotics, John J Craig, Pearson Education Publications,
6. Robot Dynamics & Control, Mark W. Spong, M. Vidyasagar, John Wiley & Sons (ASIA) Publications,

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(PROFESSIONAL ELECTIVE-I)
TOOL DESIGN

Subject Code: 18MEE312 **Credits: 3**
III Year B. Tech., II Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:
- To gain knowledge on designing of various cutting tools.
- To gain knowledge on designing of jigs and fixtures.

COURSE OUTCOMES:
On completion of this course, students should be able to
- Explain unconventional machining processes and super-finishing processes.
- Design single and multi-point cutting tools.
- Design twist drills and reamers.
- Design press tools including die-sets and plastic tools.
- Design jigs and fixtures for various machine tool operations.

UNIT-I
Classification and coding of carbide tools, Coated tools
Unconventional Machining Processes: Principles of working and applications of USM, EDM, ECM, AJM, LBM, and EBM
Super-finishing Processes: Honing, Lapping Burnishing, Ballizing, Polishing.

UNIT-II
Design of Single-Point Cutting Tools: Form Tools, Design of flat and circular form tools, Tool holding methods.
Design of Multi-Point Cutting Tools: Milling Cutters: Major types, design and manufacturing of peripheral, end and face milling cutters, forces and power estimation, grinding of milling cutters.
Broaches: Pull and Push types. Internal and External broaches, geometry and design and manufacturing of pull type and push type broaches.

UNIT-III
Drills: Twist drill geometry, Design and manufacturing of twist drill – Effect of variation of different angles on torque and thrust forces – Types and design of shanks – Sharpening of twist drill, Design and manufacture of twist drills.
Reamers: Types, Geometry, Reaming allowance, Tolerance disposition.

UNIT-IV
Design of Press Tools: Die set elements – Design of die set for simple components in Blanking, Piercing, Bending, Drawing, Forging and Spinning.
Plastic Tools: Plastic dies for simple components.

UNIT-V

Jigs & Fixtures: Design principles and constructional features – Locating methods associated with flat, cylindrical, internal and external surfaces, Types of locating pins, Requirements and choice of locating systems, Redundant location, Fool proofing – Setting blocks, Types of clamping devices and their basic elements, Quick action clamps and nuts.

TEXT BOOKS:

1. Tool Design, Cyril Donaldson, V. C. Goold, Tata McGraw Hill Pub.
2. Production Engineering Design (Tool Design, Surender Keshav, Umesh Chandra, Satya Prakashan Pub.

REFERENCES BOOKS:

1. Design of Cutting Tools, Rodin, Mir Publications, Moscow.
2. Metal Cutting Theory and practice, Amitabha Bhattacharya, Inyong Ham, ASTME Pub.

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(PROFESSIONAL ELECTIVE-I)
TRIBOLOGY

Subject Code: 18MEE313 **Credits: 3**
III Year B. Tech., II Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:

- To expose the student to different types of bearings, bearing materials,
- To understand friction characteristics and power losses in journal bearings.
- To learn theory and concepts about different types of lubrication.
- To learn concept of loss of materials on surfaces and its effects
- To design a tribological system with better efficiency

COURSE OUTCOMES:

On completion of this course, students would be able to

- Understanding friction characteristics in the field of Tribology
- Knowledge about different theories of lubrication to reduce friction and wear
- To enhance awareness of tribological issues in the design of machine components and braking systems
- Design a tribological system for optimal performance and will be able to develop technical project reports and technical presentations

UNIT-I

Tribology: Introduction to Tribology - Factors influencing Tribological phenomena, Thermo-physical Properties of materials relevant to friction and wear - Viscosity, flow of fluids, absolute and kinematic viscosity, temperature variation, viscosity index, Determination of viscosity - Viscometers.

UNIT-II

Hydrodynamic Lubrication: Hydrodynamic film - Minimum oil film thickness, Petroff's equation, Mckee's Investigation, Reynold's equation in two dimensions - Effects of side leakage, Oil Whip and Whirl

UNIT-III

Hydrostatic lubrication: Hydrostatic Film – Hydrostatic Journal Bearing and Hydrostatic Lifts
Engineering Surfaces: Surface characterization, Hertzian and nonhertzian contact, Contact Pressure and Deformation in Non-Conformal contacts.

UNIT-IV

Friction: Causes of Friction, Stick-Slip Friction Behaviour - Friction Instability, Sliding and Rolling Friction, Frictional Heating and Temperature Rise, Friction Measurement Techniques.
Wear: Wear And Wear Types, Mechanisms of Wear, Wear of Metals and Non-Metals. Wear Models - Asperity Contact, Uniform and Non-uniform Wear Rate, Geometrical Influence in Wear Models, Wear Damage, Wear Measurement and Controlling Techniques.

UNIT-V

Applications: Tribological consideration in design - Hydrodynamic Bearings and Gears, Mechanisms of tribological failures in machines, Surface Engineering for Wear and Corrosion resistance - Diffusion, Coating, Electro and Electro-less plating, Hot deep coating, Metal spraying, Cladded coating, Crystallizing coating, Selection of coating for wear and corrosion resistance - Potential properties and parameters of coating.

TEXT BOOKS:

1. Fundamentals of Tribology, Basu, SenGupta and Ahuja/PHI
2. Tribology in Industry :Sushil Kumar Srivatsava, S. Chand &Co.
3. Tribology : H.G.Phakatkar and R.R.Ghorpade,Nirali Publications

REFERENCE BOOKS:

1. Tribology – B.C. Majumdar,Tata McGraw Hill Co Ltd.
2. Lubrication - Raymono O. Gunther; Bailey, Bros &Swinfan Ltd.
3. Bearing Systems - Principles and Practice,PT Barwll.

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(INTER-DISCIPLINARY ELECTIVE – III)
ELEMENTS OF WORKSHOP TECHNOLOGY
(for ECE/EEE/CIVIL/CSE/IT)

Subject Code: 18OET335 **Credits: 2**
III Year B. Tech., II Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:

- To provide knowledge about the different manufacturing processes
- To impart knowledge on carpentry tools, operations and joints
- To understand the fitting tools, operations and joints
- To provide knowledge on forging tools, operations and joints
- To impart knowledge on sheet metal work tools, operations and joints

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

- Comprehend different manufacturing processes.
- Explain the carpentry tools and applications of carpentry joints.
- Explain the fitting tools and operations.
- Explain the forging tools and operations.
- Explain the sheet metal tools and operations and applications.

UNIT – I
Methods of manufacturing processes, casting, forming, metal removal processes, joining processes, surface finishing processes, basic workshop process, carpentry fitting, hand forging, sheet metal work, cold and hot working of metals.

UNIT – II
CARPENTRY:
Marking & measuring tools, Cutting Tools: Saws, Chisels, Planes, Boring Tools, Striking tools, Holding devices, Carpentry joints: Half lap joint, Mortise and tenon joint, bridle joint, dovetail joint.

UNIT –III
FITTING:
Marking & measuring tools, Holding Devices, Cutting tools: Hacksaw, Files, Chisels, Drill bits, Reamer, Taps, Dies & sockets, striking tools, Holding devices and Fitting Operations: chipping, filing, sawing, marking, drilling, reaming, tapping, dieing.

UNIT – IV

FORGING:

Hand forging - Hand tools**:** Anvil, swage block, Tongs, hammers, Chisels, Swages, Fullers, flatters, set hammer, punches and drift, Forging operations: Upsetting, drawing down, setting down, punching and drifting, bending, welding, cutting, swaging, fullering and flattering.

UNIT – V

SHEET METAL WORK:

Metals used for sheet metal work, Sheet metal hand tools: snips, stakes, hand hammers, mallets and Sheet Metal Operations: Shearing, bending, drawing, squeezing, Sheet metal joints-Hem joint, seam joint.

TEXT BOOKS:

1. Elements of Workshop Technology S. K. Hajra Choudhury, A. K. Hajra Choudhury.
2. Workshop Technology B. S. Raghuwanshi Dhanpat Rai & Co.,

REFERENCES BOOKS:

1. Workshop Technology by Virender Narula Pub: S.K.Kataria & Sons.

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MINOR PROJECT - II

Subject Code: 18MEP302 **Credits: 3**
III Year B. Tech., II Semester **Internal Marks: 40**
External Marks: 60

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3D MODELING LAB

Subject Code: 18MEL308 **Credits: 1.5**
III Year B. Tech., II Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES:

- To provide knowledge of modeling tools for creating solid and surface models.
- To provide knowledge on different CAD software.

COURSE OUTCOMES:
On completion of this course, students should be able
- To understand modeling using CAD software tools.
- To create virtual models of complex 3D components.

LIST OF EXPERIMENTS:
A) MODELING:
1. 3D Part modeling – Extrusion, Cut/hole, Sweep, Draft, Loft, Blend and Rib.
2. Editing – Move, Pattern, Mirror, Round and Chamfer
3. Conversion of 3D solid model to 2D drawing - Different views, Sections, Isometric view and Dimensioning
4. Introduction to Surface Modeling.
5. 3D modeling of machine elements like Flanged coupling and Screw jack.
6. Assembly Drawing (Using Application Packages)
   Parts drawing and preparation of assembled views given part details for components followed by practicing the same using CAD packages.
7. Suggested Assemblies: (any 3)
   Shaft couplings – Plummer block – Screw jack – Lathe Tailstock – Universal Joint – Machine Vice – Stuffing box – Safety Valves - Non-return valves – Connecting rod – Piston and crank shaft – Multi plate clutch – Preparation of Bill of materials and tolerance data sheet

Note: Use any of following software: CATIA, UNIGRAPHICS NX, SOLIDWORKS, SOLIDEDGE

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DYNAMICS LAB

Subject Code: 18MEL309 **Credits: 1.5**
III Year B. Tech., II Semester **Internal Marks: 40**
External Marks: 60

COURSE OBJECTIVES

- To understand and verify the laws governing the kinematics and dynamics of machines.
- To understand the effect of gyroscopic couple.
- To understand the function of governors and dynamometers.
- To understand the behaviour of vibration in simple mechanical systems.

COURSE OUTCOMES:

On completion of this course, students should be able to

- Determine gyroscopic couple.
- Test the performance of governors.
- Test for balancing of rotating masses.
- Determine the natural frequencies of vibrating systems and critical speed of rotating shaft.
- Analyze cam profile.

LIST OF EXPERIMENTS

1. Determination of gyroscopic couple using gyroscopic test rig.
2. Performance characteristics of a Watt/ Porter governor.
3. Performance characteristics of a spring loaded governor.
4. Performance characteristics of proell governor.
5. Experiment on Rope brake / Band brake dynamometer.
6. Experiment on static and dynamic balancing apparatus.
7. Determination of natural frequencies of un-damped as well as damped vibrating systems.
8. Determination of critical speed of rotating shaft.
9. Experiments using universal vibrating apparatus.
10. Experiment on Cam Analysis Apparatus.
11. Study of various gear trains.
12. Study of various mechanisms

Note : Any 10 experiments can be performed.

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PROFESSIONAL COMMUNICATION SKILLS LAB

Subject Code: 18HSL302 **Credits: 1.5**
III Year B. Tech., II Semester **Internal Marks: 40**
External Marks: 60