AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
(Approved by AICTE | Accredited by NAAC | Affiliated to JNTUA)
Gudur, Nellore Dist - 524101, A.P (India)

OUTCOME BASED EDUCATION
WITH
CHOICE BASED CREDIT SYSTEM

BACHELOR OF TECHNOLOGY

ACADEMIC REGULATIONS
UNDER AUTONOMOUS STATUS

DEPARTMENT OF
MECHANICAL ENGINEERING

B.Tech Regular Four Year Degree Programme
(For the batches admitted from the academic year 2016 - 2017)
B.Tech (Lateral Entry Admission)
(For the batches admitted from the academic year 2017 - 2018)

FAILURE TO READ AND UNDERSTAND THE REGULATIONS
IS NOT AN EXCUSE

S. No	Description
1	Preliminary Definitions and Nomenclatures
2	Foreword
3	Choice Based Credit System
4	Eligibility for Admission
5	Duration of Programme
6	Medium of Instruction
7	Semester Structure
8	Registration
9	Unique Course Identification Code
10	Curriculum and Course Structure
11	Division of marks for Internal and External Assessment
12	Evaluation Methodology
13	Grading Procedure
14	Award of Class
15	Conduct of Semester End Examinations and Evaluation
16	Supplementary Examinations
17	Attendance Requirements and Detention Policy
18	Promotion Rules
19	Graduation Requirements
20	Revaluation
21	Temporary Break of Study from the Programme
22	Termination from the Program
23	With-holding of Results
24	Student Transfers
25	Graduation Day

26 Conduct and Discipline

27 Grievance Redressal Committee

28 Transitory Regulations

29 Revision of Regulations and Curriculum

30 Program Outcomes

31 Frequently asked Questions and Answers About Autonomy

32 Malpractices Rules

One best book is equal to hundred good friends, but one good friend is equal to a library.

All of us do not have equal talent, but all of us have an equal opportunity to develop our talents

"This is the way to success"

Dr.A.P.J.Abdul Kalam

VISION AND MISSION OF THE INSTITUTE

VISION

To make Audisankara College of Engineering & Technology a centre for academic excellence where 21st century innovative minds manage with novel ideas & spreadout new technologies relevant to the social needs with increased employment opportunities and changed lifestyle.

MISSION

To provide the students with technological direction and support, acclaimed in latest cutting edge technologies with a blend of academic concepts and practical nuances in hot areas of engineering and technology so that they develop all the resourcefulness, competence and confidence to takeon the technological challenges of tomorrow.

PRELIMINARY DEFINITIONS AND NOMENCLATURES

Academic Council: The Academic Council is the highest academic body of the institute and is responsible for the maintenance of standards of instruction, education and examination within the institute. Academic Council is an authority as per UGC regulations and it has the right to take decisions on all academic matters including academic research.

Academic Autonomy: It's a privilege conferred to an institute by UGC following meticulous evaluation process to manage its academic programmes independently for promoting excellence.

Academic Year: An academic year consists of two semesters each lasting 21 weeks i.e., (one odd + one even). It is the period necessary to complete an actual course of study within a year.

AICTE: All India Council for Technical Education, New Delhi.

Autonomous Institute: An institute designated as autonomous by University Grants Commission (UGC), New Delhi in concurrence with affiliating University (Jawaharlal Nehru Technological University, Ananthapuramu) and State Government.

Backlog Course: A course is considered to be a backlog course if the student has not cleared and due to which obtained a failure grade (F) in that course.

Basic Sciences: Basic sciences are Mathematics, Physics, Chemistry, English etc., They provide the basic knowledge of all Engineering sciences.

Betterment: Betterment is a way that contributes towards improvement of the student's grade in any course(s). It can be done by either (a) re-appearing or (b) re-registering for the course.

Board of Studies (BoS): BoS is an authority as defined in UGC regulations, constituted by Head of the Organization for each of the departments separately. They are responsible to update and design curricula in respect of all the programs offered by the department.

Branch: It's specialization in an Engineering discipline like Electronics & Communication Engineering, Computer Science & Engineering, Electical & Electronics Engineering, Mechanical Engineering, Civil Engineering etc.

Certificate Course: It is a course that makes a student gain hands-on expertise and skills required for holistic development in a specific area/field.

Choice Based Credit System: The credit based semester system is one which provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching along with provision of choice for the student in the course selection.

Compulsory Course: Course required to be undertaken for the award of the degree as per the program.

UGC: University Grants Commission (UGC), New Delhi.

Continuous Internal Examination: It's an examination that evaluates a student's progress throughout the prescribed course.

Course: A course is a unit of teaching that typically lasts one academic term. Courses explore the practice of teaching from both applied and theoretical perspective.

Course Outcomes: Learning outcomes are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course or program.

Credit: A credit is a unit that gives weight to the value, level or time requirements of an academic course. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture/tutorial hour per week.

Credit Point: It is the product of grade point and number of credits for a course.

Cumulative Grade Point Average (CGPA): It is a measure of cumulative performance of a student over all the completed semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed upto two decimal places.

Curriculum: Curriculum incorporates the planned interaction of students with instructional content, materials, resources, and processes for evaluating the attainment of Program Educational Objectives.

Department: An academic entity that conducts relevant curricular and co-curricular activities, involving both teaching and non-teaching staff and other resources in the process of study for a degree.

Dropping from the Semester: A student who doesn't want to register for any semester can apply in writing in prescribed format before commencement of that semester.

Elective Course: A course that can be chosen from a set of courses. An elective can be Professional Elective and/or Open Elective.

Evaluation: Evaluation is the process of judging the academic performance of the student in her/his courses. It is done through a combination of continuous internal assessment and semester end examinations.

Grade: Standardized measurements of achievement in a course. It is an index of the performance of the students in a said course. Grades are indicated by alphabets.

Grade Point: It is a numerical weight allotted to each letter grade on a 10 - point scale.

ASCET: AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY, Gudur, Nellore Dist, Andhra Pradesh.

Massive Open Online Course (MOOC): MOOC courses inculcate the habit of self learning. MOOC courses would be additional choices in all the elective group courses.

Pre-requisite: A course, the knowledge of which is required for registration into higher level course.

Core: The courses that are essential constituents of each engineering discipline are categorized as professional core courses for that discipline.

Professional Elective: It indicates a course that is discipline centric. An appropriate choice of minimum number of such electives as specified in the program will lead to a degree with specialization.

Program: Bachelor of Technology (B.Tech) degree program / PG degree program: Master of Technology (M.Tech)/ Master of Business Administration (MBA) / Master of Computer Applications (MCA).

Program Educational Objectives: The broad career, professional and personal goals that every student will achieve through a strategic and sequential action plan.

Project Work: It is a design or research based work to be taken up by a student during his/her final year to achieve a particular aim. It is a credit based course and is to be planned carefully by the student.

Re-appearing: A student can reappear only in the semester end examination for the theory component of a course, subject to the regulations contained herein.

Registration: Process of enrolling into a set of courses in a semester of a Program.

Regulations: The regulations, common to all B.Tech programs offered by Institute are designated as "ASCET Regulations R-16" and are binding on all the stakeholders.

Semester: It is a period of study consisting of 15 to 18 weeks of academic work equivalent to normally 90 working days. The odd Semester starts usually in July and even semester in December.

Semester End Examinations: It is an examination conducted for all courses offered in a semester at the end of the semester.

S/he: A written representation of 'he or she' used as a neutral alternative to indicate someone of either sex.

Student Outcomes: The essential skill sets that need to be acquired by every student during her/his program of study. These skill sets are in the areas of employability, entrepreneurial, social and behavioral.

JNTUA: Means the Jawaharlal Nehru Technological University Anantapur, Ananthapuramu.

FOREWORD

The autonomy is conferred to **AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY**(ASCET), Gudur, Nellore Dist, Andhra Pradesh by University Grants Commission (UGC), New Delhi based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies like J N T University Anantapur (JNTUA), Ananthapuramu and AICTE. It reflects the confidence of the affiliating University in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own curriculum, examination system and monitoring mechanism, independent of the affiliating University but under its observance.

AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY is proud to win the credence of all the above bodies monitoring the quality in education and has gladly accepted the responsibility of sustaining, if not improving upon the standards and ethics for which it has been striving for more than a decade in reaching its present standing in the arena of contemporary technical education. As a followup, statutory bodies like Academic Council and Boards of Studies are constituted with the guidance of the Governing Body of the institute and recommendations of the JNTUA to frame the regulations, course structure and syllabi under autonomous status.

The autonomous regulations, course structure and syllabi have been prepared after prolonged and detailed interaction with several expertise solicited from academics, industry and research, in accordance with the vision and mission of the institute to order to produce a quality engineering graduates to the society.

All the faculty, parents and students are requested to go through all the rules and regulations carefully. Any clarifications needed are to be sought at appropriate time with Principal of the college, without presumptions, to avoid unwanted subsequent inconveniences and embarrassments. The cooperation of all the stake holders is sought for the successful implementation of the autonomous system in the larger interests of the college and brighter prospects of engineering graduates.

PRINCIPAL

AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
Gudur, Nellore Dist - 524101, A.P (India)

ACADEMIC REGULATIONS
B.Tech. Regular Four Year Degree Programme
(For the batches admitted from the academic year 2016 - 17)
&
B.Tech. (Lateral Entry Scheme)
(For the batches admitted from the academic year 2017 - 18)

For pursuing four year undergraduate Bachelor Degree programme of study in Engineering (B.Tech) offered by AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY under Autonomous status and herein after referred to as ASCET.

1.0 CHOICE BASED CREDIT SYSTEM

The Indian Higher Education Institutions (HEI's) are changing from the conventional course structure to Choice Based Credit System (CBCS) along with introduction to semester system at first year itself. The semester system helps in accelerating the teaching-learning process and enables vertical and horizontal mobility in learning.

The credit based semester system provides flexibility in designing curriculum and assigning credits based on the course content and hours of teaching. The choice based credit system provides a 'cafeteria' type approach in which the students can take courses of their choice, learn at their own pace, undergo additional courses and acquire more than the required credits, and adopt an interdisciplinary approach to learning.

Choice Based Credit System (CBCS) is a flexible system of learning and provides choice for students to select from the prescribed elective courses. A course defines learning objectives and learning outcomes and comprises of lectures / tutorials / laboratory work / field work / project work / comprehensive examination / seminars / assignments / alternative assessment tools / presentations / self-study etc. or a combination of some of these.

Under the CBCS, the requirement for awarding a degree is prescribed in terms of number of credits to be completed by the students.

The CBCS permits students to:

- Choose electives from a wide range of elective courses offered by the departments.
- Undergo additional courses of interest.
- Adopt an interdisciplinary approach in learning.
- Make the best use of expertise of the available faculty.

2.0 ELIGIBILITY FOR ADMISSION

The total seats available as per the approved intake are grouped into two categories viz. category A and Category B with a ratio of 70:30 as per the state government guidelines.

2.1 The admissions for category A and B seats shall be as per the guidelines of Andhra Pradesh State Council for Higher Education (APSCHE) in consonance with government reservation policy.

- **Under category A:** 70% of the seats are filled through EAMCET counseling.
- **Under category B:** 30% seats are filled based on 10+2 merits in compliance with guidelines of APSCHE.

2.2 Admission eligibility-Under Lateral Entry Scheme Students with diploma qualification have an option of direct admission into 2nd year B. Tech. (Lateral entry scheme). Under this scheme 10% seats of sanctioned intake will be available in each course as supernumerary seats. Admissions to this three year B Tech later entry programme will be through ECET. The maximum period to complete B. Tech. under lateral entry scheme is six consecutive academic years from the date of joining.

3.0. DURATION OF PROGRAMME

The course duration for the award of the Degree in **Bachelor of Technology** will be four academic years, with two semesters in each year. However if a student is unable to complete the course within 4 years, he/ she can do so by giving more attempts but within 8 consecutive academic years from the date of admission.

Academic Calendar

For all the eight semesters a common academic calendar shall be followed in each semester by having sixteen weeks of instruction, one week for the conduct of practical exams and with three weeks for theory examinations and evaluation. Dates for registration, sessional and end semester examinations shall be notified in the academic calendar of every semester. The schedule for the conduct of all the curricular and co-curricular activities shall be notified in the planner.

4.0.MEDIUM OF INSTRCTION

The medium of instruction shall be English for all courses, examinations, seminar presentations and project work. The curriculum will comprise courses of study as given in course structure, in accordance with the prescribed syllabi.

5.0 BRANCHES OF STUDY

- Civil Engineering (CE)
- Electrical & Electronics Engineering (EEE)
- Mechanical Engineering (ME)
- Electronics & Communication Engineering (ECE)
- Computer Science & Engineering (CSE)

6.0 TYPES OF COURSES

6.1 Foundation / Skill Course

Foundation courses are the courses based upon the content leads to enhancement of skill and knowledge as well as value based and are aimed at man making education. Skill subjects are those areas in which one needs to develop a set of skills to learn anything at all. They are fundamentals to learn any subject.

6.2 Core Course

There may be a core course in every semester. This is the course which is to be compulsorily studied by a student as a core requirement to complete the requirement of a programme in a said discipline of study.

6.3 Elective Course

Electives provide breadth of experience in respective branch and applications areas. Elective course is a course which can be chosen from a pool of courses. It may be:

- Supportive to the discipline of study
- Providing an expanded scope
- Enabling an exposure to some other discipline/domain
- Nurturing student's proficiency/skill.

An elective may be discipline centric (Professional Elective) focusing on those courses which add generic proficiency to the students or may be chosen from an unrelated discipline called as "Open Elective".

There are four professional elective groups; students can choose not more than two courses from each group. Overall, students can opt for four professional elective courses which suit their project work in consultation with the faculty advisor/mentor. Nevertheless, one course from each of the two open electives has to be selected.

7.0 SEMESTER STRUCTURE

Each academic year is divided into two semesters, TWO being Main Semesters (one odd + one even). Main Semesters are for regular class work. However, the following cases are exempted:

7.1 Students admitted on transfer from JNTUA affiliated institutes, Universities and other institutes in the subjects in which they are required to earn credits so as to be on par with regular students as prescribed by concerned 'Board of Studies'.

7.2 Each main semester shall be of 21 weeks (Table 1) duration and this period includes time for registration of courses, course work, examination preparation and conduct of examinations.

7.3 Each main semester shall have a minimum of 90 working days; out of which number of contact days for teaching / practical are 75 and 15 days for conduct of exams and preparation.

7.4 The academic calendar shown in Table 1 is declared at the beginning of the academic year.

Table 1: Academic Calendar

FIRST SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation and Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Semester Break and Supplementary Examinations			2 weeks
SECOND SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation & Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Summer Vacation and Supplementary Examinations			8 weeks

8.0 REGISTRATION

8.1 Each student has to compulsorily register for course work at the beginning of each semester as per the schedule mentioned in the Academic Calendar. It is absolutely compulsory for the student to register for courses intime. The registration will be organized departmentally under the supervision of the Head of the Department.

8.2 INABSENTIA registration will not be permitted under any circumstance.

8.3 At the time of registration, students should have cleared all the dues of Institute and Hostel in the previous semesters, paid the prescribed fees for the current semester and not been debarred from institute for a specified period on disciplinary or any other ground.

9.0 UNIQUE COURSE IDENTIFICATION CODE

Every course of the B.Tech program will be placed in one of the four groups of courses as listed in the Table 2. The various courses and their two-letter codes are given below;

S. No	Branch	Code
1	Civil Engineering	01
2	Electrical & Electronics Engineering	02
3	Mechanical Engineering	03
4	Electronics & Communication Engineering	04
5	Computer Science & Engineering	05

10.0 CURRICULUM AND COURSE STRUCTURE

The curriculum shall comprise Foundation/ Skill Courses, Core Courses, Elective Courses, Open Electives, Laboratory Courses, Technical Seminar, Term Paper, Communication Skills Practice, Soft Skills Practice, Professional Society Activities, Mini Project, Internship and Major Project and Comprehensive Viva-Voce. The list of elective courses may include subjects from allied disciplines also.

Contact Periods: Depending on the complexity and volume of the course, the number of contact periods per week will be assigned. Each Theory and Laboratory course carries credits based on the number of hours/week as follows:

- Contact Classes (Theory): 1credit per lecture hour per week.
- Tutorial Classes (Theory): 1credit per 2 lecture hours per week.
- Laboratory Hours (Practical): 1 credit for 2 Practical hours.

10.1Credit distribution for courses offered is shown in Table 3.

Table 3: Credit distribution

S. No	Course	Hours	Credits
1	Theory Course (Core/Foundation/Elective)	3	3
2	Theory Course (Core/Foundation/Elective)	2+2	3
3	MOOC Courses	-	3
4	Laboratory Courses/Drawing Courses	3	2
5	Technical Seminar	3	1
6	Term Paper	3	2
7	Mini Project	3	2
8	Internship	3	2
9	Major Project And Comprehensive Viva-Voce	8	12
10	Communication Skills Practice	3	1
11	Soft Skills Practice	3	1
12	Quantitative Aptitude	3	1
13	Technical Aptitude	3	1
14	Professional Society Activities	3	1
15	Full Semester Internship	-	21
16	Audit Course	-	-

10.2 Course Structure

Every program of study shall be designed to have 42 theory courses and 21 laboratory courses. Every course of the B.Tech program will be placed in one of the eight categories with minimum credits as listed in Table 4. In addition, a student has to carry out a mini project, project work and comprehensive examination.

Table 4: Category Wise Distribution of Credits

S. No	Category	Subject Area and % of Credits	Average No. of Credits
1	Humanities and Social Sciences (HS), including Management.	HS (05% to 10%)	**13**
2	Basic Sciences (BS) including Mathematics, Physics and Chemistry.	BS (10% to 15%)	**22**
3	Engineering Sciences (ES), including Workshop, Drawing, Basics of Electrical / Electronics / Mechanical / Computer Engineering.	ES (10% to 15%)	**18**
4	Professional Subjects - Core (PC), relevant to the chosen specialization/branch.	PC (40% to 50%)	**99**
5	Professional Subjects - Electives (PE), relevant to the chosen specialization/branch.	PE (10% to 15%)	**15**
6	Open Subjects - Electives (OE), from other technical and/or emerging subject areas.	OE (01% to 5%)	**03**
7	Project Work and Comprehensive Viva-Voce, Mini Project and Internship	10% to 15%	**16**
8	Technical Seminar, Term Paper, Quantitative Aptitude, Technical Aptitude and Professional Society Activities	CRT	**10**
		TOTAL	**196**

10.3 Semester-wise course break-up

Following are the TWO models of course structure out of which any student shall choose or will be allotted with one model based on their academic performance.

i. Full Semester Internship (FSI) Model and

ii. Non Full Semester Internship (NFSI) Model.

10.4 Four year Regular program (FSI Model):

In the FSI Model, selected/eligible students shall undergo Full Semester Internship in B.Tech 7^{th} Semester. In the Non FSI Model, the remaining students shall carry out the course work and project work as specified in the course structure. A student who secures a minimum CGPA of 7.5 upto 4^{th}

Semester with no backlogs and maintains the CGPA of 7.5 till 6th Semester shall be eligible to opt for FSI

10.5 For Four year regular program (FSI Model):

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
1st Semester	5 Foundation	3	21
2nd Semester	5 Foundation	3	21
3rd Semester	1 Foundation + 5 Core	3+CSP+PSA+Audit Course	24+1+1=26
4th Semester	1 Foundation + 5 Core	3+TS+SSP+PSA	24+1+1+1=27
5th Semester	6 Core	3+TP+QA+PSA	24+2+1+1=28
6th Semester	5 Core + 1 Elective	3+Mini Project +TA+PSA	24+2+1+1=28
7th Semester	3 Core + 1 Elective + 1 Open Elective	3+Internship+PSA	21+2+1=24
8th Semester	Full Semester Internship (FSI)		21
Total	39	21+TP+TS+Internship+ Mini Project+ CSP+ SSP+ QA+TA+PSA+FSI	196

10.6 For Four year regular programme (Non FSI Model)

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
1st Semester	5 Foundation	3	21
2nd Semester	5 Foundation	3	21
3rd Semester	1 Foundation + 5 Core	3+CSP+PSA+Audit Course	24+1+1=26
4th Semester	1 Foundation + 5 Core	3+TS+SSP+PSA	24+1+1+1=27
5th Semester	6 Core	3+TP+QA+PSA	24+2+1+1=28
6th Semester	5 Core + 1 Elective	3+Mini Project +TA+PSA	24+2+1+1=28
7th Semester	3 Core + 1 Elective + 1 Open Elective	3+Internship+PSA	21+2+1=24
8th Semester	3 Electives	Major Project +Viva	9+12=21
Total	42	21+TP+TS+Internship+Mini Project + CSP + SSP + QA+TA + PSA+Major Project	196

10.7 For Three year lateral entry program (FSI Model):

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
3rd Semester	1 Foundation + 5 Core	3+CSP+PSA+Audit Course	24+1+1=26
4th Semester	1 Foundation + 5 Core	3+TS+SSP+PSA	24+1+1+1=27
5th Semester	6 Core	3+TP+QA+PSA	24+2+1+1=28
6th Semester	5 Core + 1 Elective	3+Mini Project +TA+PSA	24+2+1+1=28
7th Semester	3 Core + 1 Elective + 1 Open Elective	3+Internship+PSA	21+2+1=24
8th Semester	Full Semester Internship (FSI)		21
Total	29	15+TP+TS+Internship+Mini Project+ CSP+ SSP +QA +TA +PSA + FSI	154

10.8 For Three year lateral entry program (Non FSI Model)

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
3rd Semester	1 Foundation + 5 Core	3+CSP+PSA	24+1+1=26
4th Semester	1 Foundation + 5 Core	3+TS+SS+PSA	24+1+1+1=27
5th Semester	6 Core	3+TP+QA+PSA+Audit Course	24+2+1+1=28
6th Semester	5 Core + 1 Elective	3+Mini Project +TA+PSA	24+2+1+1=28
7th Semester	3 Core + 1 Elective + 1 Open Elective	3+Internship+PSA	21+2+1=24
8th Semester	3 Electives	Major Project +Viva	9+12=21
Total	32	15+TP+TS+Internship+Mini Project+ CSP +SSP + QA + TA +PSA + Major Project	154

Note: PSA - Professional Society Activities
CSP - Communication Skills Practice
SSP – Soft Skills Practice
TS – Technical Seminar
TP – Term Paper
QA – Quantitative Aptitude
TA - Technical Aptitude

10.9 Course-wise break-up for Four year Regular program (FSI Model):

Total Theory Courses - 39 (36 Foundation and Core + 2 Professional Electives + 1 Open Elective)	39 @ 3credits each	117
Laboratory Courses – 21	21 @ 2 credits each	42
Term Paper with self study report	1@ 2 credit	02
Mini Project with self study report	1 @ 2credits	02
Internship	1 @ 2credits	02
Technical Seminar	1 @ 1credit	01
Communication Skills Practice	1 @ 1credit	01
Soft Skills Practice	1 @ 1credit	01
Quantitative Aptitude	1 @ 1credit	01
Technical Aptitude	1 @ 1credit	01
Professional Society Activities	5 @ 1credit each	05
Full Semester Internship	1 @ 21credit	21
	TOTAL CREDITS	**196**

10.10 Course-wise break-up for Four year Regular program(Non FSI Model)

Total Theory Courses - 42 (36 Foundation and Core + 5 Professional Electives + 1 Open Elective)	42 @ 3credits each	126
Laboratory Courses – 21	21 @ 2 credits each	42
Term Paper with self study report	1@ 2 credit	02
Mini Project with self study report	1 @ 2credits	02
Internship	1 @ 2credits	02
Technical Seminar	1 @ 1credit	01
Communication Skills Practice	1 @ 1credit	01
Soft Skills Practice	1 @ 1credit	01
Quantitative Aptitude	1 @ 1credit	01
Technical Aptitude	1 @ 1credit	01
Professional Society Activities	5 @ 1credit each	05
Major Project and Comprehensive Viva-Voce	1 @ 12credits	12
TOTAL CREDITS		**196**

10.11Course-wise break-up for three year lateral entry program(FSI Model)

Total Theory Courses - 29 (26 Foundation and Core + 2 Professional Electives + 1 Open Elective)	29 @ 3credits each	87
Laboratory Courses – 15	15 @ 2 credits each	30
Term Paper with self study report	1@ 2 credit	02
Mini Project with self study report	1 @ 2credits	02
Internship	1 @ 2credits	02
Technical Seminar	1 @ 1credit	01
Communication Skills Practice	1 @ 1credit	01
Soft Skills Practice	1 @ 1credit	01
Quantitative Aptitude	1 @ 1credit	01
Technical Aptitude	1 @ 1credit	01
Professional Society Activities	5 @ 1credit each	05
Full Semester Internship	1 @ 21credit	21
	TOTAL CREDITS	**154**

10.12 Course-wise break-up for three year lateral entry program (Non FSI Model):

Total Theory Courses - 32 (26 Foundation and Core + 5 Professional Electives + 1 Open Elective)	32 @ 3credits each	96
Laboratory Courses – 15	15 @ 2 credits each	30
Term Paper with self study report	1@ 2 credit	02
Mini Project with self study report	1 @ 2credits	02
Internship	1 @ 2credits	02
Technical Seminar	1 @ 1credit	01
Communication Skills Practice	1 @ 1credit	01
Soft Skills Practice	1 @ 1credit	01
Quantitative Aptitude	1 @ 1credit	01
Technical Aptitude	1 @ 1credit	01
Professional Society Activities	5 @ 1credit each	05
Major Project and Comprehensive Viva-Voce	1 @ 12credits	12
TOTAL CREDITS		**154**

11.0 DIVISION OF MARKS FOR INTERNAL AND EXTERNAL ASSESSMENT

Name of the Course	Continuous Internal Assessment (CIA)	Semester End Examination (SEE)
Theory	40	60
Laboratory	25	50
Technical Seminar	100	-
Term Paper	-	50
Mini Project	25	50
Internship	25	50
Communication Skills Practice	25	25
Soft Skills Practice	-	25
Quantitative Aptitude	-	50
Technical Aptitude	-	50
Professional Society Activities	-	-
Major Project and Comprehensive Viva-Voce	40	160

12.0 EVALUATION METHODOLOGY

The performance of a student in each semester shall be evaluated through Continuous Internal Assessment (CIA) and / or an Semester End Examination (SEE) conducted semester wise.

12.1 Theory Course

The performance of a student in every theory course shall be evaluated for total of 100 marks each, of which the relative weightage for Continuous Internal Assessment and Semester End Examination shall be 40 marks and 60 marks respectively.

12.2 Practical Course

The performance of a student in every practical course shall be evaluated for total of 75 marks each, of which the relative weightage for Continuous Internal Assessment and Semester End Examination shall be 25 marks and 50 marks respectively.

12.3 Internal Evaluation for Theory Course

The total internal weightage for theory courses is 40 marks with the following distribution.

- 30 marks for Mid-Term Examination
- 10 marks for Assignment Test

While the first mid-term examination shall be conducted on the 50% of the syllabus (Unit-I & Unit-II), the second mid-term examination shall be conducted on the remaining 50% of the syllabus (Unit III & Unit-IV).

10 marks are allocated for assignment test (as specified by the subject teacher concerned). The first assignment should be conducted after completion of Unit-I for 5 marks and the second assignment should be conducted after completion of Unit-III for 5 marks. The final Assignment Test marks will be the addition of these two.

Two midterm examinations each for **30 marks** with the duration of 90 minutes each will be conducted for every theory course in a semester. The midterm examination marks shall be awarded giving a weightage of 80% in the midterm examination in which the student scores better performance and 20% in the remaining midterm examination.

The final mid-term marks obtain by the addition of these two (80% + 20%).

Example: If a student scores 23 marks and 24 marks in the first and second mid-term examinations respectively,

then Weighted Average Marks = 24 x 0.8 + 23 x 0.2 = 23.8,

rounded to 24 Marks.

Note: The marks of any fraction shall be rounded off to the next higher mark.

12.4 Pattern of the midterm examination question paper is as follows

- A total of two Sections (Section-I & Section-II)
- Section-I contains five two marks questions. Two questions from each unit and a student has to be answered all five questions ($5 \times 2 = 10$ Marks)
- Section-II contains four questions are to be designed taking two questions from each unit and a student has to be answered three questions. ($3 \times 10 = 30$ Marks)
- Then its converted to 30 marks.

Pattern of the Assignment Test is as follows

- Five assignment questions are given in advance, out of which two questions given by the concerned teacher has to be answered during the assignment test
- Sum of Assignment Tests marks is considered.

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

12.5 Internal Evaluation for Practical Course

For practical subjects there shall be a Continuous Internal Evaluation during the semester for 25 internal marks. Out of the 25 marks for internal evaluation, day-today assessment in the laboratory shall be evaluated for 10 marks and internal practical examination shall be evaluated for 15 marks conducted by the laboratory teacher concerned.

12.6 Internal Evaluation for Design/ Drawing Courses

For the subject having design and/or drawing, (such as engineering graphics, engineering drawing, machine drawing, production drawing and building drawing) the internal marks distribution shall be 10 marks for day-to-day performance and 20 marks for Mid-Term Examinations.

12.7 Internal Evaluation for Technical Seminar

There shall be a Technical seminar presentation in 4th Semester. A Technical Seminar shall have two components, one chosen by the student from the course work as an extension and approved by the faculty supervisor. The other component is suggested by the supervisor and can be a reproduction of the concept in any standard research paper or an extension of concept from earlier course work. A hard copy of the information on seminar topic in the form of a report is to be submitted for evaluation along with presentation. The presentation of the seminar topics shall be made before a committee consisting of Head of the department, seminar supervisor and a senior faculty member. Each Technical Seminar shall be evaluated for 100 marks. Technical Seminar component-I for 50 marks and component-II for 50 marks making total 100 marks. (**Distribution of marks for 50:** 10 marks for report, 10 marks for subject content, 20 marks for presentation and 10 marks for queries).

12.8 Internal Evaluation for Communication Skills Practice

For communicational skills practice subject, there shall be a Continuous Internal Assessment during the semester for 25 internal marks. Out of the 25 marks for internal evaluation, day-today assessment in the laboratory shall be evaluated for 10 marks and internal practical examination shall be evaluated for 15 marks conducted by the laboratory teacher concerned.

12.9 Mini Project

The Mini Project shall be carried out during 6th Semester along with other lab courses by having regular weekly slots. Students will take mini project batch-wise and the batches will be divided as per the guidelines issued. The topic of mini project should be so selected that the students are enabled to complete the work in the stipulated time with the available resources in the respective laboratories. The scope of mini project could be handling part of the consultancy work, maintenance of the existing equipment, development of new experiment setup or can be a prelude to the main project with specific outcome.

Mini Project report will be evaluated for 75 marks. 25 marks for internal evaluation and 50 marks for external evaluation.

Assessment will be done by the supervisor/guide for 25 marks based on the work and presentation/ execution of the mini project.

The remaining 50 marks is based on report, presentation, execution and viva-voce. Evaluation is done by a committee comprising the mini project supervisor, Head of the Department and external examiner appointed by the Principal from the panel of experts recommended by Chairman, BOS in consultation with Head of the Department.

12.10 Internal Evaluation for Internship

Internship course is 25 marks for continuous internal assessment and will be evaluated based on day-to-day assessment by concern industry.

12.11 Internal Evaluation for Major Project Work: 8th Semester

The major project shall be carried out during the 8th Semester in the **Non FSI Model** and shall be evaluated for 200 marks out of which 60 marks for internal evaluation and 140 marks for semester end evaluation. Major project will be taken up batch wise and batches will be divided as per the guidelines. The object of major project is to enable the student to extend further the investigative study takenup as the project in Mini project under the guidance of the supervisor/ guide from the department.

The assignment normally includes:

- Preparing an action plan for conducting the investigation including the team work.
- In depth study of the topic assigned.
- Review and finalization of the approach to the problem relating to the assigned topic.
- Final development of product/process, testing, results, conclusions and further direction.
- Preparing a paper for conference presentation/ publication in journal, if possible.
- Preparing a dissertation in the standard format for being evaluated by the department.
- Final presentation of the work done before the Project Review Committee (PRC).

Major Project is allocated 60 internal marks. Out of 60, 30 marks are allocated for the supervisor/guide and head of the department to be evaluated based on two seminars given by each student on the topic of the project. The other 30 marks shall be evaluated on the basis of his presentation on the work done on his project by the Departmental Committee comprising of Head of the Department, respective supervisor/ guide and two senior faculty of the department appointed by the Principal.

12.12 External Evaluation for Theory Course - Semester End Examination

The Semester End Examination in each theory subject shall be conducted for 3 hours duration at the end of the semester for 60 marks.

Pattern of the Semester End Examination question paper is as follows:

- A total of two Sections (Section-I & Section-II)
- Section-I contains six two mark questions. One question from each unit and a student has to be answered all the six questions compulsory ($6 \times 2 = 12$ Marks)
- Section-II contains eight questions are to be designed taking two questions from each unit (Unit Wise - Either or type) of the total four units. ($4 \times 12 = 48$ Marks)

A student has to secure not less than a minimum of 40% of marks (24 marks) exclusively at the Semester End Examinations in each of the theory subjects in which the candidate had appeared. However, the candidate shall have to secure a minimum of 40% of marks (40 marks) in both external and internal components put together to become eligible for passing in the subject.

The emphasis on the questions is broadly based on the following criteria:

50 %	To test the objectiveness of the concept
30 %	To test the analytical skill of the concept
20 %	To test the application skill of the concept

12.13 External Evaluation for Practical Course

Out of 50 marks **35** marks are allocated for experiment (procedure for conducting the experiment carries 15 marks & readings, calculation and

result-20) and **10** marks for viva-voce examination with **5** marks for the record.

Each Semester External Lab Examination shall be evaluated by an Internal Examiner along with an External Examiner appointed by the Principal.

A candidate shall be declared to have passed in individual lab course if he secures a minimum of 50% aggregate marks (38 marks) (Internal & Semester External Examination marks put together), subject to a minimum of 50% marks (25 marks) in the semester external examination.

12.14 External Evaluation for Communication Skills Practice

25 marks to be conducted after 10 weeks of training to assess the training outcomes. Semester End Evaluation shall be done for 25 marks by the skilled soft Skill Trainer nominated by the Principal.

A candidate shall be declared to have passed in individual lab course if he secures a minimum of 50% aggregate marks (25 marks) (Internal & Semester External Examination marks put together), subject to a minimum of 50% marks (13 marks) in the semester external examination.

12.15 External Evaluation for Soft Skills Practice

25 marks to be conducted after 10 weeks of training to assess the training outcomes. Semester End Evaluation shall be done for 25 marks by the skilled soft Skill Trainer nominated by the Principal.

A candidate shall be declared to have passed in individual lab course if he secures a minimum of 50% marks (13 marks) in the semester external examination.

12.16 External Evaluation for Quantitative Aptitude

The external examination will be conducted for 50 Marks with 1 credit, examination type is Multiple Choice Question (MCQ) – Offline/Online.

12.17 External Evaluation for Technical Aptitude

The external examination will be conducted for 50 Marks with 1 credit, examination type is Multiple Choice Question (MCQ) – Offline/Online.

12.18 External Evaluation for Term Paper

The Term Paper is a self study report and shall be carried out either during 5th Semester along with other lab courses. Every student will take up this

term paper individually and submit a report. The scope of the term paper could be an exhaustive literature review choosing any engineering concept with reference to standard research papers or an extension of the concept of earlier course work in consultation with the term paper supervisor. The term paper reports submitted by the individual students during the 5th Semester shall be evaluated for a total of 50 marks for external evaluation, it shall be conducted by two Examiners, one of them being term paper supervisor as internal examiner and an external examiner nominated by the Principal from the panel of experts recommended by HOD.

12.19 External Evaluation for Major Project

The major project shall be carried out during the 8th Semester in the **Non FSI Model** and shall be evaluated for 200 marks. The Semester End Examination for major project work done during 8th Semester and for 140 marks shall be conducted by a Project Review Committee (PRC). The committee comprises of an External Examiner appointed by the Principal, Head of the Department and Project Guide/Supervisor. The evaluation of project work shall be conducted at the end of the 8th Semester. The above committee evaluates the project work report with weightages of 50% of the marks (50 marks) awarded by external examiner, 20% of marks (20 marks) awarded by HOD & 30% of the marks (30 marks) by Project Guide/ Supervisor respectively for a total of 100 marks. Of the 40 marks for Presentation & Viva-Voce examination, HOD evaluates for 10 marks and external examiner for 30 marks. The evaluation of 140 marks is distributed as given below:

Distribution of Project Work Marks

Sl. No.	Criterion	Marks
1	Report	100
2	Presentation & Viva – Voce	40

A candidate shall be declared to have passed in major project if he secures a minimum of 50% aggregate marks (100 marks) (Internal & Semester External Examination marks put together), subject to a minimum of 50% marks (70 marks) in the major project end examination.

12.20 Massive Open Online Courses (MOOCs)

Meeting with the global requirements, to inculcate the habit of self learning and incompliance with UGC guidelines, MOOC (Massive Open Online

Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers

Regulations for MOOCs

- The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.
- Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.
- A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.
- The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.
- Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.
- There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses.
- Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.

12.21 Internship

There shall be 60 hours duration to complete summer internship during summer vacations. The total internal weightage for internship course is 25 marks and will be evaluated based on day to day assessment by concern industry.

The external examination shall be evaluated by the two senior faculties (i.e one faculty act as external examiner and other one as internal examiner) for 50 marks based on the his/her report and presentation.

12.22 Full Semester Internship (FSI)

Full Semester Internship (FSI) programme carries 21 credits. During the FSI, student has to spend one full semester in an identified industry /firm / organization and has to carry out the internship as per the stipulated guidelines of that industry / firm / organization and the institute.

Following are the evaluation guidelines

- Profile and abstract –Student has to submit the industry profile and abstract of the project within four weeks from date of commencement of internship through mail or post.

  Weightage: 10%.

- Seminar 1 -at 9^{th} week from date of commencement of internship weightage: 10%
- Seminar 2 -Pre submission at 17^{th} week from date of commencement of internship– Weightage: 10%
- Internship Diary, weightage: 15 %
- Project Report, weightage: 15%
- Viva-voce & Final Presentation, weightage: 40%

The internship shall be evaluated for 200 marks out of which 60 marks for internal evaluation and 140 marks for external evaluation.

The external evaluation based on the report submitted and viva-voce exam for 140 marks by a committee comprising the HOD, Project supervisor and external examiner (Industry/ Academia).A minimum of 60% of maximum marks shall be obtained to earn the corresponding credits.

FSI shall be open to all the branches in the VII semester. The selection procedure is:

- Choice of the students
- CGPA (> 7.5) upto IV semester with no current arrears and maintains the CGPA of 7.5 till VI Semester

13.0 GRADING PROCEDURE

Grades will be awarded to indicate the performance of students in each theory subject, laboratory / practicals, Technical Seminar, Term Paper, Mini Project, Communication Skills Practice, Soft Skills Practice, Quantitative Aptitude, Technical Aptitude and Major Project. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 11 above, a corresponding letter grade shall be given.

13.1 As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	S (Superior)	10
80 and less than 90%	A (Excellent)	9
70 and less than 80%	B (Very Good)	8
60 and less than 70%	C (Good)	7
50 and less than 60%	D (Average)	6
40 and less than 50%	E (Pass)	5
Below 40%	F (FAIL)	0
Absent	AB	0

13.2 A student who has obtained an 'F' grade in any subject shall be deemed to have 'failed' and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier

13.3 To a student who has not appeared for an examination in any subject, 'Ab' grade will be allocated in that subject, and he is deemed to have 'failed'. A student will be required to reappear as a 'supplementary

student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier.

13.4 A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

13.5 A student earns grade point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding 'credit points' (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

Credit points (CP) = grade point (GP) x credits …. For a course

13.6 A student passes the subject/ course only when GP ³5 ('E' grade or above)

13.7 A student obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered.

For Mandatory courses "Satisfactory? or "Unsatisfactory? shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

13.8 Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i. The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \sum(C_i \times G_i) / \sum C_i$$

where, C_i is the number of credits of the i^{th} subject and G_i is the grade point scored by the student in the i^{th} course.

ii. The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \sum(C_i \times S_i) / \sum C_i$$

where "S_i" is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

iii. Both SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

iv. While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

Grade Point: It is a numerical weight allotted to each letter grade on a 10-point scale.

Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters S, A, B, C, D, E and F.

Example: Computation of SGPA and CGPA

Illustration for SGPA

Course	Credit	Grade Letter	Grade Point	Credit Point
Course-I	3	S	10	3x10=30
Course-II	3	A	9	3x9=27
Course-III	3	B	8	3x8=24
Course-IV	3	D	6	3x6=18
Course-V	2	B	8	2x8=16
Course-VI	1	C	7	1x7=7
	15			122

Thus, SGPA $= \frac{122}{15} = 8.13$

Illustration for CGPA

1st Semester	2nd Semester	3rd Semester	4th Semester
Credit: 21 SGPA: 8.13	Credit: 21 SGPA: 6.9	Credit: 26 SGPA: 7.3	Credit: 27 SGPA: 6.8
5th Semester	**6th Semester**	**7th Semester**	**8th Semester**
Credit: 28 SGPA: 8.2	Credit: 28 SGPA: 7.4	Credit: 24 SGPA: 7.2	Credit: 21 SGPA: 7.8

Thus, CGPA

$$\frac{(21\times 8.13)+(21\times 6.9)\times(26\times 7.3)+(27\times 6.8)+(28\times 8.2)(28\times 7.2)(24\times 7.2)(21\times 7.8)}{196}$$

$=7.432$

14.0 AWARD OF CLASS

14.1 After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of B.Tech. Degree he/she shall be placed in one of the following four classes:

CGPA ≥ 7.5	CGPA ≥ 6.5 and < 7.5	CGPA ≥ 5.0 and < 6.5	CGPA ≥ 4.0 and < 5.0	CGPA < 4.0
First Class with Distinction	**First Class**	**Second Class**	**Pass Class**	**Fail**

A student with final CGPA is < 4.00 will not be eligible for the Award of the Degree.

15.0 CONDUCT OF SEMESTER END EXAMINATIONS AND EVALUATION

15.1 Semester end examination shall be conducted by the Controller of Examinations (CoE) by inviting Question Papers from the External Examiners

15.2 Question papers may be moderated for the coverage of syllabus, pattern of questions by a Semester End Examination Committee chaired by CoE and senior subject expert before the commencement of semester end examinations. Internal Examiner shall prepare a detailed scheme of valuation.

15.3 The answer papers of semester end examination should be evaluated by the first examiner immediately after the completion of exam and the award sheet should be submitted to CoE in a sealed cover before the same papers are kept for second evaluation by external examiner.

15.4 In case of difference is more than 15% of marks, the answer paper shall be re-evaluated by a third examiner appointed by the Examination Committee and the marks awarded by third examiner is compared with first and second evaluation marks and higher marks of minimum difference pair will be considered as final marks.

15.5 CoE shall invite required number of external examiners to evaluate all the end-semester answer scripts on a prescribed date(s). Practical laboratory exams are conducted involving external examiners.

15.6 Examinations Control Committee shall consolidate the marks awarded by both the examiners and award grades.

16.0 SUPPLEMENTARY EXAMINATIONS

Apart from the regular End Examinations the institute may also schedule and conduct supplementary examinations for all subjects for the benefit of students with backlogs. Such students writing supplementary examinations as supplementary candidates may have to write more than one examination per day.

17.0 ATTENDANCE REQUIREMENTS AND DETENTION POLICY

17.1 A candidate shall putin a minimum required attendance of 75 % in that semester. Otherwise, s/he shall be declared detained and has to repeat semester.

17.2 For cases of medical issues, deficiency of attendance in a semester to the extent of 10% may be condoned by the College Academic Committee (CAC) on the recommendation of Head of the department if their attendance is between 75% and 65% in a semester, subjected to submission of medical certificates, medical case file and other needful documents to the concerned departments. The condonation is permitted maximum of two times during the entire course of study.

17.3 A prescribed fee shall be payable towards condonation of shortage of attendance.

17.4 A student shall not be promoted to the next semester unless he/she satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he/she shall not be eligible for readmission into the same class.

17.5 Any student against whom any disciplinary action by the institute is pending shall not be permitted to attend any SEE in that semester.

18.0 PROMOTION POLICIES

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no. 17.

18.1 In four year B.Tech program, a student shall be promoted from 2nd year to 3rd year only if s/he fulfills the academic requirements and earning of minimum 50% of credits upto 2nd year.

18.2 In four year B.Tech program, a student shall be promoted from 3rd year to 4th year only if s/he fulfills the academic requirements and earning of minimum 50% credits upto 3rd year.

18.3 A student shall register for all the 196 credits and earn all the 196 credits. Marks obtained in all the 196 credits shall be considered for the award of the Grade.

18.4 In three year lateral entry B.Tech program, a student shall be promoted from 3rd year to 4th year only if s/he fulfills the academic requirements and earning of minimum 50% credits upto 3rd year.

18.5 In three year lateral entry, a student shall register for all the 154 credits and earn all the 154 credits. Marks obtained in all the 154 credits shall be considered for the award of the Grade.

19.0 GRADUATION REQUIREMENTS

The following academic requirements shall be met for the award of the B.Tech degree.

19.1 Student shall register and acquire minimum attendance in all courses and secure 196 credits for regular program and 154 credits for lateral entry program.

19.2 A student of a regular program, who fails to earn 196 credits within eight consecutive academic years from the year of his/her admission with a minimum CGPA of 4.0, shall forfeit his/her degree and his/her admission stands cancelled.

19.3 A student of a lateral entry program who fails to earn 154 credits within six consecutive academic years from the year of his/her admission with a minimum CGPA of 4.0, shall forfeit his/her degree and his/her admission stands cancelled.

20.0 REVALUATION

A student, who seeks the re-evaluation of the answer script, is directed to apply for the photocopy of his/her semester examination answer paper(s) in the theory course(s), within 5 working days from the declaration of results in the prescribed format with prescribed fee to the Controller of Examinations through the Head of the department. On receiving the photocopy, the student can consult with a competent member of faculty and seek the opinion for revaluation. Based on the recommendations, the student can register for the revaluation with prescribed fee. The Controller of Examinations shall arrange for the revaluation and declare the results. Revaluation is not permitted to the courses other than theory courses.

21.0 TEMPORARY BREAK OF STUDY FROM THE PROGRAMME

21.1 A candidate is normally not permitted to break the study. However, if a candidate intends to temporarily discontinue the program in the middle for valid reasons (such as accident or hospitalization due to prolonged ill health) and to rejoin the program after the break from the commencement of the respective semester as and when it is offered, s/he shall apply to the Principal in advance. Such application shall be submitted before the commencement of the semester in question and forwarded through the Head of the department stating the reasons for such withdrawal together with supporting documents and endorsement of his / her parent / guardian.

21.2 The institute shall examine such an application and if it finds the case to be genuine, it may permit the student to rejoin. Such permission is accorded only to those who do not have any outstanding dues like tuition fee etc.

21.3 The total period for completion of the program reckoned from the commencement of the semester to which the candidate was first admitted shall not exceed the maximum period specified in clause 19.0. The maximum period includes the break period.

22.0 TERMINATION FROM THE PROGRAMME

The admission of a student to the program may be terminated and the student is asked to leave the institute in the following circumstances:

22.1 The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.

22.2 A student shall not be permitted to study any semester more than three times during the entire Program of study.

22.3 The student fails to satisfy the norms of discipline specified by the institute from time to time.

23.0 WITH-HOLDING OF RESULTS

If the candidate has any dues not paid to the institute or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld and he/she will not be allowed / promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

24.0 STUDENT TRANSFERS

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh from time to time.

25.0 GRADUATION DAY

The institute shall have its own annual Graduation Day for the award of Degrees to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute. The college shall institute prizes and medals to meritorious students and award them annually at the Graduation Day. This will greatly encourage the students to strive for excellence in their academic work.

26.0 CONDUCT AND DISCIPLINE

- Students shall conduct themselves within and outside the premises of the Institute in a descent and dignified manner befitting the students of Audisankara College of Engineering & Technology.
- As per the order of the Honorable Supreme Court of India, ragging in any form is considered a criminal offence and is totally banned. Any form of ragging will be severely dealt with the following acts of omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.

(i) Lack of courtesy and decorum; indecent behavior anywhere within or outside the college campus.

(ii) Damage of college property or distribution of alcoholic drinks or any kind of narcotics to fellow students / citizens.

- Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.
- Mutilation or unauthorized possession of library books.
- Noisy and unruly behavior, disturbing studies of fellow students.
- Hacking in computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber crime etc.
- Usage of camera /cell phones in the campus.
- Plagiarism of any nature.
- Any other act of gross indiscipline as decided by the college academic council from time to time.
- Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute/ hostel, debarring from examination, disallowing the use of certain facilities of the Institute, rustication for a specified period or even outright expulsion from the Institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.
- For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the chief Warden, the concern Head of the Department and the Principal respectively, shall have the authority to reprimand or impose fine.
- Cases of adoption of unfair means and/ or any malpractice in an examination shall be reported to the principal for taking appropriate corrective action.
- All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the Academic council of the college.
- The Institute Level Standing Disciplinary Action Committee constituted by the academic council shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.

- The Principal shall deal with any problem, which is not covered under these rules and regulations.

27.0 GRIEVANCE REDRESSAL COMMITTEE

Grievance and Redressal Committee constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters. All the students must abide by the code and conduct rules prescribed by the college from time to time.

28.0 TRANSITORY REGULATIONS

Transitory regulations required to do all the courses in the curriculum prescribed for the batch of students in which the student joins subsequently. However, exemption will be given to those candidates who have already passed such courses in the earlier semester(s) s/he was originally admitted into and substitute subjects are offered in place of them as decided by the Board of Studies. However, the decision of the Board of Studies will be final.

28.1 Four Year B.Tech Regular course

A student who is following Jawaharlal Nehru Technological University Anantapur (JNTUA) curriculum and detained due to shortage of attendance at the end of the first semester shall join the autonomous batch of first semester. Such students shall study all the courses prescribed for the batch in which the student joins and considered on par with regular candidates of Autonomous stream and will be governed by the autonomous regulations.

A student who is following JNTUA curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses will be offered in place of them as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the

supplementary examinations conducted by JNTUA for the award of degree. The total number of credits to be secured for the award of the degree will be sum of the credits up to previous semester under JNTUA regulations and the credits prescribed for the semester in which a candidate seeks readmission and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

28.2 Three Year B.Tech program under Lateral Entry Scheme

A student who is following JNTUA curriculum and detained due to shortage of attendance at the end of the first semester of second year shall join the autonomous batch of third semester. Such students shall study all the courses prescribed for the batch in which the student joins and considered on par with Lateral Entry regular candidates of Autonomous stream and will be governed by the autonomous regulations.

A student who is following JNTUA curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester of second year or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses are offered in place of them as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conducted by JNTUA for the award of degree. The total number of credits to be secured for the award of the degree will be sum of the credits up to previous semester under JNTUA regulations and the credits prescribed for the semester in which a candidate seeks readmission and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

28.3 Transfer candidates (from non-autonomous college affiliated to JNTUA)

A student who is following JNTUA curriculum, transferred from other college to this institute in third semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of

Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute courses are offered in their place as decided by the Board of Studies. The student has to clear all his backlog courses up to previous semester by appearing for the supplementary examinations conducted by JNTUA for the award of degree. The total number of credits to be secured for the award of the degree will be the sum of the credits upto previous semester under JNTUA regulations and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

28.4 Transfer candidates (from an autonomous college affiliated to JNTUA)

A student who has secured the required credits upto previous semesters as per the regulations of other autonomous institutions shall also be permitted to be transferred to this institute. A student who is transferred from the other autonomous colleges to this institute in third semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the courses in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the courses of the semester(s) of the batch which he had passed earlier and substitute subjects are offered in their place as decided by the Board of Studies. The total number of credits to be secured for the award of the degree will be the sum of the credits upto previous semester as per the regulations of the college from which he is transferred and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous status. The class will be awarded based on the academic performance of a student in the autonomous pattern.

29.0 REVISION OF REGULATIONS AND CURRICULUM

The Institute from time to time may revise, amend or change the regulations, scheme of examinations and syllabi if found necessary and on approval by the Academic Council and the Governing Body shall come into force and shall be binding on the students, faculty, staff, all authorities of the Institute and others concerned.

FAILURE TO READ AND UNDERSTAND THE REGULATIONS IS NOT AN EXCUSE

B.TECH - PROGRAM OUTCOMES (POS)

PO-1: Apply the knowledge of Mathematics, Science, Engineering fundamentals, and Engineering specialization to the solution of complex Engineering problems (**Engineering Knowledge**).

PO-2: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences **(Problem Analysis).**

PO-3: 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 **(Design/ Development of Solutions).**

PO-4: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions **(Conduct Investigations of Complex Problems).**

PO-5: 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 **(Modern Tool Usage).**

PO-6: 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 **(The Engineer and Society).**

PO-7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development **(Environment and Sustainability).**

PO-8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice **(Ethics).**

PO-9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings **(Individual and Team Work).**

PO-10: 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 **(Communication).**

PO-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.

PO-12: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change **(Life-long learning).**

FREQUENTLY ASKED QUESTIONS AND ANSWERS ABOUT AUTONOMY

1. Who grants Autonomy? UGC, Govt., AICTE or University

In case of Colleges affiliated to a university and where statutes for grant of autonomy are ready, it is the respective University that finally grants autonomy but only after concurrence from the respective state Government as well as UGC. The State Government has its own powers to grant autonomy directly to Govt. and Govt. aided Colleges.

2 Shall Audisankara College of Engineering & Technology award its own Degree?

No. Degree will be awarded by Jawaharlal Nehru Technological University Anantapur, Ananthapuramu with a mention of the name Audisankara College of Engineering & Technology on the Degree Certificate.

3 What is the difference between a Deemed to be University and an Autonomy College?

A Deemed to be University is fully autonomous to the extent of awarding its own Degree. A Deemed to be University is usually a Non-Affiliating version of a University and has similar responsibilities like any University. An Autonomous College enjoys Academic Autonomy alone. The University to which an autonomous college is affiliated will have checks on the performance of the autonomous college.

4 How will the Foreign Universities or other stake – holders know that we are an Autonomous College?

Autonomous status, once declared, shall be accepted by all the stake holders. The Govt. of Andhra Pradesh mentions autonomous status during the First Year admission procedure. Foreign Universities and Indian Industries will know our status through our website.

5 What is the change of Status for Students and Teachers if we become Autonomous?

An autonomous college carries a prestigious image. Autonomy is actually earned out of our continued past efforts on academic

performances, our capability of self- governance and the kind of quality education we offer.

6 Who will check whether the academic standard is maintained / improved after Autonomy? How will it be checked?

There is a builtin mechanism in the autonomous working for this purpose. An Internal Committee called Academic Programme Evaluation Committee, which will keep a watch on the academics and keep its reports and recommendations every year. In addition the highest academic council also supervises the academic matters. The standards of our question papers, the regularity of academic calendar, attendance of students, speed and transparency of result declaration and such other parameters are involved in this process.

7 Will the students of Audisankara College of Engineering & Technology as an Autonomous College qualify for University Medals and Prizes for academic excellence?

No. Audisankara College of Engineering & Technology has instituted its own awards, medals, etc. for the academic performance of the students. However for all other events like sports, cultural on co-curricular organized by the University the students shall qualify.

8 Can Audisankara College of Engineering & Technology have its own Convocation?

No. Since the University awards the Degree the Convocation will be that of the University, but there will be Graduation Day at Audisankara College of Engineering & Technology.

9 Can Audisankara College of Engineering & Technology give a provisional degree certificate?

Since the examinations are conducted by Audisankara College of Engineering & Technology and the results are also declared Audisankara College of Engineering & Technology, the college sends a list of successful candidates with their final Grades and Grade Point Averages including CGPA to the University. Therefore with the prior

permission of the University the college will be entitled to give the provisional certificate.

10 Will Academic Autonomy make a positive impact on the Placements or Employability?

Certainly. The number of students qualifying for placement interviews is expected to improve, due to rigorous and repetitive classroom teaching and continuous assessment. Also the autonomous status is more responsive to the needs of the industry. As a result therefore, there will be a lot of scope for industry oriented skill development built-in into the system. The graduates from an autonomous college will therefore represent better employability.

11 What is the proportion of Internal and External Assessment as an Autonomous College?

Presently, it is 60 % external and 40% internal. As the autonomy matures the internal assessment component shall be increased at the cost of external assessment.

12 Is it possible to have complete Internal Assessment for Theory or Practicals?

Yes indeed. We define our own system. We have the freedom to keep the proportion of external and internal assessment component to choose.

13 Why Credit based Grade System?

The credit based grade system is an accepted standard of academic performance the world over in all Universities. The acceptability of our graduates in the world market shall improve.

14 What exactly is a Credit based Grade System?

The credit based grade system defines a much better statistical way of judging the academic performance. One Lecture Hour per week of Teaching Learning process is assigned One Credit. One hour of laboratory work is assigned half credit. Letter Grades like S,A+,A, B+,B,C,F etc. are assigned for a Range of Marks. (e.g. 90% and above is S, 80 to 89 % could be A+ etc.) in Absolute Grading System while grades are awarded by statistical analysis in relative grading system. We thus dispense with sharp numerical boundaries. Secondly, the grades

are associated with defined Grade Points in the scale of 1 to 10. Weighted Average of Grade Points is also defined Grade Points are weighted by Credits and averaged over total credits in a Semester. This process is repeated for all Semesters and a CGPA defines the Final Academic Performance

15 What are the norms for the number of Credits per Semester and total number of Credits for UG/PG programme?

These norms are usually defined by UGC or AICTE. Usually around 28 Credits per semester is the accepted norm.

16 What is a Semester Grade Point Average (SGPA)?

The performance of a student in a semester is indicated by a number called SGPA. The SGPA is the weighted average of the grade points obtained in all the courses registered by the student during the semester.

Where, C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course and i represent the number of courses in which a student registered in the concerned semester. SGPA is rounded to two decimal places.

17 What is a Cumulative Grade Point Average (CGPA)?

An up-to-date assessment of overall performance of a student from the time of his first registration is obtained by calculating a number called CGPA, which is weighted average of the grade points obtained in all the courses registered by the students since he entered the Institute.

$$CGPA = \sum_{j=1}^{m} \left(C_j S_j \right) / \sum_{j=1}^{m} C_j$$

Where, S_j is the SGPA of the j^{th} semester and C_j is the total number of credits upto the semester and *m*represent the number of semesters completed in which a student registered upto the semester. CGPA is rounded to two decimal places.

18 Is there any Software available for calculating Grade point averages and converting the same into Grades?

Yes, the institute has its own MIS software for calculation of SGPA, CGPA, etc.

19 Will the teacher be required to do the job of calculating SGPAs etc. and convert the same into Grades?

No. The teacher has to give marks obtained out of whatever maximum marks as it is. Rest is all done by the computer.

20 Will there be any Revaluation or Re-Examination System?

No. There will double valuation of answer scripts. There will be a makeup Examination after a reasonable preparation time after the End Semester Examination for specific cases mentioned in the Rules and Regulations. In addition to this, there shall be a 'summer term' (compressed term) followed by the End Semester Exam, to save the precious time of students.

21 How fast Syllabi can be and should be changed?

Autonomy allows us the freedom to change the syllabi as often as we need.

22 Will the Degree be awarded on the basis of only final year performance?

No. The CGPA will reflect the average performance of all the semester taken together.

23 What are Statutory Academic Bodies?

Governing Body, Academic Council, Examination Committee and Board of Studies are the different statutory bodies. The participation of external members in every body is compulsory. The institute has nominated professors from IIT, NIT, University (the officers of the rank of Pro-vice Chancellor, Deans and Controller of Examinations) and also the reputed industrialist and industry experts on these bodies.

24 Who takes Decisions on Academic matters?

The Governing Body of institute is the top academic body and is responsible for all the academic decisions. Many decisions are also taken at the lower level like Boards of Studies. Decisions taken at the Board of Studies level are to be ratified at the Academic Council and Governing Body.

25 What is the role of Examination committee?

The Examinations Committee is responsible for the smooth conduct of internal, End Semester and makeup Examinations. All matters

involving the conduct of examinations spot valuations, tabulations preparation of Grade Cards etc, fall within the duties of the Examination Committee.

26 Is there any mechanism for Grievance Redressal?

The institute has grievance redressal committee, headed by Dean Student affairs and Dean - IQAC.

27 How many attempts are permitted for obtaining a Degree?

All such matters are defined in Rules & Regulation

28 Who declares the result?

The result declaration process is also defined. After tabulation work wherein the SGPA, CGPA and final Grades are ready, the entire result is reviewed by the Moderation Committee. Any unusual deviations or gross level discrepancies are deliberated and removed. The entire result is discussed in the Examinations and Result Committee for its approval. The result is then declared on the institute notice boards as well put on the web site and Students Corner. It is eventually sent to the University.

29 Who will keep the Student Academic Records, University or Audisankara College of Engineering & Technology?

It is the responsibility of the Dean, Academics of the Autonomous College to keep and preserve all the records.

30 What is our relationship with the JNT University?

We remain an affiliated college of the JNT University. The University has the right to nominate its members on the academic bodies of the college.

31 Shall we require University approval if we want to start any New Courses?

Yes, It is expected that approvals or such other matters from an autonomous college will receive priority.

32 Shall we get autonomy for PG and Doctoral Programmes also?

Yes, presently our PG programmes also enjoying autonomous status.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/Improper conduct	Punishment
	If the candidate:	
1. (a)	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 candidate 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)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons 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 candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	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 candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate 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. The Hall Ticket of the candidate is to be cancelled and sent to the Controller of Examinations.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, 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 candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate 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.	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 candidate 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 for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	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.	Refuses to obey the orders of the Controller of Examinations /Additional Controller of Examinations/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 COE 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 COE 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 Institute premises 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 candidates 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.	Leaves the exam hall taking away answer script or intentionally tears of 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 candidate 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 for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.

8.	Possess 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 candidate 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.
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 colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate 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.	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 candidate 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 candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to award suitable punishment.	

Course Structure for

B.Tech (MECHANICAL ENGINEERING)

Regular Programme

Applicable for students admitted from 2016-17 Academic Year

Course Structure for B.Tech (Mechanical Engineering) Regular Programme

Applicable for students admitted from 2016-17 Academic Year

B.Tech 1st Semester – Mechanical Engineering

S.No	Code	Course	L	T	P	Drg	C
1	16HS1101	Professional English-I	3	0	0	0	3
2	16HS1102	Calculus and Differential Equations	3	1	0	0	3
3	16HS1103	Applied Physics	3	1	0	0	3
4	16HS1105	Environmental Studies	3	0	0	0	3
5	16ME1101	Engineering Mechanics	3	1	0	0	3
6	16HS2106	Professional English Lab	0	0	3	0	2
7	16HS2107	Applied Physics Lab	0	0	3	0	2
8	16ME2104	Engineering Workshop and IT Workshop	0	0	3	0	2
		TOTAL	**15**	**3**	**9**	**0**	**21**

B.Tech 2nd Semester – Mechanical Engineering

S.No	Code	Course	L	T	P	Drg	C
1	16HS1201	Professional English-II	3	0	0	0	3
2	16HS1202	Integral Transforms	3	1	0	0	3
3	16HS1104	Applied Chemistry	3	1	0	0	3
4	16CS1101	Computer Programming	3	0	0	0	3
5	16EE1101	Basic Electrical and Electronics Engineering	3	1	0	0	3
6	16HS2108	Applied Chemistry Lab	0	0	3	0	2
7	16CS2102	Computer Programming Lab	0	0	3	0	2
8	16ME2103	Engineering Drawing Practice	0	0	0	3	2
		TOTAL	**15**	**3**	**6**	**3**	**21**

B.Tech 3rd Semester – Mechanical Engineering

S.No	Code	Course	L	T	P	Oth	C
1	16HS1302	Probability and Statistics	3	1	0	0	3
2	16CS1305	Introduction to Data Structures	3	0	0	0	3
3	16ME1301	Mechanics of Solids	3	1	0	0	3
4	16ME1302	Fluid Mechanics and Hydraulic Machinery	3	1	0	0	3
5	16ME1303	Engineering Thermodynamics	3	1	0	0	3
6	16ME1304	Engineering Graphics	3	0	0	0	3
7	16ME2305	Material Testing Lab	0	0	3	0	2
8	16ME2306	Fluid Mechanics and Hydraulic Machinery Lab	0	0	3	0	2
9	16EE2307	Basic Electrical and Electronics Engineering Lab	0	0	3	0	2
10	16AS3301	Communication Skills Practice	0	0	0	3	1
11	16AS3302	Professional Society Activities-I	0	0	0	3	1
12		Audit Course					
		TOTAL	**18**	**4**	**9**	**6**	**26**

B.Tech 4th Semester – Mechanical Engineering

S.No	Code	Course	L	T	P	Oth	C
1	16HS1401	Matrices and Numerical Methods	3	0	0	0	3
2	16ME1401	Material Science	3	1	0	0	3
3	16ME1402	Manufacturing Technology	3	1	0	0	3
4	16ME1403	Internal Combustion Engines	3	1	0	0	3
5	16ME1404	Kinematics of Machinery	3	1	0	0	3
6	16ME1405	Machine Drawing	3	0	0	0	3
7	16ME2406	Material Science Lab	0	0	3	0	2
8	16ME2407	Manufacturing Technology Lab	0	0	3	0	2
9	16ME2408	Internal Combustion Engines Lab	0	0	3	0	2
10	16AS3401	Technical Seminar	0	0	0	3	1
11	16AS3402	Soft Skills Practice	0	0	0	3	1
12	16AS3403	Professional Society Activities-II	0	0	0	3	1
		TOTAL	**18**	**4**	**9**	**9**	**27**

B.Tech 5th Semester – Mechanical Engineering

S.No	Code	Course	L	T	P	Oth	C
1	16MB1411	Engineering Economics and Project Management	3	0	0	0	3
2	16CS1506	OOPs through JAVA	3	0	0	0	3
3	16ME1501	Machines Tools and Metrology	3	1	0	0	3
4	16ME1502	Turbo Machines	3	1	0	0	3
5	16ME1503	Design of Machine Elements-I	3	1	0	0	3
6	16ME1504	Dynamics of Machinery	3	1	0	0	3
7	16CS2409	OOPs through JAVA Lab	0	0	3	0	2
8	16ME2505	IC Engines Testing Lab	0	0	3	0	2
9	16ME2506	Machine Tools Lab	0	0	3	0	2
10	16AS3501	Term Paper	0	0	0	3	2
11	16AS3502	Quantitative Aptitude	0	0	0	3	1
12	16AS3503	Professional Activities-III	0	0	0	3	1
		TOTAL	**18**	**4**	**9**	**9**	**28**

B.Tech 6th Semester – Mechanical Engineering

S.No	Code	Course	L	T	P	Oth	C
1	16ME1601	Heat Transfer	3	1	0	0	3
2	16ME1602	CAD/ CAM	3	1	0	0	3
3	16ME1603	Design of Machine Elements-II	3	1	0	0	3
4	16ME1604	Industrial Engineering and Management	3	0	0	0	3
5	16ME1605	Production Drawing	3	0	0	0	3
6	**ELECTIVE-I**						
	16ME1606	Metal Forming	3	1	0	0	3
	16ME1607	Finite Element Methods					
	16ME1608	Gas Turbines and Jet Propulsion					
	16ME1609	Available Selected MOOCs					
7	16ME2610	Metrology Lab	0	0	3	0	2
8	16ME2611	Heat Transfer Lab	0	0	3	0	2
9	16ME2612	CAD Lab	0	0	3	0	2
10	16ME2613	Mini Project	0	0	0	3	2
11	16AS3601	Technical Aptitude	0	0	0	3	1
12	16AS3602	Professional Society Activities-IV	0	0	0	3	1
		TOTAL	**18**	**4**	**9**	**9**	**28**

B.Tech 7th Semester – Mechanical Engineering

S.No	Code	Course	L	T	P	Oth	C
1	16ME1701	Automobile Engineering	3	1	0	0	3
2	16ME1702	Instrumentation and Control Systems	3	1	0	0	3
3	16ME1703	Operations Research	3	0	0	0	3
4	**ELECTIVE-II (OPEN ELECTIVE)**		3	1	0	0	3
5	**ELECTIVE-III**						
	16ME1704	Unconventional Machining Process	3	1	0	0	3
	16ME1705	Mechatronics					
	16ME1706	Power Plant Engineering					
	16ME1707	Available Selected MOOCs					
6	16ME2710	Dynamics and Measurements Lab	0	0	3	0	2
7	16ME2711	CAM Lab	0	0	3	0	2
8	16ME2712	Instrumentation and Control Systems Lab	0	0	3	0	2
9	16AS3701	Internship	0	0	0	3	2
10	16AS3702	Professional Society Activities-V	0	0	0	3	1
		TOTAL	**15**	**4**	**9**	**6**	**24**

B.Tech 8th Semester – Mechanical Engineering

S.No	Code	Course	L	T	P	Oth	C
1	**ELECTIVE-IV**						
	16ME1801	Production and Operations Management	3	1	0	0	3
	16ME1802	Tool Design					
	16ME1803	Computational Fluid Dynamics					
	16ME1804	Composite Materials					
2	**ELECTIVE-V**						
	16ME1805	Advances in Casting and Welding Processes	3	1	0	0	3
	16ME1806	Industrial Tribology					
	16ME1807	Production Planning and Control					
	16ME1808	Available Selected MOOCs					
3	**ELECTIVE-VI**						
	16ME1809	Total Quality Management	3	1	0	0	3
	16ME1810	Refrigeration and Air Conditioning					
	16ME1811	Mechanical Vibrations					
	16ME1812	Geometric Modeling					
4	16ME2813	Major Project and Comprehensive Viva-Voce	0	0	8	0	12
		TOTAL	**9**	**3**	**8**	**0**	**21**

ELECTIVE-II (OPEN ELECTIVE)

S.No	Code	Course
1	16CE1707	Disaster Management
2	16CE1708	Infrastructure Systems Planning
3	16EE1707	Renewable Energy Sources
4	16EE1708	Energy Auditing
5	16ME1708	Industrial Robotics
6	16ME1709	Nano Material Applications
7	16EC1707	Digital Image Processing
8	16EC1708	Electronic Product Design and Packaging
9	16EC1709	Bio-Medical Instrumentation
10	16CS1708	Internet of Things
11	16CS1709	Python Programming Language
12	16MB1302	Entrepreneurship Development

ENGINEERING ECONOMICS AND PROJECT MANAGEMENT

B.Tech5th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16MB1411	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:41	Tutorial Classes:13	Practical Classes: Nil			Total Classes:54			

OBJECTIVES

The course should enable the students to

1. Perform economic calculations involving the time value of money using standard formulas and tables
2. Compare alternatives using net present worth, equivalent annual worth, internal rate of return, and benefit-cost analysis
3. Apply project management techniques to create a structured project plan that includes resource and cost analysis
4. Understand project risk includes risk assessment, mitigation plans, and contingency plans.
5. Apply project management and spreadsheet software to create project management and financial documents such as work breakdown structures, Gantt charts, network diagrams, schedules, financial reports, and status reports

UNIT-I	INTRODUCTION TO ENGINEERING ECONOMIC AND DEMAND FORECASTING & COST ANALYSIS	Classes:12

Introduction to Engineering Economics: Concept of Engineering Economics – Types of efficiency – Managerial Economics Nature and Scope – Law of Demand – Elasticity of demand – Supply and law of Supply.

Demand Forecasting & Cost Analysis: Demand Forecasting: Meaning, Factors Governing Demand Forecasting, Methods of Demand Forecasting (Survey and Statistical Methods) – Cost Analysis: Basic Cost Concepts, Break Even Analysis

UNIT-II	INVESTMENT DECISIONS & MARK-ET STRUCTURES AND FINANCIAL STATEMENTS & RATIO ANALYSIS	Classes:14

Investment Decisions & Market Structures: Time Value of Money – Capital Budgeting: Meaning, Need and Techniques of Capital Budgeting – Types of Markets Structures – Features – Price Out-put determination under Perfect Competition and Monopoly.

Financial Statements & Ratio Analysis: Introduction to Financial Accounting – Double entry system – Journal – Ledger – Trail Balance – Final Accounts (with simple adjustments) – Financial Analysis through Ratios: Interpretation of Liquidity Ratios (Current Ratio and quick ratio), Activity Ratios (Inventory turnover ratio and Debtor Turnover ratio, Creditors Turnover Ratio, Capital Turnover Ratio), Capital structure Ratios (Debt-Equity ratio, Interest Coverage ratio), and Profitability ratios (Gross Profit Ratio, Net Profit ratio, Operating Ratio, P/E Ratio and EPS).

UNIT-III	INTRODUCTION TO MANAGE-MENT AND STRATEGIC MAN-AGEMENT	Classes:15

Introduction to Management: Introduction to Management: Nature – Importance – Classical

Theories of Management: F.W.Taylor's and Henri Fayol's Theory – Functions and Levels of

Management – Decision Making Process.

Strategic Management: Introduction to Strategic Management: Vision, Mission, Goals, Objectives, Strategies, Policies, Programmes – Environmental Scanning – SWOT Analysis.

UNIT-IV	PROJECT MANAGEMENT	Classes:14

Project Management: Introduction – Project Life Cycle and its Phases – Project Selection

Methods and Criteria – Technical Feasibility – Project Financing – Project Control and Scheduling through Networks – Probabilistic Models of Networks – Time-Cost Relationship

(Crashing) – Human Aspects in Project Management: Form of Project Organization – Role & Traits of Project Manager.

Text Books

1. Fundamentals of Engineering Economics by Pravin Kumar, Wiley India Pvt. Ltd. New Delhi..
2. Project Management by Rajeev M Gupta, PHI Learning Pvt. Ltd. New Delhi, 2014.

Reference Books

1. Engineering economics by PanneerSelvam, R, Prentice Hall of India, New Delhi, 2013
2. Project Management by R.B.Khanna, PHI Learning Pvt. Ltd. New Delhi, 2011.
3. Project Management by R. PanneerSelvam&P.Senthil Kumar, PHI Learning Pvt. Ltd.New Delhi, 2009.
4. Management Science by A.Aryasri, Tata McGraw Hill, 2013.
5. Managerial Economics and Financial Analysis by A. Aryasri, Tata McGraw Hill, 2014.

Web References

1. https://nptel.ac.in/courses/112107209/
2. https://onlinecourses.nptel.ac.in/noc18_me35/course

E-Text Books

1. https://easyengineering.net/engineering-economics-by-panneerselvam-book/

2. http://www.freeengineeringbooks.com/Civil/Engineering-Economics-Books.php

OUTCOMES

At the end of the course students able to

1. Perform economic calculations involving the time value of money using standard formulas and tables
2. Compare alternatives using net present worth, equivalent annual worth, internal rate of return, and benefit-cost analysis
3. Apply project management techniques to create a structured project plan that includes resource and cost analysis
4. Understand project risk includes risk assessment, mitigation plans, and contingency plans
5. Apply project management and spreadsheet software to create project management and financial documents such as work breakdown structures, Gantt charts, network diagrams, schedules, financial reports, and status reports

OOPS THROUGH JAVA

B.Tech 5th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1506	Core	L	T	P	C	CIA	SEE	TOTAL
		3	-	-	3	40	60	100
Contact Classes:60	Tutorial Classes: -	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

I. The model of object oriented programming: abstract data types, encapsulation, inheritance and polymorphism

II. Fundamental features of an object oriented language like Java: object classes and interfaces, exceptions and libraries of object collection

III. How to take the statement of a business problem and from this determine suitable logic for solving the problem; then be able to proceed to code that logic as a program written in Java.

UNIT-I	INTRODUCTION	Classes:15

Introduction: Differences between C and java, Features of java, datatypes, variables, arrays, operators, control statements, simple Java program, Input and output in java.

Introducing OOP: Problems in procedural oriented programming, Features of oop, Classes and objects creation, Constructors, Methods, static keyword, this keyword, passing & returning objects from methods, Recursion, Using String class methods, Command line arguments.

UNIT-II	INHERITANCE	Classes:15

Inheritance: Inheritance basics, Using super, Access specifiers, Types of inheritances, method overriding.

Abstract, Final & Interfaces: Abstract class & methods, Final class & Methods, Interfaces.

Packages: Package creation, Access Protection, Importing Packages.

The Applet Class: Applet basics, Simple applet creation.

UNIT-III	EXCEPTION HANDLING	Classes:15

Exception Handling : Exception Handling Fundamentals, Handling exceptions with try, catch, finally, throw & throws clause, Types of exceptions.

Multithreading: Uses of threads, creating & Running Threads, Thread life cycle.

UNIT-IV	Classes:15

Graphics programming using AWT: AWT, Event Delegation Model, Listeners & Listener Methods, Creating Frames, Check boxes, Radio buttons, TextField, TextArea, Label, Choice, List, Scrollbar, Handling mouse & keyboard events.

Layout Managers: Flow Layout, Border Layout, Card Layout, Grid Layout, Box Layout.

Text Books

1. Herbert Schildt, The Complete Reference Java J2SE 7th Edition, TMH Publishing Company Ltd, NewDelhi.
2. H.M.Dietel and P.J.Dietel, Java How to Program, Sixth Edition, Pearson Education/PHI.

Reference Books

1. Cay.S.Horstmann and Gary Cornell, Core Java 2, Vol 1, Fundamentals, Seventh Edition, Pearson Education.
2. R. Nageswara Rao, Core Java, An Integrated Approach, First Edition, DreamTech press

Web References

1. https://beginnersbook.com/2013/04/oops-concepts/
2. https://www.journaldev.com/12496/oops-concepts-java-example

E-Text Books

1. *https://zodml.org/sites/default/files/Object_Oriented Programming_ using_Java_0.pdf*
2. https://bookboon.com/en/object-oriented-programming-using-java-ebook

Outcomes

1. Solve problems using object oriented approach and implement them using Java.
2. Keep the related class of code together to create a package and im port the same for future application development.
3. Implement multiple inheritances using interface concept.
4. Handle runtime errors through exception handling mechanism.
5. Explore concepts of concurrent programming by using multi thread ing.
6. Create user friendly interface using Applets, Event handlers and swings

MACHINE TOOLS AND METROLOGY

B.Tech5th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1501	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:41	Tutorial Classes:13	Practical Classes: Nil			Total Classes:54			

OBJECTIVES

The course should enable the students to

I. Visualize the generation of surface profiles using the relative motion between directrix and generatrix.

II. Understand the basic mechanism involved in metal cutting processes using different cutting tools.

III. Understand the measurement of different attributes of metal cutting using various measuring instruments.

IV. Analyze surface topography, establish geometrical dimensioning and tolerancing.

UNIT-I	ELEMENTS OF METAL CUTTING AND PRINCIPLE OF LATHE	Classes:12

Elementary treatment of metal cutting theory, tool geometry, chip formation and types of chips, Mechanics of orthogonal cutting, tool life, Tool materials

Lathe – Principle of working, the specification of lathe – types of lathe – work holders tool holders. Turret and capstan lathes, work holders – tool holding devices, Principal features of automatic lathes.

UNIT-II	SHAPING, SLOTTING, DRILLING, BORING AND MILLING MACHINES	Classes:14

Shaping slotting and planning machines–Principal parts – specification, machining time calculations Drilling and Boring Machines– Principle parts,

tool- holding devices, Jig Boring machine. Kinematics scheme of the drilling and boring machines. Milling machine –Principal features, methods of indexing.

UNIT-III	GRINDING, LAPPING, HONING, BROACHING MACHINES	Classes:15

Grinding machine – Principle parts, selection of a grinding wheel, the Kinematic scheme of grinding machines. Superfinishing- Lapping, honing and broaching machines–Kinematics scheme of Lapping, Honing and Broaching machines. Constructional features of speed and feed Units, machining time calculations Principles of design of Jigs and fixtures. Principles of location - and clamping –Typical examples of jigs and fixtures.

MEASUREMENT OF ANGLES AND TAPERS: Different methods – Bevel protractor – angle slip gauges – spirit levels – sine bar – Sine plate, rollers, and spheres used to determine the tapers.

UNIT-IV	OPTICAL MEASURING INSTRUMENT	Classes:14

OPTICAL MEASURING INSTRUMENTS: Tool maker's microscope and its uses – collimators, optical projector – optical flats and their uses, interferometer. FLAT SURFACE

MEASUREMENT: Measurement of flat surfaces – instruments used – straight edges – surface plates – optical flat and autocollimator.

MEASUREMENT THROUGH COMPARATORS: Comparators – Mechanical, Electrical and Electronic Comparators, pneumatic comparators and their uses in mass production.

SCREW THREAD MEASUREMENT: Element of measurement – errors in screw threads – measurement of effective diameter, the angle of thread and thread pitch, profile thread gauges.

GEAR MEASUREMENT: Gear measuring instruments, Gear tooth profile measurement, Measurement of diameter, pitch pressure angle and tooth thickness. Coordinate Measuring Machines: Types of CMM, Role of CMM, and Applications of CMM

Text Books

1. Production Technology by R.K. Jain and S.C. Gupta.
2. Production Technology by H.M.T. (Hindustan Machine Tools).

Reference Books

1. Machine Tools – C.Elanchezhian and M. Vijayan / Anuradha Agencies Publishers.
2. Workshop Technology – B.S.Raghu Vamshi – Vol II

Web References

1. https://nptel.ac.in/downloads/112105127/
2. http://alvarestech.com/temp/capp/MetrologiaIndustrial2016-DMIS.pdf

E-Text Books

1. https://www.iare.ac.in/sites/default/files/PPT/MTM_PPT-1.pdf
2. https://www.iare.ac.in/sites/default/files/lecture_notes/MTM_LECTURE_NOTES.pdf

OUTCOMES

At the end of the course students able to

1. Understand the cutting tool geometry, mechanism of chip formation and mechanics of orthogonal cutting.
2. Identify the basic parts and operations of machine tools including lathe, shaper, planer, drilling, boring, milling and grinding machine.
3. Design locating and clamping devices to produce a component.
4. Select a machining operation and corresponding machine tool for a specific application in real time.
5. Select a measuring instrument to inspect the dimensional and geometric features of a given component.

TURBOMACHINES

B.Tech5th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16ME1502	Core	3	1	-	3	40	60	100
Contact Classes:48	Tutorial Classes: -12	Practical Classes: Nil			Total Classes:60			

OBJECTIVES

The course should enable the students to

I. Understand the concept of turbo machines and applications

II. Understand the types of turbo machines like radial and axial flow turbomachines

III. Understand the concept of steam turbines single stage and multistage.

IV. Understand the concept of compressors and types of compressors.

UNIT-I	INTRODUCTION TO TURBOM-ACHINE	Classes:16

Introduction: Definition of a turbomachine, parts of turbomachines, Comparison with positive displacement machines, Classification, Dimensionless parameters and their significance, Effect of Reynolds's number,

Thermodynamics of fluid flow: Static and Stagnation states- Incompressible fluids and perfect gases, Overall isentropic efficiency, stage efficiency (their comparison) and polytrophic efficiency for both compression and expansion processes.

UNIT-II	ANALYSIS OF TURBOMACHINES	Classes:14

Energy exchange in Turbomachines: Euler's turbine equation, an Alternate form of Euler's turbine equation, Velocity triangles for different values of the degree of reaction.

General Analysis of Turbomachines: Radial flow compressors and pumps – general analysis, Expression for the degree of reaction, velocity triangles.

UNIT-III	STEAM TURBINES	Classes:16

Steam Turbines: Classification, Single stage impulse turbine, condition for maximum blade efficiency, stage efficiency, Need and methods of compounding, Multi-stage impulse turbine, the expression for maximum utiliza-

tion factor, Reaction turbine – Parsons's turbine, condition for maximum utilization factor, reaction staging. Problems.

UNIT-IV	CENTRIFUGAL AND AXIAL FLOW COMPRESSORS	Classes:14

Centrifugal Compressors, Axial-flow Compressors: Centrifugal Compressors: Stage velocity triangles, slip factor, power input factor, Stage work, Pressure developed, stage efficiency and surging and problems. Axial flow Compressors: Expression for pressure ratio developed in a stage, work is done factor, efficiencies, and stalling. Problems.

Text Books

1. Operations Research/S.D Sharma – Kedarnath
2. Introduction O.R/Hiller &Libermann (TMH)

Reference Books

1. Operations Research/A.M.Natarajan. P.Balasubramani, A. Tamilarasi/ Pearson Education.
2. Operations Research Methods & Problems/Maurice Saseini, ArhurYaspan& Lawrence Friedman
3. Operation Research /R.Pannerselvam, PHI Publications.
4. Operation Research/J.K Sharma/MacMilan.

Web References:

1. https://nptel.ac.in/courses/112106200/
2. https://nptel.ac.in/courses/101101058/

E-Text Books

1. https://bookboon.com/en/key-concepts-in-turbo-machinery-ebook
2. https://engineeringstudymaterial.net/ebook/turbomachinery-design-and-theory/

Outcomes

1. Apply thermodynamic concepts to analyze turbo machines.
2. Analyze power plant and propulsion cycles
3. Analyze impulse and reaction turbo machines for energy transfer.
4. Design gas turbine and steam turbine components.
5. Evaluate the performance of turbo machine components

DESIGN OF MACHINE ELEMENTS-I

B.Tech5th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1503	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:40	Tutorial Classes: 12	Practical Classes: Nil				Total Classes:52		

OBJECTIVES

The course should enable the students to

I. To familiarize the various steps involved in the Design Process, and understand the theories of failure and material science in the design of machine components.

II. To make proper assumptions with respect to material, design for various loads.

III. To understand the standard procedure available for Design of shafts, cotter and knuckle joints

IV. To understand the standard procedure available for design of couplings, riveted joints, impact strength and power screws

V. To learn to use standard practices and standard data ,catalogues and standard machine components . (Use of P S G Design Data Book is permitted)

UNIT-I	BASICS CONCEPT OF MACHINE DESIGN,INTRODUCTION TO STATICLOADING AND THEORIES OF FAILURE & STRESS CONCENTRATION	Classes:10+3

Basics: Design, Mechanical Engineering/Machine Design, Phase/steps in Machine design process. Design Considerations, Design Methods.

Design for Static Loading: Introduction: Stresses in members subjected to axial, shear, Bending, Tensional & Eccentric loading. Principal Stresses in members subjected to a combination of static loads.

Theories of Failure & Stress Concentration: Failure Criterion & problems - Maximum Normal Stress theory, Maximum Shear stress theory, Distortion energy theory

UNIT-II	STRESS CONCENTRATION AND DESIGN FOR VARIOUS LOADS	Classes:10+3

Stress Concentration: Definition, Reason for occurrence, Methods to reduce, Stress concentration factor. Design of stress concentrated members subjected to various loads.

Design for Variable Loading: Types of variable/Cyclic loads, Mean & amplitude Stresses, Fatigue Failure, Endurance Limit & Strength, S-N Diagram. Goodman and Soderberg's criterion, Modifying factors: Size effect, surface effect, Reliability, stress concentration effects etc. Problems in the design of members for finite & infinite life in members subjected to individual & combined loading. Cumulative damage in fatigue.

UNIT-III	DESIGN OF SHAFTS, COTTER AND KNUCKLE JOINTS	Classes:10+3

Shafts: Types, Design of solid & hollow shaft on strength and rigidity basis with steady loading subjected to pure torsion. Design of shafts carrying pulleys & gears (Combined loading). ASME Code for shaft design.

Cotter & Knuckle Joints: Design procedure.

UNIT-IV	DESIGN OF COUPLINGS, RIV ETED JOINTS,IMPACT STREN GTH AND POWER SCREWS	Classes:10+3

Couplings: Types, Design of Flange, Bush & Pin type flexible coupling.

Riveted Joints: Types, Design of longitudinal & circumferential joint for various types, Simple Riveted Joints. Brackets.

Impact Strength: Introduction, Impact stress due to axial, Bending and Torsional loads

Power screws: Forms of threads, terminology, Torque in lifting & lowering the load, self-locking screw, efficiency of the screw (Square, ACME, self-locking), Design of screw & Nut for power screw.

Text Books

1. **Design of Machine Elements** - V.B.Bhandari, 2nd Edn 2007, Tata Mc Graw - Hill

2. **Mechanical Engineering Design**: Joseph E Shigley and Charles R. Mischke, 6thEdition 2003 Tata Mc Grawhill
3. **PSG Design Data hand Book** PSG College of Technology, Coimbatore.

Reference Books

1. Machine design- J.E.Shigley
2. Machine design- R S Khurmi and J K Gupta
3. Design of Machine Elements - M.F.Spotts-PHI
4. Machine Design - Kannaiah/ SciTech.

Web References

1. https://nptel.ac.in/downloads/112105125/
2. https://www.alljntuworld.in/download/design-machine-members-1-dmm-1-materials-notes/

E-Text Books

1. http://www.faadooengineers.com/threads/26687-Machine-design-by-shigley-ebook-download-pdf
2. http://www.freepdfbook.com/design-of-machine-elements-by-v-b-bhandari/
3. http://www.only4engineer.com/2014/10/a-textbook-of-machine-design-by.html

Outcomes

At the end of the course students are able

1. Students will be able to demonstrate the various steps involved in the Design Process, and understand the theories of failure and material science in the design of machine components.
2. Students will be able to make proper assumptions with respect to material, respect to material, design for various loads.
3. Apply the concepts of design to shafts, Cotter & Knuckle Joints.
4. Apply the concepts of design to power screws, joints and couplings.

DYNAMICS OF MACHINERY

B.Tech 5th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1504	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:40	Tutorial Classes: 12	Practical Classes: Nil				Total Classes:52		

OBJECTIVES

The course should enable the students to

I. Understand Synthesis and analysis by providing significant skills and experience in creating and modeling mechanisms.

II. Apply analytical skills in the mechanism synthesis process that will result in automation of the design process.

III. Apply the necessary for kinematic and dynamic analysis of mechanisms and machines, and the skills necessary consider the role of dynamics in the design of machines.

IV. Understand Static and dynamic balancing of mechanisms.

UNIT-I	STATIC AND DYNAMIC FORCE ANALYSIS	Classes:10+3

Static and dynamic force analysis: Planar mechanisms- four bar and slider-crank mechanisms.

Precession: Gyroscopes, the effect of precession motion on the stability of moving vehicles such as a motor car, motorcycle, aeroplanes and ships.

UNIT-II	TURNING MOMENT DIAGRAM AND FLYWHEELS AND GOVERNERS	Classes:10+3

Turning moment diagram and flywheels: Turning moment - crank effort and turning moment diagrams – the fluctuation of energy – flywheels and their design.

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

UNIT-III	BALANCING OF ROTATING AND RECIPROCATING MASSES	Classes:10+3

Balancing of rotating masses: Single and multiple - 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, a variation of tractive efforts. Unbalanced forces and couples - examination of "V" multi-cylinder in line and radial engines for primary and secondary balancing.

UNIT-IV	MECHANICAL VIBRATIONS,TORSIONAL VIBRATIONS AND WHIRLING OF SHAFTS	Classes:10+3

Mechanical vibrations: Free Vibration of single DOF system - oscillation of pendulums, centers of oscillation and suspension. Transverse loads, vibrations of beams with concentrated and distributed loads, Dunkerly's methods, Raleigh's method.

Torsional vibrations and whirling of shafts: Torsional vibrations, two and three rotor systems, whirling of shafts, critical speeds,

Text Books

1. Theory of Machines / S.S Rattan/ Mc. Graw Hill Publ.
2. Theory of Machines / JagadishLal&J.M.Shah / Metropolitan.

Reference Books

1. Mechanism and Machine Theory / JS Rao and RV Dukkipati / New Age
2. Theory of Machines / Shiegly / MGH

3. Theory of Machines / Thomas Bevan / CBS Publishers

4. Theory of machines / Khurmi/S.Chand.

Web References

1. http://www.uobabylon.edu.iq/uobcolleges/ad_downloads/4_1293_515.pdf

2. https://ecommons.cornell.edu/handle/1813/57656

E-Text Books

1. http://royalmechanicalbuzz.blogspot.com/2015/04/theory-of-machines-by-rs-khurmi-ebook-pdf.html

2. https://archive.org/details/theoryofmachinesOOmckarich

Outcomes

At the end of the course students are able :

1. Interpret the principle of gyroscope and calculate gyroscopic effect for aeroplanes, ships, two wheelers and four wheelers.
2. Perform static and dynamic force analysis of planar mechanisms.
3. Summarize the working of important machine elements like clutches, brakes, flywheels and governors.
4. Examine balancing of rotating and reciprocating masses.
5. Analyze mechanical systems subjected to longitudinal, transverse and torsional vibrations.

OOPS THROUGH JAVA LAB

B.Tech 5th Semester – Mechanical Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16CS2409	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	3	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 36**				**Total Classes: 36**		

OBJECTIVES

The course should enable the students to

I. Emphasize this lab on intensive study of object oriented programming using JAVA

II. Concepts like inheritance,Object instantiation, number acces control will be known.

III. Concepts like constructors, string handling, events will be known.

LIST OF EXPERIMENTS

Expt. 1	**Write a Java program:** **a. To prints all real solutions to the quadratic equation ax2 +bx + c = 0. Read in a, b, c and use the quadratic formula. If the discriminant b2 -4ac is negative, display a message stating that there are no real solutions.** **b. The Fibonacci sequence is defined by the following rule.** **c. To print, the given number is Armstrong or not.** **d. To find simple Interest.**
To demonstrate simple statements in JAVA	
Expt. 2	**Write a Java program:** **a. To Checks whether a given string is a palindrome or not. Ex: MALAYALAM is a palindrome.**

	b.To Sorting a given list of names in ascending or der. **To make frequency count of words in a given text.**
To demonstrate control statement in JAVA	
Expt. 3	**Write a Java program:** **a. That prompts the user for an integer and then prints out all prime numbers up to that integer.** **b. To find the product of matrices.** **c. That reads a line of integers, and then displays each integer, and the sum of all the integers (Use StringTokenizer class of java.util).**
Find solutions for complex problems using JAVA programs	
Expt. 4	**Write a Java program:** **a. That reads a file name from the user, and then dis plays information about whether the file exists, whether the file is readable, whether the file is writ able, the type of file and the length of the file in bytes.** **b. That reads a file and displays the file on the screen, with a line 5number before each line.** **c. 7 That displays the number of characters, lines and words in a text file.**
Demonstrate the concepts of Inheritance and constructors	
Expt. 5	**Write a Java program:** **a. To Implements stack ADT.** **b. To Converts infix expression into Postfix form.** **c. Evaluates the postfix expression**
To Demonstrate access specifiers inheritance and polymorphism	

Expt. 6	**Write a Java program:** **a. To develop an applet that displays a simple mes sage.** **b. To develop an applet that receives an integer in one text field, and computes its factorial Value and returns it in another text field, when the button named "Compute" is clicked.**
Demonstrate the concepts like packages and interfaces in JAVA	
Expt.7	**Write a Java program that works as a simple calcula tor. Use a grid layout to arrange buttons for the dig its and for the +, -,*, % operations. Add a text field to display the result.**
Demonstrate programming on calculator	
Expt. 8	**Write a Java program for handling mouse events**
Demonstrate programming on event handling	
Expt. 9	**Write a Java program** **a. To illustrate Multi-Threading.** **That correctly implements producer consumer prob lem using the concept of inter thread communica tion**
Write a program on multi-threading	
Expt. 10	**Write a program that creates a user interface to per form integer divisions. The user enters two numbers in the text fields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw a Number**

	Format Exception. If Num2 were Zero, the program would throw an Arithmetic Exception Display the ex ception in a message dialog box.
Demonstrate programming on calculator	
Expt. 11	**Write a Java program that implements a simple cli ent/server application. The client sends data to a server. The server receives the data, uses it to pro duce a result, and then sends the result back to the client. The client displays the result on the console. For ex: The data sent from the client is the radius of a circle, and the result produced by the server is the area of the circle. (Use java.net).**
Demonstrate programming on interger divisions.	
Expt. 12	**Write a java program:** **a. That simulates a traffic light. The program lets the user select one of three lights: red, yellow, or green. When a radio button is selected, the light is turned on, and only one light can be on at a time No light is on when the program starts.** **b. That allows the user to draw lines, rectangles and ovals.**
Demonstrate programming on traffic light	

Reference Books

1. Cay.S.Horstmann and Gary Cornell, Core Java 2, Vol 1, Fundamentals, Seventh Edition, Pearson Education.
2. R. Nageswara Rao, Core Java, An Integrated Approach, First Edition, DreamTech press

Web References

1. https://www.ntu.edu.sg/home/ehchua/programming/java/J3f_OOPExercises.html

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:

SOFTWARE: Net beans,eclipse

HARDWARE: PC

Course Outcome

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

1. Implement Object Oriented programming concept using basic syntaxes of control Structures, strings and function for developing skills of logic building activity.
2. Identify classes, objects, members of a class and the relationships among them needed for a finding the solution to specific problem
3. Demonstrates how to achieve reusability using inheritance, interfaces and packages and describes faster application development can be achieved.
4. Demonstrate understanding and use of different exception handling mechanisms and concept of multithreading for robust faster and efficient application development.
5. Identify, Design & develop complex Graphical user interfaces using principal Java Swing classes based on MVC architecture

IC ENGINES TESTING LABORATORY

B.Tech 5th Semester – Mechanical Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16ME2505	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	3	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 45**				**Total Classes: 45**		

OBJECTIVES

The course should enable the students to

I. Gain the knowledge about Working principle of two stroke and four stroke SI and CI Engines

II. Gain the knowledge about engine associated systems such as lubri cating system, cooling system, fuel feed system, ignition system , their necessity, requirements, construction details, different types and their working

III. Gain the knowledge the concept of combustion in Spark ignition en gine, Pressure Vs crank angle diagrams, and pre-ignition

IV. Gain the knowledge the concept of combustion in Compression igni tion engine, Pressure Vs crank angle diagrams, Knocking, Detona tion

V. Gain the knowledge about performance calculations in I.C.Engine

VI. Gain the knowledge about engine pollution and working of catalytic converter

VII. Gain the knowledge about working principle of reciprocating com pressors and its efficiencies

VIII. Gain the knowledge about Mechanical details of axial flow compres sors and its efficiencies

LIST OF EXPERIMENTS	
Expt. 1	**I.C. Engines valve / port timing diagrams**
Demonstration of construction & operations I.C. Engines valve / port timing diagrams.	
Expt. 2	**I.C. Engines performance test (4 - Stroke diesel engines)**
Demonstration of construction & operations I.C. Engines performance test (4 - Stroke diesel engines)	
Expt. 3	**Evaluation of engine friction by conducting Morse test on 4-stroke multi cylinder petrol engine**
Evaluation of engine friction by conducting Morse test on 4-stroke multi cylinder petrol engine	
Expt. 4	**I.C. Engines heat balance.**
I.C. Engines heat balance.	
Expt. 5	**Economical speed test of an IC engine**
Economical speed test of an IC engine	
Expt. 6	**Measure quality of steam by using throttling and separating calorimeter**
Measure quality of steam by using throttling and separating calorimeter	
Expt.7	**Performance test on reciprocating air compressor unit**
Performance test on reciprocating air compressor unit	
Expt. 8	**COP of Refrigeration Unit**
COP of Refrigeration Unit	
Expt. 9	**Performance of A/C System**
Performance of A/C System	
Expt. 10	**Study of boiler**
Study of boiler	

Reference Books

1. Internal combustion engines by v.ganesh
2. The Design, Building, Modification and Use of Powertrain Test Facilities Engine Testing 4th Edition

Web References

1. https://www.iitg.ac.in/mech/lab_ice.php
2. http://www.jiscollege.ac.in/me/pdf/ic-laboratory.pdf

Course Outcome

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

1. Evaluate the performance of IC engines.
2. Perform heat balance analysis of IC engines.
3. Evaluate the performance of a reciprocating air compressor.
4. Evaluate the performance of refrigeration and air conditioning systems.
5. Plot Valve and Port timing diagrams of 4-stroke and 2-stroke engines.
6. Compile and present specifications of two and four wheelers.

MACHINE TOOLS LABORATORY

B.Tech 5th Semester – Mechanical Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16ME2506	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	3	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**		**Practical Classes: 45**			**Total Classes: 45**		

OBJECTIVES

The course should enable the students to

I. Learn the Step turning and taper turning and thread cutting Drilling and Tapping on lathe machine

II. Learn the operations of Shaping and Planning and milling machine

III. Learn the Cylindrical and Surface Grinding

LIST OF EXPERIMENTS

Expt. 1	**DEMONSTRATION OF CONSTRUCTION & OPERATIONS OF GENERAL-PURPOSE MACHINES**

Demonstration of construction & operations of general-purpose machines: Lathe, drilling machine, Milling machine, Shaper, Planning machine, Slotting machine, Cylindrical Grinder, Surface grinder and Tool & cutter grinder.

Expt. 2	**STEP TURNING AND TAPER TURNING ON LATHE MACHINE**

Job on Step turning and taper turning on lathe machine

Expt. 3	**THREAD CUTTING AND KNURLING ON -LATHE MACHINE**

Job on Thread cutting and knurling on -lathe machine

Expt. 4	**DRILLING AND TAPPING**

Job on Drilling and Tapping machine

Expt. 5	**SHAPING AND PLANNING**

Job on Shaping and Planning machine

Expt. 6	**SLOTTING**
Job on Slotting machine	
Expt.7	**MILLING**
Job on Milling machine (groove cutting/ gear cutting)	
Expt. 8	**CYLINDRICAL AND SURFACE GRINDING**
Job on Cylindrical and Surface Grinding machine	
Expt. 9	**GRINDING OF TOOL ANGLES**
Job on Grinding of Tool angles.	

Reference Books

1. http://kgr.ac.in/beta/wp-content/uploads/2018/09/Machine-Tools-Lab-Manual.pdf
2. http://www.atri.edu.in/images/pdf/departments/MT % 20 lab % 20 Manual. pdf

Web References

1. http://home.iitk.ac.in/~vkjain/manual.pdf
2. http://gptcperumbavoor.ac.in/gptcpbvr/Materials/Lab/6029.pdf

Course Outcome

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

1. Perform step turning, taper turning, thread cutting, drilling and tapping operations on lathe.
2. Perform operations on shaper, planer and milling machines.
3. Perform alignment tests for the evaluation of machine tool accuracy.
4. Perform Cylindrical and Surface Grinding.

TERM PAPER

B.Tech 5th Semester – Mechanical Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
16AS3501	-	L	T	P	C	CIA	SEE	Total
		-	-	-	2	0	50	50
Contact Classes: 24	Tutorial Classes: Nil		Practical Classes: Nil			Total Classes: 24		

OBJECTIVES

The course should enable the students to

I. Guide students through the process of planning and executing a substantial project.

II. Allow students the opportunity to teach themselves.

III. Improves the power of designing, organizing, communication, coordination and judgment.

The Term Paper is a self study report and shall be carried out either during 5th Semester along with other lab courses. Every student will take up this term paper individually and submit a report. The scope of the term paper could be an exhaustive literature review choosing any engineering concept with reference to standard research papers or an extension of the concept of earlier course work in consultation with the term paper supervisor. The term paper reports submitted by the individual students during the 5th Semester shall be evaluated for a total of 50 marks for external evaluation, it shall be conducted by two Examiners, one of them being term paper supervisor as internal examiner and an external examiner nominated by the Principal from the panel of experts recommended by HOD.

Outcomes

1. Prepare comprehensive report based on literature survey related to considered area
2. Select the paper to be solved and analyze the extension possibilities
3. Identify the applicability of modern software tools and technology
4. Correct himself to improve write-up skills
5. Exhibit the professional behavior

QUANTITATIVE APTITUDE

B.Tech 5th Semester: Mechanical Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16AS3502	**-**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	-	1	0	50	50
Contact Classes: 12	**Tutorial Classes: Nil**	**Practical Classes: Nil**			**Total Classes: 12**			

The external examination will be conducted for 50 Marks with 1 Credit; examination type is Multiple Choice Question (MCQ) – Offline/Online.

OBJECTIVES

The course should enable the students to

1. Formulate the problem quantitatively and use appropriate arithmetical methods to solve the problem.
2. Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
3. Solve campus placements aptitude papers covering Quantitative Ability
4. Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

UNIT-I	**Classes:3**

Calendars, Clocks, L. C. M & H. C. F, Problems on Numbers, Averages.

UNIT-II	**Classes:3**

Percentages, Profit, Loss & Discount, Simple Interest & Compound Interest.

UNIT-III	**Classes:3**

Ratio & Proportion, Mixture and Alligation, Partnership, problems on ages.

UNIT-IV	**Classes:3**
Time & Work, Pipes and Cisterns, Time & Distance, Problem on Trains, Boats and Streams, Mensuration.	

Text Books

1. Dr. R.S. Aggarwal, "Quantitative Aptitude", S.Chand Publication, New Delhi.

Reference Books

1. Quantitative Aptitude - G. L BARRONS
2. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations", 4th Edition.

Web References

1. www.indiabix.com
2. https://www.campusgate.co.in
3. https://m4maths.com

PROFESSIONAL ACTIVITIES-III

B.Tech 5th Semester: Mechanical Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16AS3503	**-**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	-	1	-	-	-
Contact Classes: 12	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 12**		

OBJECTIVES

The course should enable the students to

1. Improve communication skills
2. Develop leadership qualities

Professional Society Activities (PSA) course is aimed at enhancing the self-learning, communication, managerial skills of the students by engaging them in various Co & Extra Curricular activities during their course of study. Activities in each of the department shall be designed and conducted by the Professional Society Executive Committee whose composition is:

1. Faculty Mentors- 2 No.
2. Student Chairman: 1 No.- Final year Student
3. Student General Secretary: 1 No.- Third year Student
4. Treasurer: 1 No.- Third year Student

Student Members: 2 No's from each class

PSA related activities would be of the following nature but not limited to:

Activity#1	Just A Minute
Activity#2	Technical Quiz
Activity#3	Open House- Lab Demo

Activity#4	Technical Paper Presentation- Preliminary
Activity#5	Technical Paper Presentation- Final
Activity#6	Poster Presentation
Activity#7	Collage- A theme based event
Activity#8	Debate Competition
Activity#9	Group Discussion Competition
Activity#10	Mock Interviews
Activity#11	Model Exhibition
Activity#12	Valedictory Function

HEAT TRANSFER

B.Tech6th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1601	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:48	Tutorial Classes: 12	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

I. Identify the important and /or possible Heat Transfer modes in any physical system.

II. provide students with an opportunity of direct experience of doing Heat Transfer calculation so that they can understand the base of the principles and able make a critical assessment of industrial environment

III. Experience with practical applications of Heat Transfer.

IV. Apply the energy balance equation Heat Transfer problems calculate the rate for Heat Transfer for all physical devices in all modes of Heat Transfer

UNIT-I	BASIC CONCEPTS ANDONE DIMENSIONAL STEADY STATE CONDUCTION HEAT TRANSFER	Classes:16

Introduction: Modes and mechanisms of heat transfer – Basic laws of heat transfer.

Conduction Heat Transfer: General heat conduction equation in Cartesian, Cylindrical and

Spherical coordinates.

One Dimensional Steady State Conduction Heat Transfer: Homogeneous slabs, hollow

cylinders and spheres – overall heat transfer coefficient – electrical analogy – Critical radius

of insulation. Systems with variable Thermal conductivity – systems with heat sources or Heat generation, Extended surface (fins) Heat Transfer – Long Fin, Fin with insulated tip and Short Fin.

UNIT-II	ONE DIMENSIONAL TRANSIENT CONDUCTION HEAT TRANSFER AND FORCEDCONVECTION	Classes:14

One Dimensional Transient Conduction Heat Transfer: Systems with negligible internal resistance – Significance of Biot and Fourier Numbers - Chart solutions of transient Conduction systems.

Convective Heat Transfer: Buckingham Pi Theorem and method, application for developing semi – empirical non- dimensional correlation for convection heat transfer – Significance of non-dimensional numbers, Concepts of Continuity, Momentum and Energy Equations.

Forced convection: Boundary layer theory – Laminar and turbulent floe over a flat plate – Integral solution to Laminar boundary layer over a flat plate.

UNIT-III	FREE CONVECTION AND HEAT TRANSFER WITH PHASE CHANGE	Classes:16

External Flows: empirical correlations for convective heat transfer for Flat plates, Cylinders And spheres.

Internal Flows: Empirical Correlations for forced convection inside tubes for laminar and turbulent flows – Constant wall temperature, Constant wall heat flux

Free Convection: Development of Hydrodynamic and thermal boundary layer along a Vertical plate – Use of empirical relations for Vertical plates and pipes.

Heat Transfer with Phase Change:

Boiling: – Pool boiling – Regimes, Calculations on Nucleate boiling, Critical Heat flux and Film boiling.

Condensation: Film wise and drop wise condensation - Film condensation on vertical and

Horizontal cylinders using empirical correlations.

UNIT-IV	HEAT EXCHANGERS	Classes:14

Heat Exchangers

Classification of heat exchangers – overall heat transfer Coefficient and fouling factor – Concepts of LMTD and NTU methods - Problems using LMTD and NTU methods.

Radiation Heat Transfer

Emission characteristics and laws of black-body radiation – Irradiation– laws of Planck, Wien, Kirchhoff, Lambert, Stefan and Boltzmann– heat exchange between two black bodies –

Concepts of shape factor – Emissivity – heat exchange between grey bodies, radiation shields.

Text Books

1. Heat Transfer / HOLMAN/TMH
2. Heat Transfer – P.K.Nag/ TMH

Reference Books

1. Fundamentals of Engg. Heat and Mass Transfer / R.C.Sachdeva / New Age International
2. Heat Transfer – Ghoshdastidar – Oxford University Press – II Edition
3. Heat and Mass Transfer –Cengel- McGraw Hill.
4. Heat and Mass Transfer – R.K. Rajput – S.Chand& Company Ltd.
5. Essential Heat Transfer - Chrispher A Long / Pearson Education

6. Heat and Mass Transfer – D.S.Kumar / S.K.Kataria& Sons
7. Heat and Mass Transfer-Kondandaraman

Web References

1. https://nptel.ac.in/courses/112108149/
2. https://www.wisc-online.com/learn/abe-ell/science/sce304/heat-transfer-conduction-convection-radiation

E-Text Books

1. https://www.e-booksdirectory.com/details.php?ebook=8139
2. https://bookboon.com/en/engineering-ebooks

Outcomes

1. Understand basic modes of heat transfer and compute temperature distribution in steady state and unsteady state heat conduction
2. Understand and Analyze the heat transfer through extended surfaces
3. Interpret and analyze the free & forced convection heat transfer problems
4. Understand the phenomena of flow regimes of boiling and condensation
5. Understand the principles of radiation heat transfer
6. Understand the concept of LMTD and NTU methods for design of heat exchangers

CAD/CAM

B.Tech6th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1602	CORE	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:45	Tutorial Classes: 1	Practical Classes: Nil				Total Classes:45		

OBJECTIVES

The course should enable the students to

I. To make the students to know the concepts of CAD/CAM to generate a suitable geometric model of an object.

II. To analyze the features on an object and develop process planning chart/ part program.

III. To use popular drafting packages to develop geometric models of parts and their assemblies.

IV. To use computer aided quality control methods to detect manufacturing errors during inspections.

UNIT-I	OVERVIEW OF CAD/CAM & COMPUTER GRAPHICS	Classes:09

Overview of CAD/CAM: Product cycle, CAD, CAM and CIM. CAD Tools, CAM Tools, Utilization in an Industrial Environment, Evaluation criteria. CAD standards, CAD data structure, Data base management systems.

Computer Graphics: Co-ordinate systems, Graphics package functions, 2D and 3D transformations, homogeneous transformations, clipping, hidden line / surface removal colour, shading.

UNIT-II	GEOMETRIC MODELLING AND NUMERICAL CONTROL	Classes:12

Geometric Modelling: Representation techniques, Parametric and non parametric representation, various construction methods, wire frame modelling, synthetic curves and their representations, surface modelling, syn-

thetics surfaces and their Representations. Solid modelling, solid representation, fundamentals, introduction to boundary representations, constructive solid geometry, analytical solid modelling.

Numerical Control: NC, NC Modes, NC Elements, NC Machine tools and their structure, Machining centre, types and features. Controls in NC, CNC systems, DNC systems. Adaptive control machining systems, types of adaptive control.

UNIT-III	CNC PART PROGRAMMING, GROUP TECHNOLOGY & FMS	Classes:12

CNC Part Programming: Fundamentals, NC word, NC Codes, canned cycles, cutter radius compensation, length compensation, computed assisted part programming using Geometry statements, motion statements, post process statements, auxiliary statements, and macro statement program for simple components.

Group Technology & FMS: Part Family, Classification and Coding, advantages & limitations, Group technology machine cells, benefits. FMS: Introduction, components of FMS, material handling systems, Computer control systems, advantages.

UNIT-IV	COMPUTER AIDED QUALITY CONTROL & COMPUTER AIDED PROCESSES PLANNING	Classes:12

Computer Aided Quality Control: Terminology in Quality control, Inspection and testing, Contact inspection methods - optical and non optical, integration of CAQC with CAD and CIM.

Computer Aided Processes Planning: Retrieval type and Generative type, benefits, Machinability data systems, Computer generated time standards. Computer integrated production planning: Capacity planning, shop floor control, MRP-I, MRP-II, CIMS benefits. Trends in Manufacturing systems: Concepts of Reconfigurable manufacturing, Sustainable manufacturing and lean manufacturing.

Text Books

1. P N Rao,CAD/CAM : Principles & Applications, 3rd Ed., TMH ,New Delhi, 2010
2. I Zeid, R Sivasubramanian, CAD/CAM Theory and Practice, 2nd Ed., TMH - New Delhi, 2009
3. Tien-Chien Chang, Richard A. Wysk, and Hsu-Pin (Ben) Wang, Computer-Aided Manufacturing, 3rd Ed., Pearson Prentice Hall, 2008.

Reference Books

1. M P. Groover, E W. Zimmers, Jr. CAD/CAM: Computer-Aided Design and Manufacturing, 5th Ed.,Pearson Prentice Hall, 2008.
2. C R. Alavala,CAD/CAM: Concepts And Applications, 2nd Ed., PHI Learning Private Limited, 2009.
3. M E. Mortenson, Geometric modeling, 3rd Ed., Industrial Press, 2006.

Web References

1. http://www.mapeng.net/files/paper/introduction_to_cad.pdf
2. www.engr.psu.edu/cim/ie450/ie450pp7.ppt
3. https://www.iare.ac.in/sites/default/files/lecture_notes/CAD_CAM.pdf

E-Text Books

1. http://www.vssut.ac.in/lecture_notes/lecture1530947994.pdf
2. http://vigyanpariyojana.weebly.com/uploads/2/4/2/5/24253861/cad_cam.pdf

Outcomes

1. Explain the influence of CAD/CAM on product cycle
2. Compare basic 2D and 3D geometric Transformations
3. Interpret the curves, surfaces and solids representation methods
4. Explain NC, DNC, CNC, GT, CAPP and FMS
5. Develop simple CNC part programs for Milling and Turning operations
6. Explain the importance of CAD/CAM in various real day to day applications

DESIGN OF MACHINE ELEMENTS-II

B.Tech 6th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1603	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:40	Tutorial Classes: 12	Practical Classes: Nil				Total Classes:52		

OBJECTIVES

The course should enable the students to

I. To gain knowledge on the principles and procedure for the design of Mechanical power Transmission components and curved beams.

II. .To understand the standard procedure available for Design of Transmission of Mechanical elements of mechanical springs and power springs.

III. To understand the standard procedure available for Design of bearings.

IV. To understand the standard procedure available for Design of spur and helical gear and engine parts.

V. To learn to use standard data and catalogues (Use of P S G Design Data Book permitted)

UNIT-I	DESIGN OF CURVED BEAMS AND POWER TRANSMISSIONS SYSTEMS	Classes:10+3

DESIGN OF CURVED BEAMS: Stresses in curved beams, Expression for radius of neutral axis for rectangular, circular, trapezoidal and T-Section. Design of crane hooks, C –clamps.

DESIGN OF POWER TRANSMISSIONS SYSTEMS: Design of Flat belt drives, V-belt drives & rope drives. Selection of wire ropes, design procedure for chain drives.

UNIT-II	DESIGN OF MECHANICAL SPRINGS AND POWER SCREWS	Classes:10+3

DESIGN OF MECHANICAL SPRINGS: Stress and deflections of helical Springs- Springs for fatigue loading – Natural frequency of helical springs-Energy storage capacity- Helical Torsion springs- Design of leaf springs.

DESIGN OF POWER SCREWS: Design of screw- Square, ACME and Buttress screws- Efficiency of the screw. Design of compound screw, differential screw, ball screw possible failures

UNIT-III	DESIGN OF BEARINGS	Classes:10+3

DESIGN OF BEARINGS: Types of Journal bearings – Lubrication – bearing materials – journal bearing design – Ball and roller bearings – Static loading of ball & roller bearings, bearing life –Failure of bearings.

UNIT-IV	DESIGN OF SPUR & HELICAL GEARS AND ENGINE PARTS	Classes:10+3

DESIGN OF SPUR & HELICAL GEARS: Spur gears- Helical gears – Bending strength– Design analysis of spur and Helical gears – Estimation of centre distance, module and face width. Check for dynamic and wear considerations.

DESIGN OF ENGINE PARTS: Pistons– Design of piston. Cylinder, Connecting Rod. Crank shafts- Centre and over hung cranks.

Text Books

1. Mechanical Engineering Design, JosephE.Shigely, TMH Publishers, NewDelhi,9th edition, 2010
2. Machine Design, R.L. Norton, Tata McGraw Hill Publishers, 2nd edition, 2012.

Reference Books

1. Machine Design, Schau's series, TMH Publishers, New Delhi, 1st edition, 2011

2. Machine Design, Sadhu Singh, Khanna Publishers, New Delhi
3. Design of Machine Elements, M.F. Spotts, and PHI Publishers, New Delhi

Web References

1. https://nptel.ac.in/downloads/112105125/
2. https://www.alljntuworld.in/download/design-machine-members-1-dmm-1-materials-notes/

E-Text Books

1. http://www.faadooengineers.com/threads/26687-Machine-design-by-shigley-ebook-download-pdf
2. http://www.freepdfbook.com/design-of-machine-elements-by-v-b-bhandari/
3. http://www.only4engineer.com/2014/10/a-textbook-of-machine-design-by.html

Outcomes

Upon the completion of this course the students will be able to

1. Gain knowledge on the principles and procedure for the design of Mechanical power Transmission components and curved beams.
2. Apply the concept of Design of Transmission of Mechanical elements of mechanical springs and power springs
3. Apply the concepts Design of spur and helical gear and engine parts.
4. Apply the concepts of design to spur, helical gears and engine parts.

INDUSTRIAL ENGINEERING AND MANAGEMENT

B.Tech6th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1604	CORE	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:45	Tutorial Classes: 1	Practical Classes: Nil				Total Classes:45		

OBJECTIVES

The course should enable the students to

I. Understand the Levels, Functions and importance of Management.

II. Understand the concepts related to Organizational Structures.

III. Design Plant Location and Plant Layout.

IV. Understand the working principle of Human Resource Management& marketing management.

UNIT-I	INTRODUCTION TO MANAGEMENT	Classes:09

Introduction to Management: Definition, Levels of Management, Functions of Management, Role and Importance of Management, Types of Management, Social responsibility of Management – Evolution of Management Thought : Taylor's Scientific Management, Fayol's Principles of Management, Douglas Mc-Gregory's Theory X and Theory Y, Hertzberg's Two Factor Theory of Motivation, Maslow's Hierarchy of Human Needs – Systems Approach to Management.

UNIT-II	ORGANIZATIONAL STRUCTURES	Classes:12

Organizational Structures: Basic concepts related to Organization - Departmentation and Decentralization, Types of mechanistic and organic structures of organization (Line organization, Line and staff Organization, functional organization, Committee organization, matrix organization, Virtual Organization, Cellular Organization, team structure, boundary less organization, inverted pyramid structure, lean and flat Organization structure) and their merits, demerits and suitability

UNIT-III	PLANT LOCATION, PLANT LAYOUT AND PROJECT MANAGEMENT	Classes:12

Plant Location and Plant Layout: Types of production, Plant location, definition, factors affecting the plant location, comparison of rural and urban sites-methods for Selection of plant. Plant Layout – definition, objectives, types of plant Layout – Principles of material handling.

Function of Production Planning and Control: Phases, Forecasting, Planning, Scheduling, Controlling, Follow up and expediting.

Project Management: Introduction to PERT / CPM, GANTT charts, Uses of Network analysis, Rules for Network Construction, Difference between PERT and CPM, Determination of Critical Path-probability of completing the Project, critical path calculation, Types of floats, introduction to crashing.

UNIT-IV	INTRODUCTIONTO HUMAN RESOURCE MANAGEMENTAND MARKETING MANAGEMENT	Classes:12

Introduction to Human Resource Management: Functions of HRM, Job Evaluation, different types of evaluation Methods. Job description, Merit Rating, Performance Appraisal, Wage and Salary Administration.

Marketing Management: Selling, Marketing, Marketing Functions, Centralization and Decentralization, marketing strategies, distribution channels..

Text Books

1. Amrine, Manufacturing Organization and Management, Pearson, 2nd Edition, 2004
2. Industrial Engineering and Management O.P. Khanna Dhanpatrai Rai.
3. Management Science – A.R.Aryasri, TMH

Reference Books

1. Stoner, Freeman, Gilbert, Management, 6th Ed, Pearson Education, New Delhi, 2005
2. Panner Selvam, Production and Operations Management, PHI, 2004.

3. Dr. C. Nadha Muni Reddy and Dr. K. Vijaya Kumar Reddy, Reliability Engineering & Quality Engineering, Galgotia Publications, Pvt., Limited.

Web References

1. ttps://ssmengg.edu.in/weos/weos/upload/EStudyMaterial/Mechanical/6thSem/industrial%20engineering%20Unit1/INDUSTRIAL-ENGINEERING.pdf
2. https://mrcet.com/downloads/digital _ notes/ ECE/II % 20 Year/Management%20Science.pdf
3. https://nscpolteksby.ac. id/ebook / files / Ebook / Hospitality/Production %20 and % 20 Operations % 20 Management%20(2008)/3.%20Chapter%202%20-% 20 PLANT % 20 LOCATION % 20 AND %20 LAYOUT.pdf

E-Text Books

1. https://mechzoneblog.files.wordpress.com/2017/08/industrial-engg-mgmnt-o-p-khanna.pdf
2. http://www.opentextbooks.org.hk/system/files/export/18/18769/pdf/Operations_Management_18769.pdf

Outcomes

1. Design organization structure and implement management principles in real time business environment
2. Design layouts for different types of industries, manufacturing, process and service sectors
3. Elaborate productivity and profitability by implementing work-study and SQC
4. Select and maintain skilled and sufficient manpower for various business proposals
5. Find sites for all kinds of industries
6. Design a best method of making a product

PRODUCTION DRAWING

B.Tech6th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1605	CORE	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:45	Tutorial Classes: 1	Practical Classes: Nil				Total Classes:45		

OBJECTIVES

The course should enable the students to

I. Understand the need and applications of conventional representation of parts.

II. Understand the importance of Limits and Fits.

III. Select a suitable Tolerances and Surface roughness for machining components.

IV. Understand the Heat treatment and surface treatment symbols on Drawings.

UNIT-I	CONVENTIONAL REPRESENTATION	Classes:09

Conventional representation of Materials - conventional representation of parts - screw joints, welded joints, springs, gears, electrical, hydraulic and pneumatic circuits - methods of indicating notes on drawings.

UNIT-II	LIMITS AND FITS	Classes:12

Limits and Fits: Types of fits, exercises involving selection I interpretation of fits and estimation of limits from tables.

UNIT-III	TOLERANCES AND SURFACE ROUGHNESS SYMBOLS ON DRAWINGS	Classes:12

Form and Positional Tolerances: Introduction and indication of the tolerances of from and position on drawings, deformation of run out and total run out and their indication. Surface roughness and its indication: Definitions - finishes obtainable from various manufacturing processes, recommended surface roughness on mechanical components.

UNIT-IV	HEAT TREATMENT AND SURFACE TREATMENT SYMBOLS ON DRAWINGS	Classes:12

Heat treatment and surface treatment symbols used on drawings Detailed/ Part drawings: Drawing of parts from assembly drawings with indications of size, tolerances, roughness, form and position errors etc.

Text Books

1. Production and Drawing – K.L. Narayana & P. Kannaiah/ New Age
2. Machine Drawing with Auto CAD- Pohit and Ghosh, PE

Reference Books

1. Geometric dimensioning and tolerancing- James D. Meadows/ B.S Publications
2. Engineering Metrology, R.K. Jain, Khanna Publications

Web References

1. http://www.scce.ac.in/noticeboard/10367_23062016pdp-complete-manual.pdf
2. http://web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf

E-Text Books

1. www.uiet.co.in/downloads/20140911122818-Machine%20Drawing.pdf
2. https://mech.iitm.ac.in/Production%20Drawing.pdf

Outcomes

1. Understand the conventions used in a production drawing.
2. Determine limits and fits and allocate tolerances for machine components.
3. Convert machine drawings into production drawings.
4. Apply concepts and methods in the preparation of production drawings.
5. Construct free hand sketches of missing views of commonly used mechanical parts.
6. Apply the industry standards used in Machine Drawing

METAL FORMING (Elective – I)

B.Tech 6th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
13ME1606	ELECT	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:45	Tutorial Classes: 1	Practical Classes: Nil			Total Classes:45			

OBJECTIVES

The course should enable the students to

I. Understand the need and applications of modern machining processes.

II. Understand the working principle of modern machining process.

III. Select a suitable modern machining process for given applications.

IV. Understand the working principle of advanced forming processes.

UNIT-I	INTRODUCTION	Classes:09

Need for modern machining methods-Classification of modern machining processes – considerations in process selection, Materials and Applications.Ultrasonic machining – Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations.

UNIT-II	MECHANICAL ENERGY AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES	Classes:12

Abrasive jet machining, Water jet machining and abrasive water jet machine: Basic principles, equipments, process variables, mechanics of metal removal, MRR, application and limitations. Magnetic abrasive finishing and Abrasive flow finishing.

Fundamentals of chemical, machining, advantages and applications- Chemical machining-principle- maskants –etchants- Photochemical machining Thermo chemical machining. Fundamentals of electro chemical machin-

ing, electro chemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy economic aspects of ECM – Simple problems for estimation of metal removal rate. Fundamentals of chemical, machining, advantages and applications. Electro stream drilling Shaped tube electrolytic machining.

UNIT-III	ELECTRICAL ENERGY BASED PROCESSES	Classes:12

General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electric discharge wire cutting processes – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy. Wire EDM, principle, applications.

Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non thermal processes –General Principle and application of laser beam machining – thermal features, cutting speed and accuracy of cut.

UNIT-IV	THERMAL ENERGY BASED PROCESSES AND ADVANCED FORMING PROCESSES	Classes:12

Plasmas – transferred and non-transferred types of PAM- Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries.

HERFs- explosive forming, Electro hydraulic forming, magnetic pulse forming, hydrostatic extrusions.

Text Books

1. Vijay.K. Jain "Advanced Machining Processes" Allied Publishers Pvt. Ltd., New Delhi, 2007

2. Pandey P.C. and Shan H.S. “Modern Machining Processes” Tata McGraw-Hill, New Delhi,2007.

Reference Books

1. Benedict. G.F. “Nontraditional Manufacturing Processes”, Marcel Dekker Inc., New York,1987.
2. Non-conventional machining- P.K.MisraNarosa publishers.
3. Mc Geough, “Advanced Methods of Machining”, Chapman and Hall, London, 1998.

Web References

1. http://home.iitk.ac.in/~vkjain/Lecture%205_AMP_MM_NF-200914.pdf
2. http://www.sasurieengg.com/e-course-material/MECH/III-Year % 20 Sem % 206/ME 2026 % 20UMP.pdf
3. https://kcgcollege.ac.in/pdf/mech/study%20materials/UCM % 20 ME % 206004/UNIT%201%20-%20 Introduction %20UNIT%201-min-min.pdf

E-Text Books

1. http://www.iste.co.uk/data/doc_ayupatunrlmy.pdf
2. https://www.me.iitb.ac.in/ramesh/courses/ME338/non_trad.pdf

Outcomes

1. Explain the need for unconventional machining processes and its classification.
2. Compare various mechanical energy and electro chemical energy based unconventional machining processes.
3. Summarize various electrical energy based unconventional machining processes.
4. Distinguish various recent trends based unconventional machining processes.

FINITE ELEMENT METHODS (Elective – I)

B.Tech6th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1607	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	0	3	40	60	100
Contact Classes:48	Tutorial Classes: 12		Practical Classes: Nil			Total Classes:60		

OBJECTIVES

The course should enable the students to

I. To learn basic principles of finite element analysis procedure.

II. To learn the theory and characteristics of finite elements that represent engineering Structures

III. To learn and apply finite element solutions to structural, Fluid Mechanics Problemsto develop the knowledge and skills needed to effectively evaluate finite element analyses performed by others.

UNIT-I — Classes:15

Introduction to Finite Element Method for solving field problems. Stress and Equilibrium. Strain - Displacement relations. Stress - strain relations.

One-Dimensional Finite Element Methods: Bar elements, temperature effects. Element matrices, assembling of global stiffness matrix, Application of boundary conditions, Elimination and penalty approaches, solution for displacements, reaction, stresses, temperature effects, Quadratic Element.

UNIT-II — Classes:10

Trusses: Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses, and temperature effects.

Beams: Element matrices, assembling of global stiffness matrix, solution for displacements, reaction, stresses

UNIT-III	Classes:20

Two Dimensional Problems: Basic concepts of plane stress and plane strain, stiffness matrix of CST element, finite element solution of plane stress problems.

Iso-Parametric Formulation: Concepts, sub parametric, super parametric elements, 2 dimensional 4 nodediso-parametric elements, and numerical integration.

Axi-Symmetric Model: Finite element modeling of axi-symmetric solids subjected to axi-symmetric loading with triangular elements.

UNIT-IV	Classes:15

Heat Transfer and Fluid Mechanics Problems:

Steady state heat conduction with convective and heat flux boundary conditions, Functional approach, Galerkin approach formulation of element characteristic matrices and vectors in 1D and 2D problems. Temperature distribution in composite walls one dimensional and two dimensional fins and extended surfaces.

Two dimensional potential flow problems: Potential function formulation and stream function formulation.

Text Books

1. Tirupathi.R. Chandrapatla and Ashok D. Belagondu, Introduction to Finite elements in Engineering.
2. Finite Element Methods, S. S. Rao , Pergamom Press, New York

Reference Books

1. J.N. Reddy, An introduction to the Finite element method. TMH.
2. Chennakesava, R Alavala, Finite element methods: Basic concepts and applications. PHI.

Web References

1. https://nptel.ac.in/courses/112104116/
2. https://themechangers.blogspot.com/2013/08/ebook-finite-element-method-in.html
3. http://www.faadooengineers.com/threads/8846-FINITE-ELEMENTS-METHODS-ebook-pdf

E-Text Books

1. https://www.kth.se/social/upload/5261b9c6f276543474835292/main.pdf
2. https://docs.zoho.com/file/2bvxic45f0e6cf8d6463db2b5d57de47bbd42

Outcomes

1. Students will be able to understand the basic concepts of FEM and its importance in engineering field.
2. Students will be able to solve 1-D problems such as rod element, truss element and beam element.
3. Students will be able to understand the concepts of CST, sub & super parametric elements and apply the same for solving plain stress & plain strain condition.

GAS TURBINES AND JET PROPULSION (Elective – I)

B.Tech 6th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1608	ELECT	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:45	Tutorial Classes: 1	Practical Classes: Nil				Total Classes:45		

OBJECTIVES

The course should enable the students to

I. Analyze the basic fundamental of the various gas turbine cycles.

II. Discuss the various laws pertaining to jet propulsion and space propulsion.

III. Identify, formulate and solve problems related to flow through ducts and waves in compressible flow.

IV. Gain some basic knowledge about Rocket Propulsion and Cryogenics.

UNIT-I	GAS TURBINE AND ISENTROPIC FLOWS	Classes:09

Gas Turbine: Simple open cycle gas turbine or air standard Brayton cycle, Actual Brayton cycle, the cycle air flow rate, the cycle work ratio, optimum pressure ratio or maximum cycle thermal efficiency, means of improving the efficiency and the specific out put of simple cycle.

Isentropic Flows; Energy and momentum equations of compressible fluid flows, Stagnation states, Mach waves and Mach cone, Effect of Mach number on compressibility, Isentropic flow through variable ducts, Nozzle and Diffusers

UNIT-II	JET PROPULSION AND SPACE PROPULSION	Classes:12

Jet propulsion: Historical sketch- reaction principle- essential features of propulsion devices- Thermal jet engines, classification of – energy flow, thrust, thrust power and propulsion efficiency- need for thermal jet engines and applications.

Turboprop and turbojet; thermodynamic cycles, plant layout, essential components, and principles of operation, performance evaluation, thrust augmentation and Thrust reversal, contrasting with piston engine propeller plant.

UNIT-III	FLOW THROUGH DUCTS AND NOR -MAL AND OBLIQUE SHOCKS	Classes:12

Flow Through Ducts: Flows through constant area ducts with heat transfer (Rayleigh flow) and Friction (Fanno flow), variation of flow properties.

Normal and Oblique Shocks: Governing equations, Variation of flow parameters across the normal and oblique shocks, Prandtl – Meyer relations and Applications.

UNIT-IV	ROCKET TECHNOLOGY	Classes:12

Rocket Technology: Flight mechanics, application thrust profiles, acceleration staging of rockets, need for feed systems, injectors and expansion nozzles, rocket transfer and ablative cooling.

Testing & instrumentation, need for Cryogenics, advanced propulsion systems, elementary treatment of Electrical nuclear and plasma Arc Propulsion.

Text Books

1. Yahya, S.M. “Fundamentals of Compressible Flow”, New Age International (P) Limited, New Delhi, 2002.
2. Ganesan. V., “Gas Turbines”, Tata McGraw Hill Publishing Co., New Delhi, 2010.
3. Anderson, J.D., “Modern Compressible flow”, 3rd Edition, McGraw Hill, 2012.

Reference Books

1. Sutton. G.P., “Rocket Propulsion Elements”, John wiley, New York,2010,.

2. Cohen. H., G.E.C. Rogers and Saravanamutto, “Gas Turbine Theory”, Longman Group Ltd.,1980 3. Zucrow. N.J., “Principles of Jet Propulsion and Gas Turbines”, John Wiley, New York, 1970.

Web References

1. https://www.nap.edu/read/23490/chapter/6
2. https://en.wikipedia.org/wiki/Gas_turbine
3. https://www.britannica.com/technology/gas-turbine-engine

E-Text Books

1. https://soaneemrana.org/onewebmedia/GAS %2 0TU RBINE % 20 AND % 20JET % 20 & % 20ROCKET%20 PROPULSION1.pdf
2. https://archive.org/details/in.ernet.dli.2015.19428/page/n5

Outcomes

At the end of the course students are able to

1. Apply the concept of gas turbines and isentropic flows.
2. Apply the concept of jet propulsion in Space Propulsion
3. Apply the concept of compressible flows in constant area ducts and examine the effect of expansion waves in compressible flow.
4. Use the concept of gas dynamics in Rocket Technology

Available Selected MOOCs (Elective – I)

B.Tech 6th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16ME1609	Core	3	1	0	3	40	60	100
Contact Classes: -	Tutorial Classes: -	Practical Classes: Nil				Total Classes: -		

Meeting with the global requirements, to inculcate the habit of self learning and incompliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers

Regulations for MOOCs

- The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.
- Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.
- A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.
- The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.
- Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.
- There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses.
- Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration

METROLOGY LABORATORY

B.Tech6th Semester – Mechanical Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16ME2610	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	3	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**		**Practical Classes: 42**			**Total Classes: 42**		

OBJECTIVES

The course should enable the students to

I. Learn the measurement of bores by internal micrometers and dial bore indices

II. Learn the measurement of the Angle and taper s by Bevel protractor, Sine bars, etc

LIST OF EXPERIMENTS

Expt. 1	**OPTICAL PROJECTOR / TOOLMAKER MI CROSCOPE**

Measurements using Optical Projector / Toolmaker Microscope

Expt. 2	**SINE CENTER / SINE BAR / BEVEL PROTRAC TOR**

Measurements of angle using Sine Center / Sine bar / bevel protractor

Expt. 3	**AUTOCOLLIMATOR / ROLLER SET**

Measurements of alignment using Autocollimator / roller set

Expt. 4	**TOOL DYNAMOMETER**

Measurements of cutting tool forces using, I) Lathe tool Dynamometer II) Drill tool Dynamometer

Expt. 5	**TWO WIRES OR THREE-WIRE METHOD**

Measurements of Screw thread Parameters using two wires or three-wire method

Expt. 6	TALLY SURF/MECHANICAL COMPARATO

Measurements of Surface roughness using Tally surf/mechanical Comparator

Expt.7	VERNIER /GEAR TOOTH MICROMETER

Measurements of gear tooth profile using gear tooth Vernier /gear tooth micrometer

Expt. 8	CALIBRATION OF MICROMETER

Calibration of micrometer using slip gauges

Expt. 9	OPTICAL FLATS

Measurement using Optical Flats

Reference Books

1. https://gsfcuniversitymmm.files.wordpress.com/2017/02/ krishnamurthy _ l-_raghavendra_n-_v_engineeringbookzz-org.pdf
2. http://www.darshan.ac.in/Upload/DIET/Documents/ME/2141901 _ MMM _ E-Note_22032016_031012AM.pdf

Web References

1. https://www.bitswgl.ac.in/ME/Metrology-Lab-Manual%203%20year%201sem.pdfhttp://gptcperumbavoor.ac.in/gptcpbvr/Materials/Lab/6029.pdf
2. http://cittumkur.org/manuals/mech/3rd%20semester/MMM%20Lab.pdf

Course Outcome

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

1. Use various measuring instruments and its application.
2. Gain expertise in analyzing quality control aspects.
3. Compose and calibrate the measuring instruments.

HEAT TRANSFER LABORATORY

B.Tech 6h Semester – Mechanical Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16ME2611	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	3	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 48**				**Total Classes: 48**		

OBJECTIVES

The course should enable the students to

I. Impart experimental experience in Heat Transfer Lab those support Mechanical Engineering.

II. 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 make a critical assessment of industrial environment

III. Teach the students fundamentals in element of Heat Transfer & its applications. So as identify, formulate and solve the problems of Heat Transfer device designs.

IV. Develop an idea about how measure heat transfer coefficients/constant like h, emissivity, Stefan Boltzmann constants for devices like metal rod, lagged pipe, etc.,

V. Encourage the students understand importance energy conversation and make them experience with practical applications in Heat Transfer Lab.

LIST OF EXPERIMENTS

Expt. 1	**COMPOSITE SLAB APPARATUS – OVERALL HEAT TRANSFER CO-EFFICIENT.**

Determination of overall heat transfer coefficient of a composite slab

Expt. 2	**HEAT TRANSFER THROUGH LAGGED PIPE.**

Determination of heat transfer rate through a lagged pipe.

Expt. 3	**HEAT TRANSFER THROUGH A CONCENTRIC SPHERE**
Determination of heat transfer rate through a concentric sphere	
Expt. 4	**THERMAL CONDUCTIVITY OF GIVEN METAL ROD.**
Determination of thermal conductivity of a metal rod	
Expt. 5	**HEAT TRANSFER IN PIN-FIN**
Determination of effectiveness and efficiency of a pin fin	
Expt. 6	**EXPERIMENT ON TRANSIENT HEAT CONDUC TION**
Determination of thermal conductivity in transient mode	
Expt.7	**HEAT TRANSFER IN FORCED CONVECTION APPARATUS.**
Determination of heat transfer coefficient in forced convection	
Expt. 8	**HEAT TRANSFER IN NATURAL CONVECTION**
Determination of heat transfer coefficient in natural convection	
Expt. 9	**PARALLEL AND COUNTER FLOW HEAT EX CHANGER.**
Determination of effectiveness of parallel and counter flow heat exchangers.	
Expt. 10	**EMISSIVITY APPARATUS.**
Determination of emissivity of a given surface.	
Expt. 11	**STEFAN BOLTZMAN APPARATUS.**
Determination of Stefan Boltzman constant.	
Expt. 12	**HEAT TRANSFER IN DROP AND FILM WISE CONDENSATION.**
Determination of heat transfer rate in drop and film wise condensation.	
Expt. 13	**CRITICAL HEAT FLUX APPARATUS.**
Determination of critical heat flux.	

Expt. 14	STUDY OF HEAT PIPE AND ITS DEMONSTRATION.

Study the effectiveness of a heat pipe in cooling complex electromechanical systems

Reference Books

1. Fundamentals of Engg. Heat and Mass Transfer / R.C.Sachdeva / New Age International
2. Heat Transfer – Ghoshdastidar – Oxford University Press – II Edition
3. Heat and Mass Transfer –Cengel- McGraw Hill.

Web References

1. https://en.wikipedia.org/wiki/Heat_transfer
2. https://en.wikipedia.org/wiki/Heat

Course Outcome

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

1. Apply the knowledge of heat transfer perform experiments related conduction heat transfer
2. Evaluate heat transfer coefficient in free and forced convection heat transfer situation
3. Determine fin efficiency and emissivity in respective experiments
4. Observe the phenomena of drop and film wise condensation
5. Evaluate the performance of heat exchangers in parallel & counter flow types

CAD LAB

B.Tech6th Semester – Mechanical Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16ME2612	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	3	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 48**				**Total Classes: 48**		

OBJECTIVES

The course should enable the students to

I. To make the students understand and interpret drawings of machine components

II. To prepare assembly drawings both manually and using standard CAD packages

III. To familiarize the students with Indian Standards on drawing practices and standard components

IV. To gain practical experience in handling 2D drafting and 3D modeling software systems.

LIST OF EXPERIMENTS

Expt. 1	**2D Drafting using Auto CAD or any drafting pack age**

Draw the 2D drafting using Auto CAD or any drafting package

Expt. 2	**Modeling of Component in 3D – V block**

Modeling of Component in 3D – V block

Expt. 3	**Modeling of Component in 3D – Open Bearing**

Modeling of Component in 3D – Open Bearing

Expt. 4	**Modeling of Component in 3D – Angular block**

Modeling of Component in 3D – Angular block

Expt. 5	**Modeling of Component in 3D – Dovetail Guide**
Modeling of Component in 3D – Dovetail Guide	
Expt. 6	**Modeling of Component in 3D –Dovetail Bracket**
Modeling of Component in 3D – Dovetail Bracket	
Expt.7	**Modeling of Component in 3D – Tool post**
Modeling of Component in 3D – Tool post	
Expt. 8	**Assembly of a screw jack parts**
Assembly of a screw jack parts	
Expt. 9	**Assembly of aknuckle joint**
Assembly of a knuckle joint	
Expt. 10	**Assembly of aOldham?s coupling**
Assembly of aOldham?s coupling	
Expt. 11	**Assembly of a footstep bearing**
Assembly of a footstep bearing	
Expt. 12	**Assembly of a stuffing box**
Assembly of a stuffing box	
Expt. 13	**Assembly of a square tool post**
Assembly of a square tool post	

Reference Books

1. "Computer Integrated Design and Manufacturing" by David Bedworth and Philip Wolfe
2. "Computer Aided Manufacturing" by P N Rao

Web References

1. http://www.atri.edu.in/images/pdf/Autocad%20lab%20manual.pdf
2. http://www.rpsinstitutions.org/downloads/lab%20manual/cad%20lab%20manual.pdf

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:

SOFTWARE: Auto CAD or Pro-E or CATIA or Solid Works or Iron CAD

HARDWARE: Desktop Computers (04 nos)

Course Outcome

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

1. With laboratory classes, it helps the students to get familiarized with the computer applications in design and preparing drawings for various mechanical components.
2. Analyze and Manufacture in a standardized manner suitable for industrial scenarios.
3. Design Components and Develop part programs for mechanical components involving simple features
4. Implement appropriate hardware and software for CAD thereby enhancing productivity in design.

MINI PROJECT

B.Tech 6th Semester – Mechanical Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
16ME2613	Core	L	T	P	C	CIA	SEE	Total
		-	-	-	2	25	50	75
Contact Classes: 36	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 36		

OBJECTIVES

The course should enable the students to

I. Apply the programming knowledge into a real- world situation/problem and exposed the students how programming skills helps in developing a good engineer

II. The student should gain a thorough knowledge in the problem, he/she has selected and the language / software/Hardware, he/she is using.

The Mini Project shall be carried out during 6th Semester along with other lab courses by having regular weekly slots. Students will take mini project batch-wise and the batches will be divided as per the guidelines issued. The topic of mini project should be so selected that the students are enabled to complete the work in the stipulated time with the available resources in the respective laboratories. The scope of mini project could be handling part of the consultancy work, maintenance of the existing equipment, development of new experiment setup or can be a prelude to the main project with specific outcome.

Mini Project report will be evaluated for 75 marks. 25 marks for internal evaluation and 50 marks for external evaluation.

Assessment will be done by the supervisor/guide for 25 marks based on the work and presentation/ execution of the mini project.

The remaining 50 marks are based on report, presentation, execution and viva-voce. Evaluation is done by a committee comprising the mini project supervisor, Head of the Department and external examiner appointed by the Principal from the panel of experts recommended by Chairman, BOS in consultation with Head of the Department.

Outcomes

1. Acquire practical knowledge within the chosen area of technology for project development
2. contribute as an individual or in a team in development of technical projects
3. develop effective communication skills for presentation of project related activities
4. identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach

TECHNICAL APTITUDE

B.Tech 6th Semester – Mechanical Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16AS3601	-	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	-	1	25	50	75
Contact Classes: 36	**Tutorial Classes: Nil**		**Practical Classes: Nil**			**Total Classes: 36**		

OBJECTIVES

The course should enable the students to

I. To ensure that students learn to think critically about mathematical models.

II. To ensure students in solving problems effectively and accurately.

III. Application of mathematical or statistical models to different real world contexts.

UNIT-I	**Classes:5**

Problem Solving in Commercial Mathematics

(Percentages, Profit and Loss, Discount and Interest)

UNIT-II	**Classes:5**

Problem Solving in advanced level of Mathematical Ability

(Ratio and Proportions, Mixtures, Time and Work, Time and Distance)

UNIT-III	**Classes:7**

C - language concepts

C language basics, Structure of a C Program, C Tokens, Variables, Constants, C functions, types, recursion, Header files, Preprocessor Commands, Storage Classes, Arrays, types of Arrays, Strings, Pointers, Structures.

UNIT-IV	**Classes:8**

Data Structures:

Introduction, Stacks, Queues, types of Queues, Applications of Stacks and

Queues, Linked Lists, Search Techniques: Linear Search, Binary Search, Sorting Techniques: Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort, Trees: basic terminology, Binary Trees, Binary Search Trees.

UNIT-V	**Classes:11**

Personality Development- Personal Grooming-Dressing, Body, Language, Leadership Skills, Basic Etiquettes, Mannerism / Confidence Building - Positive Attitude/ Mind Power Training etc

HR Fundamentals- Practice of self concept.

Kinds of Interviews –Structured Interview. A structured interview is typically formal and organized and may include several interviewers, commonly referred to as a panel interview. ...

Unstructured Interview. ...

Stress Interview. ...

Behavioral Interview. ...

Problem Solving or Case Interview. ...

Panel Interview. Required Key Skills – Corporate culture

Interview Skills - Mock Interviews [One –One, Panel, Telephonic & Skype]

Outcomes

1. Student can attempt different technical competitive exams.
2. Student can enhance technical ability and logical thinking.

PROFESSIONAL SOCIETY ACTIVITIES-IV

B.Tech 6th Semester – Mechanical Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16AS3602	**-**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	-	1	-	-	-
Contact Classes: 12	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 12**		

OBJECTIVES

The course should enable the students to

1. Improve communication skills
2. Develop leadership qualities

Professional Society Activities (PSA) course is aimed at enhancing the self-learning, communication, managerial skills of the students by engaging them in various Co & Extra Curricular activities during their course of study. Activities in each of the department shall be designed and conducted by the Professional Society Executive Committee whose composition is:

1. Faculty Mentors- 2 No.
2. Student Chairman: 1 No.- Final year Student
3. Student General Secretary: 1 No.- Third year Student
4. Treasurer: 1 No.- Third year Student

Student Members: 2 No's from each class

PSA related activities would be of the following nature but not limited to:

Activity#1	Just A Minute
Activity#2	Technical Quiz
Activity#3	Open House- Lab Demo

Activity#4	Technical Paper Presentation- Preliminary
Activity#5	Technical Paper Presentation- Final
Activity#6	Poster Presentation
Activity#7	Collage- A theme based event
Activity#8	Debate Competition
Activity#9	Group Discussion Competition
Activity#10	Mock Interviews
Activity#11	Model Exhibition
Activity#12	Valedictory Function

AUTOMOBILE ENGINEERING

B.Tech7th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1701	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:44	Tutorial Classes: 14	Practical Classes: Nil			Total Classes:58			

OBJECTIVES

The course should enable the students to

I. The students would be able to apply the concepts of an engine design in the design of an IC engine.

II. The students would be applying the concept of power trains in an automobile to solve numerical problems and also used in combination of different engine components to get a new reasonable product for the real world application.

III. The students would be able to appreciate and synthesize the concept of drive to wheels in designing of drive systems in an automobile.

UNIT-I	ENGINE COMPONENTS AND COOLING & LUBRICATION SYSTEMS AND FUELS, FUEL SUPPLY SYSTEMS FOR SI AND CI ENGINES	Classes:14

Engine Components and Cooling & Lubrication systems:

SI & CI engines, cylinder – arrangements and their relatives merits, Liners, Piston, connecting rod, crankshaft, valves, valve actuating mechanisms, valve and port timing diagrams, Types of combustion chambers for S.I.Engine and C.I.Engines, Compression ratio, methods of a Swirl generation, choice of materials for different engine components, engine positioning, cooling requirements, methods of cooling, thermostat valves, different lubrication arrangements.

Fuels, fuel supply systems for SI and CI engines:

Conventional fuels, alternative fuels, thermodynamic cycles, normal and

abnormal combustion, cetane and octane numbers, Fuel mixture requirements for SI engines, types of carburetors, C.D.& G,.C. carburetors, multi point and single point fuel injection systems, fuel transfer pumps, Fuel filters, fuel injection pumps and injectors.

UNIT-II	IGNITION SYSTEMS, SUPERCH-ARGERS AND TURBOCHARGE-RS AND POWER TRAINS	Classes:15

Ignition Systems:

Battery Ignition systems, magneto Ignition system, Transistor assist contacts. Electronic Ignition, Automatic Ignition advance systems.

Superchargers and Turbochargers:

Naturally aspirated engines, Forced Induction, Types pf superchargers, Roots supercharger, Spiral (Scroll) supercharger, Turbocharger construction and operation, Intercooler, Turbocharger lag.

Power Trains:

General arrangement of clutch, Principle of friction clutches, Torque transmitted, Constructional details, Fluid flywheel, and Single plate, multi-plate and centrifugal clutches. Gear box: Necessity for gear ratios in transmission, synchromesh gear boxes, 3,4 and 5 speed gear boxes . Free wheeling mechanism, planetary gears systems, over drives, fluid coupling and torque converters, Epicyclic gear box, principle of automatic transmission, calculation of gear ratios, Numerical calculations for torque transmission by clutches., hot-wire anemometer.

UNIT-III	DRIVE TO WHEELS, SUSPENSI-ON, SPRINGS	Classes:14

Drive to Wheels:

Propeller shaft and universal joints, Hotchkiss and torque tube drives, differential, rear axle, different arrangements of fixing the wheels to rear

axle, steering geometry, camber, king pin inclination, included angle, castor, toe in & toe out, condition for exact steering, steering gears, power steering, general arrangements of links and stub axle, over steer, under steer and neutral steer, Numerical Problems, types of chassis frames.

Suspension, Springs : Requirements, Torsion bar suspension Systems, leaf spring, coil spring, independent suspension for front wheel and rear wheel. Air suspension system

UNIT-IV	BRAKES AND AUTOMOTIVE EMISSION CONTROL SYSTEMS	Classes:15

Brakes: Types of brakes, mechanical compressed air, vacuum and hydraulic braking systems, construction and working of master and wheel cylinder, brake shoe arrangements, Disk brakes, drum brakes, Antilock-Braking systems, purpose and operation of antilock braking system, ABS Hydraulic Unit, Rear-wheel antilock.

Automotive Emission Control Systems: Automotive emission controls, Controlling crankcase emissions, Controlling evaporative emissions, Cleaning the exhaust gas, Controlling the air-fuel mixture, Controlling the combustion process, Exhaust gas recirculation, Treating the exhaust gas, Air-injection system, Air-aspirator system, Catalytic converter, Emission standards-Euro I, II, III and IV norms, Bharat Stage II, III norms.

Text Books

1. Automotive Mechanics, William H Crouse & Donald L Anglin, 10th Edition Tata McGraw Hill Publishing Company Ltd., 2007.
2. Automotive Mechanics by S.Srinivasan, Tata McGraw Hill 2003.

Reference Books

1 Automotive mechanics: Principles and Practices, Joseph Heitner, D Van Nostrand Company, Inc .

2. Fundamentals of Automobile Engineering, K.K.Ramalingam, Scitech Publications (India) Pvt. Ltd.

3. Automobile Engineering, R.B.Gupta, Satya prakashan, 4th edn. 1984.

Web References

1. https://www.sanfoundry.com/best-reference-books-automobile-engineering/
2. https://archive.org/details/automobileengine00londrich/page/n6

E-Text Books

1. https://www.pdfdrive.com/automobile-engineering-books.html
2. http://www.faadooengineers.com/threads/47759-a-textbook-of-automobile-engineering-by-rk-rajput-free-download-pdf

OUTCOMES

At the end of the course students are able:

1. The students would be able to apply the concepts of an engine design in the design of an IC engine.
2. The students would be applying the concept of power trains in an automobile to solve numerical problems and also used in combination of different engine components to get a new reasonable product for the real world application.
3. The students would be able to appreciate and synthesize the concept of drive to wheels in designing of drive systems in an automobile.

INSTRUMENTATION AND CONTROL SYSTEMS

B.Tech7th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1702	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:44	Tutorial Classes: 14		Practical Classes: Nil			Total Classes:58		

OBJECTIVES

The course should enable the students to

I. Educate the operating principles and function of measuring instruments used in Engineering and process industries.

II. Be conversant with various working principles of instruments.

III. Understand and analyze the behavioral characteristics of instruments.

IV. Learn about calibration procedure the instrument.

V. Get educated about the fundamental aspects of control systems and their use in the context of industry applications.

UNIT-I	PRINCIPLES OF MEASUREMENT AND MEASUREMENT OF DISPL ACEMENT AND TEMPERATURE	Classes:14

Definition - Basic principles of measurement - measurement systems, generalized configuration and functional descriptions of measuring instruments - examples, dynamic performance characteristics - sources of error, classification and elimination of error.

MEASUREMENT OF DISPLACEMENT: Theory and construction of various transducers to measure displacement – piezo electric, inductive, capacitance, resistance, calibration.

MEASUREMENT OF TEMPERATURE: Classification - ranges – various principles of measurement - expansion, electrical resistance - thermistor - thermocouple - pyrometers - temperature indicators.

UNIT-II	MEASUREMENT OF PRESSURE, LEVEL AND FLOW	Classes:15

MEASUREMENT OF PRESSURE: Units -classification -different principles used. Manometers, piston, bourdon pressure gauges, bellows – diaphragm gauges. low pressure measurement - thermal conductivity gauges –McLeod pressure gauge.

MEASUREMENT OF LEVEL: Direct method - indirect methods - capacitive, ultrasonic, magnetic, cryogenic fuel level indicators – bubbler level indicators.

FLOW MEASUREMENT: Rotameter, magnetic, ultrasonic, turbine flow meter, hot-wire anemometer.

UNIT-III	MEASUREMENT OF SPEED AND STRESS–STRAIN	Classes:14

MEASUREMENT OF SPEED: Mechanical tachometers – electrical tachometers - stroboscope, noncontact type of tachometer Measurement of Acceleration and Vibration: Different simple instruments – principles of seismic instruments - vibrometer and accelerometer using this principle.

STRESS STRAIN MEASUREMENTS: Various types of stress and strain measurements - electrical strain gauge - gauge factor\ - method of usage of resistance strain gauge for bending compressive and tensile strains – usage for measuring torque, strain gauge rosettes.

UNIT-IV	MEASUREMENT OF HUMIDITY, FORCE, TORQUE, POWER AND ELEMENTS OF CONTROL SYSTEMS	Classes:15

MEASUREMENT OF HUMIDITY - Moisture content of gases, sling psychrometer, Absorption psychrometer, Dew point meter.

MEASUREMENT OF FORCE, TORQUE AND POWER- Elastic force meters, load cells, torsion meters, dynamometers.

ELEMENTS OF CONTROL SYSTEMS: Introduction, importance - classification - open and closed systems, Servomechanisms-examples with block diagrams-temperature, speed & position control systems.

Text Books

1. Measurement Systems: Applications & Design I D.S Kumar/Anuradha Agencies.
2. Instrumentation, measurement & analysis IB.C.Nakra& K.K.Choudhary/ TMH.

Reference Books

1. Principles of Industrial Instrumentation and Control Systems Chennakesava R Alavala/ Cengage Learning.
2. Mechanical and Industrial Measurements I R.K. Jain/ Khanna Publishers.

Web References

1. https://nptel.ac.in/courses/108105063/pdf/L-04 (SS) (IA&C) %20 ((EE) NPTEL). pdf
2. https://nptel.ac.in/courses/112103174/module2/lec2/2.html
3. https://nptel.ac.in/courses/108105064/4

E-Text Books

1. https://www.pdfdrive.com/process-control-instrumentation-technology-8th-edpdf-e33409857.html
2. https://www.pdfdrive.com/measurement-and-instrumentation-principles-e19238305.html

OUTCOMES

At the end of the course students are able

1. Understand working principles of basic measuring instruments.
2. Select a transducer for measurement of primary and derived variables.
3. Analyze the response of a measuring instrument.
4. Analyze and design an instrumentation system.
5. Understand temperature, speed and position control systems.

OPERATION RESEARCH

B.Tech7th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1703	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:48	Tutorial Classes: 12	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

I. Develop systematic approach handle problems with a goal of maximizing the profit and minimizing cost.

II. Understand the various optimization techniques such as classified optimization, linear programming. One dimensional minimization methods, unconstrained optimization techniques, constrained optimization techniques and dynamic programming.

III. Understand the necessary sufficient conditions for finding the solution of the problems in classical optimization.

IV. Comprehend the numerical methods for finding approximate solution of complicated problems.

V. Apply methods like North West corner rule, least count method etc. solve the transportation problem.

UNIT-I	INTRODUCTION TO LINERAR PROGRAMMING	Classes:16

Introduction: Development - definition - characteristics and phases - types of models operation research models –applications, LP problem formulation - graphical solution

Linear programming: - simplex method - artificial variables techniques - two – phases method, Big-M method - duality principle

UNIT-II	NON LINEAR PROGRAMMING AND TRANSPORT	Classes:14

Nonlinear programming: One-Dimensional Minimization: Unimodal function- Elimination methods- Unrestricted search- Exhaustive search- Dichomous search- Fibonacci method- Golden section method- Interpolation methods- Quadratic interpolation Method.

Transportation problem: Formulation -optimal solution, unbalanced transportation problem degeneracy, assignment problem - formulation -optimal solution - variants of Assignment problem travelling salesman problem.

UNIT-III	SEQUENCING	Classes:16

Sequencing - Introduction - flow - shop sequencing - n jobs through two machines – n jobs through three machines - job shop sequencing - two jobs through,m? machines

Replacement- Introduction - replacement of items that deteriorate with time – when money value is not counted and counted - replacement of items that fail completely, group replacement

UNIT-IV	GAME THEORY AND WAITING LINES	Classes:14

Game theory: Introducing - mini. Max(max.mini) - criterion and optimal strategy – solution of games with saddle points - rectangular games without saddle points - 2 x 2 games - dominance principle -m x 2 & 2 x n games - graphical method.

Waiting lines: Introduction - single channel - poison arrivals - exponential service times - with infinite population and finite population models - multichannel - poison arrivals - exponential service times with infinite population single channel poison arrivals.

Text Books

1. Operations Research/S.D Sharma – Kedarnath
2. Introduction O.R/Hiller &Libermann (TMH)

Reference Books

1. Operations Research/A.M.Natarajan. P.Balasubramani, A. Tamilarasi/ Pearson Education.
2. Operations Research Methods & Problems/Maurice Saseini, ArhurYaspan& Lawrence Friedman
3. Operation Research /R.Pannerselvam, PHI Publications.
4. Operation Research/J.K Sharma/MacMilan.

Web References

1. https://en.wikipedia.org/wiki/Operations_research
2. https://nptel.ac.in/courses/112106134/
3. https://nptel.ac.in/noc/individual_course.php?id=noc17-mg10

E-Text Books

1. file:///C:/Users/Student/Downloads/14 b14198b 6e26157b7 eba 06b390 ab 763-original.pdf
2. https://bookboon.com/en/operations-research-ebook

Outcomes

1. Formulate a real time situation into a mathematical model.
2. Assign a right job to a right person using job sequencing.
3. Make right decisions in operations management using game theory, queuing theory and replacement analysis.
4. Solve non-linear problems using non-linear programming techniques.
5. Perform optimum problem solving using dynamic programming and simulation techniques.

INDUSTRIAL ROBOTICS (Elective – II)

B.Tech 7th Semester: Mechanical Engineering (Open Elective)								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1708	ELEC	L	T	P	C	CIA	SEE	TOTAL
		41	13	-	3	40	60	100
Contact Classes:41	Tutorial Classes:13	Practical Classes: Nil			Total Classes:54			

OBJECTIVES

The course should enable the students to

1. Make the students acquainted with the theoretical aspects of Robotics
2. Enable the students acquire practical experience in the field of Robotics through design projects and case studies.
3. Make the students understand the importance of robots in various fields of engineering.
4. Expose the students various robots and their operational details.

UNIT-I	INTRODUCTION, COMPONENTS OF THE INDUSTRIAL ROBOTICS AND TYPES OF ARMS	Classes:12

Introduction: Automation and Robotics, CAD/CAM and Robotics – An over view of Robotics –

Present and future applications – classification by coordinate system and control system.

Components of the Industrial Robotics: Function line diagram representation of robot arms, common, Types of arms. Components, Architecture, number of degrees of freedom – Requirements and challenges of end effectors, determination of the end effectors.

UNIT-II	ROBOT MOTION ANALYSIS & MANIPULATOR KINEMATICS	Classes:14

Motion Analysis: Homogeneous transformations as applicable rotation and translation – problems.

Manipulator Kinematics: Specifications of matrices, D-H notation joint coordinates and world

Co-ordinates, Forward and inverse kinematics – problems.

UNIT-III	ROBOT DYNAMICS	Classes:15

Differential transformation and manipulators, Jacobians – problems.

Dynamics: Lagrange – Euler and Newton– Euler formations – Problems.

Trajectory planning and avoidance of obstacles, path planning, Skew motion, joint integrated motion –straight line motion.

UNIT-IV	ROBOT ACTUARS & ROBOT APPLICATION IN MANUFACTURING	Classes:14

Robot actuators and Feedback components: Actuators: Pneumatic, Hydraulic actuators, electric & stepper motors. Feedback components: position sensors – potentiometers, resolvers, encoders – Velocity sensors.

Robot Application in Manufacturing: Material Transfer - Material handling, loading and unloading-Processing - spot and continuous arc welding & spray painting - Assembly and Inspection.

Text Books

1. Industrial Robotics / Groover M P /Pearson Edu.
2. Robotic Engineering / Richard D. Klafter, Prentice Hall
3. Robotics and Control / Mittal R K & Nagrath I J / TMH.

Reference Books

1. Robotics / Fu K S/ McGraw Hill.
2. An Introduction Robot Technology, / P. Coiffet and M. Chaironze / Kogam Page Ltd. 1983 London.
3. Robot Analysis and Intelligence / Asada and Slow time / Wiley Inter-Science.

4. Introduction Robotics / John J Craig / Pearson Edu.
5. Robot Dynamics & Control – Mark W. Spong and M. Vidyasagar / John Wiley & Sons (ASIA) Pte Ltd.

Web References

1. http://www.montana.edu/dsobek/teaching/ime471/lectures/Lecture %2014b% 20-% 20Industrial %20 Robotics%20-%20Ch%208.pdf
2. https://nptel.ac.in/courses/112101099/3

E-Text Books

1. http://www.mech.sharif.ir/c/document_library/get_file?uuid=5a4bb247-1430-4e46-942c-d692dead831f&groupId=14040

OUTCOMES

At the end of the course students able to

1. Understand basic parts and configurations of robotic systems.
2. Analyze robotic systems using forward and inverse kinematics.
3. Analyze robotic systems for dynamic performance using Lagrange – Euler and Newton-Euler formulations.
4. Develop a trajectory plan for a given application.
5. Understand actuators and feedback devices used in robotic systems.

NANO MATERIAL APPLICATION (Elective – II)

B.Tech 7th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16ME1709	Core	3	1	-	3	40	60	100
Contact Classes:48	Tutorial Classes: -12	Practical Classes: Nil			Total Classes:60			

OBJECTIVES

The course should enable the students to

I. To acquire the knowledge of basic sciences required to understand the fundamentals of Nanomaterials

II. To acquire the knowledge of electronic, optical and magnetic properties of nanomaterials.

III. To get familiarize with the basic concepts of Statistical and Quantum mechanics.

UNIT-I	INTRODUCTION TO NANOTECHNOLOGY	Classes:16

Nanotechnology – Background and definition of nanotechnology –Types of nano materials- Microstructure – Properties – Application in different fields – Reliability issues of MEMS/NEMS

UNIT-II	SYNTHESIS OF NAN MATERIALS	Classes:14

Nanomaterials synthesis and applications – Chemical methods- Gas phase synthesis – Liquid phase synthesis –Plasma vapor deposition – Spray synthesis – Extrusion forging – ECAP – Characterization : Description of AFM/FFM and various measurement techniques , TEM

UNIT-III	TYPES OF NANOMATERIALS	Classes:16

Types of nano materials :Metallic nano particles – Metallic alloys – Nano wires and rods – Thin films – Carbon nano tubes : Structure – Synthesis – Growth mechanisms - Properties – Applications - Nano wires: Synthesis – Characterization and physical properties – Applications - Polymer ceramic nano composites- Biological based nano materials- Importance of hierarchy and third dimension of bone – Self assembly –Applications.

UNIT-IV	MECHANICAL PROPERTIES OF NANO STRUCTURES	Classes:14

Mechanical Properties of Nanostructures

Mechanical properties of nano structures: Melting and solidification of nano

phase materials- Creep in nano materials - Experimental techniques for measurement of mechanical properties of nano structures - Self assembled mono layers for controlling adhesion - Friction and Wear.

MEMS/NEMS Devices and Applications

MEMS devices and applications - NEMS devices and applications - Current challenges and future trends – MEMS fabrication techniques – Tribological issues in MEMS/NEMS – Lubrication studies for MEMS/NEMS - Manufacturing strategy - Robust manufacturing – MEMS packaging – Hermetic and vacuum packaging and applications.

Text Books

1. Charles P. Poole and Frank J. Owens (2007), Introduction to Nanotechnology, John Wiley & Sons. ISBN: 978-8-126-51099-3

Reference Books

1. JinZhang, Zhong-lin Wang, Jun Liu, Shaowei Chen and Gang-yu Liu, (2003), Self Assembled Nanostructures, Kluwer Academic/Plenum Publishers.ISBN: 978-0-306-47299-2.
2. Bharat Bhushan (2007), Hand book of Nanotechnology, Springer Hand Book. ISBN: 978-3-540-29855-7
3. Bharat Bhushan (2007), Hand book of Nanotechnology, Springer Hand Book. ISBN: 978-3-540-29855-7

Web References

1. https://physicsworld.com/c/materials/
2. https://www.understandingnano.com/

E-Text Books

1. https://www.researchgate.net/publication/259118068_Chapter_-_INTRODUCTION_TO_NANOMATERIALS
2. https://www.researchgate.net/publication/259118068_Chapter_-_INTRODUCTION_TO_NANOMATERIALS

Outcomes

1. Use Nanomaterials for various industrial applications
2. Design MEMS / NEMS devices for various applications
3. Demonstrate the knowledge of devices used in MEMS/NEMS

UNCONVENTIONAL MACHINING PROCESS (Elective – III)

B.Tech 7th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16ME1704	ELECT	3	1	-	3	40	60	100
Contact Classes:45	Tutorial Classes: 1	Practical Classes: Nil			Total Classes:45			

OBJECTIVES

The course should enable the students to

I. Understand the need and applications of modern machining processes.

II. Understand the working principle of modern machining process.

III. Select a suitable modern machining process for given applications.

IV. Understand the working principle of advanced forming processes.

UNIT-I	INTRODUCTION	Classes:09

Need for modern machining methods-Classification of modern machining processes – considerations in process selection, Materials and Applications. Ultrasonic machining, Elements of the process, mechanics of metal removal process parameters, economic considerations, applications and limitations.

UNIT-II	MECHANICAL ENERGY AND ELECTRO-CHEMICAL ENERGY BASED PROCESSES	Classes:12

Abrasive jet machining, Water jet machining and abrasive water jet machine: Basic principles, equipments, process variables, mechanics of metal removal, MRR, application and limitations. Magnetic abrasive finishing and Abrasive flow finishing.

Fundamentals of chemical, machining, advantages and applications- Chemical machining-principle- maskants –etchants- Photochemical machining Thermo chemical machining. Fundamentals of electro chemical machin-

ing, electro chemical grinding, electro chemical honing and deburring process, metal removal rate in ECM, Tool design, Surface finish and accuracy economic aspects of ECM – Simple problems for estimation of metal removal rate. Fundamentals of chemical, machining, advantages and applications. Electro stream drilling Shaped tube electrolytic machining.

UNIT-III	ELECTRICAL ENERGY BASED PROCESSES	Classes:12

General Principle and applications of Electric Discharge Machining, Electric Discharge Grinding and electric discharge wire cutting processes – Power circuits for EDM, Mechanics of metal removal in EDM, Process parameters, selection of tool electrode and dielectric fluids, methods surface finish and machining accuracy. Wire EDM, principle, applications.

Generation and control of electron beam for machining, theory of electron beam machining, comparison of thermal and non thermal processes –General Principle and application of laser beam machining – thermal features, cutting speed and accuracy of cut.

UNIT-IV	THERMAL ENERGY BASED PROCESSES AND ADVANCED FORMING PROCESSES	Classes:12

Plasmas – transferred and non-transferred types of PAM- Application of plasma for machining, metal removal mechanism, process parameters, accuracy and surface finish and other applications of plasma in manufacturing industries.

HERFs- explosive forming, Electro hydraulic forming, magnetic pulse forming, hydrostatic extrusions.

Text Books

1. Vijay.K. Jain "Advanced Machining Processes" Allied Publishers Pvt. Ltd., New Delhi, 2007

2. Pandey P.C. and Shan H.S. “Modern Machining Processes” Tata McGraw-Hill, New Delhi,2007.

Reference Books

1. Benedict. G.F. “Nontraditional Manufacturing Processes”, Marcel Dekker Inc., New York,1987.
2. Non-conventional machining- P.K.Misra Narosa publishers.
3. Mc Geough, “Advanced Methods of Machining”, Chapman and Hall, London, 1998.

Web References

1. https://www.brainkart.com/subject/Unconventional-Machining-Processes_84/
2. https://www.researchgate.net/publication/330181999-Unconventional Machining _ Process

E-Text Books

1. https://easyengineering.net/unconventional-machining-processes-by-senthil-kumar/
2. https://www.kopykitab.com/Unconventional-Machining-Processes-by-Jagadeesha-T

Outcomes

1. Explain the need for unconventional machining processes and its classification.
2. Compare various mechanical energy and electro chemical energy based unconventional machining processes.
3. Summarize various electrical energy based unconventional machining processes.
4. Distinguish various recent trends based unconventional machining processes.

MECHATRONICS (Elective – III)

B.Tech 7th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1705	ELECT	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:45	Tutorial Classes: 1	Practical Classes: Nil			Total Classes:45			

OBJECTIVES

The course should enable the students to

I. Understand of different sensors, transducers and signal conditioning techniques.

II. Understand a system models like Mechanical, Electrical, Fluid & Thermal systems.

III. Learn Transfer function for different Systems.

IV. Learn the working principle of different controllers like Proportional, Derivative, Integral, PI, PD, PID and PLC programming techniques with Microprocessor, ladder diagram for different logic Gates.

UNIT-I	INTRODUCTION OF MECHATRONICS, TRANSDUCERS AND SENSORS	Classes:09

Introduction of Mechatronics: Introduction of Mechatronics systems, Measurement system, control systems, microprocessor based controllers, Mechatronics approach and their associated problems. Examples and discussion on typical systems.

Transducers & Sensors: Introduction of Transducers, Classifications, light sensors, selection of sensors, inputting data by switches, their merits and demerits. Strain gauge & Wheat Stone Bridge.

UNIT-II	ELECTRICAL ACTUATION SYSTEMS AND SIGNAL CONDITIONING	Classes:12

Electrical actuation systems: Electrical systems, Mechanical switches, solid-state switches, solenoids, DC & AC motors, Stepper motors and their merits and demerits.

Signal Conditioning: Introduction to signal conditioning. The operational amplifier, Protection, Filtering, Wheatstone bridge, Digital signals Multiplexers, Data acquisition, Introduction to Digital system processing Pulse-modulation.

UNIT-III	MICROPROCESSOR AND MICRO CONTROLLER	Classes:12

Introduction to Microprocessors: Organization of Microprocessors (Preliminary concepts), basic concepts of programming of microprocessors. Review of concepts – Boolean algebra, Logic Gates and Gate Networks, Binary &Decimal number systems, memory representation of positive and negative integers, maximum and minimum integers. Conversion of real numbers, floating point notation ,representation of floating point numbers, accuracy and range in floating point representation, overflow and underflow, addition of floating point numbers, character representation.

Logic function, Data word representation: Basic elements of control systems 8085A processor architecture terminology such as CPU, memory and address, ALU, assembler data registers, Fetch cycle, write cycle, state, bus, interrupts. Micro Controllers. Difference between microprocessor and micro controllers. Requirements for control and their implementation in microcontrollers. Classification of micro controllers.

UNIT-IV	PROGRAMMABLE PERIPHERAL INTERFACE	Classes:12

Organization & Programming of Microprocessors: Introduction to organization of INTEL 8085-Data and Address buses, Instruction set of 8085, programming the 8085, assembly language programming.

Central Processing Unit of Microprocessors: Introduction, timing and control unit basic concepts, Instruction and data flow, system timing, examples of INTEL 8085.

Text Books

1. Microprocessor Architecture, Programming And Applications With 8085/8085A – R.S. Ganokar, Wiley Eastern.
2. Mechatronics – W.Bolton, Longman, 2Ed, Pearson Publications, 2007.

Reference Books

1. Mechatronics Principles & applications by Godfrey C.Canwerbolu, Butterworth –Heinemann 2006.
2. Mechatronics – Dan Necsulescu, Pearson Publication, 2007.
3. Introduction Mechatronics – David and Alcaire Michael B.Histand TMH, 4th Edition ,2006.

Web References

1. https://mechatronics.colostate.edu/resources.html.
2. https://en.wikipedia.org/wiki/Mechatronics.

E-Text Books

1. https://ait.libguides.com/MechanicalEngineering.
2. https://engineeringstudymaterial.net/tag/mechatronics-books/.

Outcomes

At the end of the course students are able to

1. Recognize of different sensors, transducers, signal conditioning techniques.
2. Develop a system models like Mechanical, Electrical, Fluid & Thermal systems.
3. Understand the working principle of different controllers like Proportional, Derivative, Integral, PI,PD and PID.
4. Develop a PLC programming techniques with Microprocessor, ladder diagram for different logic Gates

POWER PLANT ENGINEERING (Elective – III)

B.Tech7th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1706	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:48	Tutorial Classes: 12	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

I. Give insight regarding different sources of energy

II. Familiarize with Equipment, Plant layout, principle of working of various systems

III. Familiarize with Power Plant Economics and Environmental Considerations

UNIT-I	INTRODUCTION TO THE SOURCES OF ENERGY	Classes:16

Introduction to the Sources of Energy –Power generation scenario in India. Steam Power Plant: Plant Layout, Working of different Circuits, Fuel handling equipments, types of coals, coal handling, choice of handling equipment, coal storage, Ash handling systems. Combustion Process: Properties of coal – overfeed and underfeed fuel beds, traveling grate stokers, spreader stokers, retort stokers, pulverized fuel burning system and its components, combustion needs and draught system, cyclone furnace, design and construction, Dust collectors-Electro static Precipitators.

UNIT-II	INTERANAL COMBUSTION ENGINE PLANT	Classes:14

Internal combustion engine plant: Diesel Power Plant: Introduction – IC Engines, types, construction– Plant layout with auxiliaries – fuel supply system, air starting equipment, lubrication and cooling system – super charging. Introduction – classification - construction – Layout with auxiliaries – Principles of Gas turbine Plant: working of closed and open cycle gas turbines. Combined Cycle Power Plants and comparison.

UNIT-III	HYDROELECTRIC POWER PLANT	Classes:16

Hydro Electric Power Plant: Water power – Hydrological cycle / flow

measurement – drainage area characteristics – Hydrographs – storage and Pondage – classification of dams and spill ways.Hydro Projects and Plant: Classification – Typical layouts – plant auxiliaries – plant operation pumped storage plants.

UNIT-IV	NUCLEAR POWER STATION	Classes:14

Nuclear Power Station: Nuclear fuel – breeding and fertile materials – Nuclear reactor – reactor operation. Types of Reactors: Pressurized water reactor, Boiling water reactor, sodium-graphite reactor, fast Breeder Reactor, Homogeneous Reactor, Gas cooled Reactor, Radiation hazards and shielding – radioactive waste disposal.

Text Books

1. Gas Turbine Theory by Cohen & Rogers-Pearson Education-5th Edition
2. Power Plant Engineering by P. K. Nag.-TMH-3rd Edition

Reference Books

1. Gas Turbine & Jet Propulsion by Khajuria & Dubey- Dhanpat Rai & Sons-3rd Edition
2. Power plant Engineering by Arora and Domakundwar-Dhanpat Rai & Sons-3rd Edition
3. Thermal Engineering by P L Ballaney-Khanna Publishers.
4. An Introduction Power Plant Technology / G.D. Rai

Web References

1. https://en.wikipedia.org/wiki/Power_plant_engineering
2. https://nptel.ac.in/courses/112107216/

E-Text Books

1. https://www.pdfdrive.com/power-plant-engineering-d6453483.html

Outcomes

1. Understand the various sources of energy
2. Gain the knowledge regarding Equipment, Plant layout, principle of working of various diesel and gas turbine plants.
3. Understand the various combustion systems
4. Familiarize the working principles of various nuclear reactors.

Available Selected MOOCs (Elective – III)

B.Tech 7th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1707	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes: -	Tutorial Classes: -	Practical Classes: Nil				Total Classes: -		

Meeting with the global requirements, to inculcate the habit of self learning and incompliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers

Regulations for MOOCs

- The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.
- Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.
- A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.
- The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.
- Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.
- There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses.

  Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.

DYNAMICS AND MEASUREMENTS LABORATORY

B.Tech 7th Semester – Mechanical Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16ME2710	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	4	2	25	50	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 68**				**Total Classes: 68**		

OBJECTIVES

The course should enable the students to

I. Understand the knowledge on design and analysis of mechanisms for the specified type of motion in a machine.

II. Discriminate mobility; enumerate links and joints in the mechanisms

III. Enumerate links and joints in the mechanisms

IV. Formulate the concept of analysis of different mechanisms.

V. Demonstration exercises are provided with wide varieties of transmission element models to understand machine kinematics.

LIST OF EXPERIMENTS

Expt. 1	**The Gyroscopic couple on Motorized Gyroscope and compare with applied couple.**

To find experimentally the Gyroscopic couple on Motorized Gyroscope and compare with applied couple.

Expt. 2	**To find out critical speed experimentally and to com pare the Whirling Speed of a shaft with theoretical values.**

To find out critical speed experimentally and to compare the Whirling Speed of a shaft with theoretical values.

Expt. 3	**The Moment of Inertia of a Flywheel and Axle com pare with the theoretical values.**

To determine experimentally, the Moment of Inertia of a Flywheel and Axle compare with the theoretical values.

Expt. 4	**Balancing of rotating parts and find the unbalanced couple and forces**
To perform the experiment of Balancing of rotating parts and find the unbalanced couple and forces	
Expt. 5	**Gear- Helical, cross helical, worm, bevel gear**
To study various types of gear- Helical, cross helical, worm, bevel gear	
Expt. 6	**Calibration of Pressure Gauge**
Calibration of Pressure Gauge	
Expt.7	**Calibration OfThermocouple**
Calibration of Thermocouple	
Expt. 8	**Calibration of LVDT**
Calibration of LVDT	
Expt. 9	**Calibration of load cell**
Calibration of load cell	
Expt. 10	**Determination of modulus of elasticity of a mild steel specimen using strain gauges**
Determination of modulus of elasticity of a mild steel specimen using strain gauges	

Reference Books

1. Theory of Machines by Thomas Bevan/ CBS
2. Theory of Machines / R.K Bansal
3. Theory of Machines Sadhu Singh PearsonsEdn
4. Mechanism and Machine Theory / JS Rao and RV Dukkipati / New Age
5. The theory of Machines /Shiegley/ Oxford.
6. Theory of machines – PL. Balaney/khanna publishers.

Web References

1. https://www.researchgate.net/publication/297336746 _ Dynamics _ of _ Machines _ Lab_Manual
2. https://www.vidyarthiplus.com/vp/Thread-ME6511-Dynamics-of-Machinery - Lab-Manuals#.XOUsPVIzbIU

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:

SOFTWARE: No

HARDWARE: Dynamics of Machine

Course Outcome

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

1. The gyroscopic couple evaluation and judgment of sense
2. Evaluate the Moment of Inertia of a Flywheel and Axle
3. will get a through knowledge on gears
4. Calibrations and measurement by using strain gauges
5. Will get Basic knowledge on LVDT and load cell.

CAM LABORATORY

B.Tech 6th Semester – Mechanical Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16ME2711	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	4	2	25	50	100
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 68**				**Total Classes: 68**		

OBJECTIVES

The course should enable the students to

I. Understand the Manual Part programs using G and M codes

II. Learn machining on CNC machines

LIST OF EXPERIMENTS

Expt. 1	**Study of " G" codes and "M" codes.**

Study of " G" codes and "M" codes.

Expt. 2	**CNC – Milling rectangular pocketing.**

CNC – Milling rectangular pocketing.

Expt. 3	**CNC – Milling circular pocketing.**

CNC – Milling circular pocketing.

Expt. 4	**CNC – Simple turning**

CNC – Simple turning

Expt. 5	**CNC – Step turning.**

CNC – Step turning.

Expt. 6	**CNC Lathe – Simple Facing.**

CNC Lathe – Simple Facing.

Expt.7	**CNC Lathe – Right Hand Taper Turning.**

CNC Lathe – Right Hand Taper Turning.

Expt. 8	**CNC Lathe – Left Hand Taper Turning.**

CNC Lathe – Left Hand Taper Turning.

Expt. 9	**CNC Lathe – Thread Cutting Operation**

CNC Lathe – Thread Cutting Operation

Reference Books

1. Theory of Machines by Thomas Bevan/ CBS
2. Theory of Machines / R.K Bansal
3. Theory of Machines Sadhu Singh PearsonsEdn
4. Mechanism and Machine Theory / JS Rao and RV Dukkipati / New Age
5. The theory of Machines /Shiegley/ Oxford.
6. Theory of machines – PL. Balaney/khanna publishers.

Web References

1.https://www.scribd.com/doc/76126882/CAM-Lab-Manual

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:

SOFTWARE: CNC

HARDWARE: CNC Machine

Course Outcome

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

1. Execute steps required for modeling 3D objects by using protrusion, cut, sweep, extrude commands
2. The Manual Part programs using G and M codes
3. Learn machining on CNC machines

INSTRUMENTATION AND CONTROL SYSTEMS LABORATORY

B.Tech7th Semester – Mechanical Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16ME2712	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	3	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**		**Practical Classes: 48**			**Total Classes: 48**		

OBJECTIVES

The course should enable the students to:

I. Understand principles involved in the measurement and control of industrial processes.

II. Understand principles involved in Calibration.

III. Learn about the Temperature sensors (Thermocouples, RTD's, Thermistor's, etc.

IV. Aware of Pneumatic and hydraulic pressure concepts.

V. Balance the reciprocating mases

LIST OF EXPERIMENTS

Expt. 1	**CALIBRATION OF PRESSURE GAUGES**

To calibrate the Pressure Gauges

Expt. 2	**CALIBRATION OF LVDT TRANSDUCER**

Study and calibration of LVDT transducer for displacement measurement.

Expt. 3	**CALIBRATION OF THERMOCOUPLE**

Calibration of thermocouple for temperature measurement.

Expt. 4	**CALIBRATION OF CAPACITIVE TRANSDUCER**

Calibration of capacitive transducer for angular displacement.

Expt. 5	**CALIBRATION OF PHOTO AND MAGNETIC SPEED PICKUPS**
Study and calibration of photo and magnetic speed pickups for the measurement of speed.	
Expt. 6	**SEISMIC PICKUP FOR THE MEASUREMENT OF VIBRATION AMPLITUDE**
Study and use of a Seismic pickup for the measurement of vibration amplitude of an engine bed at various loads.	
Expt.7	**CALIBRATION OF MCLEOD GAUGE**
Study and calibration of McLeod gauge for low pressure	
Expt. 8	**CALIBRATION OF RESISTANCE TEMPERA TURE**
Calibration of resistance temperature detector for temperature measurement	
Expt. 9	**CALIBRATION OF A ROTA METER**
Study and calibration of a Rota meter for flow measurement.	
Expt. 10	**DETERMINATION OF CRITICAL SPEED**
Determination of critical Speed by using Whirling of Shaft	
Expt. 11	**BALANCING OF ROTATING MASSES**
Balancing of Rotating Masses	
Expt. 12	**DETERMINATION OF GYROSCOPIC COUPLE**
Determination of Gyroscopic Couple	
Expt. 13	**CAM PROFILE ANALYSIS**
Cam profile Analysis	

Reference Books

1. John P.Bentley,- Principles of Measurement Systems □, Pearson Education, Third Edition, 2009.

2. John Park, Steve Mackay, Edwin Wright, -Practical Data Communications for Instrumentation and Control Systems, Elsevier, Newnes, 2003.

Web References

1. https://www.bits-pilani.ac.in/hyderabad/EEE/InstrumentationLab
2. https://automationforum.in/t/free-online-instrumentation-courses/4783

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS FOR A BATCH OF 36 STUDENTS:

SOFTWARE: No

HARDWARE: Machines

Course Outcome

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

1. Perform calibration on Pressure gauges, temperature detectors and LVDT.
2. Study the working and calibrate photo and magnetic pickups and seismic pickups.
3. Determine the critical speed using whirling of shaft.
4. Perform balancing of rotating masses.
5. Determine gyroscopic couple.

INTERNSHIP

B.Tech 7th Semester: Mechanical Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
16AS3701	**Core**	-	-	-	2	25	50	75
Contact Classes: -	**Tutorial Classes: Nil**		**Practical Classes: -**			**Total Classes: -**		

OBJECTIVES

The course should enable the students to

I. Assist the student's development of employer-valued skills such as teamwork, communications and attention to detail

II. Expose the student to the environment and expectations of performance on the part of accountants in professional accounting practice, private/public companies or government entities.

III. Expose the student to professional role models or mentors who will provide the student with support in the early stages of the internship and provide an example of the behaviors expected in the intern's workplace.

Internship course is 25 marks for continuous internal assessment and will be evaluated based on day to day assessment by concern industry.

There shall be 60 hours duration to complete summer internship during summer vacations. The total internal weightage for internship course is 25 marks and will be evaluated based on day to day assessment by concern industry.

The external examination shall be evaluated by the two senior faculties (i.e one faculty act as external examiner and other one as internal examiner) for 50 marks based on the his/her report and presentation.

Course Outcome

1. An internship motivate you to create opportunities, embrace new ideas, and give direction to positive change
2. Enhance some of the skills that are transferable to any professional work setting.
3. Applied your knowledge, skills, experience to a work environment
4. Developed self-understanding, self-discipline, maturity and confidence.
5. Reflected on the content and process of the learning experience

PROFESSIONAL SOCIETY ACTIVITIES-V

B.Tech 7th Semester: Mechanical Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
16AS3702	-	-	-	-	1	-	-	-
Contact Classes: 12	**Tutorial Classes: Nil**	**Practical Classes: Nil**			**Total Classes: 12**			

OBJECTIVES

The course should enable the students to

1. Improve communication skills
2. Develop leadership qualities

Professional Society Activities (PSA) course is aimed at enhancing the self-learning, communication, managerial skills of the students by engaging them in various Co & Extra Curricular activities during their course of study. Activities in each of the department shall be designed and conducted by the Professional Society Executive Committee whose composition is:

1. Faculty Mentors- 2 No.
2. Student Chairman: 1 No.- Final year Student
3. Student General Secretary: 1 No.- Third year Student
4. Treasurer: 1 No.- Third year Student

Student Members: 2 No's from each class

PSA related activities would be of the following nature but not limited to:

Activity#1	Just A Minute
Activity#2	Technical Quiz
Activity#3	Open House- Lab Demo

Activity#4	Technical Paper Presentation- Preliminary
Activity#5	Technical Paper Presentation- Final
Activity#6	Poster Presentation
Activity#7	Collage- A theme based event
Activity#8	Debate Competition
Activity#9	Group Discussion Competition
Activity#10	Mock Interviews
Activity#11	Model Exhibition
Activity#12	Valedictory Function

PRODUCTION AND OPERATIONS MANAGEMENT (Elective – IV)

B.Tech 8th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1801	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:40	Tutorial Classes: 11	Practical Classes: Nil				Total Classes:51		

OBJECTIVES

The course should enable the students to

I. Acquire a working understanding of the roles/functions pf production management

II. Develop skills in solving production management problems

III. Recognize, appreciate and perform the job of a competent production or operation manager

UNIT-I	INTRODUCTION TO PRODUCTION MANAGEMENT	Classes:13

Introduction to Production Management: Production, Productivity, Methods of production, Production process, Types of Process charts, Productivity Engineering and Management, Total productivity model, Product & Process Development.

UNIT-II	STRATEGIC MANAGEMENT AND MATERIALS MANAGEMENT	Classes:12

Strategic Management: Corporate Planning process, Principles of Planning, Types of Plans, Environmental Scanning, Environmental analysis, SWOT Analysis.

Materials Management-Objectives, Inventory – functions, inventory classification Techniques-ABC and VED analysis. Stores Management and Stores Records. Purchase management

UNIT-III	INSPECTION AND QUALITY CONTROL	Classes:13

Inspection and Quality control: Types of inspections - Statistical Quality Control-techniques-variables and attributes-assignable and non assignable causes- variable control charts, and R charts, attributes control Charts,

p charts and c charts. Acceptance sampling plan- single sampling and double sampling plans.

UNIT-IV	WORK STUDY	Classes:13

Work study - Definition, objectives, method study - definition, objectives, steps involved- various types of associated charts-difference between micro motion and macro motion studies. Work measurement- definition, Time study, steps involved-equipment, different methods of performance rating-allowances, standard time Calculation. Work Sampling – definition, steps involved and standard time calculations.

Text Books

1. R.Panneerselvam, "Production and Operations Management" - PHI Learning private Ltd
2. Aswathappa.K- "Production and Operation Management"- Himalaya publishing house, Mumbai

Reference Books

1. S N Chary, "Production and Operations Management" - Tata McGraw Hill, New delhi,2008
2. Mahadevan, "Operations Management" - Pearson, New Delhi

Web References

1. https://en.wikipedia.org/wiki/Operations_management
2. https://onlinelibrary.wiley.com/journal/19375956

E-Text Books

1. http://www.vssut.ac.in/lecture_notes/lecture1429900757.pdf
2. https://www.academia.edu/23992923/Production _ and _ Operations _ Management _ 2nd_Edition_by_S._Anil_Kumar_and_N._Suresh

Outcomes

1. Acquire a working understanding of the roles/functions pf production management
2. Develop skills in solving production management problems
3. Recognize, appreciate and perform the job of a competent production or operation manager

TOOL DESIGN (Elective – IV)

B.Tech8th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1802	ELECT	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:45	Tutorial Classes: 1	Practical Classes: Nil				Total Classes:45		

OBJECTIVES

The course should enable the students to

I. To impart the knowledge of the basic cutting tool angles.

II. To analyze the cutting tool requirement and specify the material and geometry required for a given tool in a given machining Situation.

III. To design multipoint cutting tools and jigs/fixtures in selected applications.

IV. To identify the tooling and other requirements for machining an object with complex geometry.

UNIT-I	DESIGN OF GAUGE, SINGLE POINT & MULTIPOINT CUTTING TOOLS	Classes:11

Gauge Design: Gauges and gauge design coated tools, ceramic tools.

Design of Single Point Cutting Tools: Single point, cutting tools-various systems of specifications, geometry and their inter, relation, theories of formation of chip and their effect, design of broach.

Design of multipoint Cutting Tools: Drill geometry, Design of Drills, Rake & Relief angles of twist drill, speed, feed and depth of cut, machining time, forces, milling cutters, cutting speeds and feed-machining times-design-form cutters, combination tools, reamers etc.

UNIT-II	DESIGN OF SHEET METAL BLANKING, PIERCING, SHEET METAL BENDING, FORMING AND DRAWINGS DIE	Classes:11

Design of Sheet Metal Blanking And Piercing: Fundamentals of die cutting operating, power press types, General pressinformation, Material handling equipment, cutting action in punch and dieoperation. Die clearance, and types of Die construction. Die designfundamentals-blanking and piercing die construction, pilots, striper and pressurepads presswork material, strip layout, short run tooling for piercing.

Design of Sheet Metal Bending, Forming and Drawings Die: Bending dies, drawing dies, forming dies, drawingoperations, variables that effect metal flow during drawing. Determination ofblank size, drawing force, single and double action draw dies

UNIT-III	DESIGN OF JIGS AND FIXTURES	Classes:11

Design of Jigs And Fixtures: Basic principles of location and clamping, locating, methods and devices, jigs, definitions, types, general consideration in the design of jigs, drills bushing, methods of construction, fixtures-vice fixtures milling, boring, and lathe grinding fixtures.

UNIT-IV	DESIGN OF MOULDS	Classes:12

Design of Moulds: Design of single cavity, multi cavity moulds for injection and blowing.

Using plastics as tooling materials: introduction, plastics commonly used as tooling material application of epoxy plastic tools construction methods of plastic tooling metal forming operations with Urethane dies. Calculating forces for urethane pressure pads, and economics of tooling.

Text Books

1. Donaldson, Lecain and Goold, Tool Design. TMH.
2. A Bhattacharya, Principles of Metal cutting. New Central Book Agency, Calcutta.

Reference Books

1. Surendra Kenav and Umesh Chandra, Production Engineering Design (Tool Design). Satyaprakashan, New Delhi 1994.

2. Amitabh Bhattacharya and Inyong Ham, Design of Cutting Tools. Use of Metal Cutting Theory. ASTME publication Michigan USA, 1969.
3. RK Singal and Others, Fundamentals of Machining and Machine Tools. I.K. International, 2008.
4. Shaw, Metal Cutting Principles. Oxford Univ. Press.

Web References

1. http://www.uobabylon.edu.iq/uobColeges/ad_downloads/4_1293_515.pdf
2. http://ebooks.library.cornell.edu/k/kmoddl/toc_heywood1.html

E-Text Books

1. https://drive.google.com/file/d/0B7raaoEF40D7eEJIR1VoODJodFE/edit.
2. http://royalmechanicalbuzz.blogspot.in/2015/04/tooldesign-by-vganesan-ebook-pdf.html.
3. https://docs.google.com/file/d/0B5dLUIZfysmqMXBhakRyODhublU/edit.
4. https://archive.org/details/tooldesign00mckarich

Outcomes

1. Explain the importance of tool design and various tool design.
2. Design of Single point, Multi point, cutting tool, Sheetmetal dies.
3. Design of Jigs, Fixtures and Moulds.
4. Develop the Mould design with different materials.

COMPUTATIONAL FLUID DYNAMICS (Elective – IV)

B.Tech8th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1803	ELECT	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:45	Tutorial Classes: 1	Practical Classes: Nil				Total Classes:45		

OBJECTIVES

The course should enable the students to

I. Understand the need and applications of computation in fluid flow processes.

II. To give the student a working knowledge of a variety of computational techniques that can be used for solving fluid flow engineering problems.

UNIT-I	INTRODUCTION TO NUMERICAL TECHNIQUES	Classes:09

Elementary details in numerical Techniques: Number system and errors, Representation of integers, Fractions, Floating point Arithmetic, loss of significance and error propagation, condition and instability, computational methods for error estimation, Convergence of Sequences.

Applied Numerical Methods: Solution of a system of simultaneous Linear Algebraic Equations, iterative schemes. Of Matrix Inversion, Direct Methods for Matrix Inversion, Direct Methods for banded matrices.

UNIT-II	FINITE DIFFERENCE IN HEAT CONDUCTION AND CONVENTION	Classes:12

Finite Difference Applications in Heat conduction and Convention - Heat conduction, steady heat conduction in a rectangular geometry, transient heat conduction, and finite difference application in convective heat transfer. Finite Differences, discretization, consistency, stability, and Fundamentals

of fluid flow modeling: Introduction, elementary finite difference quotients, implementation aspects of finite difference equations, consistency, explicit and implicit methods.

UNIT-III	FLUID FLOW AND HEAT TRANSFER	Classes:12

Introduction to first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling. Conservative property, the upwind scheme. Review of Equations Governing **Fluid Flow and Heat Transfer:** Introduction, conservation of mass, Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle, and special forms of the Navier-stokes equations.

UNIT-IV	FINITE VOLUME METHOD	Classes:12

Steady flow, dimensionless form of Momentum and Energy equations, Stokes equation, conservative body force fields, stream function - Vorticity formulation.

Finite Volume Method: Approximation of surface integrals, volume integrals, interpolation and differentiation practices, upwind interpolation, linear interpolation and Quadratic Interpolation.

Text Books

1. Numerical heat transfer and fluid flow, Suhas V. Patankar, Butterworth Publishers
2. Computational fluid dynamics, Basics with applications, John. D. Anderson! Mc Graw Hill.

Reference Books

1. Computational Fluid Flow and Heat Transfer, Niyogi, Pearson Publications.
2. Fundamentals of Computational Fluid Dynamics, Tapan K. Sengupta, Universities Press.

3. Muralidhar, K .Sundarajan, T., Computational Fluid Flow and Heat Transfer, Narosa Publishing House, 2003.

Web References

1. https://cg.informatik.uni-freiburg.de/course_notes/cfd.pdf
2. www.cchem.berkeley.edu/cbe150a/mom/CFD%20Lecture.ppt
3. users.tamuk.edu/kfldp00/MEIE_Peel_website/Courses/Meen5330/.../CFD_f06.ppt

E-Text Books

1. https://soaneemrana.org/onewebmedia/
2. http://read.pudn.com/downloads132/ebook/560912/

Outcomes

1. Create governing equation
2. Explain the knowledge of CFD techniques, basic aspects of discretization and grid generation
3. Solve fluid flow fields using CFD methods
4. Model fluid flow problems
5. Apply the principles for heat transfer problems
6. Analyze fluid flow and heat transfer problems

COMPOSITE MATERIALS (Elective – IV)

B.Tech8th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1804	ELECT	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:45	Tutorial Classes: 1	Practical Classes: Nil				Total Classes:45		

OBJECTIVES

The course should enable the students to

I. To impart the knowledge of the composite materials.

II. To analyse the micro mechanics and macro mechanics of the composite materials.

III. To understands laminated plates & sandwich constructions.

IV. To provide knowledge on fabrication processes of composite materials.

UNIT-I	STRESS STRAIN RELATION	Classes:11

Introduction- Advantages and application of composite materials, reinforcements andmatrices – Generalized Hooke's Law – Elastic constants for anisotropic, orthotropic andisotropic materials.

UNIT-II	METHODS OF ANALYSIS	Classes:11

Micro mechanics – Mechanics of materials approach, elasticity approach to determinematerial properties – Macro Mechanics – Stress-strain relations with respect to naturalaxis, arbitrary axis – Determination of material properties. Experimental characterization oflamina.

UNIT-III	LAMINATED PLATES&SANDWICH CONSTRUCTIONS	Classes:11

Governing differential equation for a general laminate, angle ply and cross ply laminates. Failure criteria for composites

Basic design concepts of sandwich construction -Materials used for sandwichconstruction - Failure modes of sandwich panels

UNIT-IV	FABRICATION PROCESSES	Classes:12

Various Open and closed mould processes. Manufacture of fibers – Types of resins and properties and applications – Netting analysis.

Text Books

1. Mechanics of composite materials by Autar K Kaw Published by Crc Press.
2. Introduction to Composite Materials hull d twclyne, Published by Cambridge University Press India

Reference Books

1. Principles Of Composite Material Mechanics Ronald F Gibson by Crc Press
2. K.K. Chawla, Composite Materials: Science and Engineering, DOI 10.1007/978-0-387-74365-3_1, © Springer Science Business Media New York 2012
3. George E Dieter Mechanical Metallurgy Mcgraw-Hill, 1988

Web References

1. http://katedry.fmmi.vsb.cz/Opory_FMMI_ENG/2_rocnik/TRaCM/Composite%20materials.pdf
2. https://nptel.ac.in/courses/Webcourse-contents/IISc-BANG/Composite%20Materials/pdf/Teacher_Slides/mod1.pdf
3. http://home.iitk.ac.in/~mohite/Composite_introduction.pdf

E-Text Books

1. http://dl.iran-mavad.com/pdf95/Chawla_Composite_Materials_iran-mavad.com.pdf
2. http://www.iaukhoy.ac.ir/download/Principles %20 of %20 composite %20 materials.(GIBSON)..pdf

Outcomes

1. Identify and explain the types of composite materials and their characteristic features
2. Understand the differences in the strengthening mechanism of composite and its corresponding effect on performance and application
3. Understand and explain the methods employed in composite fabrication
4. Appreciate the theoretical basis of the experimental techniques utilized for failure mode of composites.
5. Develop expertise on the applicable engineering design of composite

ADVANCES IN CASTING AND WELDING PROCESSES (Elective – V)

B.Tech 8th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1805	ELECT	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:45	Tutorial Classes: 1	Practical Classes: Nil				Total Classes:45		

OBJECTIVES

The course should enable the students to

I. Understand the basic principles of casting and welding.

II. Understand the basic principles and applications of recent trends in casting.

III. Gain a fundamental understanding of the welding metallurgy and its design.

IV. Understand the basic principles and applications of recent trends in casting.

UNIT-I	INTRODUCTION	Classes:09

CASTING DESIGN: Heat transfer between metal and mould, Design considerations in casting, Designing for directional solidification and minimum stresses, principles and design of gating and risering.

CASTING METALLURGY: Solidification of pure metal and alloys, shrinkage in cast metals, progressive and directional solidification, Degasification of the melt-casting defects, Castability of steel , Cast Iron, Al alloys , Babbit alloy and Cu alloy.

UNIT-II	RECENT TRENDS IN CASTINGS	Classes:12

RECENT TRENDS IN CASTING AND FOUNDRY LAYOUT: Shell moulding, precision investment casting, CO2 moulding, centrifugal casting, Die casting, Continuous casting, Counter gravity low pressure casting, Squeeze casting and semisolid processes. Layout of mechanized foundry,

sand reclamation, material handling in foundry pollution control in foundry, Computer aided design of casting.

UNIT-III	WELDING METALLURGY AND DESIGN	Classes:12

WELDING METALLURGY AND DESIGN : Heat affected Zone and its characteristics, Weldability of steels, cast iron, stainless steel, aluminum, Mg , Cu , and titanium alloys, Carbon Equivalent of Plain and alloy steels Hydrogen embrittlement, Lamellar tearing, Residual stress, Distortion and its control . Heat transfer and solidification, Analysis of stresses in welded structures, pre and post welding heat treatments, weld joint design, welding defects, Testing of weldment.

UNIT-IV	RECENT TRENDS IN WELDING	Classes:12

RECENT TRENDS IN WELDING: Friction welding, friction stir welding, explosive welding, diffusion bonding, high frequency induction welding, ultrasonic welding, electron beam welding, Laser beam welding, Plasma welding, Electroslag welding, narrow gap, hybrid twin wire active TIG, Tandem MIG- modern brazing and soldering techniques, induction, dip resistance, diffusion processes, Hot gas, wave and vapor phase soldering. Overview of automation of welding in aerospace, nuclear, surface transport vehicles and under water welding.

Text Books

1. ASM Handbook vol.6, welding Brazing & Soldering, 2003.
2. Beeley P.R., “Foundry Technology” (Buttersworth).
3. P.C.Mukherji, “Metal Casting Technology”.

Reference Books

1. Jain P.L., Principles of Foundry Technology, Tata McGraw Hill Publishers, 2003.

2. Parmer R.S., Welding Engineering and Technology, Khanna Publishers,2002

3. Principle of Metal Casting- Heine, R.W. Loper ,C. Philip and C.R.Rosenthal, McGraw Hill.

Web References

1. http://www.iitg.ac.in/engfac/ganu/public_html/Metal %20 casting %20 processes _ 1.pdf
2. http://hsit.ac.in/elearning/mechanical%20engineering/iii%20semester/metal % 20casting%20&%20welding%2017

E-Text Books

1. https://ssmengg.edu.in/weos/weos/upload/EStudyMaterial/Mechanical/4thSem/production-techonology/CastingAndWelding.pdf
2. https://rdso.indianrailways.gov.in/works/uploads/File/Handbook %20 on %20 Welding %20Techniques(2).pdf

Outcomes

At the end of the course students are able to

1. Develop an understanding on casting design and castings metallurgy.
2. Develop in-depth knowledge on various recent trends used in the foundry.
3. Learn the applications and testing of welded materials.
4. Develop analytical skills for investigating welding techniques.

INDUSTRIAL TRIBOLOGY (Elective – V)

B.Tech 8th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1806	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	0	3	40	60	100
Contact Classes:48	Tutorial Classes: 12	Practical Classes: Nil			Total Classes:50			

OBJECTIVES

The course should enable the students to

1. Develop an understanding on fluid properties
2. Develop in-depth knowledge on various friction measurements
3. Learn the applications of lubrication system

   Develop analytical skills for investigating and analyzing boundary layer system

UNIT-I — Classes:15

Introduction: Tribology in design, Tribology in industry Viscosity, flow of fluids, viscosity and its variation absolute and kinematic viscosity, temperature variation, viscosity index determination of viscosity, different viscometers, Tribological considerations Nature of surfaces and their contact; Physic mechanical properties of surface layer, Geometrical properties of surfaces, methods of studying surfaces; Study of contact of smoothly and rough surfaces.

UNIT-II — Classes:10

Friction and wear: Role of friction and laws of static friction, causes of friction, theories of friction, Laws of rolling friction; Friction of metals and non-metals; Friction measurements. Definition of wear, mechanism of wear, types and measurement of wear, friction affecting wear, Theories of wear; Wear of metals and non-metals.

UNIT-III — Classes:10

Hydrostatic lubrication: Principle of hydrostatic lubrication, General requirements of bearing materials, types of bearing materials., Hydrostatic step bearing, application to pivoted pad thrust bearing and other applications, Hydrostatic lifts, hydrostatic squeeze films and its application to journal bearing, optimum design of hydrostatic step bearing.

UNIT-IV	Classes:13

Lubrication and lubricants: Introduction, dry friction; Boundary lubrication; classic hydrodynamics, hydrostatic and elasto hydrodynamic lubrication, Functions of lubricants, Types of lubricants and their industrial uses; SAE classification, recycling, disposal of oils, properties of liquid and grease lubricants; lubricant additives, general properties and selection.

Text Books

1. Fundamentals of Tribology, Basu, SenGupta and Ahuja/PHI
2. Tribology in Industry : Sushil Kumar Srivatsava, S. Chand &Co.

Reference Books

1. Tribology – B.C. Majumdar, McGraw Hill Co Ltd.
2. Standard Hand Book of Lubrication Engg., O'Conner and Royle, McGraw Hills C

Web References

1. https://nptel.ac.in/courses/112102015/4
2. http://web.iitd.ac.in/~hirani/lec11.pdf
3. https://en.wikipedia.org/wiki/Tribology

E-Text Books

1. https://zodml.org/sites/default/files/Introduction _ to _ Tribology %2C _ 2_ edition.pdf
2. http://home.ufam.edu.br/berti/nanomateriais/8403_PDF_toc.pdf

Outcomes

1. Develop an understanding on fluid properties
2. Develop in-depth knowledge on various friction measurements
3. Learn the applications of lubrication system
4. Develop analytical skills for investigating and analyzing boundary layer system

PRODUCTION PLANNING AND CONTROL (Elective – V)

B.Tech 8th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1807	ELECT	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:45	Tutorial Classes: 1	Practical Classes: Nil				Total Classes:45		

OBJECTIVES

The course should enable the students to

I. Understand the hierarchy of production planning and control decisions from long term planning real-time batch control.

II. Understand the interaction between marketing, purchasing, engineering design, manufacturing, and production control.

III. Understand the aggregate planning models including ability formulate objective functions, resource constraints, and inventory balances.

UNIT-I	INTRODUCTION	Classes:09

Definition, Objectives of production Planning and Control, Functions of production planning and control, Elements of production planning and control, Types of production, Organization of production planning and control department, Internal organization of department.

Forecasting, Importance of forecasting, Types of forecasting, their uses, General principles of forecasting, Forecasting techniques, qualitative methods and quantitative methods.

UNIT-II	INVENTORY CONTROL AND RECENT TRENDS IN PPC	Classes:12

Overview of reorder point techniques, MRP-I- Bill of Materials, Lead time, Procurement, Master Production Schedule and Receiving Dock MRP-II- Demand Forecasting, Shipping Dock, Capacity Requirement Planning Introduction ERP, JIT manufacturing.

UNIT-III	FACRY PHYSICS	Classes:12

Facry physics: Basic facry dynamics, Little?s law, Variability, Corrupting influence of variability, Push and pull production systems.

UNIT-IV	PRODUCTION SCHEDULING	Classes:12

Routing, Definition, Routing procedure , Route sheets, Bill of material, Facrs affecting routing procedure, Schedule, definition, Difference with loading, Scheduling Policies, Techniques, Standard scheduling methods, Expediting, controlling aspects, Line of balance (LOB), Dispatching, Activities of dispatcher, Dispatching procedure, follow up, definition, Reason for existence of functions, types of follow up, applications of computer in production planning and control.

Introduction aggregate planning, capacity planning.

Text Books

1. Elements of Production Planning and Control / Samuel Eilon.
2. Modern Production/ operation managements / Baffa & Rakesh Sarin
3. Facry Physics, Hopp and spearman

Reference Books

1. Operations Management – S.N. Chary.
2. Inventory Control Theory and Practice / Martin K. Starr and David W. Miller.
3. Production Control A Quantitative Approach / John E. Biegel.

Web References

1. https://en.wikipedia.org/wiki/Production_planning.
2. https://www.managementstudyguide.com/production-planning-and-control.htm.

E-Text Books

1. https://easyengineering.net/production-planning-and-control-jayakumar/
2. http://airwalkbooks.com/images/pdf/pdf_52_1.pdf.
3. http://jnujprdistance.com/assets/lms/LMS%20JNU/MBA/MBA%20 % 20 Operation % 20 Management / Sem % 20III/Production %20 Planning %20 and %20 Control/Production %20Planning %20and%20 Control. pdf.

Outcomes

At the end of the course students are able to

1. Define and relate the tasks of strategic planning, materials requirements planning, aggregate production planning and scheduling.
2. Develop forecasting models for demand forecasting.
3. Solve various inventory management problems.
4. Implement various scheduling techniques schedule shop floor activities of the industry.
5. Develop aggregate production plans weekly assembly quantities for end items.

Available Selected MOOCs (Elective – V)

B.Tech 8th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16ME1808	Core	3	1	-	3	40	60	100
Contact Classes: -	Tutorial Classes: -		Practical Classes: Nil			Total Classes: -		

Meeting with the global requirements, to inculcate the habit of self learning and incompliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers

Regulations for MOOCs

- The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.
- Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.
- A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.
- The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.
- Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.
- There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses.

  Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.

TOTAL QUALITY MANAGEMENT (Elective – VI)

B.Tech 8th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16ME1809	ELECT	3	1	-	3	40	60	100
Contact Classes:45	Tutorial Classes: 1	Practical Classes: Nil			Total Classes:45			

OBJECTIVES

The course should enable the students to

I. Provide students' knowledge about basic concepts of Quality and to describe it in its broader perspective.

II. Provide a forum for discussion on quality, and to provide an exposure and discussion on quality issues.

III. Analyze some existing methods and techniques of quality management within an organization and to advise on how to overcome various quality issues

IV. Give exposure to students on a basic competence with the tools and techniques used by real-life quality assurance department in maintaining quality.

UNIT-I	INTRODUCTION	Classes:09

TQM, overview, concepts, elements, History, Quality management philosophies, Juran, Deming, Crosby, Feigenbaum, Ishikawa, Stages of Evolution, continuous improvement, Objectives, internal and external customers.

Quality standards, Need of standardization, Institutions, bodies of standardization, ISO 9000 series, ISO 14000 series, other contemporary standards, ISO certification process and Third party audit.

UNIT-II	TQM PRINCIPLES	Classes:12

Process management, Quality measurement systems (QMS), developing and implementing QMS, nonconformance database, TQM tools & techniques, 7 QC tools, 7 New QC tools.

Problem solving techniques, Problem Solving process, corrective action, order of precedence, System failure analysis approach, flow chart, fault tree analysis, failure mode assessment and assignment matrix, organizing failure mode analysis and pedigree analysis.

UNIT-III	TQM TOOLS AND TECHNIQUES I	Classes:12

Quality circles, organization, focus team approach, statistical process control process chart, Ishikawa diagram, preparing and using control charts.

Quality Function Development (QFD), elements of QFD, benchmarking, Types, Advantages & limitations of benchmarking, Taguchi Analysis, loss function, Taguchi design of experiments. Poka-yoke, Kaizen, Deming cycle.

UNIT-IV	TQM TOOLS AND TECHNIQUES I	Classes:12

Value improvement elements – value improvement assault – supplier teaming. Business process reengineering & elements of Supply chain management. Six sigma approach – application of six sigma approach to various industrial situations..

Text Books

1. Vijay Total Quality Management, Joseph & Susan Berg.
2. Dale H.Besterfiled, Carol B.Michna,Glen H. Besterfield,Mary B.Sacre,Hemant Urdhwareshe and Rashmi Urdhwareshe, "Total Quality Management", Pearson Education Asia, Revised Third Edition, Indian Reprint, Sixth Impression, 2013.

Reference Books

1. James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2. Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006

3. Suganthi.L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.

Web References

1. https://www.researchgate.net/publication/31865450 _ Total _ Quality _ Management _ Notes
2. https://books.google.co.in/books/about/Total _ Quality _ Management.html?id = PlIkDAAAQBAJ&redir_esc=y

E-Text Books

1. https://easyengineering.net/total-quality-management-books-collections/
2. http://www.mescenter.ru/images/abook_file/Total _ Quality _ Management _ and_Six_Sigma.pdf.
3. http://naac.gov.in/docs/Books/Total % 20 Quality %20 Management %20for%20 Tertiary %20Education.pdf

Outcomes

At the end of the course students able to:

1. Evaluate the principles of quality management and to explain how these principles can be applied within quality management systems.
2. Identify the key aspects of the quality improvement cycle and to select and use appropriate tools and techniques for controlling, improving and measuring quality.
3. Critically appraise the organizational, communication and teamwork requirements for effective quality management.
4. Critically analyze the strategic issues in quality management, including current issues and developments, and to devise and evaluate quality implementation plans.

REFRIGERATION AND AIRCONDITIONING (Elective – VI)

B.Tech 8th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1810	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:48	Tutorial Classes: -16	Practical Classes: Nil				Total Classes:64		

OBJECTIVES

The course should enable the students to

I. Provide the basics of refrigeration cycles and performance calculations.

II. Provide the basics of air conditioning

III. Provide the knowledge on different refrigeration techniques

IV. Provide the basic principles of psychrometry.

V. Develop knowledge on the different air conditioning components

UNIT-I	INTRODUCTION TO REFRIGERATION	Classes:10

Introduction to Refrigeration: Necessity and Applications, Carnot Refrigerator, First and Second Law Applied to Refrigerating Machines, Unit of Refrigeration, COP, EER, Different Refrigeration Methods

Air Refrigeration: Bell-Coleman Cycle, Ideal and Actual Cycles, Open and Dense Air Systems -Numerical Problems – Refrigeration Needs of Air Crafts.

UNIT-II	VAPOUR COMPRESSION REFRIGERATION AND REFRIGERANTS	Classes:10

Vapour compression Refrigeration (VCR) System – Basic Cycle - Working Principle and Essential Components of The Plant – COP – Representation of Cycle On T-S and P-h Charts – Expander Vs. Throttling, Effect of Sub Cooling and Super Heating – Cycle Analysis – Actual Cycle-

Influence of Various Parameters on System Performance – Construction and Use of P-h Charts – Numerical Problems.

Refrigerants – Desirable Properties – Classification of Refrigerants Used – Nomenclature- Secondary Refrigerants- Lubricants – Ozone Depletion – Global Warming- Newer Refrigerants

UNIT-III	VAPOR ABSORPTION REFRIGE-RATION	Classes:10

Vapor Absorption Refrigeration(VAR) System – Description and Working of NH3 – Water System and Li Br –Water (Two Shell & Four Shell) System -Calculation of Max COP, Principle of Operation of Three Fluid Absorption System. Steam Jet Refrigeration System: Working Principle and Basic Components-Estimation of Motive Steam Required, Principle and Operation of: (I) Thermo-Electric Refrigerator (Ii) Vortex Tube OrHilsch Tube.

Introduction to Air Conditioning: Psychrometric Properties & Processes – Characterization of Sensible and Latent Heat Loads — Need For Ventilation, Consideration of Infiltrated Air – Heat Load Concepts

UNIT-IV	AIR CONDITIONING SYSTEMS	Classes:10

Air conditioning Systems: Air Cooler (Evaporative Cooling) ,Window, Split, Summer , Winter, Year Round, Central Air Conditioning Systems.

Air Conditioning Equipment - Humidifiers – Dehumidifiers – Air Filters, Fans and Blowers. Human Comfort: Requirements of Temperature, Humidity And Concept of Effective Temperature, Comfort Chart. Heat Pump – Heat Sources – Different Heat Pump Circuits

Text Books

1. Refrigeration And Air Conditioning Cp Arora, Tmh, 15th Edition, 2013.
2. A course in refrigeration and Air conditioning, S. CArora & Domkundwar, Dhanpatrai

Reference Books

1. Refrigeration and Air Conditioning / Manohar Prasad / New Age
2. Principles of Refrigeration - Dossat / Pearson Education
3. Refrigeration and Air Conditioning-P.L.Ballaney
4. Basic Refrigeration and Air-Conditioning – P.N.Ananthanarayanan / TMH

Web References

1. https://nptel.ac.in/downloads/112105129/
2. https://nptel.ac.in/syllabus/112105129/

E-Text Books

1. http://www.engineeringbookspdf.com/textbook-refrigeration-air-conditioning-r-s-khurmi-j-k-gupta/
2. https://www.slideshare.net/REHMAN4226/a-text-book-of-refrigerarion-and-airconditioning-by-r-s-khurmi

Outcomes

1. Understand the principles and applications of refrigeration systems
2. Understand vapor compression refrigeration system and identify methods for performance improvement
3. Study the working principles of steam jet, vapor absorption, thermoelectric and vortex tube systems
4. Analyze air conditioning processes using principles of psychometry.
5. Evaluate cooling and heating load in an air conditioning system
6. Identify ecofriendly refrigerants and use P-H charts to evaluate the performance of refrigeration systems

MECHANICAL VIBRATIONS (Elective – VI)

B.Tech 8th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1811	ELECT	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:45	Tutorial Classes: 1	Practical Classes: Nil			Total Classes:45			

OBJECTIVES

The course should enable the students to

I. Understand the need and applications of vibration systems.

II. Determine a complete solution to the modeled mechanical vibration problems.

III. Students use the fundamental principles of mechanics to examine the performance of a mechanical system and redesign the system to improve its response characteristics.

IV. This course requires students to apply knowledge of mathematics, science and engineering to the solution of practical linear mechanical vibration problems.

UNIT-I	INTRODUCTION	Classes:09

Introduction: Importance and scope, definition and terminology, simple harmonic motion, combination of simple harmonic motions, Fourier analysis.

Single Degree Freedom Systems-I: Undamped free vibration: Classical method, Energy method, phase plane method, equivalent systems, and tensional systems.

UNIT-II	DEGREE FREEDOM SYSTEMS	Classes:12

Single Degree Freedom Systems-II: Damped free vibration: Viscous damping, under damping, critical damping, coulomb damping, equivalent damping coefficient.

Single Degree Freedom Systems With Forced Vibrations: Steady state forced vibration, sources of excitation, impressed harmonic force,

impressed force due to unbalance, motion excitation, transmissibility and isolation, performance of different type of isolators, power absorbed by viscous damping, General theory of seismic instruments, accelerometer and Vibrometer, methods of vibration control, excitation reduction at source, System modification.

UNIT-III	MULTI DEGREE FREEDOM SYSTEMS	Classes:12

Two Degree Freedom Systems: Natural frequencies and modes of vibration by classical method of spring-mass system, forced vibration, dynamic vibration absorber

Multi Degree Freedom Systems: Influence co-efficient method, damped mass and distributed mass systems, stodola method, Holzer's method, newtons iteration method, Orthogonality of mode shapes.

UNIT-IV	VIBRATION IN CONTINUOUS SYSTEMS	Classes:12

Vibration In Continuous Systems: Longitudinal vibration of bars, torsional vibrations of circular rods or shafts, lateral vibrations of beams and shafts. Whirling of shafts critical speed of shafts, Rayleigh's upper bound approximation, Dunkerley's lower bound approximation, critical speed of shafts with damping.

Text Books

1. Mechanical Vibrations, G.K.Grover.
2. Theory and practice of mechanical Vibrations J.S.Rao and K.Gupta.

Reference Books

1. Vibration Theory and Applications, W.T.Thomson.
2. Vibration problems in Engineering, Timeoshenko and Young.

Web References

1. https://engineering.purdue.edu/~deadams/ME563/notes_10.pdf
2. https://nptel.ac.in/courses/112103111/

E-Text Books

1. 60592857366.free.fr/joe/ebooks/Mechanica %20 Engineering %20 Books %20 Collection / VIBRATIONS /mechVib %20 theory %20 and %20 applications. pdf
2. https://2k9meduettaxila.files.wordpress.com/2012/09/rao-mechanical-vibrations-5th-edition-2k9meduettaxila-wordpress-com.pdf

Outcomes

1. Students will be able to solve for the motion and the natural frequency of (1) a freely vibrating single degree of freedom undamped motion and (2) a freely vibrating single degree of freedom damped motion.
2. Students will be able to solve for the motion and the natural frequency for forced vibration of a single degree of freedom damped or undamped system.
3. Students will be able to solve vibration problems that contain multiple degrees of freedom
4. Students will be able to obtain numerical solutions to vibration problems by simple algorithms, and display the findings in graphical form.

GEOMETRIC MODELING (Elective – VI)

B.Tech 8th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1812	ELECT	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:45	Tutorial Classes: 1	Practical Classes: Nil				Total Classes:45		

OBJECTIVES

The course should enable the students to

I. Understand the use of computers in product design and manufacturing and their life cycle.

II. Perform basic 2D and 3D geometric and viewing Transformations.

III. Perform basic 2D and 3D geometric Transformations

IV. Interpret and develop models of simple curves and design projects involving animation systems.

UNIT-I	INTRODUCTION	Classes:09

Introduction: Application area of Computer graphics, Overview of graphic system, Video - display devices, Raster- scan systems, Random scan systems, Graphics monitors and work stations and input devices.

Output primitives: Points and lines, Line drawing algorithms, Midpoint circle algorithm, Filled area primitives: Scan-line polygon fill algorithm, Boundary-fill and flood –fill algorithm.

UNIT-II		Classes:12

2-D geometrical transformations: Translation, Scaling, Rotation, Reflection and shear transformation matrix representations and homogeneous co-ordinates, Composite transformations, Transformations between coordinates

2-D viewing: The viewing pipeline, Viewing coordinate reference frame, Window to view–port-co-ordinate transformations, Viewing function, Cohen-Sutherland and Cyrus –beck line clipping algorithms, Sutherland-Hodgeman polygon clipping algorithm

UNIT-III		Classes:12

3-D object representation: Polygon surfaces, Quadric surfaces, Spline representation, Hermite curve, Bezier curve and B-spline curve, Bezier and B-spline surfaces, Basic illumination models, Shading algorithms.

3-D geometric transformations: Translation, Rotation, Scaling, Reflection and shear transformation and composite transformations.

UNIT-IV		**Classes:12**

Visible surface detection methods: Classification, Back-face detection, Depth - buffer, Scan - line, Depth sorting.

Computer animation: Design of animation sequence, General computer animation functions, Raster animation, Computer animation language, Key frame system, Motion specification

Text Books

1. David F Rogers, Mathematical Elements for Computer Graphics, TMH.
2. M.C. Trivedi, Computer Graphics and Animation, Jaico Publications.

Reference Books

1. Ibrahim Zeid, CAD/CAM Theory and Practice, TMH.
2. Zhigand Xiang, Roy Plastock, Computer Graphics, 2nd Edition, Schaum's outlines, TMH..
3. Steven Harrington, Computer Graphics, TMH.

Web References

1. https://en.wikipedia.org/wiki/Geometric_modeling
2. https://nptel.ac.in/courses/112102101/44

E-Text Books

1. https://www.mobt3ath.com/uplode/book/book-24138.pdf.
2. https://www.engr.uvic.ca/~mech410/old/2 _ Lecture _ Notes/5 _ Geometric _ Modeling.pdf.

Outcomes

1. Understand the role of computer graphics in the context of the object representation.
2. Represent and generate points, lines and circles using algorithms.
3. Work with multiple 2-D and 3-D geometrical transformations to represent and solve real engineering problems.
4. Gain experience in design projects involving animation systems.

MAJOR PROJECT AND COMPREHENSIVE VIVA – VOCE

B.Tech 8th Semester: Mechanical Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME2813	Core	L	T	P	C	CIA	SEE	TOTAL
		-	-	8	12	60	140	200
Contact Classes: -	Tutorial Classes: -		Practical Classes: 120			Total Classes: 120		

Internal Evaluation for Major Project Work:

The major project shall be carried out during the 8th Semester in the **Non FSI Model** and shall be evaluated for 200 marks out of which 60 marks for internal evaluation and 140 marks for semester end evaluation. Major project will be taken up batch wise and batches will be divided as per the guidelines. The object of major project is to enable the student to extend further the investigative study taken up as the project in Mini project under the guidance of the supervisor/ guide from the department.

The assignment normally includes:

- Preparing an action plan for conducting the investigation including the team work.
- In depth study of the topic assigned.
- Review and finalization of the approach to the problem relating to the assigned topic.
- Final development of product/process, testing, results, conclusions and further direction.
- Preparing a paper for conference presentation/ publication in journal if possible.
- Preparing a dissertation in the standard format for being evaluated by the department.
- Final presentation of the work done before the Project Review Committee (PRC).

Major Project is allocated 60 internal marks. Out of 60, 30 marks are allocated for the supervisor/guide and head of the department to be evaluated based on two seminars given by each student on the topic of the project. The other 30 marks shall be evaluated on the basis of his presentation on the work done on his project by the Departmental Committee comprising of Head of the Department, respective supervisor/ guide and two senior faculty of the department appointed by the Principal.

External Evaluation for Major Project:

The major project shall be carried out during the 8th Semester in the **Non FSI Model** and shall be evaluated for 200 marks. The Semester End Examination for major project work done during 8th Semester and for 140 marks shall be conducted by a Project Review Committee (PRC). The committee comprises of an External Examiner appointed by the Principal, Head of the Department and Project Guide/Supervisor. The evaluation of project work shall be conducted at the end of the 8th Semester. The above committee evaluates the project work report with weightages of 50% of the marks (50 marks) awarded by external examiner, 20% of marks (20 marks) awarded by HOD & 30% of the marks (30 marks) by Project Guide/Supervisor respectively for a total of 100 marks. Of the 40 marks for Presentation & Viva-Voce examination, HOD evaluates for 10 marks and external examiner for 30 marks. The evaluation of 140 marks is distributed as given below:

Distribution of Project Work Marks

Sl. No.	Criterion	Marks
1	Report	100
2	Presentation & Viva – Voce	40

A candidate shall be declared to have passed in major project if he secures a minimum of 50% aggregate marks (100 marks) (Internal & Semester External Examination marks put together), subject to a minimum of 50% marks (70 marks) in the major project end examination.