# Study & Evaluation Scheme

# of

# Bachelor of Technology
# (Mechanical Engineering)

**[Applicable w.e.f. Academic Session - 2020-21 till revised]**

***[As per CBCS guidelines given by AICTE]***

## TEERTHANKER MAHAVEER UNIVERSITY

**N.H.-24, Delhi Road, Moradabad, Uttar Pradesh-244001**

**Website: www.tmu.ac.in**

| ***Study & Evaluation Scheme*** | |
|---|---|
| ***SUMMARY*** | |
| ***Institute Name*** | *Faculty of Engineering* |
| ***Programme*** | *B.Tech (Mechanical Engineering)* |
| ***Duration*** | *Four-year full time (Eight Semesters)* |
| ***Medium*** | *English* |
| ***Minimum Required Attendance*** | *75%* |
| ***Credits*** | |
| ***Maximum Credits*** | *180* |
| ***Minimum Credits Required for Degree*** | *172* |

**Assessment:**

| **Evaluation** | | | **Internal** | **External** | **Total** |
|---|---|---|---|---|---|
| **Theory** | | | 40 | 60 | 100 |
| **Practical/ Dissertations/ Project Reports/ Viva-Voce** | | | 50 | 50 | 100 |
| **Class Test-1** | **Class Test-2** | **Class Test-3** | **Assignment(s)** | **Attendance & Participation** | **Total** |
| **Best two out of three** | | | | | |
| 10 | 10 | 10 | 10 | 10 | 40 |
| **Duration of Examination** | | | **External** | **Internal** | |
| | | | 3 Hours | 1.5 Hours | |

*To qualify the course a student is required to secure a minimum of 45% marks in aggregate including the semester end examination and teachers continuous evaluation (i.e. both internal and external).A candidate who secures less than 45% of marks in a course shall be deemed to have failed in that course. The student should have at least 45% marks in aggregate to clear the semester.*

*# Provision for delivery of 25% content through online mode.*

# Policy regarding promoting the students from semester to semester & year to year. No specific condition to earn the credit for promoting the students from one semester to next semester.

# Maximum no of years required to complete the program: N+2 (N=No of years for program)

| ***Question Paper Structure*** | |
|---|---|
| ***1*** | *The question paper shall consist of six questions. Out of which first question shall be of short answer type (not exceeding 50 words) and will be compulsory. Question no. 2 to 6 (from Unit-I to V) shall have explanatory answers (approximately 350 to 400 words) along with having an internal choice within each unit.* |
| ***2*** | *Question No. 1 shall contain 8 parts from all units of the syllabus with at least one question from each unit and students shall have to answer any five, each part will carry 2 marks.* |
| ***3*** | *The remaining five questions shall have internal choice within each unit; each question will carry 10 marks.* |
| ***IMPORTANT NOTES:*** | |
| ***1*** | *The purpose of examination should be to assess the Course Outcomes (CO) that will ultimately lead to of attainment of Programme Specific Outcomes (PSOs). A question paper must assess the following aspects of learning: Remember, Understand, Apply, Analyze, Evaluate & Create (reference to Bloom's Taxonomy).* |
| ***2*** | *Case Study is essential in every question paper (wherever it is being taught as a part of pedagogy) for evaluating higher-order learning. Not all the courses might have case teaching method used as pedagogy.* |
| ***3*** | *There shall be continuous evaluation of the student and there will be a provision of fortnight progress report.* |

# Program Structure-B.Tech. (Mechanical Engineering)

## A. Introduction:

Mechanical Engineering is a backbone of various developments and innovations. It uses scientific principles to design and build machines/tools, processes, products, structures and other desired things. B,Tech in Mechanical Engineering programme has wide scope as it gives job opportunities in local to international companies and secures life-long rewarding career. Curriculum for Mechanical Engineering degree prepare the students to work in the vast range of sectors including automotive, energy, production, fabrication, power plants, metal industries etc. in design, projects, operations, manufacturing, and maintenance domains. The curriculum is so designed that the students can gain an in-depth knowledge of the engineering disciplines and applied functional areas necessary to meet the requirements of the industry.

Students will develop and gain various skills that are transferable within the engineering world and practical skills that are equally useful in plenty of other sectors. Problem-solving skills are honed, and their interpersonal and communication skills will also improve with the amount of team work that they will be required to do. Students will also learn how to better manage their time and resources and assess the risks involved in a certain project. Other useful skills that they will learn include design, leadership and organisational skills.

The institute emphasis on the following courses ***balanced with core and elective courses****:* The curriculum of B.Tech. program emphasizes an intensive, flexible engineering education with 145 credits of core courses (all types), 23 credits of electives and 12 credits of field/internship projects. Total 180 credits are allotted for the B.Tech. degree.

The programme structure and credits for B.Tech. are finalized based on the stakeholders' requirements and general structure of the programme. Minimum number of classroom contact teaching credits for the B.Tech. program will be 168 credits (one credit equals 1.0 hour) and Project/internship will be of 12 credits. However, the minimum number of the credits for award of B.Tech. degree will be 172 credits. Out of 168 credits of classroom contact teaching, 63 credits are to be allotted for core courses (CC), 16 credits are allotted to Basic Science Courses (BSC), 26 credits are allotted to Engineering Science Courses (ESC), 03 credits are allotted to Mandatory Courses (MC), 06 credits are allotted to open elective courses (OEC), 14 credits are allotted to Humanities and Social Sciences including Management courses (HSMC), 17 credits are allotted to Professional Elective courses and rest of 23 credits for Laboratory courses. Credits distribution is given below in tabular form:

| B.Tech. Mechanical Engineering: Four-Year (8-Semester) CBCS Programme | | | |
|---|---|---|---|
| **Basic Structure: Distribution of Courses** | | | |
| **S.No.** | **Type of Course** | **Credit** | **Total Credits** |
| **1** | BSC - Basic Science Courses | 4 Courses of 4 Credits each (Total Credit 4X4) | 16 |
| **2** | ESC - Engineering Science Courses | 4 Courses of 4 Credits each (Total Credit 4X4)<br>2 Courses of 3 Credits each (Total Credit 2X3) | 22 |
| **3** | HSMC - Humanities and Social Sciences including Management courses | 4 Courses of 3 Credits each (Total Credit 4X3)<br>1 Course of 2 Credits each (Total Credit1X2) | 14 |
| **4** | PCC - Professional core courses | 9 Courses of 3 Credits each (Total Credit 9X3)<br>10 Courses of 4 Credits each (Total Credit 10X4) | 67 |
| **5** | PEC - Professional Elective courses | 4 Courses of 4 Credits each (Total Credit 4X4)<br>1 Course of 1 Credits each (Total Credit 1X1) | 17 |
| **6** | OEC - Open Elective courses | 2 Course of 3 Credits each (Total Credit2X3) | 06 |
| **7** | Value Added Course (VAC) | 6 Courses of 0 Credits each (Total Credit 6X0) | 0 |
| **8** | LC - Laboratory course | 19 Courses of 1 Credits each (Total Credit 19X1)<br>2 Courses of 2 Credits each (Total Credit 2X2) | 23 |
| **9** | MC-Mandatory Courses | 1 Course of 3 Credits each (Total Credit1X3) | 03 |
| **10** | PROJ-Viva Voce for Dissertation and Skill based practical training & Industrial Training Report | 1 Course of 5 Credits each (Total Credit 1X5)<br>1 Course of 3 Credits each (Total Credit 1X3)<br>2 Course of 2 Credits each (Total Credit 2X2) | 12 |
| **11** | MOOC-Optional (credits will consider only in case a student fails to secure minimum required credits for the award of degree) | 4 Course of 0 Credits each (Total Credit 4X0) | 00 |
| **Total Credits** | | | **180** |

Contact hours include work related to Lecture, Tutorial and Practical (LTP), where our institution will have flexibility to decide course wise requirements.

## B. Tech (Honours) Programme:

A new academic programme B.Tech (Hons.) is introduced in order to facilitate the students to choose additionally the specialized courses of their choices and build their competence in a specialized area. The features of the new programme, include:

1. B.Tech Student in regular stream can opt for B.Tech (Hons.), provided he/she passed in all courses with minimum aggregate 75% marks upto the end of second semester.
2. For B. Tech (Hons), Student needs to earn additional 24 credits (over and above the required minimum 180 credits) relevant to her/his discipline as recommended by the faculty advisor.
3. The students opting for this program have to take four additional courses of their specialization of a minimum of 2 credits each from 3rd to 8th semesters.

4. The faculty advisor will suggest the additional courses to be taken by the students based on their choice and level of their academic competence.
5. The list of such additional courses offered by the NPTEL will be approved by the Honourable Vice Chancellor in the beginning of the academic year to facilitate the registration process.
6. The student can also opt for post graduate level courses.
7. The students have to submit the NPTEL course completion certificate to exam division for considering as B.Tech (Hons)

* Student should have to take permission of registration for the B.Tech. (Hons.) degree from Honourable Vice Chancellor in starting of third semester.

## B. Choice Based Credit System (CBCS)

Choice Based Credit System (CBCS) is a versatile and flexible option for each student to achieve his/her target number of credits as specified by the AICTE/UGC and adopted by our University.

The following is the course module designed for the B.Tech. program:

- ***Program Core Course (PCC):*** Core courses of B.Tech. program will provide a holistic approach to engineering education, giving students an overview of the field, a basis to build and specialize upon. These core courses are the strong foundation to establish technical knowledge and provide broad multi-disciplined knowledge can be studied further in depth during the elective phase.
  The core courses will provide more practical-based knowledge, case-based lessons and collaborative learning models. It will train the students to analyze, decide, and lead-rather than merely know-while creating a common student experience that can foster deep understanding, develop decision-making ability and contribute to the society at large.
  A wide range of core courses provides groundwork in the field of thermo-fluids, engineering designs, industrial and production engineering etc.
  We offer core courses in semester III, IV, V, VI, VII &VIII during the B.Tech.- Mechanical program. There will be 3 or 4 credits for each core course offered depending upon the course content.

- ***HSMC – (Humanities and Social Sciences including Management courses):*** As per the AICTE guidelines of Choice Based Credit System (CBCS) for all Universities, including the private Universities, the ***Humanities and Social Sciences including Management courses*** are actually Ability Enhancement Compulsory Course (AECC) which is designed to develop the ability of students in communication (especially English) and other related courses where they might find it difficult to communicate at a higher level in their prospective job at a later stage due to lack of practice and exposure in the language, etc. Students are motivated to learn the theories, fundamentals and tools of communication which can help them develop and sustain in the corporate environment and culture. We offered four HSMCs of 2 & 3 credits in I, II, IV, VI semesters.

- ***Skill Enhancement Course:*** This course may be chosen from a pool of courses designed to provide value-based and/or skill-based knowledge. We offer two SECs course as Lab- one each in VII Semester & VIII Semester. One SEC will carry 2 credits each.

- ***Open Elective Course (OEC):*** Open Elective is an interdisciplinary additional subject that is compulsory in a program. The score of Open Elective is counted in the overall aggregate marks under Choice Based Credit System (CBCS). Each Open Elective paper will be of 3 Credits in VII and VIII semesters. Each student has to take Open/Generic Electives from department other than the parent department. Core / Discipline Specific Electives will not be offered as Open Electives.

- ***Mandatory Course (MC):*** This is a compulsory course that does not have any choice and will be of 3 credits. Each student of B.Tech. Program has to compulsorily pass the Environmental Studies and acquire 3 credits.

- ***Value Added Course (VAC):*** A Value-Added Course is a non-credit course which is basically meant to enhance general ability of students in areas like soft skills, quantitative aptitude and reasoning ability - required for the overall development of a student and at the same time crucial for industry/corporate demands and requirements. The student possessing these skills will definitely develop acumen to perform well during the recruitment process of any premier organization and will have the desired confidence to face the interview. Moreover, these skills are also essential in day-to-day life of the corporate world. The aim is to nurture every student for making effective communication, developing aptitude and a general reasoning ability for a better performance, as desired in corporate world. There shall be four courses of Aptitude in Semester III, IV, V & VI semesters and two courses of Soft Skills in V &VI Semesters and will carry no credit, however, it will be compulsory for every student to pass these courses with minimum 45% marks to be eligible for the certificate. These marks will not be included in the calculation of CGPI. Students have to specifically be registered in the specific course of the respective semesters.

- ***Professional Elective courses (PEC):*** The discipline specific elective course is chosen to make students specialist or having specialized knowledge of a specific domain like thermo-fluids, designing, industrial, production management etc. It will be covered in two semesters (VII &VIII) of fourth year of the program relevant to chosen disciplines of core courses of the program. The student will have to choose any four theories and one lab out of the given list of specialization offered. Each theory of 4 credits and lab with one credit is opting by students.

## C. Program Outcomes for Engineering:

| | |
|---|---|
| **PO – 1** | **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. |
| **PO – 2** | **Problem analysis& Solving:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences. |
| **PO – 3** | **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. |
| **PO – 4** | **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. |
| **PO – 5** | **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations. |
| **PO – 6** | **Social Interaction & effective citizenship:** 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. |
| **PO – 7** | **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. |
| **PO – 8** | **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| **PO – 9** | **Attitude (Individual and team work):** Function effectively as an individual, and as member or leader in diverse teams, and in multidisciplinary settings. |

| | |
|---|---|
| **PO – 10** | **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clean instructions. |
| **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** | **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. |
| **PO-13** | **Entrepreneurship:** An Entrepreneurship cut across every sector of human life including the field of engineering, engineering entrepreneurship is the process of harnessing the business opportunities in engineering and turning it into profitable commercially viable innovation. |
| **PO-14** | **Interpersonal skills:** Interpersonal skills involve the ability to communicate and build relationships with others. Effective interpersonal skills can help the students during the job interview process and can have a positive impact on your career advancement. |
| **PO-15** | **Technology savvy/usage:** Being technology savvy is essentially one's skill to be smart with technology. This skill reaches far beyond 'understanding' the concepts of how technology works and encompasses the 'utilization' of such modern technology for the purpose of enhancing productivity and efficiency. |

## D. Programme Specific Outcomes (PSOs)

The learning and abilities or skills that a student would have developed by the end of four-year **B.Tech. Program:**

| | |
|---|---|
| **PSO – 1** | **Understanding** knowledge of mathematics, engineering and science to identify, formulate, analyse the engineering problems and find cost-effective and optimal solution of real-life problems. |
| **PSO – 2** | **Applying** mechanical engineering concepts and tools to solve complex engineering and industrial problems in the field of Manufacturing Engineering, Thermal Engineering and Design Engineering. |
| **PSO – 3** | **Analysing** managerial and entrepreneurial skills to work effectively in multidisciplinary teams for building nation and helping society by following ethical and environmentally friendly practices. |
| **PSO – 4** | **Evaluating** the need of lifelong learning and will engage in learning modern techniques and engineering tools like CAD, Solid Works, CNC machining, 3D printing etc. |
| **PSO – 5** | **Creating** positive attitude for conducting experiments and developing new concepts on emerging fields. |

## E. Pedagogy & Unique practices adopted:

"Pedagogy is the method and practice of teaching, especially for teaching an academic subject or theoretical concept". In addition to conventional time-tested lecture method, the institute will emphasize on experiential learning.

- ***Audio-Visual Based Learning:*** These days technology has taken a front seat and classrooms are well equipped with equipment and gadgets. Video-based learning has become an indispensable part of learning. Similarly, students can learn various concepts through video lectures. In fact, many teachers give examples from movies during their discourses. Making students learn few important theoretical concepts through Audio visual Aids is a good idea and method. The learning becomes

really interesting and easy as videos add life to concepts and make the learning engaging and effective. Therefore, our institute is promoting *Audio-Visual Based Learning* wherever possible.

- ***Field / Live Projects*:** The students, who take up experiential projects in companies, where senior executives with a stake in teaching guide them, drive the learning. All students are encouraged to do some live project other than their regular classes.

- ***Industrial Visits:*** Industrial visit are essential to give students hand-on exposure and experience of how things and processes work in industries. Our institute organizes such visits to enhance students' exposure to practical learning and work out for a report of such a visit relating to their specific topic, course or even domain.

- ***MOOCs:*** Students may earn credits by passing MOOCs as decided by the college. Graduate level programs may award Honors degree provided students earn pre-requisite credits through MOOCs.

  University allows students to undertake additional subjects/course(s) (In-house offered by the university through collaborative efforts or courses in the open domain by various internationally recognized universities) and to earn additional credits on successful completion of the same. Each course will be approved in advance by the University following the standard procedure of approval and will be granted credits as per the approval.

  Keeping this in mind, University proposed and allowed a maximum of two credits to be allocated for each MOOC courses. In the pilot phase it is proposed that a student undertaking and successfully completing a MOOC course through only NPTEL could be given 2 credits for each MOOC course.
  For smooth functioning and monitoring of the scheme the following shall be the guidelines for MOOC courses, Add-on courses carried out by the College from time to time.

  **a)** This is recommended for every student to take at least one MOOC Course throughout the programme.
  **b)** There shall be a MOOC co-ordination committee in the College with a faculty at the level of Professor heading the committee and all Heads of the Department being members of the Committee.
  **c)** The Committee will list out courses to be offered during the semester, which could be requested by the department or the students and after deliberating on all courses finalize a list of courses to be offered with 2 credits defined for each course and the mode of credit consideration of the student. The complete process shall be obtained by the College before end of June and end of December for Odd and Even semester respectively of the year in which the course is being offered. In case of MOOC course, the approval will be valid only for the semester on offer.
  **d)** Students will register for the course and the details of the students enrolling under the course along with the approval of the Vice Chancellor will be forwarded to the Examination department within fifteen days of start of the semester by the Coordinator MOOC through the Principal of the College.
  **e)** After completion of MOOC course, Student will submit the photo copy of Completion certificate of MOOC Course to the Examination cell as proof.
  **f)** Marks will be considered which is mentioned on Completion certificate of MOOC Course.
  **g)** College will consider the credits only in case a student fails to secure minimum required credits then the additional subject(s) shall be counted for calculating the minimum credits required for the award of degree.

- ***Special Guest Lectures (SGL) & Extra Mural Lectures (EML):*** Some topics/concepts need extra attention and efforts as they either may be high in difficulty level or requires experts from specific industry/domain to make things/concepts clear for a better understanding from the perspective of the industry. Hence, to cater to the present needs of industry we organize such lectures, as part of lecture-

series and invite prominent personalities from academia and industry from time to time to deliver their vital inputs and insights.

- ***Student Development Programs (SDP):*** Harnessing and developing the right talent for the right industry an overall development of a student is required. Apart from the curriculum teaching various student development programs (training programs) relating to soft skills, interview skills, SAP, Advanced excel training etc. that may be required as per the need of the student and industry trends, are conducted across the whole program. Participation in such programs is solicited through volunteering and consensus.

- ***Industry Focused programs:*** Establishing collaborations with various industry partners to deliver the programme on sharing basis. The specific courses are to be delivered by industry experts to provide practice based insight to the students.

- ***Special assistance program for slow learners & fast learners:*** There is a provision of identify slow learners; develop the mechanism to correcting knowledge gap through result analysis of various class tests. Extra classes will be arranged for slow learners and facilitate them with required study material. There are some terms of advance topics what learning challenging it will be provided to the fast learners.

- ***Induction program:*** Every year 3 weeks induction program is organized for 1st year students to make them familiarize with the entire academic environment of university including Curriculum, Classrooms, Labs, Faculty/ Staff members, Academic calendar and various activities.

- **Mentoring scheme:** There is Mentor-Mentee system. One mentor lecture is provided per week in a class. Students can discuss their problems with mentor who is necessarily a teaching faculty. In this way, student's problems or issues can be identified and resolved.

- **Extra-curricular Activities:** Organizing& participation in extracurricular activities will be mandatory to help students develop confidence & face audience boldly. It brings out their leadership qualities along with planning & organizing skills. Students undertake various cultural, sports and other competitive activities within and outside then campus. This helps them build their wholesome personality.

- **Career &Personal Counseling:** - Identifies the problem of student as early as possible and gives time to discuss their problems individually as well as with the parents. Counseling enables the students to focus on behavior and feelings with a goal to facilitate positive change.
  Its major role lies in giving: Advice, Help, Support, Tips, Assistance, and Guidance.
  *Strategies:* a) Once in a week the counselors meet the students in order to inquire about problems. b) Available 24x7 on SOS basis.

- **Participation in Workshops, Seminars & writing & Presenting Papers:** Departments plan to organize the workshops, Seminars & Guest lecturers time to time on their respective topics as per academic calendar. Students must have to attend these programs. These participation would be count in the marks of general Discipline & General Proficiency which is the part of course scheme as non credit course.

- **Formation of Student Clubs, Membership &Organizing& Participating events:** Every department as the departmental clubs with the specific club name. The entire student's activity would be performed by the club. One faculty would be the coordinator of the student clubs & students would be the members with different responsibility.

- **Capability Enhancement & Development Schemes:** The Institute has these schemes to enhance the capability and holistic development of the students. Following measures/ initiatives are taken up from time to time for the same: Career Counseling, Soft skill development, Remedial Coaching, Bridge Course, Language Lab, Yoga and Meditation, Personal Counseling

- **Library Visit & Utilization of E-Learning Resources:** Student can visit the library from morning 10 AM to evening 8 PM. Library created its resources Database and provided Online Public Access Catalogue (OPAC) through which users can be accessed from any of the computer connected in the LAN can know the status of the book. Now we are in process to move from OPAC to KOHA.
  - **a)** Institute Library & Information is subscribing online e-books and e-journals databases (DELNET and EBSCO host E-databases) as per the requirement of the institute and fulfilling AICTE norms. IP based access is given to all computers connected on campus LAN to access e-journals.
  - **b)** For the effective utilisation of resources, Information Literacy training programs are conducted to the staff and students.
  - **c)** Wi-Fi enabled campus
  - **d)** Regular addition of latest books and journals
  - **e)** Well maintained e-library to access e-resources

## Study & Evaluation Scheme

## B.Tech (Mechanical Engineering)-Semester I

| S. No | Category | Course Code | Course | Periods | | | Credit | Evaluation Scheme | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | | Internal | External | Total |
| 1 | BSC-1 | EAS116 | Engineering Mathematics-I | 3 | 1 | - | 4 | 40 | 60 | 100 |
| 2 | BSC-2 | EAS112 | Engineering Physics | 3 | 1 | - | 4 | 40 | 60 | 100 |
| | | EAS113 | Engineering Chemistry | | | | | | | |
| 3 | ESC-1 | EEE117 | Basic Electrical Engineering | 3 | 1 | - | 4 | 40 | 60 | 100 |
| | | EEC111 | Basic Electronics Engineering | | | | | | | |
| 4 | MC-1 | TMU101 | Environmental Studies | 2 | 1 | - | 3 | 40 | 60 | 100 |
| 5 | HSMC-1 | TMUGE101 | English Communication- I | 2 | - | 2 | 3 | 40 | 60 | 100 |
| 6 | LC-1 | EAS162 | Engineering Physics (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| | | EAS163 | Engineering Chemistry (Lab) | | | | | | | |
| 7 | LC-2 | EEE161 | Basic Electrical Engineering (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| | | EEC161 | Basic Electronics Engineering (Lab) | | | | | | | |
| 8 | LC-3 | EME161 | Engineering Drawing (Lab) | - | - | 4 | 2 | 50 | 50 | 100 |
| | | EME162 | Workshop Practice (Lab) | | | | | | | |
| 9 | DGP-1 | EGP111 | Discipline & General Proficiency | - | - | - | - | 100 | - | 100 |
| | | | **Total** | **13** | **4** | **10** | **22** | **350** | **450** | **800** |

# B.Tech (Mechanical Engineering)-Semester II

| *S. No* | *Category* | *Course Code* | **Course** | *Periods* | | | *Credit* | *Evaluation Scheme* | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *L* | *T* | *P* | | *Internal* | *External* | *Total* |
| **1** | BSC-3 | EAS211 | Engineering Mathematics-II | 3 | 1 | - | 4 | 40 | 60 | 100 |
| **2** | BSC-4 | EAS212 | Engineering Physics | 3 | 1 | - | 4 | 40 | 60 | 100 |
| | | EAS213 | Engineering Chemistry | | | | | | | |
| **3** | ESC-2 | EEE217 | Basic Electrical Engineering | 3 | 1 | - | 4 | 40 | 60 | 100 |
| | | EEC211 | Basic Electronics Engineering | | | | | | | |
| **4** | ESC-3 | ECS212 | Computer System & Programming in C++ | 3 | - | - | 3 | 40 | 60 | 100 |
| **5** | HSMC-2 | TMUGE201 | English Communication- II | 2 | - | 2 | 3 | 40 | 60 | 100 |
| **6** | LC-4 | EAS262 | Engineering Physics (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| | | EAS263 | Engineering Chemistry (Lab) | | | | | | | |
| **7** | LC-5 | EEE261 | Basic Electrical Engineering (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| | | EEC261 | Basic Electronics Engineering (Lab) | | | | | | | |
| **8** | LC-6 | ECS262 | Computer System &Programming in C++ (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| **9** | LC-7 | EME261 | Engineering Drawing (Lab) | - | - | 4 | 2 | 50 | 50 | 100 |
| | | EME262 | Workshop Practice (Lab) | | | | | | | |
| **10** | DGP-2 | EGP211 | Discipline & General Proficiency | **-** | **-** | **-** | **-** | 100 | - | 100 |
| | | | **Total** | **14** | **3** | **12** | **23** | **400** | **500** | **900** |

# B.Tech (Mechanical Engineering)-Semester III

| S. No | Category | Course Code | Course | Periods | | | Evaluation Scheme | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | Credit | Internal | External | Total |
| 1 | PCC-1 | EME311 | Engineering Mechanics | 3 | 1 | - | 4 | 40 | 60 | 100 |
| 2 | PCC-2 | EME312 | Engineering Thermodynamics | 3 | 1 | - | 4 | 40 | 60 | 100 |
| 3 | PCC-3 | EME313 | Material Science | 3 | 1 | - | 4 | 40 | 60 | 100 |
| 4 | PCC-4 | EME314 | Industrial Engineering | 3 | - | - | 3 | 40 | 60 | 100 |
| 5 | ESC-4 | EHM311 | Operations Research | 3 | 1 | - | 4 | 40 | 60 | 100 |
| 6 | LC-8 | EME361 | Machine Drawing (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| 7 | LC-9 | EME362 | Engineering Thermodynamics (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| 8 | LC-10 | EME363 | Material Science (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| 9 | DGP-3 | EGP311 | Discipline & General Proficiency | - | - | - | - | 100 | - | 100 |
| | | | **Total** | **15** | **4** | **6** | **22** | **350** | **450** | **800** |

**Following additional Course for Lateral Entry Students with B.Sc./Polytechnic background to be taken in III semester and all should pass with minimum of 45% marks for obtaining the degree: credits will not be added**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | LC | EME161/261 | Engineering Drawing (Lab) | - | - | 4 | - | 50 | 50 | 100 |
| 2 | | TMU101 | Environmental Studies | 2 | 1 | - | - | 40 | 60 | 100 |

**Value AddedCourse:**
It is an audit course. The performance of the student in this course will not be counted in the overall result however the student has to pass it compulsorily with 45% marks.

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | VAC-1 | TMUGA-301 | Foundation in Quantitative Aptitude | 2 | 1 | - | - | 40 | 60 | 100 |

# B.Tech (Mechanical Engineering)-Semester IV

| *S. No* | *Category* | *Course Code* | Course | *Periods* | | | *Evaluation Scheme* | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *L* | *T* | *P* | *Credit* | *Internal* | *External* | *Total* |
| **1** | PCC-5 | EME411 | Strength of Materials | 3 | 1 | - | 4 | 40 | 60 | 100 |
| **2** | PCC-6 | EME412 | Production Technology – I | 3 | 1 | - | 4 | 40 | 60 | 100 |
| **3** | PCC-7 | EME413 | Measurement, Metrology & Control | 3 | 1 | - | 4 | 40 | 60 | 100 |
| **4** | PCC-8 | EME414 | Fluid Mechanics | 3 | - | - | 3 | 40 | 60 | 100 |
| **5** | HSMC-3 | TMUGE401 | English Communication- III | 2 | - | 2 | 3 | 40 | 60 | 100 |
| **6** | LC-11 | EME461 | Production Technology-I (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| **7** | LC-12 | EME462 | Measurement, Metrology & Control (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| **8** | LC-13 | EME463 | Fluid Mechanics (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| **9** | DGP-4 | EGP411 | Discipline & General Proficiency | **-** | **-** | **-** | **-** | 100 | - | 100 |
| | | | **Total** | **14** | **3** | **8** | **21** | **350** | **450** | **800** |

*Skill based Training/Internship of 4 weeks duration from a reputed Industry/organization after completion of 4th semester end-semester examination.

**Following additional Courses for Lateral Entry Students with B.Sc./Polytechnic background to be taken in IV semester and all should pass with minimum of 45% marks for obtaining the degree: credits will not be added**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | LC | EME162/262 | Workshop Practice (Lab) | - | - | 4 | - | 50 | 50 | 100 |

***Value Added Course:**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | VAC-2 | TMUGA-401 | Analytical Reasoning | 2 | 1 | - | - | 40 | 60 | 100 |

# B.Tech (Mechanical Engineering)-Semester V

| S. No | Category | Course Code | Course | Periods | | | Evaluation Scheme | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | L | T | P | Credit | Internal | External | Total |
| **1** | PCC-9 | EME511 | Production Technology –II | 3 | 1 | - | 4 | 40 | 60 | 100 |
| **2** | PCC-10 | EME512 | Dynamics of Machines | 3 | - | - | 3 | 40 | 60 | 100 |
| **3** | PCC-11 | EME513 | Heat & Mass Transfer | 3 | - | - | 3 | 40 | 60 | 100 |
| **4** | PCC-12 | EME514 | Automobile Engineering | 3 | - | - | 3 | 40 | 60 | 100 |
| **5** | PCC-13 | EME515 | Energy Conservation | 3 | 1 | - | 4 | 40 | 60 | 100 |
| **6** | HSMC-4 | EHM513 | Human values & Professional Ethics | 2 | - | - | 2 | 40 | 60 | 100 |
| **7** | LC-14 | EME561 | Production Technology-II (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| **8** | LC-15 | EME562 | Dynamics of Machines (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| **9** | LC-16 | EME563 | Heat & Mass Transfer (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| **10** | PROJ-1 | EME592 | Skill based Practical Training & Presentation | - | - | - | 2 | 50 | 50 | 100 |
| **11** | DGP-5 | EGP511 | Discipline & General Proficiency | **-** | **-** | **-** | **-** | 100 | - | 100 |
| | | | **Total** | **17** | **2** | **6** | **24** | **440** | **560** | **1000** |

***Value Added Course:**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | VAC-3 | TMUGA-501 | Modern Algebra and Data Management | 2 | 1 | - | - | 40 | 60 | 100 |
| **2** | VAC-4 | TMUGS-501 | Managing Self | 2 | 1 | - | - | 50 | 50 | 100 |

**MOOC Course:**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | MOOC-1 | MOOC01 | MOOC Program -I (Optional) | - | - | - | 2 | - | 100 | 100 |

# B.Tech (Mechanical Engineering)-Semester VI

| *S. No* | *Category* | *Course Code* | Course | *Periods* | | | *Evaluation Scheme* | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | *L* | *T* | *P* | *Credit* | *Internal* | *External* | *Total* |
| **1** | PCC-14 | EME611 | Refrigeration & Air Conditioning | 3 | 1 | - | 4 | 40 | 60 | 100 |
| **2** | PCC-15 | EME612 | Mechanical Vibrations | 3 | - | - | 3 | 40 | 60 | 100 |
| **3** | PCC-16 | EME613 | Design of Machine Elements | 3 | - | - | 3 | 40 | 60 | 100 |
| **4** | ESC-5 | EEE614 | Non-Conventional Energy Resources | 3 | 1 | - | 4 | 40 | 60 | 100 |
| **5** | ESC-6 | EHM611 | Operations Management | 3 | - | - | 3 | 40 | 60 | 100 |
| **6** | HSMC-5 | TMUGE601 | English Communication- IV | 2 | - | 2 | 3 | 40 | 60 | 100 |
| **7** | LC-17 | EME661 | Refrigeration & Air Conditioning (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| **8** | LC-18 | EME662 | Solid Works (Lab) | - | - | 2 | 1 | 50 | 50 | 100 |
| **9** | DGP-6 | EGP611 | Discipline & General Proficiency | **-** | **-** | **-** | **-** | 100 | - | 100 |
| | | | **Total** | **17** | **2** | **6** | **22** | **340** | **460** | **800** |

*Industrial Training of 6 weeks duration from a reputed Industry/organization after completion of 6$^{th}$ semester end-semester examination.

***Value Added Course:**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | VAC-5 | TMUGA-601 | Advance Algebra and Geometry | 2 | 1 | - | - | 40 | 60 | 100 |
| **2** | VAC-6 | TMUGS-601 | Managing Work and Others | 2 | 1 | - | - | 50 | 50 | 100 |

**MOOC Course:**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | MOOC-2 | MOOC02 | MOOC Program –II (Optional) | - | - | - | 2 | - | 100 | 100 |

## B.Tech (Mechanical Engineering)-Semester VII

| S. No. | Category | Course Code | Course | | Periods | | | Evaluation Scheme | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Credit | Internal | External | Total |
| 1 | PCC-17 | EME711 | Computer Aided Design (CAD) | | 3 | - | - | 3 | 40 | 60 | 100 |
| 2 | PCC-18 | EME712 | IC Engines | | 3 | - | - | 3 | 40 | 60 | 100 |
| 3 | PEC-1 | | Program Elective | Program Elective-I | 3 | 1 | - | 4 | 40 | 60 | 100 |
| 4 | PEC-2 | | | Program Elective-II | 3 | 1 | - | 4 | 40 | 60 | 100 |
| 5 | OEC-1 | | Open Elective | Open Elective-I | 3 | - | - | 3 | 40/50 | 60/50 | 100 |
| 6 | LC-19 | EME761 | Computer Aided Design (Lab) | | - | - | 2 | 1 | 50 | 50 | 100 |
| 7 | LC-20 | EME762 | IC Engines (Lab) | | - | - | 2 | 1 | 50 | 50 | 100 |
| 8 | PROJ-2 | EME792 | Industrial Training & Presentation | | - | - | - | 2 | 50 | 50 | 100 |
| 9 | PROJ-3 | EME798 | Project Work Phase-1 | | - | - | 10 | 5 | 100 | - | 100 |
| 10 | DGP-7 | EGP711 | Discipline & General Proficiency | | - | - | - | - | 100 | - | 100 |
| | | | **Total** | | **15** | **2** | **14** | **26** | **450/460** | **450/440** | **900** |

**MOOC Course:**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | MOOC-3 | MOOC03 | MOOC Program –III (Optional) | - | - | - | 2 | - | 100 | 100 |

# B.Tech (Mechanical Engineering)-Semester VIII

| S. No | Category | Course Code | Course | | Periods | | | Evaluation Scheme | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | L | T | P | Credit | Internal | External | Total |
| **1** | PCC-19 | EME811 | Computer Aided Manufacturing (CAM) | | 3 | 1 | - | 4 | 40 | 60 | 100 |
| **2** | PEC-3 | | Program Elective | Program Elective-III | 3 | 1 | - | 4 | 40 | 60 | 100 |
| **3** | PEC-4 | | | Program Elective-IV | 3 | 1 | - | 4 | 40 | 60 | 100 |
| **4** | PEC-5 | | Program Elective (Lab) | Program Elective-V | - | - | 2 | 1 | 50 | 50 | 100 |
| **5** | OEC-2 | | Open Elective | Open Elective-II | 3 | - | - | 3 | 40/50 | 60/50 | 100 |
| **6** | LC-21 | EME861 | Computer Aided Manufacturing (CAM) (Lab) | | - | - | 2 | 1 | 50 | 50 | 100 |
| **7** | PROJ-4 | EME898 | Project Work Phase –II | | - | - | 6 | 3 | 50 | 50 | 100 |
| **8** | DGP-8 | EGP811 | Discipline & General Proficiency | | - | - | - | - | 100 | - | 100 |
| | | | **Total** | | **12** | **3** | **10** | **20** | **310/320** | **390/380** | **700** |

**MOOC Course:**

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **1** | MOOC-4 | MOOC04 | MOOC Program –IV (Optional) | - | - | - | 2 | - | 100 | 100 |

## ELECTIVE COURSES OFFERED

| S.No | Code | Course | L | T | P | Credit |
|---|---|---|---|---|---|---|
| **Semester VII- Program Elective I(Thermal Engineering)(Any one)** | | | | | | |
| **1** | EME713 | Power Plant Engineering | 3 | 1 | 0 | 4 |
| **2** | EME714 | Hydraulic Machines | 3 | 1 | 0 | 4 |
| **3** | EME715 | Gas Dynamics | 3 | 1 | 0 | 4 |
| **Semester VII- Program Elective II(Industrial Management)(Any one)** | | | | | | |
| **4** | EHM735 | Industrial Sociology | 3 | 1 | 0 | 4 |
| **5** | EHM736 | Principles of Management and Organizational Behaviour | 3 | 1 | 0 | 4 |
| **6** | EHM734 | Engineering and Managerial Economics | 3 | 1 | 0 | 4 |
| **Semester VIII- Program Elective III(Advanced Manufacturing Systems) (Any one)** | | | | | | |
| **7** | EME812 | Unconventional Manufacturing Process | 3 | 1 | 0 | 4 |
| **8** | EME813 | Mechatronics | 3 | 1 | 0 | 4 |
| **Semester VIII- Program Elective IV(Product development and Quality control) (Any one)** | | | | | | |
| **9** | EME814 | Product Design and Value Engineering | 3 | 1 | 0 | 4 |
| **10** | EHM832 | Total Quality Management | 3 | 1 | 0 | 4 |
| **11** | EME816 | Maintenance Engineering | 3 | 1 | 0 | 4 |
| **Semester VIII- Program Elective V(Advanced Manufacturing systems Labs) (Any one)** | | | | | | |
| **12** | EME862 | Unconventional Manufacturing Process (Lab) | 0 | 0 | 2 | 1 |
| **13** | EME863 | Mechatronics (Lab) | 0 | 0 | 2 | 1 |

| Course Code: EAS116 | B.Tech- Semester-I<br>**Engineering Mathematics-I** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be:** | |
| **CO1.** | **Understanding** the concepts of eigenvalues and eigenvectors, Optimization & derivatives of functions of several variables, partial and total differentiation, implicit functions. | |
| **CO2.** | **Understanding** the concepts of curl and divergence of vector field. | |
| **CO3.** | **Understanding** of Green's theorem, Gauss Theorem, and Stokes theorem. | |
| **CO4.** | **Applying** the concept of Leibnitz's theorem for successive derivatives. | |
| **CO5.** | **Analyzing** the intangibility of a differential equation to find the optimal solution of first order first degree equations. | |
| **CO6.** | **Evaluating** the double integration and triple integration using Cartesian, polar co-ordinates and the concept of Jacobian of transformation. | |
| **Course Content:** | | |
| **Unit-1:** | **Determinants**- Rules of computation; Linear Equations and Cramer's rule.<br>**Matrices:** Elementary row and column transformation; Rank of matrix; Linear dependence; Consistency of linear system of equations; Characteristic equation; Cayley-Hamilton Theorem (without proof); Eigen values and Eigen vectors; Complex and Unitary matrices. | **8 Hours** |
| **Unit-2:** | **Differential Equation--**First order first degree Differential equation: variable separable, Homogeneous method, Linear differential equation method, Exact Differential equation. | **8 Hours** |
| **Unit-3:** | **Differential Calculus:** Leibnitz theorem; Partial differentiation; Euler's theorem; Change of variables; Expansion of function of several variables, Jacobians, Error function. | **8 Hours** |
| **Unit-4:** | **Multiple Integrals:** Double integral, Triple integral, Beta and Gamma functions; Dirichlet theorem for three variables, Liouville's Extension of Dirichlet theorem. | **8 Hours** |
| **Unit-5:** | **Vector Differentiation:**<br>Vector function, Differentiation of vectors, Formulae of Differentiation, Scalar and Vector point function, Geometrical Meaning of Gradient, Normal and Directional Derivative, Divergence of a vector function, Curl of a vector<br>**Vector Integration:** Green's theorem, Stokes' theorem; Gauss' divergence theorem. | **8 Hours** |
| **Text Books:** | **1.** Grewal B.S., *Higher Engineering Mathematics*, Khanna Publishers. | |
| **Reference Books:** | **1.** Kreyszig E., *Advanced Engineering Mathematics*, Wiley Eastern.<br>**2.** Piskunov N, *Differential & Integral Calculus*, Moscow Peace Publishers.<br>**3.** Narayan Shanti, *A Text book of Matrices*, S. Chand<br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronics reference material:** | **1.** https://www.youtube.com/watch?v=EGnI8WyYb3o<br>**2.** https://www.youtube.com/watch?v=ksS_yOK1vtk&list=PLbRMhDVUMngfIrZCNOyPZwHUU1pP66vQW | |

| Course Code: EAS112 | B.Tech- Semester-I<br>**Engineering Physics** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes :** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the basic concepts of interference, diffraction and polarisation. | |
| **CO2.** | **Understanding** the concept of bonding in solids and semiconductors. | |
| **CO3.** | **Understanding** the special theory of relativity. | |
| **CO4.** | **Applying** special theory of relativity to explain the phenomenon of length contraction, time dilation, mass-energy equivalence etc. | |
| **CO5.** | **Applying** the concepts of polarized light by the Brewster's and Malus Law | |
| **Course Content:** | | |
| **Unit-1:** | **Interference of Light:** Introduction, Principle of Superposition, and Interference due to division of wavefront: Young's double slit experiment, Theory of Fresnel's Bi-Prism, Interference due to division of amplitude: parallel thin films, Wedge shaped film, Michelson's interferometer, Newton's ring. | **8 Hours** |
| **Unit-2:** | **Diffraction**: Introduction, Types of Diffraction and difference between them, Condition for diffraction, difference between interference and diffraction. **Single slit diffraction**: Quantitative description of maxima and minima with intensity variation, linear and angular width of central maxima. **Resolving Power**: Rayleigh's criterion of resolution, resolving power of diffraction grating and telescope. | **8 Hours** |
| **Unit-3:** | **Polarization:** Introduction, production of plane polarized light by different methods, Brewster's and Malus Law. Quantitative description of double refraction, Nicol prism, Quarter & half wave plate, specific rotation, Laurent's half shade polarimeter. | **8 Hours** |
| **Unit-4:** | **Elements of Material Science:** Introduction, Bonding in solids, Covalent bonding and Metallic bonding, Classification of Solids as Insulators, Semi-Conductor and Conductors, Intrinsic and Extrinsic Semiconductors, Conductivity in Semiconductors, Determination of Energy gap of Semiconductor. **Hall Effect:** Theory, Hall Coefficients and application to determine the sign of charge carrier, Concentration of charge carrier, mobility of charge carriers. | **8 Hours** |
| **Unit-5:** | **Special Theory of Relativity:** Introduction, Inertial and non-inertial frames of Reference, Postulates of special theory of relativity, Galilean and Lorentz Transformations, Length contraction and Time Dilation, Relativistic addition of velocities, Variation of mass with velocity, Mass-Energy equivalence. | **8 Hours** |
| **Text Books:** | **1.** Elements of Properties of Matter, D. S. Mathur, S. Chand & Co. | |
| **Reference Books:** | **1.** F. A. Jenkins and H. E. White, Fundamentals of Optics, McGraw-Hill.<br>**2.** Concept of Modern Physics, Beiser, Tata McGraw-Hill.<br>**3.** R. Resnick, Introduction to Special Relativity, John Wiley, Singapore.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronics reference material:** | **1.** https://www.youtube.com/watch?v=toGH5BdgRZ4&list=PLD9DDFBDC338226CA<br>**2.** https://www.youtube.com/watch?v=CuqsU7B1MtU | |

| Course Code: EAS162 | B.Tech- Semester-I<br>**Engineering Physics (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** of the operation of various models of optical devices. | |
| **CO2.** | **Understanding** types of Semiconductors using Hall experiments. | |
| **CO3.** | **Applying** the concept of interference, polarization & dispersion in optical devices through Newton's ring, Laser, polarimeter & spectrometer. | |
| **CO4.** | **Applying** the concept of resonance to determine the AC frequency using sonometer & Melde's apparatus. | |
| **CO5.** | **Applying** the concept of resolving & dispersive power by a prism. | |
| **LIST OF EXPERIMENTS:** | **Note: Select any ten experiments from the following list:** | |
| **1** | To determine the wavelength of monochromatic light by Newton's ring. | |
| **2** | To determine the wavelength of monochromatic light by Michelson-Morley experiment. | |
| **3** | To determine the wavelength of monochromatic light by Fresnel's Bi-prism.To determine the Planck's constant using LEDs of different colours. | |
| **4** | To determine the Planck's constant using LEDs of different colours. | |
| **5** | To determine the specific rotation of cane sugar solution using Polarimeter | |
| **6** | To verify Stefan's Law by electrical method | |
| **7** | To study the Hall Effect and determine Hall coefficient and mobility of a given semiconductor material using Hall-effect set up | |
| **8** | To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's experiment. | |
| **9** | To compare Illuminating Powers by a Photometer. | |
| **10** | To determine the frequency of A.C. mains by means of a Sonometer. | |
| **11** | To determine refractive index of a prism material by spectrometer | |
| **12** | To determine the Flashing & Quenching of Neon bulb. | |
| **13** | Determination of Cauchy's constant by using spectrometer. | |
| **14** | To study the PN junction characteristics | |
| **15** | To determine the resolving power and dispersive power by a prism | |
| **16** | To determine the value of Boltzmann Constant by studying Forward Characteristics of a Diode | |
| **17** | Study the characteristics of LDR | |
| **18** | To study the characteristics of a photo-cell. | |
| **Books:** | **1.** B.Sc.Practical Physics, Gupta and Kumar, PragatiPrakashan.<br>**2.** B.Sc. Practical Physics, C.L. Arora, S. Chand & Company Pvt. Ltd.<br>***Latest editions of all the suggested books are recommended.** | |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EAS113 | B.Tech- Semester-I<br>**Engineering Chemistry** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concept of softening & purification of water. | |
| **CO2.** | **Understanding** calorific value& combustion, analysis of coal, Physical & Chemical properties of hydrocarbons & quality improvements. | |
| **CO3.** | **Understanding** the concept of lubrication, Properties of Refractory & Manufacturing of cements. | |
| **CO4.** | **Applying** the conceptsof the mechanism of polymerization reactions, Natural and synthetic rubber& vulcanization. | |
| **CO5.** | **Applying** the conceptsof spectroscopic & chromatographic techniques. | |
| **Course Content:** | | |
| **Unit-1:** | **Water and Its Industrial Applications:** Sources, Impurities, Hardness and its units, Industrial water, characteristics, softening of water by various methods (External and Internal treatment), Boiler trouble causes effects and remedies, Characteristic of municipal water and its treatment, Numerical problem based on water softening method like lime soda, calgonetc | **8 Hours** |
| **Unit-2:** | **Fuels and Combustion:** Fossil fuel and classification, calorific value, determination of calorific value by Bomb and Jumker's calorimeter, proximate and ultimate analysis of coal and their significance, calorific value computation based on ultimate analysis data, Combustion and its related numerical problems carbonization manufacturing of coke, and recovery of byproduct, knocking relationship between knocking and structure and hydrocarbon, improvement ant knocking characteristic IC Engine fuels, Diesel Engine fuels, Cetane Number. | **8 Hours** |
| **Unit-3:** | **Lubricants:** Introduction, mechanism of lubrication, classification of lubricant, properties and testing of lubricating Oil Numerical problem based on testing methods. **Cement and Refractories:** Manufacture, IS code, Setting and hardening of cement, Portland cement Plaster of Paris, **Refractories.** Introduction, classification and properties of refractories | **8 Hours** |
| **Unit-4:** | **Polymers:** Introduction, types and classification of polymerization, reaction mechanism, Natural and synthetic rubber, Vulcanization of rubber, preparation, properties and uses of the following Polythene, PVC, PMMA, Teflon, Polyacrylonitrile, PVA, Nylon 6, Terylene, Phenol Formaldehyde, Urea Formaldehyde Resin, Glyptal, Silicones Resin, Polyurethanes, Butyl Rubber, Neoprene, Buna N, Buna S. | **8 Hours** |
| **Unit-5:** | **A. Instrumental Techniques in chemical analysis:** Introduction, Principle, Instrumentation and application of IR, NMR, UV, Visible, Gas Chromatography, Lambert and Beer's Law.<br>**B. Water Analysis Techniques:** Alkalinity, Hardness (Complexometric), Chlorides, Free Chlorine, DO, BOD, and COD, Numerical Problem Based on above techniques. | **8 Hours** |

| | | |
|---|---|---|
| **Text Books:** | **1.** Agarwal R. K., Engineering Chemistry, Krishna Prakashan. | |
| **Reference Books:** | **1.** Morrison & Boyd, Organic Chemistry, Prentice Hall<br>**2.** Barrow Gordon M., Physical Chemistry, McGraw-Hill.<br>**3.** Manahan Stanley E., Environmental Chemistry, CRC Press<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronics reference material:** | 1. https://www.youtube.com/watch?v=RV-OyRTaIOI<br>2. https://www.youtube.com/watch?v=phhfkikb6Lw | |

| Course Code: EAS163 | B.Tech- Semester-I<br>**Engineering Chemistry (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts of Hardness of water. | |
| **CO2.** | **Analyzing** & estimating of various parameters of water. | |
| **CO3.** | **Analyzing** of Calorific value of Solid fuel by Bomb calorimeter & Liquid Fuels by Junkers Gas Calorimeter. | |
| **CO4.** | **Analyzing** of open & closed Flash point of oil by Cleveland & Pensky's Martens apparatus. | |
| **CO5.** | **Analyzing** of viscosity of lubricating oil using Redwood Viscometer. | |
| **LIST OF EXPERIMENTS:** | **Note: Select any ten experiments from the following list** | |
| **1** | Determination of Total Hardness of a given water sample. | |
| **2** | Determination of mixed alkalinity (a) Hydroxyl & Carbonate (b) Carbonate & Bicarbonate | |
| **3** | To determine the pH of the given solution using pH meter and pH-metric titration | |
| **4** | Determination of dissolved oxygen content of given water sample | |
| **5** | To find chemical oxygen demand of waste water sample by potassium dichromate | |
| **6** | Determination of free chlorine in a given water sample | |
| **7** | To determine the chloride content in the given water sample by Mohr's method | |
| **8** | To prepare the Bakelite resin polymer | |
| **9** | To determine the concentration of unknown sample of iron spectrophotometrically | |
| **10** | To determine the viscosity of a given sample of a lubricating oil using Redwood Viscometer | |
| **11** | To determine the flash & fire point of a given lubricating oil | |
| **12** | Determination of calorific value of a solid or liquid fuel. | |
| **13** | Determination of calorific value of a gaseous fuel | |
| **14** | Determination of % of $O_2$, $CO_2$, % CO in flue gas sample using Orsat apparatus. | |
| **15** | Proximate analysis of coal sample. | |

**Evaluation Scheme of Practical Examination:**
**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EEE117 | B.Tech-Semester-I<br>**Basic Electrical Engineering** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the basics of Network, AC Waveform and its characteristics. | |
| **CO2.** | **Understanding** the basic concept of Measuring Instruments, Transformers & three phase Power systems. | |
| **CO3.** | **Understanding** the basic concepts of Transformer. | |
| **CO4.** | **Understanding** the basic concept of power measurement using two wattmeter methods. | |
| **CO5.** | **Applying** the concept of Kirchhoff's laws and Network Theorems to analyze complex electrical circuits. | |
| **Course Content:** | | |
| **Unit-1:** | **D.C. Network Theory:** Passive, active, bilateral, unilateral, linear, nonlinear element, Circuit theory concepts-Mesh and node analysis; Voltage and current division, source transformation, Network Theorems- Superposition theorem, Thevenin's theorem, Norton's theorem, and Maximum Power Transfer theorem, Star-delta & delta-star conversion. | **8 Hours** |
| **Unit-2:** | **Steady State Analysis of A.C. Circuits:** Sinusoidal and phasor representation of voltage and Current; Single phase A.C. circuit behavior of resistance, inductance and capacitance and their Combination in series & parallel; Power factor; Series and parallel resonance; Band width and Quality factor. | **8 Hours** |
| **Unit-3:** | **Basics of Measuring Instruments:** Introduction to wattmeter & Energy meter extension range of voltmeter and ammeter.<br>**Three Phase A.C. Circuits:** Line and phase voltage/current relations; three phase power, power measurement using two wattmeter methods. | **8 Hours** |
| **Unit-4:** | **Single phase Transformer:** Principle of operation; Types of construction; Phasor diagram; Equivalent circuit; Efficiency and losses. | **8 Hours** |
| **Unit-5:** | **Electrical machines:**<br>DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems) | **8 Hours** |
| **Text Books:** | **1.** Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill | |
| **Reference Books:** | **1.** Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.<br>**2.** A Grabel, Basic Electrical Engineering, McGraw Hill.<br>**3.** Cotton H., Advanced Electrical Technology, Wheeler Publishing.<br>4. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.<br>**5.** W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.<br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronics reference material:** | • https://nptel.ac.in/courses/108/108/108108076/<br>• https://sites.google.com/tmu.ac.in/dr-garima-goswami/home | |

| Course Code: EEE161 | B.Tech- Semester-I<br>**Basic Electrical Engineering (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts of Kirchoff & Voltage law. | |
| **CO2.** | **Understanding** the concepts of dc network theorem. | |
| **CO3.** | **Analyzing** the energy by a single-phase energy meter. | |
| **CO4.** | **Analyzing** the losses and efficiency of Transformer on different load conditions. | |
| **CO5.** | **Analyzing** the electrical circuits using electrical and electronics components on bread board. | |
| **LIST OF EXPERIMENTS:** | **Note: Select any ten experiments from the following list** | |
| **1** | To verify the Kirchhoff's current and voltage laws. | |
| **2** | To study multimeter. | |
| **3** | To verify the Superposition theorem | |
| **4** | To verify the Thevenin's theorem. | |
| **5** | To verify the Norton's theorem. | |
| **6** | To verify the maximum power transfer theorem | |
| **7** | To verify current division and voltage division rule. | |
| **8** | To measure energy by a single-phase energy meter | |
| **9** | To measure the power factor in an RLC by varying the capacitance | |
| **10** | To determine resonance frequency, quality factor, bandwidth in series resonance | |
| **11** | To measure the power in a 3-phase system by two-wattmeter method | |
| **12** | To measure speed for speed control of D.C. Shunt Motor | |
| **13** | To determine the efficiency of single-phase transformer by load test. | |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EEC111 | B.Tech- Semester-I<br>**Basic Electronics Engineering** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts of electronic components like diode, BJT & FET. | |
| **CO2.** | **Understanding** the applications of pn junction diode as clipper, clamper, rectifier & regulator whereas BJT & FET as amplifiers | |
| **CO3.** | **Understanding** the functions and applications of operational amplifier-based circuits such as differentiator, integrator, and inverting, non-inverting, summing & differential amplifier. | |
| **CO4.** | **Understanding** the concepts of number system, Boolean algebra and logic gates. | |
| **CO5.** | **Applying** the knowledge of series, parallel and electromagnetic circuits. | |
| **Course Content:** | | |
| **Unit-1:** | **p-n Junction:** Energy band diagram in materials, Intrinsic & Extrinsic Semiconductor, Introduction to PN-Junction, Depletion layer, V-I characteristics, p-n junction as rectifiers (half wave and full wave), calculation of ripple factor of rectifiers, clipping and clamping circuits, Zener diode and its application as shunt regulator | **8 Hours** |
| **Unit-2:** | **Bipolar Junction Transistor (BJT):** Basic construction, transistor action; CB, CE and CC configurations, input/output characteristics, Relation between α, β & γ, Biasing of transistors: Fixed bias, emitter bias, potential divider bias | **8 Hours** |
| **Unit-3:** | **Field Effect Transistor (FET):** Basic construction of JFET; Principle of working; concept of pinch-off condition & maximum drain saturation current; input and transfer characteristics; Characteristics equation; fixed and self-biasing of JFET amplifier; Introduction of MOSFET; Depletion and Enhancement type MOSFET- Construction, Operation and Characteristics. | **8 Hours** |
| **Unit-4:** | **Operational Amplifier (Op-Amp):** Concept of ideal operational amplifier; ideal and practical Op-Amp parameters; inverting, non-inverting and unity gain configurations, Applications of Op-Amp as adders, difference amplifiers, integrators and differentiator. | **8 Hours** |
| **Unit-5:** | **Switching Theory:** Number system, conversion of bases (decimal, binary, octal and hexadecimalnumbers), Addition & Subtraction, BCD numbers, Boolean algebra, De Morgan's Theorems, Logic gates and truth table- AND, OR & NOT, Seven segment display & K map. | **8 Hours** |
| **Text Books:** | **1.** Robert Boylestad& Louis Nashelsky, Electronic Circuit and Devices, Pearson India. | |
| **Reference Books:** | **1.** Sedra and Smith, Microelectronic Circuits, Oxford University Press.<br>**2.** Gayakwad, R A, Operational Amplifiers and Linear Integrated circuits, Prentice Hall of India Pvt. Ltd.<br>**3.** Chattopadhyay D and P C Rakshit, Electronics Fundamentals and Applications, New Age International.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronics reference material:** | 1. https://www.youtube.com/watch?v=USrY0JspDEg<br>2. https://www.youtube.com/watch?v=Hkz27cFW4Xs | |

| Course Code: EEC161 | B.Tech- Semester-I<br>**Basic Electronics Engineering (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the implementation of diode-based circuits. | |
| **CO2.** | **Understanding** the implementation of Operational amplifier-based circuits. | |
| **CO3.** | **Analyzing** the characteristics of pn junction diode & BJT. | |
| **CO4.** | **Analyzing** the different parameters for characterizing different circuits like rectifiers, regulators using diodes and BJTs. | |
| **CO5.** | **Analyzing** the truth tables through the different type's adders. | |
| **LIST OF EXPERIMENTS:** | **Note: Minimum eight experiments should be performed-** | |
| **1** | To study the V-I characteristics of p-n junction diode. | |
| **2** | To study the diode as clipper and clamper | |
| **3** | To study the half-wave rectifier using silicon diode. | |
| **4** | To study the full-wave rectifier using silicon diode. | |
| **5** | To study the Zener diode as a shunt regulator. | |
| **6** | To study transistor in Common Base configuration & plot its input/output characteristics | |
| **7** | To study the operational amplifier in inverting & non-inverting modes using IC 741. | |
| **8** | To study the operational amplifier as differentiator & integrator. | |
| **9** | To study various logic gates & verify their truth tables. | |
| **10** | To study half adder/full adder & verify their truth tables | |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: TMU101 | B.Tech- Semester-I<br>**Environmental Studies** | L-2<br>T-1<br>P-0<br>C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** environmental problems arising due to constructional and developmental activities. | |
| **CO2.** | **Understanding** the natural resources and suitable methods for conservation of resources for sustainable development. | |
| **CO3.** | **Understanding** the importance of ecosystem and biodiversity and its conservation for maintaining ecological balance. | |
| **CO4.** | **Understanding** the types and adverse effects of various environmental pollutants and their abatement devices. | |
| **CO5.** | **Understanding** Greenhouse effect, various Environmental laws, impact of human population explosion, environment protection movements, different disasters and their management. | |
| **Course Content:** | | |
| **Unit-1:** | Definition and Scope of environmental studies, multidisciplinary nature of environmental studies, Concept of sustainability & sustainable development.<br>**Ecology and Environment**: Concept of an Ecosystem-its structure and functions, Energy Flow in an Ecosystem, FoodChain, FoodWeb, Ecological Pyramid& Ecological succession, Study of following ecosystems: Forest Ecosystem, Grass land Ecosystem & Aquatic Ecosystem & Desert Ecosystem. | **8 Hours** |
| **Unit-2:** | **Natural Resources:** Renewable & Non-Renewable resources; Landre sources and landuse change; Land degradation, Soil erosion & desertification. **Deforestation**: Causes & impacts due to mining, Dam building on forest biodiversity & tribal population. **Energy Resources**: Renewable & Non-Renewable resources, Energy scenario & use of alternate energy sources, Case studies.<br>**Biodiversity:** Hot SpotsofBiodiversityinIndiaandWorld,Conservation,ImportanceandFactorsResponsibleforLossofBiodiversity,BiogeographicalClassification of India | **8 Hours** |
| **Unit-3:** | **Environmental Pollutions:** Types, Causes, Effects & control; Air, Water, soil & noise pollution, Nuclear hazards & human health risks, Solid waste Management; Control measures of urban & industrial wastes, pollution case studies | **8 Hours** |
| **Unit-4:** | **Environmental policies & practices: Climate change & Global** Warming (Green house Effect),Ozone Layer -Its Depletion and Control Measures, Photo chemical Smog, Acid Rain Environmental laws: Environment protection Act; air prevention & control of pollution act, Water Prevention & Control of Pollution Act, Wild Life Protection Act, Forest Conservation Acts, International Acts; Montreal & Kyoto Protocols & Convention on biological diversity, Nature reserves, tribal population & Rights & human wild life conflicts in Indian context | **8 Hours** |
| **Unit-5:** | Human population growth; impacts on environment, human health & welfare, Resettlement & rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Landslides, Environmental Movements; Chipko, Silent Valley, Vishnoi's of Rajasthan, Environmental Ethics; Role of Indian & other regions & culture in environmental conservation, Environmental communication & public awareness; Case study | **8 Hours** |

| | | |
|---|---|---|
| **Field Work:** | **1.** Visit to an area to document environmental assets; river/forest/flora-fauna etc.<br>**2.** Visit to a local polluted site: urban/rural/industrial/agricultural.<br>**3.** Study of common plants, insects, birds & basic principles of identification.<br>**4.** Study of simple ecosystem; pond, river etc. | |
| **Text Books:** | **1.** "Environmental Chemistry", De, A. K., New Age Publishers Pvt. Ltd. | |
| **Reference Books:** | **1.** "Biodiversity and Conservation", Bryant, P. J., Hypertext Book<br>**2.** "Textbook of Environment Studies", Tewari, Khulbe & Tewari,I.K Publication<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronics reference material:** | https://www.youtube.com/watch?v=mIPBPG-5dUw<br>https://www.youtube.com/watch?v=6BhCijJ-d4s<br>https://www.youtube.com/watch?v=Cd1M9xD482s | |

| Course Code: TMUGE101 | B.Tech- Semester-I<br>**English Communication – I** | L-2<br>T-0<br>P-2<br>C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Remembering and understanding** of the basic of English grammar and vocabulary. | |
| **CO2.** | **Understanding** of the basic Communication process. | |
| **CO3.** | **Applying** correct vocabulary and tenses in sentences construction. | |
| **CO4.** | **Analyzing** communication needs and developing communication strategies using both verbal & non-verbal method. | |
| **CO5.** | **Drafting** applications in correct format for common issues. | |
| **CO6.** | **Developing** self-confidence. | |
| **Course Content:** | | |
| **Unit-1:** | **Introductory Sessions**<br>• Self-Introduction<br>• Building Self Confidence: Identifying strengths and weakness, reasons Failure, strategies to overcome Fear of Failure<br>• Importance of English Language in present scenario<br>(Practice: Self-introduction session) | **6 Hours** |
| **Unit-2:** | **Basics of Grammar**<br>• Parts of Speech<br>• Tense<br>• Subject and Predicate<br>• Vocabulary: Synonym and Antonym<br>(Practice: Conversation Practice) | **12 Hours** |
| **Unit-3:** | **Basics of Communication**<br>• Communication: Process, Types, 7Cs of Communication, Importance & Barrier<br>• Language as a tool of communication<br>• Non-verbal communication: Body Language<br>• Etiquette & Manners<br>• Basic Problem Sounds<br>(Practice: Pronunciation drill and building positive body language) | **10 Hours** |
| **Unit-4:** | **Application writing**<br>• Format & Style of Application Writing<br>• Practice of Application writing on common issues. | **8 Hours** |
| **Unit-5:** | **Value based text reading:** Short Story (Non- detailed study)<br>• Gift of Magi - O. Henry | **4 Hours** |
| **Text Books:** | **1**. Singh R.P., An Anthology of Short stories, O.U.P. New Delhi. | |
| **Reference Books:** | **1.** Kumar, Sanjay. &PushpLata. "Communication Skills" New Delhi: Oxford University Press.<br>**2.** Carnegie Dale. "How to win Friends and Influence People" New York: Simon & Schuster.<br>**3.** Goleman, Daniel. "Emotional Intelligence' Bantam Book.<br><br>***Latest editions of all the suggested books are recommended.** | |

| | | |
|---|---|---|
| **Additional electronics reference material:** | **1.** https://www.youtube.com/watch?v=4XEa-8HD3lE<br>**2.** https://www.youtube.com/watch?v=sb6ZZ2p3hEM&feature=youtu.be<br>**3.** https://www.youtube.com/watch?v=Df3ysUkdB38<br>**4.** https://www.youtube.com/watch?v=0LdYaj3jcws<br>**5.** https://www.youtube.com/watch?v=64XIkMqPm_8<br>**6.** https://www.youtube.com/watch?v=_vS6O8YlMq0 | |
| **Methodology:** | **1.** Language Lab software.<br>**2.** The content will be conveyed through Real life situations, Pair Conversation, Group Talk and Class Discussion.<br>**3.** Conversational Practice will be effectively carried out by Face to Face & Via Media (Telephone, Audio-Video Clips)<br>**4.** Modern Teaching tools (PPT Presentation, Tongue-Twisters & Motivational videos with sub-titles) will be utilized | |

## Evaluation Scheme

| **Internal Evaluation** | | | **External Evaluation** | | **Total Marks** |
|---|---|---|---|---|---|
| **40 Marks** | | | **60 Marks** | | **100** |
| 20 Marks (Best 2 out of Three CTs)<br>***(From Unit- II, IV & V)*** | 10 Marks (Oral Assignments)<br>***(From Unit I & III)*** | 10 Marks (Attendance) | 40 Marks (External Written Examination)<br>***(From Unit II, IV & V)*** | 20 Marks (External Viva)*<br>***(From Unit -1 & III)*** | |

## *Parameters of External Viva

| **Content** | **Body Language** | **Confidence** | **Question Responsiveness** | **TOTAL** |
|---|---|---|---|---|
| 05 Marks | 05 Marks | 05 Marks | 05 Marks | 20 Marks |

**Note:** External Viva will be conducted by 2-member committee comprising

**a)** One Faculty teaching the class

**b)** One examiner nominated by University Examination cell.

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

| Course Code: EME161 | B.Tech- Semester-I<br>**Engineering Drawing (Lab)** | L-0<br>T-0<br>P-4<br>C-2 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts of Engineering Drawing. | |
| **CO2.** | **Understanding** how to draw and represent the shape, size & specifications of physical objects. | |
| **CO3.** | **Applying** the principles of projection and sectioning. | |
| **CO4.** | **Applying** the concepts of development of the lateral surface of a given object. | |
| **CO5.** | **Creating** isometric projection of the given orthographic projection. | |
| **LIST OF EXPERIMENTS:** | **All to be performed** | |
| **1** | To write all Numbers (0 to 9) and alphabetical Letters (A to Z) as per the standard dimensions. | |
| **2** | To draw the types of lines and conventions of different materials. | |
| **3** | To draw and study dimensioning and Tolerance | |
| **4** | To construction geometrical figures of Pentagon and Hexagon | |
| **5** | To draw the projection of points and lines | |
| **6** | To draw the Orthographic Projection of given object in First Angle | |
| **7** | To draw the Orthographic Projection of given object in Third Angle | |
| **8** | To draw the sectional view of a given object | |
| **9** | To draw the development of the lateral surface of given object | |
| **10** | To draw the isometric projection of the given orthographic projection. | |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the drawing sheet by the students and a Viva taken by the faculty concerned. The marks shall be given on the drawing sheet & regard maintained by the faculty.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| Drawing Sheet (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

**Note:** The drawing sheet could be manual or in Auto CAD.

| Course Code: EME162 | B.Tech- Semester-I<br>**Workshop Practice (Lab)** | L-0<br>T-0<br>P-4<br>C-2 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts to prepare simple wooden joints using wood working tools. | |
| **CO2.** | **Applying** the techniques to produce fitting jobs of specified dimensions. | |
| **CO3.** | **Applying** the concepts to prepare simple lap, butt, T and corner joints using arc welding equipment. | |
| **CO4.** | **Applying** the concepts of black smithy and lathe machine to produce different jobs. | |
| **CO5.** | **Creating** core and moulds for casting. | |
| **LIST OF EXPERIMENTS:** | **Perform any ten experiments selecting at least one from each shop** | |
| **1** | **Carpentry Shop**:<br>1. To prepare half-lap corner joint.<br>2. To prepare mortise &tenon joint.<br>3. To prepare a cylindrical pattern on woodworking lathe. | |
| **2** | **Fitting Bench Working Shop:**<br>1. To prepare a V-joint fitting<br>2. To prepare a U-joint fitting<br>3. To prepare a internal thread in a plate with the help of tapping process | |
| **3** | **Black Smithy Shop:**<br>1. To prepare a square rod from given circular rod<br>2. To prepare a square U- shape from given circular rod | |
| **4** | **Welding Shop:**<br>1. To prepare a butt and Lap welded joints using arc welding machine.<br>2. To prepare a Lap welded joint Gas welding equipment.<br>3. To prepare a Lap welded joint using spot welding machine | |
| **5** | **Sheet-metal Shop:**<br>1. To make round duct of GI sheet using 'soldering' process.<br>2. To prepare a tray of GI by fabrication | |
| **6** | **Machine Shop:**<br>1. To study the working of basic machine tools like Lathe m/c, Shaper m/c, Drilling m/c and Grinding m/c.<br>2. To perform the following operations on Centre Lathe:<br>Turning, Step turning, Taper turning, Facing, Grooving and Knurling<br>3. To perform the operations of drilling of making the holes on the given metallic work-piece (M.S.) by use of drilling machine. | |
| **7** | **Foundry Shop:**<br>1. To prepare core as per given size.<br>2. To prepare a mould for given casting. | |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EGP111 | B.Tech- Semester-I<br>**Discipline & General Proficiency** | L-0<br>T-0<br>P-0<br>C-0 |
|---|---|---|

There shall be continuous evaluation of the student on the following broad parameters:

**1.** Observance of dress code.

**2.** Participation in Conferences /Workshops / Seminars.

**3.** Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

**4.** Participation in community projects including NSS.

**5.** Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

**6.** Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

**7.** Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

**8.** General behavior

**9.** Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

| S No | | Enroll No. | Student Name | Dress code | Participation in Conferences /Workshops / Seminars | Participation in guest lectures, invited talks and special technical sessions | Participation in community Services | Participation in Culture & extra curriculum activities, Department Club Activities | Participation in sports/ co-curricular activities | General Behavior | Any Extra Achievement |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **(5)** | **(15)** | **(20)** | **(10)** | **(20)** | **(20)** | **(5)** | **(5)** |
| | **Responsible for marks** | | | Mentor | Head | Head | Mentor | Cultural Events Coordinator & Department Club Coordinator | Sports Coordinator | Mentor | Director or Principal |

| Course Code: EAS211 | B.Tech- Semester-II<br>**Engineering Mathematics-II** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes :** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts of the wave, diffusion and Laplace equations & Fourier series. | |
| **CO2.** | **Understanding** the methods of separation of variables. | |
| **CO3.** | **Understanding** the concepts of Fourier series' representation of single variable function. | |
| **CO4.** | **Applying** Laplace transform to determine the complete solutions of linear ODE. | |
| **CO5.** | **Applying** the method of variations of parameters to find solution of equations with variable coefficients. | |
| **Course Content:** | | |
| **Unit-1:** | **Differential Equations:** Linear Differential Equation, Linear Differential Equation with constant coefficient: Complementary functions and particular integrals, Linear Differential Equation with variable coefficient: Removal method, changing independent variables, Method of variation of parameters, Homogeneous Linear Differential Equation, Simultaneous linear differential equations. | **8 Hours** |
| **Unit-2:** | **Series Solutions:** PowerSeries solutions of ODE, Ordinary Point, Singular Points, Frobenius Method.<br>**Special Functions:** Legendre equation and Polynomial, Legendre Function, Rodrigue's formula, Laplace definite integral for first and second kind, Bessel equation and Polynomial, Bessel Function, Orthogonal properties and Recurrence Relation for Legendre and Bessel function. | **8 Hours** |
| **Unit-3:** | **Partial differential equations –**Method of separation of variables for solving partial differential equations; Wave equation up to two dimensions; Laplace equation in two-dimensions; Heat conduction equations up to two-dimensions; Equations of transmission Lines. | **8 Hours** |
| **Unit-4:** | **Fourier Series:** Periodic functions, Trigonometric series; Fourier series; Dirichlet's conditions, Determination of Fourier coefficient by Euler's formulae; Fourier series for discontinuous functions, Even and odd functions, Half range sine and cosine series. | **8 Hours** |
| **Unit-5:** | **Laplace Transform:** Laplace transform; Existence theorem; Laplace transform of derivatives and integrals; Inverse Laplace transform; Unit step function; Diratch delta function; Laplace transform of periodic functions; Convolution theorem. | **8 Hours** |
| **Text Books:** | **1.** Das H.K., Engineering Mathematics Vol-II, S. Chand. | |
| **Reference Books:** | **1.** Kreyszig E., Advanced Engineering Mathematics, Wiley Eastern.<br>**2.** Piskunov N, Differential & Integral Calculus, Moscow Peace Publishers.<br>**3.** Narayan Shanti, A Text book of Matrices, S. Chand<br>**4.** Bali N.P., Engineering Mathematics-II, Laxmi Publications.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronics reference material:** | 1. https://www.youtube.com/watch?v=luJMl37-nso<br>**2.** https://www.youtube.com/watch?v=NdouX5-KD6Y | |

| Course Code: EAS212 | B.Tech- Semester-II<br>**Engineering Physics** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes :** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the basic concepts of interference, diffraction and polarisation. | |
| **CO2.** | **Understanding** the concept of bonding in solids and semiconductors. | |
| **CO3.** | **Understanding** the special theory of relativity. | |
| **CO4.** | **Applying** special theory of relativity to explain the phenomenon of length contraction, time dilation, mass-energy equivalence etc. | |
| **CO5.** | **Applying** the concepts of polarized light by the Brewster's and Malus Law. | |
| **Course Content:** | | |
| **Unit-1:** | **Interference of Light:** Introduction, Principle of Superposition, and Interference due to division of wavefront: Young's double slit experiment, Theory of Fresnel's Bi-Prism, Interference due to division of amplitude: parallel thin films, Wedge shaped film, Michelson's interferometer, Newton's ring. | **8 Hours** |
| **Unit-2:** | **Diffraction**: Introduction, Types of Diffraction and difference between them, Condition for diffraction, difference between interference and diffraction. **Single slit diffraction**: Quantitative description of maxima and minima with intensity variation, linear and angular width of central maxima. **Resolving Power**: Rayleigh's criterion of resolution, resolving power of diffraction grating and telescope. | **8 Hours** |
| **Unit-3:** | **Polarization:** Introduction, production of plane polarized light by different methods, Brewster's and Malus Law. Quantitative description of double refraction, Nicol prism, Quarter & half wave plate, specific rotation, Laurent's half shade polarimeter. | **8 Hours** |
| **Unit-4:** | **Elements of Material Science:** Introduction, Bonding in solids, Covalent bonding and Metallic bonding, Classification of Solids as Insulators, Semi-Conductor and Conductors, Intrinsic and Extrinsic Semiconductors, Conductivity in Semiconductors, Determination of Energy gap of Semiconductor. **Hall Effect:** Theory, Hall Coefficients and application to determine the sign of charge carrier, Concentration of charge carrier, mobility of charge carriers. | **8 Hours** |
| **Unit-5:** | **Special Theory of Relativity:** Introduction, Inertial and non-inertial frames of Reference, Postulates of special theory of relativity, Galilean and Lorentz Transformations, Length contraction and Time Dilation, Relativistic addition of velocities, Variation of mass with velocity, Mass-Energy equivalence. | **8 Hours** |
| **Text Books:** | **1.** Elements of Properties of Matter, D. S. Mathur, S. Chand & Co. | |
| **Reference Books:** | **1.** F. A. Jenkins and H. E. White, Fundamentals of Optics, McGraw-Hill.<br>**2.** Concept of Modern Physics, Beiser, Tata McGraw-Hill.<br>**3.** R. Resnick, Introduction to Special Relativity, John Wiley, Singapore.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronics reference material:** | **1.** https://www.youtube.com/watch?v=toGH5BdgRZ4&list=PLD9DDFBDC338226CA<br>**2.** https://www.youtube.com/watch?v=CuqsU7B1MtU | |

| Course Code: EAS262 | B.Tech- Semester-II<br>**Engineering Physics (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** of the operation of various models of optical devices. | |
| **CO2.** | **Understanding** types of Semiconductors using Hall experiments. | |
| **CO3.** | **Applying** the concept of interference, polarization & dispersion in optical devices through Newton's ring, Laser, polarimeter & spectrometer. | |
| **CO4.** | **Applying** the concept of resonance to determine the AC frequency using sonometer & Melde's apparatus. | |
| **CO5.** | **Applying** the concept of resolving & dispersive power by a prism. | |
| **LIST OF EXPERIMENTS:** | **Note: Select any ten experiments from the following list:** | |
| **1** | To determine the wavelength of monochromatic light by Newton's ring. | |
| **2** | To determine the wavelength of monochromatic light by Michelson-Morley experiment. | |
| **3** | To determine the wavelength of monochromatic light by Fresnel's Bi-prism.To determine the Planck's constant using LEDs of different colours. | |
| **4** | To determine the Planck's constant using LEDs of different colours. | |
| **5** | To determine the specific rotation of cane sugar solution using Polarimeter | |
| **6** | To verify Stefan's Law by electrical method | |
| **7** | To study the Hall Effect and determine Hall coefficient and mobility of a given semiconductor material using Hall-effect set up | |
| **8** | To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's experiment. | |
| **9** | To compare Illuminating Powers by a Photometer. | |
| **10** | To determine the frequency of A.C. mains by means of a Sonometer. | |
| **11** | To determine refractive index of a prism material by spectrometer | |
| **12** | To determine the Flashing & Quenching of Neon bulb. | |
| **13** | Determination of Cauchy's constant by using spectrometer. | |
| **14** | To study the PN junction characteristics | |
| **15** | To determine the resolving power and dispersive power by a prism | |
| **16** | To determine the value of Boltzmann Constant by studying Forward Characteristics of a Diode | |
| **17** | Study the characteristics of LDR | |
| **18** | To study the characteristics of a photo-cell. | |
| **Books:** | 1. B.Sc. Practical Physics, Gupta and Kumar, PragatiPrakashan.<br>2. B.Sc. Practical Physics, C.L. Arora, S. Chand & Company Pvt. Ltd.<br>***Latest editions of all the suggested books are recommended.** | |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EAS213 | B.Tech- Semester-II<br>**Engineering Chemistry** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concept of softening & purification of water. | |
| **CO2.** | **Understanding** calorific value& combustion, analysis of coal, Physical & Chemical properties of hydrocarbons & quality improvements. | |
| **CO3.** | **Understanding** the concept of lubrication, Properties of Refractory & Manufacturing of cements. | |
| **CO4.** | **Applying** the conceptsof the mechanism of polymerization reactions, Natural and synthetic rubber& vulcanization. | |
| **CO5.** | **Applying** the conceptsof spectroscopic & chromatographic techniques. | |
| **Course Content:** | | |
| **Unit-1:** | **Water and Its Industrial Applications:** Sources, Impurities, Hardness and its units, Industrial water, characteristics, softening of water by various methods (External and Internal treatment), Boiler trouble causes effects and remedies, Characteristic of municipal water and its treatment, Numerical problem based on water softening method like lime soda, calgonetc | **8 Hours** |
| **Unit-2:** | **Fuels and Combustion:** Fossil fuel and classification, calorific value, determination of calorific value by Bomb and Jumker's calorimeter, proximate and ultimate analysis of coal and their significance, calorific value computation based on ultimate analysis data, Combustion and its related numerical problems carbonization manufacturing of coke, and recovery of byproduct, knocking relationship between knocking and structure and hydrocarbon, improvement ant knocking characteristic IC Engine fuels, Diesel Engine fuels, Cetane Number. | **8 Hours** |
| **Unit-3:** | **Lubricants:** Introduction, mechanism of lubrication, classification of lubricant, properties and testing of lubricating Oil Numerical problem based on testing methods. **Cement and Refractories:** Manufacture, IS code, Setting and hardening of cement, Portland cement Plaster of Paris, **Refractories.** Introduction, classification and properties of refractories. | **8 Hours** |
| **Unit-4:** | **Polymers:** Introduction, types and classification of polymerization, reaction mechanism, Natural and synthetic rubber, Vulcanization of rubber, preparation, properties and uses of the following Polythene, PVC, PMMA, Teflon, Polyacrylonitrile, PVA, Nylon 6, Terylene, Phenol Formaldehyde, Urea Formaldehyde Resin, Glyptal, Silicones Resin, Polyurethanes, Butyl Rubber, Neoprene, Buna N, Buna S. | **8 Hours** |
| **Unit-5:** | **A. Instrumental Techniques in chemical analysis:** Introduction, Principle, Instrumentation and application of IR, NMR, UV, Visible, Gas Chromatography, Lambert and Beer's Law.<br>**B. Water Analysis Techniques:** Alkalinity, Hardness (Complexometric), Chlorides, Free Chlorine, DO, BOD, and COD, Numerical Problem Based on above techniques. | **8 Hours** |
| **Text Books:** | **1.** Agarwal R. K., Engineering Chemistry, Krishna Prakashan. | |
| **Reference Books:** | **1.** Morrison & Boyd, Organic Chemistry, Prentice Hall<br>**2.** Barrow Gordon M., Physical Chemistry, McGraw-Hill.<br>**3.** Manahan Stanley E., Environmental Chemistry, CRC Press<br>***Latest editions of all the suggested books are recommended.** | |

| | | |
|---|---|---|
| **Additional electronics reference material:** | 1. https://www.youtube.com/watch?v=RV-OyRTaIOI<br>2. https://www.youtube.com/watch?v=phhfkikb6Lw | |

| Course Code: EAS263 | B.Tech- Semester-II<br>**Engineering Chemistry (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts of Hardness of water. | |
| **CO2.** | **Analyzing** & estimating of various parameters of water. | |
| **CO3.** | **Analyzing** of Calorific value of Solid fuel by Bomb calorimeter & Liquid Fuels by Junkers Gas Calorimeter. | |
| **CO4.** | **Analyzing** of open & closed Flash point of oil by Cleveland & Pensky's Martens apparatus. | |
| **CO5.** | **Analyzing** of viscosity of lubricating oil using Redwood Viscometer. | |
| **LIST OF EXPERIMENTS:** | **Note: Select any ten experiments from the following list** | |
| **1** | Determination of Total Hardness of a given water sample. | |
| **2** | Determination of mixed alkalinity (a) Hydroxyl & Carbonate (b) Carbonate & Bicarbonate | |
| **3** | To determine the pH of the given solution using pH meter and pH-metric titration | |
| **4** | Determination of dissolved oxygen content of given water sample | |
| **5** | To find chemical oxygen demand of waste water sample by potassium dichromate | |
| **6** | Determination of free chlorine in a given water sample | |
| **7** | To determine the chloride content in the given water sample by Mohr's method | |
| **8** | To prepare the Bakelite resin polymer | |
| **9** | To determine the concentration of unknown sample of iron spectrophotometrically | |
| **10** | To determine the viscosity of a given sample of a lubricating oil using Redwood Viscometer | |
| **11** | To determine the flash & fire point of a given lubricating oil | |
| **12** | Determination of calorific value of a solid or liquid fuel. | |
| **13** | Determination of calorific value of a gaseous fuel | |
| **14** | Determination of % of $O_2$, $CO_2$, % CO in flue gas sample using Orsat apparatus. | |
| **15** | Proximate analysis of coal sample. | |

**Evaluation Scheme of Practical Examination:**
**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EEE217 | B.Tech-Semester-I<br>**Basic Electrical Engineering** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the basics of Network, AC Waveform and its characteristics. | |
| **CO2.** | **Understanding** the basic concept of Measuring Instruments, Transformers & three phase Power systems. | |
| **CO3.** | **Understanding** the basic concepts of Transformer. | |
| **CO4.** | **Understanding** the basic concept of power measurement using two wattmeter methods. | |
| **CO5.** | **Applying** the concept of Kirchhoff's laws and Network Theorems to analyze complex electrical circuits. | |
| **Course Content:** | | |
| **Unit-1:** | **D.C. Network Theory:** Passive, active, bilateral, unilateral, linear, nonlinear element, Circuit theory concepts-Mesh and node analysis; Voltage and current division, source transformation, Network Theorems- Superposition theorem, Thevenin's theorem, Norton's theorem, and Maximum Power Transfer theorem, Star-delta & delta-star conversion. | **8 Hours** |
| **Unit-2:** | **Steady State Analysis of A.C. Circuits:** Sinusoidal and phasor representation of voltage and Current; Single phase A.C. circuit behavior of resistance, inductance and capacitance and their Combination in series & parallel; Power factor; Series and parallel resonance; Band width and Quality factor. | **8 Hours** |
| **Unit-3:** | **Basics of Measuring Instruments:** Introduction to wattmeter & Energy meter extension range of voltmeter and ammeter.<br>**Three Phase A.C. Circuits:** Line and phase voltage/current relations; three phase power, power measurement using two wattmeter methods. | **8 Hours** |
| **Unit-4:** | **Single phase Transformer:** Principle of operation; Types of construction; Phasor diagram; Equivalent circuit; Efficiency and losses. | **8 Hours** |
| **Unit-5:** | **Electrical machines:**<br>DC machines: Principle & Construction, Types, EMF equation of generator and torque equation of motor, applications of DC motors (simple numerical problems) | **8 Hours** |
| **Text Books:** | **1.** Nagrath I.J., Basic Electrical Engineering, Tata McGraw Hill | |
| **Reference Books:** | **1.** Fitzgerald A.E & Higginbotham., D.E., Basic Electrical Engineering, McGraw Hill.<br>**2.** A Grabel, Basic Electrical Engineering, McGraw Hill.<br>**3.** Cotton H., Advanced Electrical Technology, Wheeler Publishing.<br>4. Del Toro, Principles of Electrical Engineering, Prentice-Hall International.<br>**5.** W.H. Hayt& J.E. Kemmerly, Engineering Circuit Analysis, McGraw Hill.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronics reference material:** | 1. https://nptel.ac.in/courses/108/108/108108076/<br>2. https://sites.google.com/tmu.ac.in/dr-garima-goswami/home | |

| Course Code: EEE261 | B.Tech- Semester-II<br>**Basic Electrical Engineering (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts of Kirchoff & Voltage law. | |
| **CO2.** | **Understanding** the concepts of dc network theorem. | |
| **CO3.** | **Analyzing** the energy by a single-phase energy meter. | |
| **CO4.** | **Analyzing** the losses and efficiency of Transformer on different load conditions. | |
| **CO5.** | **Analyzing** the electrical circuits using electrical and electronics components on bread board. | |
| **LIST OF EXPERIMENTS:** | **Note: Select any ten experiments from the following list** | |
| **1** | To verify the Kirchhoff's current and voltage laws. | |
| **2** | To study multimeter. | |
| **3** | To verify the Superposition theorem | |
| **4** | To verify the Thevenin's theorem. | |
| **5** | To verify the Norton's theorem. | |
| **6** | To verify the maximum power transfer theorem | |
| **7** | To verify current division and voltage division rule. | |
| **8** | To measure energy by a single-phase energy meter | |
| **9** | To measure the power factor in an RLC by varying the capacitance | |
| **10** | To determine resonance frequency, quality factor, bandwidth in series resonance | |
| **11** | To measure the power in a 3-phase system by two-wattmeter method | |
| **12** | To measure speed for speed control of D.C. Shunt Motor | |
| **13** | To determine the efficiency of single-phase transformer by load test. | |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EEC211 | B.Tech- Semester-II<br>**Basic Electronics Engineering** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts of electronic components like diode, BJT & FET. | |
| **CO2.** | **Understanding** the applications of pn junction diode as clipper, clamper, rectifier & regulator whereas BJT & FET as amplifiers | |
| **CO3.** | **Understanding** the functions and applications of operational amplifier-based circuits such as differentiator, integrator, and inverting, non-inverting, summing & differential amplifier. | |
| **CO4.** | **Understanding** the concepts of number system, Boolean algebra and logic gates. | |
| **CO5.** | **Applying** the knowledge of series, parallel and electromagnetic circuits. | |
| **Course Content:** | | |
| **Unit-1:** | **p-n Junction:** Energy band diagram in materials, Intrinsic & Extrinsic Semiconductor, Introduction to PN-Junction, Depletion layer, V-I characteristics, p-n junction as rectifiers (half wave and full wave), calculation of ripple factor of rectifiers, clipping and clamping circuits, Zener diode and its application as shunt regulator | **8 Hours** |
| **Unit-2:** | **Bipolar Junction Transistor (BJT):** Basic construction, transistor action; CB, CE and CCconfigurations, input/output characteristics, Relation between α, β & γ, Biasing of transistors: Fixed bias, emitter bias, potential divider bias | **8 Hours** |
| **Unit-3:** | **Field Effect Transistor (FET):** Basic construction of JFET; Principle of working; concept of pinch-off condition & maximum drain saturation current; input and transfer characteristics; Characteristics equation; fixed and self-biasing of JFET amplifier; Introduction of MOSFET; Depletion and Enhancement type MOSFET- Construction, Operation and Characteristics. | **8 Hours** |
| **Unit-4:** | **Operational Amplifier (Op-Amp):** Concept of ideal operational amplifier; ideal and practical Op-Amp parameters; inverting, non-inverting and unity gain configurations, Applications of Op-Amp as adders, difference amplifiers, integrators and differentiator. | **8 Hours** |
| **Unit-5:** | **Switching Theory:** Number system, conversion of bases (decimal, binary, octal and hexadecimalnumbers), Addition & Subtraction, BCD numbers, Boolean algebra, De Morgan's Theorems, Logic gates and truth table- AND, OR & NOT, Seven segment display & K map. | **8 Hours** |
| **Text Books:** | **1.** Robert Boylestad& Louis Nashelsky, Electronic Circuit and Devices, Pearson India. | |
| **Reference Books:** | **1.** Sedra and Smith, Microelectronic Circuits, Oxford University Press.<br>**2.** Gayakwad, R A, Operational Amplifiers and Linear Integrated circuits, Prentice Hall of India Pvt. Ltd.<br>**3.** Chattopadhyay D and P C Rakshit, Electronics Fundamentals and Applications, New Age International.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronics reference material:** | **1.** https://www.youtube.com/watch?v=USrY0JspDEg<br>**2.** https://www.youtube.com/watch?v=Hkz27cFW4Xs | |

| Course Code: EEC261 | B.Tech- Semester-II<br>**Basic Electronics Engineering (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the implementation of diode-based circuits. | |
| **CO2.** | **Understanding** the implementation of Operational amplifier-based circuits. | |
| **CO3.** | **Analyzing** the characteristics of pn junction diode & BJT. | |
| **CO4.** | **Analyzing** the different parameters for characterizing different circuits like rectifiers, regulators using diodes and BJTs. | |
| **CO5.** | **Analyzing** the truth tables through the different type's adders. | |
| **LIST OF EXPERIMENTS:** | **Note: Minimum eight experiments should be performed-** | |
| **1** | To study the V-I characteristics of p-n junction diode. | |
| **2** | To study the diode as clipper and clamper | |
| **3** | To study the half-wave rectifier using silicon diode. | |
| **4** | To study the full-wave rectifier using silicon diode. | |
| **5** | To study the Zener diode as a shunt regulator. | |
| **6** | To study transistor in Common Base configuration & plot its input/output characteristics | |
| **7** | To study the operational amplifier in inverting & non-inverting modes using IC 741. | |
| **8** | To study the operational amplifier as differentiator & integrator. | |
| **9** | To study various logic gates & verify their truth tables. | |
| **10** | To study half adder/full adder & verify their truth tables | |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: ECS212 | B.Tech Semester-II<br>**Computer System & Programming in C++** | L-3<br>T-0<br>P-0<br>C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concept of various components of computer system | |
| **CO2.** | **Understanding** the Object-Oriented Programming Language concepts. | |
| **CO3.** | **Analyzing** basic mathematical problem and their solutions through programming | |
| **CO4.** | **Applying** the concepts of programming solutions for distinct problems | |
| **CO5.** | **Applying** the concepts of scalable solutions through function | |
| **Course Content:** | | |
| **Unit-1:** | **Problem Solving**: Phases of problem solving, Algorithms, Structure Chart, Flow chart, Practice of solving Sequence Problems, Selection Problems, Repetition problem.<br>**Statements for problem solving:** if, switch, while, for, do, break, continue, go to statements. | **8 Hours** |
| **Unit-2:** | **Concepts in Computer Application:** Generations, Characteristic and Application of Computers, Functional Component of Computer: CPU, I/O devices, Type of Memory.<br>Translators: Assembler, Compiler, and Interpreter; Number System: Decimal, Octal, Binary and Hexadecimal &their Conversions; Various Codes: BCD, ASCII and EBCDIC and Gray Code. | **8 Hours** |
| **Unit-3:** | **Concepts in Operating System**: Purpose, Services, Types, Functions.<br>**Data Communication & Networks:** Types, Topology, IP address classes.<br>C++ Basics: Data types, Variables, Constants, Keywords, Identifiers, Types of Operators, Memory Allocation operators, Expressions, Pre-processor directives, Introduction to Array, Pointers, Structures and Strings. | **8 Hours** |
| **Unit-4:** | **Functions:** Scope of variables; Parameter passing; Default arguments; Inline functions; Recursive functions; Pointers to functions.<br>**C++ Classes and Data Abstraction: Class** Structure, Objects; this pointer; Friend function; Static class members; Constructors and Destructors; Data abstraction.<br>**Inheritance:** Types, Access to the base class members; Virtual base class. | **8 Hours** |
| **Unit-5:** | **Polymorphism:** Function overloading; Operator overloading; Static Binding andDynamic bindings; Virtual function: Definition, Call mechanism, Pure virtual functions; Virtual destructors; Abstract Classes.<br>**C++ I/O:** Stream classes hierarchy; Stream I/O; File streams; Overloading << and >> operators; File Modes, Reading and Writing to a file; Formatted I/O. | **8 Hours** |
| **Text Books:** | 1. BjarneStroutrup, The C++ Programming Languge, Adison Wesley. | |
| **Reference Books:** | 1. Beginning C++, The Complete Language, Horton,SPD/WROX<br>2. Programming with C++, Radhaganesan, Scitech<br>3. Projects using C++, Varalaxmi, Scitech<br>4. Object Oriented modelling & Design, RumBaugh, PHI<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronics reference material:** | 1. https://www.youtube.com/watch?v=LZFoktwiars&list=PLmp4ylk-B4KrM9uOEdvPIVFUkU3jNc6D2<br>2. https://www.youtube.com/watch?v=XTiIiI-LOY8&list=PLJvIzs_rP6R73WlvumJvCQJrOY3U5zq1j | |

| Course Code: ECS262 | B.Tech - Semester-II<br>**Computer System & Programming in C++ (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts of execution to programs written in C language. | |
| **CO2.** | **Applying** to prepare programming solutions for specific problems. | |
| **CO3.** | **Applying** to prepare scalable solutions through functions. | |
| **CO4.** | **Applying** basic elements of a C program including arithmetic and logical operators, functions, control structures, and arrays | |
| **CO5.** | **Analyzing** basic mathematical problem and their solutions through programming. | |
| **LIST OF EXPERIMENTS:** | **Note: Minimum 15 experiments should be performed from the following:** | |
| **1** | Write a Program (WAP) to calculate Sum & average of N numbers. | |
| **2** | WAP to convert integer arithmetic to a given number of day and month. | |
| **3** | WAP to find maximum and minimum out of 3 numbers a, b & c. | |
| **4** | WAP to find factorial of positive integer. | |
| **5** | WAP to find sum of series up to n number, 2+5+8+……+n. | |
| **6** | WAP to print all the number between 1 to 100 which are dividing by 7. | |
| **7** | WAP to generate Fibonacci series up to n. | |
| **8** | WAP to calculate area of circle using Functions. | |
| **9** | WAP to calculate factorial of given number using Recursion function. | |
| **10** | WAP to find whether number is prime or not. | |
| **11** | WAP to find that the enter character is a letter or digit. | |
| **12** | WAP to find addition of two matrix of n*n order. | |
| **13** | WAP to find multiplication of two matrix of n*n order. | |
| **14** | WAP to find even or odd up to a given limit n. | |
| **15** | WAP to find whether a given no is palindrome or not. | |
| **16** | WAP to Swap two numbers using third Variable and without using third variable. | |
| **17** | WAP to Swap two numbers using call by value and call by reference. | |
| **18** | WAP illustrating overloading of various operators. | |
| **19** | WAP illustrating use of Friend | |
| **20** | WAP illustrating use of Inline Function. | |
| **21** | WAP illustrating use of destructor and various types of constructor. | |
| **22** | WAP illustrating various forms of Inheritance. | |
| **23** | WAP illustrating use of virtual functions, virtual Base Class. | |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: TMUGE201 | B.Tech - Semester-II<br>**English Communication – II** | L-2<br>T-0<br>P-2<br>C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Remembering & understanding** the basics of English Grammar and Vocabulary. | |
| **CO2.** | **Understanding** the basics of Listening, Speaking & Writing Skills. | |
| **CO3.** | **Understanding** principles of letter drafting and various types of formats. | |
| **CO4.** | **Applying** correct vocabulary and grammar in sentence construction while writing and delivering presentations. | |
| **CO5.** | **Analyzing** different types of listening, role of Audience & Locale in presentation. | |
| **CO6.** | **Drafting** Official Letters, E-Mail & Paragraphs in correct format. | |
| **Course Content:** | | |
| **Unit-1:** | **Functional Grammar**<br>• Prefix, suffix and One words substitution<br>• Modals<br>• Concord | **10 Hours** |
| **Unit-2:** | **Listening Skills**<br>• Difference between listening & hearing, Process and Types of Listening<br>• Importance and Barriers to listening | **04Hours** |
| **Unit-3:** | **Writing Skills**<br>• Official letter and email writing<br>• Essentials of a paragraph,<br>• Developing a paragraph: Structure and methods<br>Paragraph writing (100-120 words) | **12 Hours** |
| **Unit-4:** | **Strategies & Structure of Oral Presentation**<br>• Purpose, Organizing content, Audience & Locale, Audio-visual aids, Body langauge<br>• Voice dynamics: Five P's - Pace, Power, Pronunciation, Pause, and Pitch.<br>• Modes of speech delivery and 5 W's of presentation | **8 Hours** |
| **Unit-5:** | **Value based text reading:**<br>Short Essay (Non- detailed study)<br>How should one Read a book? - Virginia Woolf | **6 Hours** |
| **Text Books:** | **1.** Singh R.P., An Anthology of English Essay, O.U.P. New Delhi | |
| **Reference Books:** | **1.** Nesfield J.C. "*English Grammar Composition & Usage*" Macmillan Publishers<br>**2.** Sood Madan "*The Business letters"* Goodwill Publishing House, New Delhi<br>**3.** Kumar Sanjay & Pushplata "*Communication Skills"* Oxford University Press, New Delhi.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional Electronics Reference Material** | **1.** https://www.youtube.com/watch?v=A0uekze2GOU<br>**2.** https://www.youtube.com/watch?v=JIKU_WT0Bls<br>**3.** https://www.youtube.com/watch?v=3Tu1jN65slw<br>**4.** https://youtu.be/sb6ZZ2p3hEM | |

| | | |
|---|---|---|
| | **5.** https://youtu.be/yY6-cgShhac<br>**6.** https://youtu.be/cc4yXwOQsBk<br>**7.** https://youtu.be/yY6-cgShhac<br>**8.** https://youtu.be/84qoeCofXXQ<br>**9.** https://www.youtube.com/watch?v=-9MXmxLisI8&t=28s | |
| **Methodologies :** | **1.** Words and exercises, usage in sentences.<br>**2.** Language Lab software.<br>**3.** Sentence construction on daily activities and conversations.<br>**4.** Format and layout to be taught with the help of samples and preparing letters on different subjects.<br>**5.** JAM sessions and Picture presentation.<br>**6.** Tongue twisters, Newspaper reading and short movies.<br>**7.** Modern Teaching tools (PPT Presentation, Tongue-Twisters& Motivational videos with sub-titles) will be utilized.<br>**8.** Text reading: discussion in detail, critical appreciation by reading the text to develop students' reading habits with voice modulation. | |

## Evaluation Scheme

<table>
<tr><th colspan="3">Internal Evaluation</th><th colspan="2">External Evaluation</th><th>Total Marks</th></tr>
<tr><td colspan="3">40 Marks</td><td colspan="2">60 Marks</td><td rowspan="4">100</td></tr>
<tr><td>20 Marks (Best 2 out of Three</td><td>10 Marks (Oral</td><td rowspan="3">10 Marks (Attendance)</td><td>40 Marks (External Written</td><td>20 Marks</td></tr>
<tr><td>CTs)</td><td>Assignments)</td><td>Examination)</td><td>(External Viva)*</td></tr>
<tr><td>(From Unit-I, III & V)</td><td>(From Unit-II &IV)</td><td>(From Unit-1, III & V)</td><td>(From Unit- II & IV)</td></tr>
</table>

### *Parameters of External Viva

| Content | Body Language | Communication skills | Confidence | TOTAL |
|---|---|---|---|---|
| 05 Marks | 05 Marks | 05 Marks | 05 Marks | 20 Marks |

***Note**: External Viva will be conducted by 2-member committee comprising*

***a)** One Faculty teaching the class*

***b)** One examiner nominated by University Examination cell.*

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

| Course Code: EME261 | B.Tech- Semester-II<br>**Engineering Drawing (Lab)** | L-0<br>T-0<br>P-4<br>C-2 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts of Engineering Drawing. | |
| **CO2.** | **Understanding** how to draw and represent the shape, size & specifications of physical objects. | |
| **CO3.** | **Applying** the principles of projection and sectioning. | |
| **CO4.** | **Applying** the concepts of development of the lateral surface of a given object. | |
| **CO5.** | **Creating** isometric projection of the given orthographic projection. | |
| **LIST OF EXPERIMENTS:** | **All to be performed** | |
| **1** | To write all Numbers (0 to 9) and alphabetical Letters (A to Z) as per the standard dimensions. | |
| **2** | To draw the types of lines and conventions of different materials. | |
| **3** | To draw and study dimensioning and Tolerance | |
| **4** | To construction geometrical figures of Pentagon and Hexagon | |
| **5** | To draw the projection of points and lines | |
| **6** | To draw the Orthographic Projection of given object in First Angle | |
| **7** | To draw the Orthographic Projection of given object in Third Angle | |
| **8** | To draw the sectional view of a given object | |
| **9** | To draw the development of the lateral surface of given object | |
| **10** | To draw the isometric projection of the given orthographic projection. | |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the drawing sheet by the students and a Viva taken by the faculty concerned. The marks shall be given on the drawing sheet & regard maintained by the faculty.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| Drawing Sheet (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

**Note:** The drawing sheet could be manual or in Auto CAD.

| Course Code: EME262 | B.Tech- Semester-II<br>**Workshop Practice (Lab)** | L-0<br>T-0<br>P-4<br>C-2 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts to prepare simple wooden joints using wood working tools. | |
| **CO2.** | **Applying** the techniques to produce fitting jobs of specified dimensions. | |
| **CO3.** | **Applying** the concepts to prepare simple lap, butt, T and corner joints using arc welding equipment. | |
| **CO4.** | **Applying** the concepts of black smithy and lathe machine to produce different jobs. | |
| **CO5.** | **Creating** core and moulds for casting. | |
| **LIST OF EXPERIMENTS:** | **Perform any ten experiments selecting at least one from each shop** | |
| **1** | **Carpentry Shop**:<br>1. To prepare half-lap corner joint.<br>2. To prepare mortise &tenon joint.<br>3. To prepare a cylindrical pattern on woodworking lathe. | |
| **2** | **Fitting Bench Working Shop:**<br>1. To prepare a V-joint fitting<br>2. To prepare a U-joint fitting<br>3. To prepare a internal thread in a plate with the help of tapping process | |
| **3** | **Black Smithy Shop:**<br>1. To prepare a square rod from given circular rod<br>2. To prepare a square U- shape from given circular rod | |
| **4** | **Welding Shop:**<br>1. To prepare a butt and Lap welded joints using arc welding machine.<br>2. To prepare a Lap welded joint Gas welding equipment.<br>3. To prepare a Lap welded joint using spot welding machine | |
| **5** | **Sheet-metal Shop:**<br>1. To make round duct of GI sheet using 'soldering' process.<br>2. To prepare a tray of GI by fabrication | |
| **6** | **Machine Shop:**<br>1. To study the working of basic machine tools like Lathe m/c, Shaper m/c, Drilling m/c and Grinding m/c.<br>2. To perform the following operations on Centre Lathe:<br>Turning, Step turning, Taper turning, Facing, Grooving and Knurling<br>3. To perform the operations of drilling of making the holes on the given metallic work-piece (M.S.) by use of drilling machine. | |
| **7** | **Foundry Shop:**<br>1. To prepare core as per given size.<br>2. To prepare a mould for given casting. | |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EGP211 | B.Tech- Semester-II<br>**Discipline & General Proficiency** | L-0<br>T-0<br>P-0<br>C-0 |
|---|---|---|

There shall be continuous evaluation of the student on the following broad parameters:

**1.** Observance of dress code.

**2.** Participation in Conferences /Workshops / Seminars.

**3.** Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

**4.** Participation in community projects including NSS.

**5.** Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

**6.** Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

**7.** Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

**8.** General behavior

**9.** Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

| S No | | Enroll No. | Student Name | Dress code | Participation in Conferences /Workshops / Seminars | Participation in guest lectures, invited talks and special technical sessions | Participation in community Services | Participation in Culture & extra curriculum activities, Department Club Activities | Participation in sports/ co-curricular activities | General Behavior | Any Extra Achievement |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **(5)** | **(15)** | **(20)** | **(10)** | **(20)** | **(20)** | **(5)** | **(5)** |
| | **Responsible for marks** | | | Mentor | Head | Head | Mentor | Cultural Events Coordinator & Department Club Coordinator | Sports Coordinator | Mentor | Director or Principal |

| Course Code: EME311 | B. Tech (Mechanical)- Semester-III<br>**Engineering Mechanics** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the system of forces, free body diagrams and resultant of forces and/or moments. | |
| **CO2.** | **Applying** the laws of mechanics to determine efficiency of simple machineswith consideration of friction. | |
| **CO3.** | **Analyzing** the loads and support reactions on a structural member. | |
| **CO4.** | **Analyzing**the planner areas and location of their centroid. | |
| **CO5.** | **Evaluating**the internal reactions in a beam; draw correct shear-force and bending moment diagrams. | |
| **Course Content:** | | |
| **Unit-1:** | Force systems and analysis: Concepts of force and force systems; Resultant of force systems; Determination of Resultant of coplanar, concurrent force system; Resolution and composition of forces; Resultant of coplanar and non-concurrent force system<br>Equilibrium: Concepts of equilibrium; Types of loads; Types of supports; Conditions of equilibrium for coplanar force system; Body constraints and free body diagrams; Moments of a force; Moment and arm of a couple; Beam reactions; | **8 Hours** |
| **Unit-2:** | Friction: Introduction; Definitions; Types of Friction; Coulomb's law of friction; Angle of Repose; simple cases of equilibrium of bodies involving dry fiction. | **8 Hours** |
| **Unit-3:** | Shear Force and Bending Moment<br>Definitions- Types of beams; Conception of shear Force and Bending Moment- Sign conventions- Sagging and hogging moments- shear force and bending moment diagrams for cantilevers and simply supported beams subjected to point load, uniformly distributed loads | **8 Hours** |
| **Unit-4:** | Properties of Section<br>Centroid: Centre of gravity and Centroid; Centroid of plane areas; Centroid of Composite areas; some cases of location of centroid of common areas.<br>Moment of Inertia: Area Moment of Inertia; Parallel axis theorem; Perpendicular axis theorem; Polar moment of inertia; Moment of inertia of composite sections; Radius of gyration. | **8 Hours** |
| **Unit-5:** | Trusses: Introduction; Simple Trusses; Types of Trusses; Assumptions; Determination of Forces in simple trusses members; Methods of joints.<br>Torsion: Introduction; pure torsion; Theory of pure torsion; assumptions in theory of pure torsion; Torsional moment of resistance; polar modulus of shafts of circular section; power transmitted by a circular shaft; Shear stress and twist due to torque. | **8 Hours** |
| **Text Books:** | **1.** Bansal R. K., "A Text book of Engineering Mechanics", Laxmi Publications. | |
| **Reference Books:** | 1. Khurmi R. S., "Engineering Mechanics", S. Chand Publication.<br>2. S. Ramamrutham, "Strength of materials", Dhanpat Rai Publishing company<br>3. Kumar K. L., "Engineering Mechanics", Tata McGraw Hill Publication.<br>*** Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://youtu.be/A-3W1EbQ13k<br>https://youtu.be/TnWBAnkCDuc<br>https://www.youtube.com/watch?v=sin3rsh0-Ic | |

| Course Code: EME312 | B. Tech (Mechanical)- Semester-III<br>**Engineering Thermodynamics** | L-3 T-1 P-0 C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding**the basic concept of thermodynamics like system , surrounding, macroscopic, microscopic, heat , work and reversibility. | |
| **CO2.** | **Applying** the laws of thermodynamics to determine the efficiency of engine and COP of heat pump and refrigerator. | |
| **CO3.** | **Analysing** the properties of pure substances,draught of boiler based on critical thinking and problem solving skill. | |
| **CO4.** | **Evaluating** different vapour power cycles Rankine cycles, reheat cycles regenerative cycles. | |
| **CO5.** | **Creating** thermodynamic models and prototype of gas turbine and jet propulsion. | |
| **Course Content:** | | |
| **Unit-1:** | **Basic Concepts of Thermodynamics:** Definitions, system, control volume, surrounding, boundaries, universe; Types of systems; Macroscopic and Microscopic viewpoints; Thermodynamic equilibrium; State, property, process; Cycle - Reversibility - Quasi - static process; Irreversible process; Causes of irreversibility; Energy in state and in transition; Types of work and heat; Point and path function**.** | **8 Hours** |
| **Unit-2:** | **Laws of Thermodynamics**: First law of thermodynamics; Corollaries: First law applied to a Process, applied to a flow system; Steady flow energy equation; Limitations of the first law; Thermal reservoir; Heat engine; Heat pump; Parameters of performance; Second law of thermodynamics: Kelvin-Plank and Clausius statements and their corollaries; PMM; Carnot's principle; Carnot cycle and its specialties; Thermodynamic scale of temperature; Clausius Inequality; Entropy; Principle of entropy increase; Energy equation; Availability and irreversibility; Thermodynamic potentials, Gibbs and Helmholtz Functions; Maxwell relations**.** | **8 Hours** |
| **Unit-3:** | **Properties of Steam and Boiler:** Pure substances; P-V-T- surfaces; T-S and h-s diagrams; Phase transformations: Triple point at critical state properties during change of phase; Dryness Fraction; Properties of steam; Use of steam table &mollier charts; Steam generators: Classifications, working of fire tube & water tube boiler, boiler mounting & accessories, drought & its calculation. | **8 Hours** |
| **Unit-4:** | **Vapor Power Cycles:** Rankine & modified Rankine cycles; Working of steam engine; Indicator diagram; Effect of pressure & temperature on Rankine cycle; Reheat cycle; Regenerative cycle; Feed water heater;<br>Classification of turbines; Comparison with steam engine; Velocity diagram of simple & compound turbines & related calculations. | **8 Hours** |
| **Unit-5:** | **Gas Power Cycle & Jet Propulsion:** Gas turbine classifications, Brayton cycle; Principles of gas turbine; Gas turbine cycles with inter-cooling, reheat & regeneration, stage efficiency, polytrophic efficiency; Deviation of actual cycles from ideal cycles; introduction to the principal of jet propulsion: Turbojet & turboprop engines & their processes; Introduction to rocket engine. | **8 Hours** |
| **Text Books:** | **1.** Nag PK. Engineering Thermodynamics, TMH. | |
| **Reference Books:** | **1.** Singh onkar, Applied Thermodynamics, New Age International Pub.<br>**2.** Ballaney P.L., Thermal Engineering, Khanna Publisher<br>**3.** Rajput R.K., Thermal Engineering, Laxmi Publications.<br><br>*** Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://youtu.be/ju7akwzEmAw?list=PLPA2YbyQreSPkMmhGzrN7mh2bZvaeOsr5<br>https://youtu.be/Ioy62wL0XFM?list=PLPA2YbyQreSPkMmhGzrN7mh2bZvaeOsr5<br>https://youtu.be/Ud5A6vC_AmU?list=PLPA2YbyQreSPkMmhGzrN7mh2bZvaeOsr5 | |

| Course Code: | | L-0 |
|---|---|---|

| EME362 | B. Tech (Mechanical)- Semester-III<br>**Engineering Thermodynamics (Lab)** | T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the working of various types of boiler used in power production. | |
| **CO2.** | **Understanding** and formulating power production based on the fundamental laws of thermal engineering. | |
| **CO3.** | **Understanding** the application of appropriate experiments related to heat engines. | |
| **CO4.** | **Applying** energy conversion process in mechanical power generation for the benefit of mankind. | |
| **CO5.** | **Evaluating** the feasibility of various energy conversion processes. | |
| **Course Content:** | | |
| | **Note: Minimum ten experiments should be performed-** | |
| **Experiment-1:** | To study of Fire Tube boiler | **2 Hours** |
| **Experiment-2:** | To study of water Tube boiler | **2 Hours** |
| **Experiment-3:** | To study of velocity compounded steam turbine and pressure compounded steam turbine | **2 Hours** |
| **Experiment-4:** | To study of impulse & Reaction turbine | **2 Hours** |
| **Experiment-5:** | To study of steam Engine model. | **2 Hours** |
| **Experiment-6:** | To study and working of two stroke petrol Engine | **2 Hours** |
| **Experiment-7:** | To study and working of Four stroke petrol Engine | **2 Hours** |
| **Experiment-8:** | To determine the Indicated H.P. of I.C. Engine by Morse Test | **2 Hours** |
| **Experiment-9:** | To study of Gas Turbine Model | **2 Hours** |
| **Experiment-10:** | To prepare the energy balance for Diesel/Petrol Engine | **2 Hours** |
| **Experiment-11:** | To study & working of two stroke Diesel Engine | **2 Hours** |
| **Experiment-12:** | To study & working of four stroke Diesel Engine. | **2 Hours** |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| EME313 | B. Tech (Mechanical)- Semester-III<br>**Material Science** | T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the basic concepts related to internal structure of material, miller-indices, strain-hardening, magnetism and imperfection in solids | |
| **CO2.** | **Understanding** the purpose of heat treatment in material and importance of TTT curve in steel. | |
| **CO3.** | **Understanding** the various sources, properties and application of Plastics, Ceramics, Composite, Nano and Smart materials. | |
| **CO4.** | **Analysing** various properties and application of ferrous and non - ferrous material and apply its knowledge to select suitable material for specific purpose. | |
| **CO5.** | **Evaluating** mechanical properties of material such as Tensile, Hardness, Torsion and Fatigue strength by performing various mechanical testing. | |
| **Course Content:** | | |
| **Unit-1:** | **Crystallography and Imperfections**: Introduction to material science, Concept of unit cell, space lattice, Bravais lattices, common crystal structures; Atomic packing factor and density; Miller indices; X-ray crystallography techniques; Imperfections, Defects & Dislocations in solids.<br>**Mechanical properties and Testing**: Stress-strain diagram; Ductile & brittle materials; Toughness, Hardness, Fracture, Fatigue and Creep; Testing: Strength testing, Hardness testing, Impact testing, Fatigue testing, Creep testing, Non-destructive testing (NDT). | **8 Hours** |
| **Unit-2:** | **Deformation of Metal**: Elastic and plastic deformation, mechanism of plastic deformation, twinning, conventional and true stress strain curves for polycrystalline materials, yield point phenomena, strain ageing, work hardening, Bauschinger effect, season cracking. Recovery, re-crystallization and grain growth.<br>**Phase Diagram and Equilibrium Diagram**: Unary and Binary diagrams, Phase rules; Types of equilibrium diagrams: Solid solution type, Eutectic type and combination type; Iron-carbon equilibrium diagram. | **8 Hours** |
| **Unit-3:** | **Ferrous Materials**: Iron and steel manufacture, furnaces; Carbon steels, alloy steels and cast irons, and their properties and uses.<br>**Non-Ferrous Metals and Alloys:** Non-ferrous metals such as Cu, Al, Zn, Cr, Ni etc. and its applications; Various type brass, bronze, bearing materials, its properties and uses; Aluminum alloys such a Duralumin. | **8 Hours** |
| **Unit-4:** | **Heat Treatment:** Heat treatment such as Annealing, Normalizing, Quenching, Tempering and Case hardening; Time Temperature Transformation (TTT) diagrams.<br>**Magnetic Properties**: Concept of magnetism; Dia-, para-, ferro-magnetism; Hysteresis; Soft and hard magnetic materials; Superconductor; basic concepts and its applications; Meissner effect; Type I & II superconductors. | **8 Hours** |
| **Unit-5:** | **Ceramics**: Structure, Properties, Applications; Mechanical /Electrical behavior and processing of Ceramics.<br>**Plastics:** Types of polymers/plastics and their applications; Mechanical behaviors and processing of plastics; Future of plastics.<br>**Other Materials**: Description of material such as optical and thermal materials, Concrete, Smart materials, Composite materials and their uses. | **8 Hours** |

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| **Text Books:** | 1. Dr. K. M. Gupta, Material Science in Engineering, Umesh Publications. | |
| **Reference Books:** | 1. Raghvan, Material Science, Prentice Hall of India<br>2. Narula, Material Science, TMH<br>3. Callister W.D., Material Science & Engineering Addition, Wesly Publishing Co.<br>*** Latest editions of all the suggested books are recommended**. | |
| **Additional electronic reference material** | https://www.youtube.com/watch?v=6vyYRnLvnqI<br>https://www.youtube.com/watch?v=Izhv87GIL4U<br>https://www.youtube.com/watch?v=IiBgHQ5D-3Y | |

| Course Code: EME363 | B. Tech (Mechanical)- Semester-III<br>**Material Science (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the basic steps of specimen preparation for microstructure examination. | |
| **CO2.** | **Analyzing** the testing results of tensile and compression test on metallic and nonmetallic specimens by conducting on universal testing machine | |
| **CO3.** | **Analyzing** the testing results of IZOD and CHARPY test by conducting on metallic specimens. | |
| **CO4.** | **Analyzing** the testing results of Brinell and Rockwell hardness on metallic specimens. | |
| **CO5.** | **Evaluating** the microstructure of different metallic materials. | |
| **Course Content:** | | |
| | **Note: Minimum ten experiments should be performed-** | |
| | **1. Material Science Lab Experiments:**<br>(To conduct at least 5 of the following) | |
| **Experiment-1:** | To make a plastic mould for small metallic specimen. | **2 Hours** |
| **Experiment-2:** | To prepare a Specimen for micro structural examination-cutting, grinding, polishing, etching. | **2 Hours** |
| **Experiment-3:** | To determine grain Size of a given specimen. | **2 Hours** |
| **Experiment-4:** | To compare microstructures of different specimens (mild steel, gray C.I., brass, copper) | **2 Hours** |
| **Experiment-5:** | To identify the material from 50 common items kept in a box. | **2 Hours** |
| **Experiment-6:** | To study of microstructure of welded component using microscope | **2 Hours** |
| | **II. Material Testing Lab Experiments**:<br>(To conduct at least 5 of the following) | |
| **Experiment-1:** | To determine Strength of a given mild steel specimen on UTM and plot a stress-strain graph 2. | **2 Hours** |
| **Experiment-2:** | To determine bending Strength and shear strength of a given mild steel specimen on UTM. | **2 Hours** |
| **Experiment-3:** | To determine impact strength using Charpy impact testing machine. | **2 Hours** |
| **Experiment-4:** | To perform hardness test on given mild steel and compare Brinell hardness and Rockwell hardness. | **2 Hours** |
| **Experiment-5:** | To determine Spring index on spring testing machine. | **2 Hours** |

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|---|---|---|
| **Experiment-6:** | To determine fatigue strength fatigue testing machine. | **2 Hours** |
| **Experiment-7:** | To determine deflection of beam and comparison of actual measurement of deflection with dial gauge to the calculated one, and evaluation of young's modulus of beam. | **2 Hours** |
| **Experiment-8:** | To determine torsion strength of a rod on torsion testing machine | **2 Hours** |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EME314 | B. Tech (Mechanical)- Semester-III<br>**Industrial Engineering** | L-3 T-0 P-0 C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will** | |
| **CO1.** | **Understanding** various concepts and techniques of Industrial Engineering like productivity, work study, facility location decisions, principles of facility layout and principles of material handling. | |
| **CO2.** | **Applying** functions of PPC like routing, scheduling, dispatching, loading & follow-up in industry. | |
| **CO3.** | **Analyzing** break even chart, acceptance sampling plans, and various maintenance strategies. | |
| **CO4.** | **Evaluating** depreciation of fixed assets through various methods; economic order quantity for inventory management by EOQ model; job evaluation, merit rating and wage incentive plans by various methods. | |
| **CO5.** | **Creating** organizational charts as per organization's needs. | |
| **Course Content:** | | |
| **Unit-1:** | **Productivity**: Introduction, Definition, Measurement of Productivity index, Productivity improvement techniques.<br>**Work study**: Meaning and benefits of work study, Method study, Man machine chart, Work measurement, Calculation of Standard time, Work sampling, Principles of Motion economy. | **8 Hours** |
| **Unit-2:** | **Plant layout and materials Handling**: Plant location; Type of layouts; Principles of facility layout;Principles of material handling; Material Handling equipment.<br>**Production planning and control**: Objectives of PPC; PPC functions: routing, scheduling, Dispatching, Loading & follow-up. | **8 Hours** |
| **Unit-3:** | **Break Even Analysis:** Purpose; Costs: Overheads, Fixed & variable costs; Steps of Break EvenAnalysis Margin of safety; Angle of incidence; Profit volume graph.<br>**Depreciation Analysis**: Causes; Obsolescence; Methods.<br>**Maintenance Management**: Maintenance, Planning & Control; Maintenance Strategies. | **8 Hours** |
| **Unit-4:** | **Inventory Control**: Inventory, classification of inventory, inventory related costs, EOQ model, Introduction to Supply-chain Management<br>**Quality Control:** Introduction, SQC; Single, double & sequentialsampling; Introduction to TQM & bench marking. | **8 Hours** |
| **Unit-5:** | **Industrial Ownership**: Proprietorship; Partnership; Joint stock & co-operative stores.<br>**Manpower Planning**: Process.<br>**Organization**: Principles of organization; Development of Organizational charts like line, staff, lineand staff & Functional types.<br>**Job Evaluation & Merit rating**: Job analysis; Job description, job evaluationmethods, Merit rating, Wage incentive plans. | **8 Hours** |
| **Text Books:** | 1 Mahajan, Industrial Engineering, Dhanpat Rai & Sons. | |
| **Reference Books:** | 1. Khanna O.P., Industrial Engineering & Management, Dhanpat Rai & Sons.<br>2. Shanker. Ravi, Industrial Engineering, Galgotia Publications.<br>3. Buffa E.S., Modern Production Operations Management, Wiley Eastern. | |

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| | ***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://www.youtube.com/watch?v=gBmuDp7jvDg&list=PLLy_2iUCG87D5n9zraFS2QYajk0OAOlVK&index=61<br>https://www.youtube.com/watch?v=bE4RAtI9QxQ&list=PLLy_2iUCG87D5n9zraFS2QYajk0OAOlVK&index=37<br>https://www.youtube.com/watch?v=yfW9mtfjD8&list=PLLy_2iUCG87D5n9zraFS2QYajk0OAOlVK&index=48 | |

| Course Code: EHM311 | B. Tech (Mechanical)- Semester-III<br>**Operations Research** | L-3 T-1 P-0 C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will** | |
| **CO1.** | **Understanding** various types of Inventory model with different parameters. | |
| **CO2.** | **Applying**the concept of formulation of the problem and their desired output by either graphical and simplex methods | |
| **CO3.** | **Analyzing**various methods to minimize the transportation cost corresponding to factories and their inventories. | |
| **CO4.** | **Evaluating** the process by which job to be assign a particular machine and worker to reduce the cost and time using Hungarian methods | |
| **CO5.** | **Creating** an appropriate method to analysis the decision tree in the analysis of sequencing problem. | |
| **Course Content:** | | |
| **Unit-1:** | Operations Research: History, Characteristics, Models and modelling, General Methodology to solve OR problem, Applications. Linear Programming: Applications and Model Formation; Graphical method; Simplex method; Duality in Linear Programming. | **8 Hours** |
| **Unit-2:** | Transportation Problem: Mathematical model of Transportation problem; Transportation Algorithm; Methods for finding initial solution: North-West corner method, Least cost method, Vogel's approximation method; Test for optimality; Steps of MODI method; Variations in transportation problems: Unbalanced supply and demand, Degeneracy and its resolution; Alternative optimal solution; Maximization of transportation problem. Assignment problems: Mathematical model of assignment problems; Hungarian method; Variations of the assignment problems: Multiple optimal solutions, maximization case; Unbalanced assignment problems. | **8 Hours** |
| **Unit-3:** | Sequencing Problem: Processing of n jobs through two-machines, three-machines, m-machines; Processing two jobs through m machines. Decision theory: Steps of Decision making process; Types of Decision making environments; Decision making under. | **8 Hours** |
| **Unit-4:** | Ventory Models: Inventory cost components; EOQ; Deterministic inventory cost models: Inventory model with constant demand & Instantaneous supply, EOQ model with different rates of demand, EOQ model with gradual replenishment, Multi-item inventory control models with constraint, EOQ models with warehouse space constraint; Investment constraint; Average inventory level constraint; Number of orders constraints; Selective inventory control techniques: ABC analysis, VED analysis, FSN analysis. | **8 Hours** |
| **Unit-5:** | Project Management: PERT & CPM; Network construction; Critical path analysis; Program evaluation and review technique (PERT); Project Time Cost Trade-Off; Project-crashing. | **8 Hours** |
| **Text Books:** | 1. Sharma J.K., Operations Research, SK Kataria& sons. | |

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| **Reference Books:** | 1. Sharma S.D., Operations Research, Kedar Nath Ram Nath & Co.<br>2. Taha, Operations Research, PHI<br>3. Kapoor V.K., Operations Research, Sultan Chand & Sons<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://drive.google.com/file/d/1qOwjLOLyjuhsB0_u2qSC89H-kRBCQhyG/view?usp=drivesdk<br>https://drive.google.com/file/d/1Khy_hgGkjJd2J_i9v_6mQHMBI6GWXpLJ/view?usp=drivesdk<br>https://youtu.be/KVmgedCeay8 | |

| Course Code: EME361 | B. Tech (Mechanical)- Semester-III<br>**Machine Drawing (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the conventional representation of materials and machine elements, surface roughness symbols, machining symbols and the basic concepts of AutoCAD. | |
| **CO2.** | **Applying** the knowledge to draw the popular forms of screw threads bolts and rivet joints. | |
| **CO3.** | **Analyzing**the machine components and assembly drawings based on critical thinking and problem-solving skills. | |
| **CO4.** | **Evaluating** and interpreting engineering technical drawings of parts and assemblies. | |
| **CO5.** | **Creating** the assembly drawing of cross heads & eccentrics, shaft coupling-spigot & socket pipe joint, cotter joints & knuckle joint, screws jacks and plummer block using AutoCAD parametric software. | |
| **Course Content:** | | |
| **Experiment-1:** | To draw the Conventional representation of materials, common machine elements and parts. | **2 Hours** |
| **Experiment-2:** | To draw the Surface roughness symbols; Machining symbols, indication of surface roughness. | **2 Hours** |
| **Experiment-3:** | To draw the popular forms of screw threads, bolts, nuts, stud bolts, tap bolts, set screws. | **2 Hours** |
| **Experiment-4:** | To draw the riveted joints for plates. | **2 Hours** |
| **Experiment-5:** | To prepare the different types of limits, fits and tolerances. | **2 Hours** |
| **Experiment-6:** | To prepare the part drawing of Cross heads & Eccentrics. (AutoCAD) | **2 Hours** |
| **Experiment-7:** | To draw the Shaft coupling-Spigot and Socket pipe joint. (AutoCAD) | **2 Hours** |
| **Experiment-8:** | To draw the Keys; cotter joints and knuckle joint. (AutoCAD) | **2 Hours** |
| **Experiment-9:** | To prepare the part drawing of Screws jacks &Tailstock. (AutoCAD) | **2 Hours** |
| **Experiment-10:** | To prepare the assembly drawing of Plummer block & stuffing boxes. (AutoCAD) | **2 Hours** |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EGP311 | B.Tech- Semester-III<br>**Discipline & General Proficiency** | L-0<br>T-0<br>P-0<br>C-0 |
|---|---|---|

There shall be continuous evaluation of the student on the following broad parameters:

**1.** Observance of dress code.

**2.** Participation in Conferences /Workshops / Seminars.

**3.** Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

**4.** Participation in community projects including NSS.

**5.** Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

**6.** Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

**7.** Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

**8.** General behavior

**9.** Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

| S No | | Enroll No. | Student Name | Dress code | Participation in Conferences /Workshops / Seminars | Participation in guest lectures, invited talks and special technical sessions | Participation in community Services | Participation in Culture & extra curriculum activities, Department Club Activities | Participation in sports/ co-curricular activities | General Behavior | Any Extra Achievement |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **(5)** | **(15)** | **(20)** | **(10)** | **(20)** | **(20)** | **(5)** | **(5)** |
| | **Responsible for marks** | | | Mentor | Head | Head | Mentor | Cultural Events Coordinator & Department Club Coordinator | Sports Coordinator | Mentor | Director or Principal |

| Course Code: TMUGA-301 | Value Added Course<br>B.Tech.- Semester-III<br>**Foundation in Quantitative Aptitude** | L-2<br>T-1<br>P-0<br>C-0 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | Solving complex problems using Criss cross method, base method and square techniques. | |
| **CO2.** | Applying the arithmetical concepts of Average, Mixture and Allegation. | |
| **CO3.** | Evaluating the different possibilities of various reasoning based problems in series, Blood relation and Direction. | |
| **CO4.** | Operationalizing the inter-related concept of Percentage in Profit Loss and Discount, Si/CI and Mixture/Allegation. | |
| **Course Content:** | | |
| **Unit-1:** | **Speed calculations**<br>Squares till 1000,square root, multiplications: base 100, 200 300 etc., 11-19, crisscross method for 2X2, 3X3, 4X4, 2X3, 2X4 etc., cubes, cube root | **3 Hours** |
| **Unit-2:** | **Percentages**<br>Basic calculation, ratio equivalent, base, change of base, multiplying factor, percentage change, increment, decrement, successive percentages, word problems | **5 Hours** |
| **Unit-3:** | **Profit Loss Discount**<br>Basic definition, formula, concept of mark up, discount, relation with successive change, faulty weights | **5 Hours** |
| **Unit-4:** | **SI and CI**<br>Simple Interest, finding time and rate, Compound Interest, difference between SI and CI, Installments | **4 Hours** |
| **Unit-5:** | **Averages**<br>Basic Averages, Concept of Distribution, Weighted Average, equations | **3 Hours** |
| **Unit-6:** | **Mixtures and allegations**<br>Mixtures of 2 components, mixtures of 3 components, Replacements | **5 Hours** |
| **Unit-7:** | **Blood relations**<br>Indicating type, operator type, family tree type | **3 Hours** |
| **Unit-8:** | **Direction sense**<br>Simple statements, shadow type | **2 Hours** |
| **Reference Books:** | • R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude<br>• R2:-Quantitative Aptitude by R.S. Agrawal<br>• R3:-M Tyra: Quicker Maths<br>• R4:-Nishith K Sinha:- Quantitative Aptitude for CAT<br>• R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com<br>• R6:-Logical Reasoning by Nishith K Sinha<br>• R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal<br><br>*** Latest editions of all the suggested books are recommended.** | |

| Course Code: EME412 | B. Tech (Mechanical)- Semester-IV<br>**Production Technology-1** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** various types of forming process, production concepts and Die Casting machine | |
| **CO2.** | **Applying** the concept of Various manufacturing process, implementation and their desired output | |
| **CO3.** | **Analyzing** various sheet operations, compound, progressive die punch assembly and their operation analysis. | |
| **CO4.** | **Evaluating** the working principal of back rollers, rolling mills and their comparative analysis. | |
| **CO5.** | **Creating** an appropriate method to understanding the process,drawing, extrusion, deep drawing and their practical output. | |
| **Course Content:** | | |
| **Unit-1:** | Introduction: Importance of manufacturing; Economic & technological considerations in manufacturing; Survey of manufacturing processes; Materials & manufacturing processes for common items. Metal Forming Processes: Elastic & plastic deformation, yield criteria; Hot working and cold working; Load required to accomplish metal forming operation; Analysis (equilibrium equation method) of forging process with sliding friction, sticking friction and mixed condition for slab and disc; Work required for forging; Hand, Power, Drop Forging. | **8 Hours** |
| **Unit-2:** | Metal Forming Processes (continued): Analysis of Wire/strip drawing and maximum reduction; Tube drawing; Extrusion and its application; Conditions for Rolling force and power in rolling; Rolling mills; Design, lubrication and defects in metal forming processes. | **8 Hours** |
| **Unit-3:** | Sheet Metal working: Presses and their classification; Die & punch assembly and press work methods and processes; Cutting/Punching mechanism; Blanking and Piercing; Compound Combination and Progressive die; Flat-face and Inclined-face punch and Load (capacity) needed; Analysis of forming process like cup/deep drawing and bending. | **8 Hours** |
| **Unit-4:** | jigs & Fixtures: Principle of locating & clamping devices; Jigs and Fixtures and their applications. Manufacturing of Plastic components: Review of plastics and its uses and applications. Injection moulding and blow moulding; Extrusion of plastic section; Welding of plastics; Resins & adhesives. | **8 Hours** |
| **Unit-5:** | Casting: Basic principle & survey of casting processes; Types of patterns and allowances; Types and properties of moulding sand; Elements of mould and design considerations, gating, riser, runner, core; Solidification of casting; Sand-casting; Defects of casting and its remedies; Cupola and crucible furnace; Die Casting, Centrifugal casting, Investment casting etc. | **8 Hours** |
| **Text Books:** | 1. Ghosh and Mallik, Manufacturing Science, East West Pvt ltd | |
| **Reference Books:** | 1. Rao P N., Manufacturing Technology, Tata. McGraw Hill<br>2. Paul Degarmo, Materials and Manufacturing, Macmillan Pub. Company.<br>3. Pandey P.C., Production Engg. Science, Standard Publishers Ltd. 3. Jain R.K., Production Technology, Khanna<br>*** Latest editions of all the suggested books are recommended.** | |

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| **Additional electronic reference material** | https://youtu.be/bgMPuYn2ips<br>https://youtu.be/YtksJ12suFM<br>https://youtu.be/pSyOkn127bs | |

| Course Code: EME461 | B. Tech (Mechanical)- Semester-IV<br>**Production Technology- I (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** various types of tool used in various manufacturing process. | |
| **CO2.** | **Applying** various sheet metal work using die and punch assembly to production of washer as well as hole with desired structure. | |
| **CO3.** | **Analyzing** various method of the rolling process to reduce the diameter of thin sheet and also importance of back rollers in the process. | |
| **CO4.** | **Evaluating** the property of the different category of the sand and calculate the grain fineness (GFN) of the sand. | |
| **CO5.** | **Creating** method for the development of the pattern,mould and the casting process with a unique specification | |
| **Course Content:** | | |
| | **Note: Minimum eight experiments should be performed-** | |
| **Experiment-1:** | To Prepare a Cylindrical Pattern. | **2 Hours** |
| **Experiment-2:** | To prepare a cylindrical sheet metal work piece with the help of roller | **2 Hours** |
| **Experiment-3:** | To make a mould (with core) for casting | **2 Hours** |
| **Experiment-4:** | To determine grain fineness number of Sand | **2 Hours** |
| **Experiment-5:** | To prepare a component as per the given drawing by hand forging process | **2 Hours** |
| **Experiment-6:** | To preparea elbow on injection moulding machine | **2 Hours** |
| **Experiment-7:** | To Study the foundry tools. | **2 Hours** |
| **Experiment-8:** | To perform tube bending with a tube-bending machine. | **2 Hours** |
| **Experiment-9:** | To study different types of dies used on a press and to prepare a washer of specified dimension on press. | **2 Hours** |
| **Experiment-10:** | To prepare a wire from a soft material using wire drawing by Extrusion operation. | **2 Hours** |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EME413 | B. Tech (Mechanical)- Semester-IV<br>**Measurement, Metrology & Control** | L-3 T-1 P-0 C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** various types of measurement systems, measuring instruments, Sensor and transducers. | |
| **CO2.** | **Applying** the concept of measurements on different strain gauges. | |
| **CO3.** | **Analyzing** standard of linear measurement line and end standard , limits, fits and tolerance. | |
| **CO4.** | **Evaluating** measurement of geometric form straightness flatness roundness profile projector and auto collimator valuate and interpret different psychrometric process, cooling and heating load calculations and grand sensible heat factor. | |
| **CO5.** | **Creating** models on hydraulic and pneumatic control systems. | |
| **Course Content:** | | |
| **Unit-1:** | **Mechanical Measurements:** Introduction to measurement and measuring instruments; Generalized measuring system and functional elements; Units of measurement; Static and dynamic performance characteristics of measurement devices; Calibration, concept of error, sources of error, statistical analysis of errors;<br>**Sensors and Transducers**: Types of sensors; Types of transducers and their characteristics; Signal transmission and processing devices and systems; Signal display & recording devices. | **8 Hours** |
| **Unit-2:** | **Strain Measurement**<br>Strain gauges, various types of metallic resistance strain gauges, Selection and Installation factors for metallic strain gauge, Strain rosettes, And The Strain Gauge ballast circuit, Wheat stone bridge circuit, and Temperature compensation.<br>**Measurement of Pressure**<br>Gravitational, direct acting, Elastic and indirect type pressure transducers, strain gauge pressure cells, measurement of high pressure, Measurement of low pressures.<br>**Temperature Measurement**<br>Thermometers, bi-metallic thermocouples, thermistors and pyrometers, Calibration of temperature measuring devices.<br>**Force, Speed and Torque Measurement:**<br>Load Cells, Dynamometers, Tachometer, Stroboscope, measurement of torque of rotating shafts, The seismic instruments: vibrometers and accelerometers. | **8 Hours** |
| **Unit-3:** | **Metrology and Inspection**: Standards of linear measurement-line and end standards; Limit, fits and tolerances; Interchange-ability and standardization; Linear and angular measurements devices and systems. **Comparators:** Sigma, Johansson's Microkator; Limit gauges classification; Taylor's Principle of Gauge design. | **8 Hours** |
| **Unit-4:** | **Measurement of geometric forms**: Straightness, Flatness, Roundness; Tool makers microscope, Profile-projector, autocollimator.<br>**Interferometer**: Principle and use of interferometer; optical flat; Measurement of screw threads and gears.<br>**Surface texture**: Quantitative evaluation of surface roughness and its measurement (Taly surf). | **8 Hours** |
| **Unit-5:** | **Controls**: Introduction, Concept of Automatic Controls; Open loop & closed loop systems; Servo- mechanisms;<br>Block diagrams; Transfer functions; Applications of Laplace Transform in control systems with simple examples; Representation of control components & Systems; Series & parallel combinations; Cascade system, **Controllers**: Introduction to Pneumatic and hydraulic control systems. | **8 Hours** |
| **Text Books:** | 1. .<br>2. Kumar D.S., Mechanical Measurements and Control, Metropolitan, N. Delhi. | |
| **Reference Books:** | 1. Gupta, I.C., Engineering Metrology, Dhanpat Rai & Sons, New Delhi, 1994<br>2. Jain, R.K., Engineering Metrology, Khanna Publishers. | |

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|---|---|---|
| | 3. Nagrath and Gopal, Control System Engineering, New Age Publishers.<br><br>*** Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://youtu.be/HpIEeBtJupY?list=PLbMVogVj5nJSZiwuh_tp50dKry8mCxzKA<br>https://youtu.be/_qz8_sbhwY?list=PLbMVogVj5nJSZiwuh_tp50dKry8mCxzKA<br>https://youtu.be/uAntebtIgCY?list=PLbMVogVj5nJSZiwuh_tp50dKry8mCxzKA | |

| Course Code: EME462 | B. Tech (Mechanical)- Semester-IV<br>**Measurement, Metrology & Control (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the measurement of linear dimensions using various measuring instruments. | |
| **CO2.** | **Applying** bevel protractor and sine bar to measure angles. | |
| **CO3.** | **Applying** measuring instruments to measure circularity, roundness and roughness. | |
| **CO4.** | **Applying** measuring devices to measure temperature and pressure. | |
| **CO5.** | **Evaluating** and compare component sizes with standard size using dial indicator. | |
| **Course Content:** | | |
| | **Note: All experiments should be performed:** | |
| **Experiment-1:** | To determine length, width and height of given component using verniercallipers, micrometer, and compare the result. | **2 Hours** |
| **Experiment-2:** | To measure the angle of a given job using bevel protector. | **2 Hours** |
| **Experiment-3:** | To Measure angle of given component using sine bar & slip gauges. | **2 Hours** |
| **Experiment-4:** | To measure the dimensional parameters of a given bolt by using profile projector. | **2 Hours** |
| **Experiment-5:** | To measure the speed of the haft using stroboscope and compare with tachometer. | **2 Hours** |
| **Experiment-6:** | To check the roundness of a circular rod using dial indicator. | **2 Hours** |
| **Experiment-7:** | To measure pressure using pressure gauge. | **2 Hours** |
| **Experiment-8:** | To measure temperature using RTD and compare with thermometer. | **2 Hours** |
| **Experiment-9:** | To check spark plug gap using feeler gauges and measure surface roughness by using Talysurf. | **2 Hours** |
| **Experiment-10:** | To compare given component sizes with standard size using dial indicator. | **2 Hours** |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EME414 | B. Tech (Mechanical)- Semester-IV<br>**Fluid Mechanics** | L-3<br>T-0<br>P-0<br>C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts of fluid behavior. | |
| **CO2.** | **Applying** the concept of fluid mechanics on static as well as dynamic conditions. | |
| **CO3.** | **Analyzing**the mechanics related to fluid motion. | |
| **CO4.** | **Evaluating** different problems related to the fundamental principles of fluid statics, fluid kinematics and fluid dynamics. | |
| **CO5.** | **Creating** designs of different machining equipment's using fluid as a working medium. | |
| **Course Content:** | | |
| **Unit-1:** | Fluid and continuum, Physical properties of fluids, Rheology of fluids. Pressure-density-height relationship, manometers, pressure transducers, pressure on plane and curved surfaces, centre of pressure, buoyancy, stability of immersed and floating bodies, fluid masses subjected to linear acceleration and uniform rotation about an axis. | **8 Hours** |
| **Unit-2:** | Types of fluid flows: Continuum & free molecular flows. Steady and unsteady, uniform and non-uniform, laminar and turbulent flows, rotational and irrotational flows, compressible and incompressible flows, subsonic, sonic and supersonic flows, sub-critical, critical and supercritical flows, one, two and three-dimensional flows, streamlines, continuity equation for 3D and 1D flows, circulation, stream function and velocity potential. Dimensional analysis, Buckingham's Pi theorem, important dimensionless numbers and their significance, | **8 Hours** |
| **Unit-3:** | Potential Flow: source, sink, doublet and half-body. Equation of motion along a streamline and its integration, Bernoulli's equation and its applications- Pitot tube, orifice meter, venturi meter and bend meter, Hot-wire anemometer and LDA, notches and weirs, momentum equation and its application to pipe bends. Similarity Laws: geometric, kinematics and dynamic similarity, undistorted and distorted model studies. | **8 Hours** |
| **Unit-4:** | Equation of motion for laminar flow through pipes, Stokes' law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, isotropic, homogenous turbulence, scale and intensity of turbulence, measurement of turbulence, eddy viscosity, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, resistance to flow, minor losses, pipe in series and parallel, power transmission through a pipe, siphon, water hammer, three reservoir problems and pipe networks. | **8 Hours** |
| **Unit-5:** | Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, application of momentum equation, turbulent boundary layer, laminar sublayer, separation and its control, Drag and lift, drag on a sphere, a two-dimensional cylinder, and an aero foil, Magnus effect. Introduction to compressible flow. | **8 Hours** |
| **Text Books:** | **1.** Bansal R K, "Fluid Mechanics and Hydraulic Machines", Laxmi Publications | |
| **Reference Books:** | **1.** Modi and Seth, "Hydraulics and Fluid Mechanics including Hydraulic Machines", Standard Book House.Fox & Donald, "Introduction to Fluid Mechanics" John Wiley &Sons Pvt Ltd. | |

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|---|---|---|
| | **2.** Som and Biswas, "Introduction to Fluid Mechanics and Machines", Mc Graw Hill Publications<br>**3.** V Gupta and S K Gupta, "Fluid Mechanics and its Applications", Wiley Eastern Ltd<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://www.youtube.com/watch?v=xT5Ow63BK7I<br>https://www.youtube.com/watch?v=i7QrAK9bUrc<br>https://www.youtube.com/watch?v=IcJOkRZPNMI | |

| Course Code: EME463 | B. Tech (Mechanical)- Semester-IV<br>**Fluid Mechanics (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concept of Fluid flow behavior such as laminar transition and turbulent. | |
| **CO2.** | **Applying** the concept of Bernoulli's Equation on pipe flow. | |
| **CO3.** | **Analyzing** the discharge coefficient and friction coefficient value for applications of Bernoulli's Equation. | |
| **CO4.** | **Evaluating** different calculations to verify different fluid equations. | |
| **CO5.** | **Creating** different models with fluid as a working medium. | |
| **Course Content:** | | |
| | **Note: Minimum ten experiments should be performed-** | |
| **Experiment-1:** | To measure the surface tension of a liquid. | **2 Hours** |
| **Experiment-2:** | To determine the meta-centric height of a ship model experimentally. | **2 Hours** |
| **Experiment-3:** | To determine the coefficients of velocity, contraction and discharge of an orifice (or a mouth piece) of a given shape. Plot the flow net for a given model using the concept of electrical analogy. | **2 Hours** |
| **Experiment-4:** | To verify the Bernoulli's theorem. | **2 Hours** |
| **Experiment-5:** | To calibrate an orifice meter and venturimeter and to study the variation of the coefficient of discharge with the Reynolds number. | **2 Hours** |
| **Experiment-6:** | To calibrate and to determine the coefficient of discharge for rectangular and triangular notches. | **2 Hours** |
| **Experiment-7:** | To verify Darcy's law and to find out the coefficient of permeability of the given medium. | **2 Hours** |
| **Experiment-8:** | To verify the momentum equations | **2 Hours** |
| **Experiment-9:** | To study the boundary layer velocity profile and to determine boundary layer thickness and displacement thickness. Also determine the exponent in the power law of velocity distribution. | **2 Hours** |
| **Experiment-10:** | To study the variation of friction factor (f) for turbulent flow in smooth and rough commercial pipes. | **2 Hours** |
| **Experiment-11:** | To determine the loss coefficients for the various pipe fittings. | **2 Hours** |
| **Experiment-12:** | To study the flow behavior in a pipe bend and to calibrate the cap for discharge measurement. | **2 Hours** |
| **Experiment-13:** | To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number. | **2 Hours** |

| | | |
|---|---|---|
| **Experiment-14:** | To find the velocity distribution in a pipe and hence to compute the discharge by integrating the velocity profile obtained. | **2 Hours** |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**
The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: TMUGE401 | B. Tech (Electrical)- Semester-III<br>**English Communication- III** | L-2<br>T-0<br>P-2<br>C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be:** | |
| **CO1.** | **Understanding** knowledge of grammar to face competitive exams. | |
| **CO2.** | **Understanding** advance English language by using variety of words i.e. idioms and phrase in variety of sentences in functional context. | |
| **CO3.** | **Understanding** listening for effective communication. | |
| **CO4.** | **Applying** their English grammar knowledge in day to day context. | |
| **CO5.** | **Applying** writing and comprehensive skills in English. | |
| **CO6.** | **Analyzing** Comprehending & enriching their vocabulary through prescribed text. | |
| **Course Content:** | | |
| **Unit-1:** | **English Grammar & Vocabulary**<br>• Correction of Common Errors (with recap of English Grammar with its usage in practical context.)<br>• Synthesis: Simple, complex and compound sentence<br>• Commonly used Idioms & phrases (Progressive learning whole semester) | **14 Hours** |
| **Unit-2:** | **Speaking Skills**<br>• Art of public speaking<br>• Common conversation<br>• Extempore<br>• Power Point Presentation (PPt) Skills: Nuances of presenting PPTs | **10 Hours** |
| **Unit-3:** | **Comprehension Skills**<br>• Strategies of Reading comprehension: Four S's<br>• How to solve a Comprehension (Short unseen passage: 150-200 words) | **6 Hours** |
| **Unit-4:** | **Professional Writing**<br>• Preparing Notice, Agenda & Minutes of the Meeting | **7 Hours** |
| **Unit-5:** | **Value based text reading:** Short story<br>• The Barber's Trade Union - Mulk Raj Anand | **3 Hours** |
| **Text Books:** | **1.** Singh R.P., An Anthology of English Essay, O.U.P. New Delhi | |
| **Reference Books:** | **1.** Wren & Martin *"High School English Grammar and Composition*" S.Chand&Co.Ltd., New Delhi.<br>**2.** Kumar Sanjay &Pushplata *"Communication Skills*" Oxford University Press, New Delhi.<br>**3.** Agrawal, Malti *"Professional Communication*" Krishana Prakashan Media (P) Ltd. Meerut.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional Electronics Reference Material** | 1-https://www.youtube.com/watch?v=dpYltVtsS_Q<br>2- https://www.youtube.com/watch?v=Z8HttKW8jVE<br>3-https://www.youtube.com/watch?v=srn5jgr9TZo<br>4-https://www.youtube.com/watch?v=En9-8xWYWqk<br>5-https://www.youtube.com/watch?v=aUEpmAo0OvM | |
| **Methodology:** | **1.** Idiom & Phrases and exercises, usage in sentences.<br>**2.** Language Lab software.<br>**3.** Power Point presentation.<br>**4.** Newspaper reading, short articles from newspaper to comprehend and short movies. | |

| | | |
|---|---|---|
| | **5.** Modern Teaching tools (PPT Presentation & Motivational videos with sub-titles) will be utilized.<br>**6.** Text reading: discussion in detail, Critical appreciation by reading the text to develop students' reading habits with voice modulation. | |

## Evaluation Scheme

| **Internal Evaluation** | | | **External Evaluation** | | **Total Marks** |
|---|---|---|---|---|---|
| 40 Marks | | | 60 Marks | | |
| 20 Marks<br><br>(Best 2 out of Three CTs)<br><br>(From Unit-I, III, IV & V) | 10 Marks (Oral Assignments)<br><br>(Unit -II) | 10 Marks (Attendance) | 40 Marks (External Written Examination)<br><br>(From Unit-1, III, IV & V) | 20 Marks (External Viva)*<br><br>(Unit -II) | 100 |

## *Parameters of External Viva

| Content | Body Language | Communication skills | Confidence | TOTAL |
|---|---|---|---|---|
| 05 Marks | 05 Marks | 05 Marks | 05 Marks | 20 Marks |

**Note**: External Viva will be conducted by 2-member committee comprising

***a)*** One Faculty teaching the class

***b)*** One examiner nominated by University Examination cell.

Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.

| Course Code: EGP411 | B.Tech- Semester-IV<br>**Discipline & General Proficiency** | L-0<br>T-0<br>P-0<br>C-0 |
|---|---|---|

There shall be continuous evaluation of the student on the following broad parameters:

**1.** Observance of dress code.

**2.** Participation in Conferences /Workshops / Seminars.

**3.** Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

**4.** Participation in community projects including NSS.

**5.** Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

**6.** Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

**7.** Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

**8.** General behavior

**9.** Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

| S No | | Enroll No. | Student Name | Dress code | Participation in Conferences /Workshops / Seminars | Participation in guest lectures, invited talks and special technical sessions | Participation in community Services | Participation in Culture & extra curriculum activities, Department Club Activities | Participation in sports/ co-curricular activities | General Behavior | Any Extra Achievement |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **(5)** | **(15)** | **(20)** | **(10)** | **(20)** | **(20)** | **(5)** | **(5)** |
| | **Responsible for marks** | | | Mentor | Head | Head | Mentor | Cultural Events Coordinator & Department Club Coordinator | Sports Coordinator | Mentor | Director or Principal |

| Course Code: TMUGA-401 | Value Added Course<br>B.Tech.- Semester-IV<br>**Analytical Reasoning** | L-2<br>T-1<br>P-0<br>C-0 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | Applying the arithmetical concepts in Ratio Proportion Variation. | |
| **CO2.** | Employing the techniques of Percentage; Ratios and Average in inter related concepts of Time and Work, Time Speed and Distance. | |
| **CO3.** | Identifying different possibilities of reasoning based problems of Syllogisms and Venn diagram. | |
| **CO4.** | Examining the optimized approach to solve logs and Surds. | |
| **Course Content:** | | |
| **Unit-1:** | **Ratio, proportions and variations**<br>Concept of ratios, proportions, variations, properties and their applications | **5 Hours** |
| **Unit-2:** | **Time and Work**<br>Same efficiency, different efficiency, alternate work, application in Pipes and Cisterns | **6 Hours** |
| **Unit-3:** | **Time Speed Distance**<br>Average speed, proportionalities in Time, Distance, trains, boats, races, circular tracks | **6 Hours** |
| **Unit-4:** | **Logs and Surds**<br>Concept and properties of logs, surds and indices | **4 Hours** |
| **Unit-5:** | **Coding and decoding**<br>Sequential coding, reverse coding, abstract coding | **3 Hours** |
| **Unit-6:** | **Syllogisms**<br>Two statements, three statements | **4 Hours** |
| **Unit-7:** | **Venn diagram**<br>Basic concept and applications | **2 Hours** |
| **Reference Books:** | • R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude<br>• R2:-Quantitative Aptitude by R.S. Agrawal<br>• R3:-M Tyra: Quicker Maths<br>• R4:-Nishith K Sinha:- Quantitative Aptitude for CAT<br>• R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com<br>• R6:-Logical Reasoning by Nishith K Sinha<br>• R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal<br><br>*** Latest editions of all the suggested books are recommended.** | |

| Course Code: EME511 | B.Tech (Mechanical)- Semester-V<br>**Production Technology –II** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** metal removal and joining processes of production technology. | |
| **CO2.** | **Applying** the different methods of metal removal/surface finishing and welding processes on various jobs. | |
| **CO3.** | **Analyzing** various methods for surface finishing and welding processes according to the job requirements. | |
| **CO4.** | **Evaluating** the different metal removal and welding processes according to machining parameters on various jobs. | |
| **CO5.** | **Creating** appropriate methods of machining and welding to different jobs according to their requirements. | |
| **Course Content:** | | |
| **Unit-1:** | **Metal Cutting and Machine Tools:** Metal Cutting: Mechanics of metal cutting; Geometry of tool and nomenclature as per ASA system; Orthogonal vs. oblique cutting; Mechanics of chip formation; Types of chips; Shear angle relationship; Merchant's force circle diagram; Cutting forces; Power required for Cutting; Cutting fluids/lubricants; Tool materials; Tool wear and tool life; Machinability; Brief introduction to machine tool vibration and surface finish. | **8 Hours** |
| **Unit-2:** | **Lathe:** Principle, Types, Operations; Turret/capstan, Semi/Automatic; Tool layout.<br>Shaper, Slotter, Planer: Working principle; Operations; Drives. | **8 Hours** |
| **Unit-3:** | **Milling:** Milling cutters; up milling & down milling; Dividing head & indexing; Max chip thickness & power required.<br>Drilling and Boring: Drilling; Drill-bits; Geometry of twist drills; Boring, Reaming tools. | **8 Hours** |
| **Unit-4:** | **Grinding & Super finishing:** Grinding: Abrasive; Cutting action; Grinding wheel specifications; Grinding wheel wear: Attritions wear, fracture wear; Dressing and Truing; Maximum chip thickness and Guest criteria; Surface grinding, Cylindrical grinding and Centerless grinding.<br>**Super finishing:** Honing, lapping, and polishing. | **8 Hours** |
| **Unit-5:** | **Metal Joining (Welding):** Survey of welding and allied processes; Gas welding and cutting; Process and equipment; Arc welding: Power sources and consumables; TIG & MIG processes and their parameters; Resistance welding: spot, seam projection etc; Other welding processes such as atomic hydrogen, submerged arc, electro slag, friction welding; Soldering & Brazing; Thermodynamic and Metallurgical aspects in welding and weld; Shrinkage/residual stress in welds; Distortions & Defects in welds and remedies; Weld decay in HAZ. | **8 Hours** |
| **Text Books:** | 1. Ghosh & Malik, Manufacturing Science, E.W. Press. | |
| **Reference Books:** | 1. H.M.T., Production Technology, Tata McGraw Hill.<br>2. Pandey P.C., Production Engineering Science, Standard Publishers.<br>3. Jain R.K., Production Technology, Khanna Publications.<br><br>*** Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://www.youtube.com/watch?v=2E1UW_MxSWg&ab_channel=NPTELIITGuwahati<br>https://www.youtube.com/watch?v=ljveGnQw2G0&list=PLSGws_74K018JY-1RyIj0cm4yppa1h54r&index=2&t=0s&ab_channel=MetalCuttingAndMachineTools-IITKGP<br>https://www.youtube.com/watch?v=A0dTvf_Q8BA&list=PL82E9A8429ED7BB27&ab_channel=nptelhrd | |

| F**Course Code: EME561** | **B .Tech (Mechanical) - Semester-V**<br>**Production Technology-II (Lab)** | **L-0<br>T-0<br>P-2<br>C-1** |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the various types of tools and machining operations such as surface grinding, gear cutting etc. | |
| **CO2.** | **Applying** various types of joining processes on workpiece. | |
| **CO3.** | **Analysing** various tool cutting parameters. | |
| **CO4.** | **Evaluating** the methods of welding, soldering and brazing. | |
| **CO5.** | **Creating** weld joints with different welding machines. | |
| **List Of Experiments** | **Note: Minimum ten experiments should be performed:** | |
| **Experiment-1** | To determine shear-angle and chip thickness ratio for orthogonal cutting on lathe machine. | **3 Hours** |
| **Experiment-2** | To prepare a bolt (thread) on lathe machine. | **3 Hours** |
| **Experiment-3** | To provide tool angles on tool using Grinding Machine. | **3 Hours** |
| **Experiment-4** | To perform Gear cutting on milling machine | **3 Hours** |
| **Experiment-5** | To Prepare a block of given size on shaper machine. | **3 Hours** |
| **Experiment-6** | To Obtain a given job on surface grinding machine. | **3 Hours** |
| **Experiment-7** | To prepare a hole using drilling machine and study of twist of twist drill. | **3 Hours** |
| **Experiment-8** | To Study different types of tools, its angles and materials. | **3 Hours** |
| **Experiment-9** | To prepare weld joint using gas welding machine. | **3 Hours** |
| **Experiment-10** | To prepare weld joint using manual metal arc welding machine. | **3 Hours** |
| **Experiment-11** | To prepare weld joint using resistance welding machine. | **3 Hours** |
| **Experiment-12** | To perform soldering & brazing on given work piece | **3 Hours** |
| **Experiment-13** | To prepare a weld joint using TIG/MIG welding machine. | **3 Hours** |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code EME512 | B.Tech (Mechanical)- Semester-V<br>**Dynamics of Machines** | L-3 T-0 P-0 C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** complex systems of linkages, gears and cams. | |
| **CO2.** | **Applying** law of gearing and gear trains concepts. | |
| **CO3.** | **Analysing** slider crank& bar mechanism; piston and crank mechanism. | |
| **CO4.** | **Analysing** problems related to governers. | |
| **CO5.** | **Evaluating** problems related to flywheel, effect of gyroscopic couple upon the stability of aero planes, ships, two & four-wheelers. | |
| **Course Content:** | | |
| **Unit-1:** | Introduction: Links-types; Kinematics pairs-classification; Constraints-types; Degrees of Freedom; Grubler's equation; Linkage mechanisms; Inversions of four bar linkage; Slider crank chain and double slider crank chain; Velocity in Mechanisms-Velocity of point in mechanism; Relative velocity method; Instantaneous point in mechanism; Kennedy's theorem; Instantaneous center method. | **8 Hours** |
| **Unit-2:** | CAMS: Cams and Followers: Classification & terminology; Cam profile by graphical methods for uniform velocity; Simple harmonic motion and parabolic motion of followers.<br>Gears: Classification & terminology; Law of gearing; Tooth forms; Interference; Under cutting; Minimum number of teeth on gear and pinion to avoid interference, Gear trains. | **8 Hours** |
| **Unit-3:** | Force Analysis, Turning Moment & Flywheel: Dynamic analysis of slider crank & Bar mechanism; Piston and Crank effort; Inertia; Torque; Turning moment diagrams; Fluctuation of energy; Flywheel | **8 Hours** |
| **Unit-4:** | Governors: Dead weight and spring-loaded governors; Sensitivity; Stability; Hunting; Isochronism; Effort and Power; Friction and Insensitivity; Introduction to inertia governors. | **8 Hours** |
| **Unit-5:** | Gyroscopic Motion: Principles; Gyroscopic acceleration; Gyroscopic couple and Reaction; Effect of gyroscopic couple upon the stability of aero planes, ships, two & four-wheelers. | **8 Hours** |
| **Text Books:** | **1.** Ratan S.S., Theory of Machine, TMH. | |
| **Reference Books:** | **1.** Shiglay, Theory of Machine & Mechanism.<br>**2.** Bansal R. K., Theory of Machine, Laxmi Publication.<br>**3.** Ghosh & Mallik, Theory of Machine & Mechanism, Affiliated East-West Press (P) Ltd<br><br>*** Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://nptel.ac.in/courses/112/104/112104121/<br>https://www.youtube.com/watch?v=MJeRFzs4oRU&list=PLBEA57F7E7560C8E8<br>https://nptel.ac.in/courses/112/104/112104114/ | |

| Course Code: EME562 | B. Tech (Mechanical)- Semester-V<br>**Dynamics of Machines (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the dynamics of various moving objects. | |
| **CO2.** | **Applying** the practical and theoretical balancing of rotating masses. | |
| **CO3.** | **Applying** the concepts of governor and gyroscope. | |
| **CO4.** | **Analysing** thekinematicsofthethree-dimensionalparticlemotioninvariouscoordinatesystems. | |
| **CO5.** | **Evaluating** themoment of inertia of any object. | |
| **CO6.** | **Evaluating** natural frequency of vibration of a system. | |
| **Course Content:** | | |
| | **Note: All experiments should be performed:** | |
| **Experiment-1:** | To compare practical and theoretical balancing (statically and dynamically) of rotating masses. | **2 Hours** |
| **Experiment-2:** | To determine the controlling force at given speed, sensitiveness at given limits of lift and governor effort and power. | **2 Hours** |
| **Experiment-3:** | To find the spring tension and follower displace at various angle of cam. | **2 Hours** |
| **Experiment-4:** | To find the applied torque in case of gyroscope couple. | **2 Hours** |
| **Experiment-5:** | To determine the frequency of vibration (oscillation). | **2 Hours** |
| **Experiment-6:** | To determine the natural frequency of vibration in case of two rotor system | **2 Hours** |
| **Experiment-7:** | To identify the amplitude of vibration of beam for different damping | **2 Hours** |
| **Experiment-8:** | To verify for the epicyclical gear train input torque + holding torque = output torque. | **2 Hours** |
| **Experiment-9:** | To find the whirling speed of rotating shafts. | **2 Hours** |
| **Experiment-10:** | To find out the moment of inertia of a given specimen using velocity and acceleration. | **2 Hours** |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EME513 | B. Tech (Mechanical)- Semester-V<br>**Heat & Mass Transfer** | L-3<br>T-0<br>P-0<br>C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the basic laws of heat and mass transfer. | |
| **CO2.** | **Analyzing** the performance of heat exchangers. | |
| **CO3.** | **Analyzing** problems involving fin with different geometries and steady state heat conduction in simple geometries. | |
| **CO4.** | **Evaluating** transient heat conduction in simple geometries. | |
| **CO5.** | **Evaluating** heat transfer relations for laminar film condensation on vertical surfaces and on horizontal tube. | |
| **Course Content:** | | |
| **Unit-1:** | **Heat Transfer:** Mechanisms of heat flow: conduction, convection and radiation; Effect of temperature on thermal conductivity of materials; Introduction to combined heat transfer mechanism. Conduction: One-dimensional general differential heat conduction equation in the rectangular, cylindrical and spherical coordinate systems; Initial and boundary conditions; Steady State one-dimensional heat conduction for Composite Systems in rectangular, cylindrical and spherical coordinates with and without energy generation; Thermal resistance concept; Analogy between heat and electricity flow; Thermal contact resistance; Critical thickness of insulation. | **8 Hours** |
| **Unit-2:** | **Fins of Uniform Cross-sectional Area**: Types of fin, Heat transfer from fin with differentgeometries; Fin efficiency; Fin effectiveness; Applications of the fins.<br>**Transient Conduction**: Transient heat conduction; Lumped capacitance method: Time constant;Unsteady state heat conduction in one dimension only; Heisler charts. | **8 Hours** |
| **Unit-3:** | **Forced Convection**: Basic concepts; Hydrodynamic boundary layer; Thermal boundary layer; Flowover a flat plate; Flow across a single cylinder and a sphere; Flow inside ducts; Empirical heat transfer relations; Relation between fluid friction and heat transfer; Liquid metal heat transfer.<br>**Natural Convection**: Physical mechanism of natural convection; Buoyant force; Empirical heattransfer relations for natural convection over vertical planes and cylinders, horizontal plates | **8 Hours** |
| **Unit-4:** | **Thermal Radiation:** Basic concepts; Radiation properties of surfaces; Laws of black-body radiation; Shape factor; Black-body radiation exchange; Radiation exchange between diffused non black bodies in an enclosure; Radiation shields; Solar radiation. | **8 Hours** |
| **Unit-5:** | **Heat Exchanger:** Types of heat exchangers; Fouling factors; Overall heat transfer coefficient;Logarithmic mean temperature difference (LMTD) method; Effectiveness-NTU method; Compact heat exchangers.<br>**Condensation and Boiling**: Introduction to condensation phenomenon; Heat transfer relations forlaminar film condensation on vertical surfaces and on a horizontal tube; Boiling modes: Pool boiling, curve, forced convective boiling.<br>**Introduction to Mass Transfer**: Introduction; Flick'slaw of diffusion; Steady state equi-molarcounter diffusion; Steady state diffusion though a stagnant gas film. | **8 Hours** |

| | | |
|---|---|---|
| **Text Books:** | **1.** Holman J.P., Heat Transfer, McGraw-Hill International | |
| **Reference Books:** | **1.** Frank Kreith, Principles of Heat Transfer, McGraw-Hill Book co.<br>**2.** Gupta Vijay, Heat Transfer, New Age International (P) Ltd. Publishers.<br>**3.** Rao Y.V.C., Heat Transfer, University Press.<br><br>***Latest editions of all the suggested books are recommended** | |
| **Additional electronic reference material** | https://youtu.be/qa-PQOjS3zA<br>https://youtu.be/uJuPsVieeWg<br>https://youtu.be/mXtVN9F92Es | |

| Course Code: EME563 | B. Tech (Mechanical)- Semester-V<br>**Heat & Mass Transfer (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | Understanding thermal properties of material by applying 1-D steady state heat transfer equation. | |
| **CO2.** | Understanding effectiveness of parallel and counterflow heat exchangers. | |
| **CO3.** | Applying Fourier's law to validate the theoretical over all heat transfer coefficient. | |
| **CO4.** | Analysing and determine non-dimensional numbers to evaluate and validate heat transfer parameters. | |
| **CO5.** | Evaluating fin efficiency and fin effectiveness. | |
| **CO6** | Evaluating emissivity relation by applying Stefan-Boltzmann law of radiation. | |
| **Course Content:** | | |
| | **Note: All experiments should be performed:** | |
| **Experiment-1:** | To study and determine thermal resistance of a composite wall. | **2 Hours** |
| **Experiment-2:** | To determine heat flow rate through the lagged pipe and thermal conductivity of lagging material. | **2 Hours** |
| **Experiment-3:** | To determine the critical heat flux using critical heat flux apparatus. | **2 Hours** |
| **Experiment-4:** | To determine the variation of heat transfer coefficient over the vertical surface in natural convection. | **2 Hours** |
| **Experiment-5:** | To demonstrate effective thermal conducting of heat pipe. | **2 Hours** |
| **Experiment-6:** | To determine heat flow rate and effectiveness of a fin for steady state of temperature distribution along the length. | **2 Hours** |
| **Experiment-7:** | To study forced measurement test rig. | **2 Hours** |
| **Experiment-8:** | To determine emissivity of test plate. | **2 Hours** |
| **Experiment-9:** | To ensure the speed of the shaft study speed measurement test rig. | **2 Hours** |
| **Experiment-10:** | To determine the LMTD of parallel and counter flow Heat exchanger. | **2 Hours** |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EME514 | B. Tech (Mechanical)- Semester-V<br>**Automobile Engineering** | L-3<br>T-0<br>P-0<br>C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** different parts and assemblies used in automotive vehicles. | |
| **CO2.** | **Applying** concepts related to transmission system. | |
| **CO3.** | **Analyzing** braking system, electrical system and various types of suspension systems. | |
| **CO4.** | **Evaluating** loads on the frame; strength and stiffness for chassis and suspension system. | |
| **CO5.** | **Evaluating** different types of lubrication and maintenance strategies for automobiles. | |
| **Course Content:** | | |
| **Unit-1:** | **Power Unit and Gear Box**: Principles of Design of main components; Valve mechanism; Power andTorque characteristics; Rolling; Air and gradient Resistance; Tractive effort; Gear Box; Gear ratio determination; Design of Gear box. | **8 Hours** |
| **Unit-2:** | **Transmission System:** Requirements; Clutches; Torque converters; Over Drive and free wheel;Universal joint; Differential gear mechanism of rear axle; Automatic transmission; Steering and front axle; Castor angle, Wheel camber & toe in toe out; Steering geometry; Ackerman mechanism; Under-steer and over-steer. | **8 Hours** |
| **Unit-3:** | **Braking System**: General requirements; Road tyre adhesion; Weight transfer; **Brakes**: Mechanical brakes, Hydraulic brakes, Vacuum and air brakes; Thermal aspects; **Chassis and Suspension System**: Loads on the frame; Strength and stiffness; Various types ofsuspension systems. | **8 Hours** |
| **Unit-4:** | **Electrical System**: Types of starting motors; Generator & regulators; Lighting system; Ignitionsystem; Horn; Battery; **Fuel Supply System**: Diesel & Petrol vehicle system such as Fuel Injection Pump; Injector & FuelPump; Carburetor; MPFI. | **8 Hours** |
| **Unit-5:** | **Automobile Air-Conditioning:** Requirements; Cooling & heating systems, **Lubrication System**: Different type of lubrication system, **Maintenance system**: Preventive maintenance; Break down maintenance and over hauling system**.** | **8 Hours** |
| **Text Books:** | **1.** Singh Kripal, Automobile Engineering, Standard Publishers | |
| **Reference Books:** | **1.** Narang, Automobile Engineering, Khanna Publisher<br>**2.** Crouse, Automotive Mechanics, Tata McGraw Hill<br>**3.** Newton & Steeds, Automobile Engineering, ELBS Publishing<br><br>***Latest editions of all the suggested books are recommended** | |
| **Additional electronic reference material** | https://www.youtube.com/watch?reload=9&v=0LBdCeht3TQ<br>https://www.youtube.com/watch?v=a0xq5YCBIOk<br>https://www.youtube.com/watch?v=QPaUJfA1KsY | |

| Course Code: EME515 | B. Tech (Mechanical)- Semester-V<br>**Energy Conservation** |
|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** |
| **CO1.** | **Understanding**different types of energy audit, its basic components, instrumentation and techno economic analysis used in energy audit |
| **CO2.** | **Applying**different types of insulation and refractories, mechanism of FBC boiler and find losses and blow down in boiler. |
| **CO3.** | **Applying**steam system, steam recovery system, cogeneration and trigeneration. |
| **CO4.** | **Applying**refrigeration and air conditioning system and different types of compressed air system. |
| **CO5.** | **Analysing**electrical billing, power factor, types of electricmotors, losses and efficiency in motors. |
| **Course Content:** | |
| **Unit-1:** | **Energy Audit:** Definition, Need and Objectives**.**<br>**Types of Energy Audit:** Internal Audit, External Audit, Walk through Energy Audit, PreliminaryEnergy Audit, Detailed Energy Audit, Industrial Energy Audit, Utility (Services) Energy Audit,Commercial Energy Audit, Residential Energy Audit.<br>**Basic Components of Energy Audit:** Preparing for Audit Visit, Instrumentation, Data CollectionTechnoeconomic Analysis, Safety Considerations**.** |
| **Unit-2:** | **Fuel Analysis:** Proximate Analysis, Ultimate Analysis, Calorific Value**.**<br>**Insulation and Refractories:** Insulation Type and Application, Economic Thickness of Insulation, Heat Savings and Application Criteria, Refractory-Types, Selection and Application of Refractories**.**<br>**Boilers:** Types, FBC Boilers, Mechanism of Fluidized Bed Combustion, Saving Potential. Analysis of Losses, Performance Evaluation, Blow Down, Energy Conservation Opportunities |
| **Unit-3:** | **Steam System:** Properties of Steam, Assessment of Steam Distribution Losses, Steam Leakages,Steam Trapping, Condensate and Flash Steam Recovery System, Identifying Opportunities forEnergy Saving.<br>**Cogeneration and Trigeneration:** Need, Applications, Advantages, Combined Cycles, SavingPotential. |
| **Unit-4:** | **Waste Heat Recovery:** Availability and Reversibility, First and Second Law Efficiencies,Classification, Advantages and Applications, Commercially Viable Heat Recovery Devices, HVACand Refrigeration System, Factors Affecting Refrigeration and Air Conditioning System Performance and Savings Opportunities. Distribution systems for conditioned air.<br>**Compressed Air Systems:** Types of air compressors, compressor efficiency, efficient compressoroperation, compressed air systems components, capacity assessment, leakage test, factors affecting theperformance and energy savings opportunities |
| **Unit-5:** | **Electrical Systems**: Active power, reactive power and apparent power, star, delta connection,electrical load management and electrical billing.<br>**Power Factor:** Power factor, Power factor improvement and its benefit, selection and location ofcapacitors, and energy conservation opportunities.<br>**Electric Motors**: Types, losses in induction motors, motor efficiency, factor affecting motorperformance, rewinding and motor replacement issues, energy saving opportunities in motors, energyefficient motors, soft starter with energy savers. |

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| **Text Books:** | 1. G. L. Witte, Phillips S.Scbmidt and Daid R. Brown, Industrial Energy Management andUtilization, Hemisphere Publishing Corporation, Washington |
| **Reference Books:** | **1.** Carig,B. Saith, Energy Management Principles, Applications, Bnefit and Saving, Per n Press, NewYork.<br>**2.** F. W. Pyne, P gm Energy Conservation Manual, Fairmont Proem, INC.P.O. Box 14227Atlanta,GA 30224<br>**3.** D. Patrick and S.W. Fardo, Energy U-sent and Conservation, Prentice Hall, INC Engleweek Cliffs(NJ) 7632.<br><br>***Latest editions of all the suggested books are recommended.** |
| **Additional electronic reference material** | https://youtu.be/IM1QLY2NP3I<br>https://youtu.be/ell3ExEpzd8<br>https://youtu.be/QgdnhDlI8NM |

| Course Code: EHM613 | B. Tech (Electrical)- Semester-VI<br>**Human Values & Professional Ethics** | L-2<br>T-0<br>P-0<br>C-2 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the importance of value education in life and method of self-exploration. | |
| **CO2.** | **Understanding** 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration. | |
| **CO3.** | **Applying** right understanding about relationship and physical facilities. | |
| **CO4.** | **Analysing** harmony in myself, harmony in the family and society, harmony in the nature and existence. | |
| **CO5.** | **Evaluating** human conduct on ethical basis. | |
| **Course Content:** | | |
| **Unit-1:** | Understanding of Morals, Values and Ethics; Introduction to Value Education- need for Value Education. Self- Exploration–content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration. Continuous Happiness and Prosperity- basic Human Aspirations. Gender Issues: Gender Discrimination and Gender Bias (home & office), Gender issues in human values, morality and ethics. | **8 Hours** |
| **Unit-2:** | Conflicts of Interest: Conflicts between Business Demands and Professional Ethics. Social and Ethical Responsibilities of Technologists. Ethical Issues at Workplace: Discrimination, Cybercrime, Plagiarism, Sexual Misconduct, Fraudulent Use of Institutional Resources. Intellectual Property Rights and its uses. Whistle blowing and beyond, Case study. | **8 Hours** |
| **Unit-3:** | Harmony in the Family and Society- Harmony in Human-Human Relationship, Understanding harmony in the Family- the basic unit of human interaction. Understanding values in human-human relationship; meaning of Nyaya; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman and other salient values in relationship. | **8 Hours** |
| **Unit-4:** | Understanding Harmony in the Nature and Existence – Whole existence as Co-existence. Interconnectedness and mutual fulfillment among the four orders of nature- recyclability and self-regulation in nature. Understanding Existence as Coexistence (Sah-astitva) of mutually interacting units in all pervasive space. Holistic perception of harmony at all levels of existence. | **8 Hours** |
| **Unit-5:** | Implications of the above Holistic Understanding of Harmony on Professional Ethics. Natural acceptance of human values. Definitiveness of Ethical Human Conduct. Competence in professional ethics:<br>a) Ability to utilize the professional competence for augmenting universal human order<br>b) Ability to identify the scope and characteristics of people friendly and eco-friendly production systems<br>c) Ability to identify and develop appropriate technologies and management patterns for above production systems. | **8 Hours** |

| | | |
|---|---|---|
| **Text Book:** | **1.** R R Gaur, R Sangal, G P Bagaria, A Foundation Course in Value Education. | |
| **Reference Books:** | **1.** Ivan Illich, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA 2. E.F. Schumacher, Small is Beautiful: a study of economics as if people mattered, Blond & Briggs, Britain.<br>**2.** A Nagraj, Jeevan Vidya ekParichay, Divya Path Sansthan, Amarkantak.<br>**3.** Sussan George, How the Other Half Dies, Penguin Press. Reprinted.<br>**4.** PL Dhar, RR Gaur, Science and Humanism, Commonwealth Purblishers.<br>**5.** A.N. Tripathy, Human Values, New Age International Publishers.<br>**6.** E G Seebauer& Robert L. Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronics reference material** | https://www.youtube.com/watch?v=Cnw1nK3K5qk<br>https://www.youtube.com/watch?v=hTTCMrQyF8E | |

| Course Code: EME592 | B. Tech (Mechanical)- Semester-V<br>**Skill based Practical Training & Presentation** | L-0<br>T-0<br>P-0<br>C-2 |
|---|---|---|
| **Course Procedure:** | | |
| | Students will have to undergo Skill based Practical Training(Certificate course)of four weeks in any industry or reputed organization or training centre after the IV semester examination in summer. The evaluation of this certificate course shall be included in the V semester evaluation.<br>The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the IV semester and shall be the nodal officer for coordination of the training.<br>Students will receive certificate after completion his/her training which will be duly signed by the officer under whom training was undertaken in the industry/ organization/training centre.<br>The student at the end of the V semester will present his/her presentation about the training before a committee constituted by the Director/Principal of the College which would comprise of at least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director/Principal. The students guide would be a special invitee to the presentation. The presentation session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director/Principal.<br>The marks by the external examiner would be based on the presentation presented by the student which shall be evaluated by the external examiner and cross examination done of the student concerned. | |
| | **The marking shall be as follows:** | |
| **Internal: 50 marks** | By the Faculty Guide – 25 marks.<br>By Committee appointed by the Director/Principal – 25 marks. | |
| **External:50 marks** | By External examiner appointed by the University – 50 marks | |

| Course Code: EGP511 | B.Tech- Semester-V<br>**Discipline & General Proficiency** | L-0<br>T-0<br>P-0<br>C-0 |
|---|---|---|

There shall be continuous evaluation of the student on the following broad parameters:

**1.** Observance of dress code.

**2.** Participation in Conferences /Workshops / Seminars.

**3.** Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

**4.** Participation in community projects including NSS.

**5.** Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

**6.** Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

**7.** Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

**8.** General behavior

**9.** Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

| S No | | Enroll No. | Student Name | Dress code | Participation in Conferences /Workshops / Seminars | Participation in guest lectures, invited talks and special technical sessions | Participation in community Services | Participation in Culture & extra curriculum activities, Department Club Activities | Participation in sports/ co-curricular activities | General Behavior | Any Extra Achievement |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **(5)** | **(15)** | **(20)** | **(10)** | **(20)** | **(20)** | **(5)** | **(5)** |
| | **Responsible for marks** | | | Mentor | Head | Head | Mentor | Cultural Events Coordinator & Department Club Coordinator | Sports Coordinator | Mentor | Director or Principal |

| Course Code: TMUGA-501 | Value Added Course<br>B.Tech.- Semester-V<br>**Modern Algebra and Data Management** | L-2<br>T-1<br>P-0<br>C-0 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | Applying the concepts of modern mathematics Divisibility rule, Remainder Theorem, HCF /LCM in Number System. | |
| **CO2.** | Relating the rules of permutation and combination, Fundamental Principle of Counting to find the probability. | |
| **CO3.** | Applying calculative and arithmetical concepts of ratio, Average and Percentage to analyze and interpret data. | |
| **CO4.** | Correlating the various arithmetic concepts to check sufficiency of data | |
| **Course Content:** | | |
| **Unit-1:** | **Number theory**<br>Classification of Numbers, Divisibility Rules, HCF and LCM, Factors, Cyclicity(Unit Digit and Last Two digit), Remainder Theorem, Highest Power of a Number in a Factorial, Number of trailing zeroes | **8 Hours** |
| **Unit-2:** | **Data interpretation**<br>Data Interpretation Basics, Bar Chart, Line Chart, Tabular Chart, Pie Chart, DI tables with missing values | **7 Hours** |
| **Unit-3:** | **Data Sufficiency**<br>Introduction of Data Sufficiency, different topics based DS | **5 Hours** |
| **Unit-4:** | **Permutations and combinations**<br>Fundamental counting, and or, arrangements of digits, letters, people in row, identical objects, rank, geometrical arrangements, combination: - basic, handshakes, committee, selection of any number of objects, identical and distinct, grouping and distribution, de-arrangements | **6 Hours** |
| **Unit-5:** | **Probability**<br>Introduction, Probability based on Dice and Coins, Conditional Probability, Bayes Theorem | **4 Hours** |
| **Reference Books:** | • R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude<br>• R2:-Quantitative Aptitude by R.S. Agrawal<br>• R3:-M Tyra: Quicker Maths<br>• R4:-Nishith K Sinha:- Quantitative Aptitude for CAT<br>• R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com<br>• R6:-Logical Reasoning by Nishith K Sinha<br>• R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal<br><br>*** Latest editions of all the suggested books are recommended.** | |

| Course Code: TMUGS-501 | B.Tech- Semester-V<br>**Managing Self** | L-2<br>T-1<br>P-0<br>C-0 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | Utilizing effective verbal and non-verbal communication techniques in formal and informal settings | |
| **CO2.** | Understanding and analyzing self and devising a strategy for self growth and development. | |
| **CO3.** | Adapting a positive mindset conducive for growth through optimism and constructive thinking. | |
| **CO4.** | Utilizing time in the most effective manner and avoiding procrastination. | |
| **CO5.** | Making appropriate and responsible decisions through various techniques like SWOT, Simulation and Decision Tree. | |
| **CO6.** | Formulating strategies of avoiding time wasters and preparing to-do list to manage priorities and achieve SMART goals. | |
| **Course Content:** | | |
| **Unit-1:** | **Personal Development:**<br>Personal growth and improvement in personality<br>Perception<br>Positive attitude<br>Values and Morals<br>High self motivation and confidence<br>Grooming | **10 Hours** |
| **Unit-2:** | **Professional Development:**<br>Goal setting and action planning<br>Effective and assertive communication<br>Decision making<br>Time management<br>Presentation Skills<br>Happiness, risk taking and facing unknown | **8 Hours** |
| **Unit-3:** | **Career Development:**<br>Resume Building<br>Occupational Research<br>Group discussion (GD) and Personal Interviews | **12 Hours** |
| **Reference Books:** | 1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education<br>2. Tracy, Brian, Time Management (2018), Manjul Publishing House<br>3. Hill, Napolean, Think and grow rich (2014), Amazing Reads<br>4. Scott, S.J., SMART goals made simple (2014), Createspace Independent Pub<br>5. https://www.hloom.com/resumes/creative-templates/<br>6. https://www.mbauniverse.com/group-discussion/topic.php<br>7. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan<br>8. Burne, Eric, Games People Play (2010), Penguin UK<br>9. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression<br><br>*** Latest editions of all the suggested books are recommended.** | |

| Course Code: EME611 | B. Tech (Mechanical)- Semester-VI<br>**Refrigeration & Air conditioning** | L-3 T-1 P-0 C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding**the method of refrigeration, Air craft refrigeration systems and DART | |
| **CO2.** | **Applying** steady flow energy equation and determine the COP of vapor compression refrigeration system. | |
| **CO3.** | **Analyzing** the vapor absorption cycle and component assemblies based on critical thinking and problem-solving skill | |
| **CO4.** | **Evaluating** and interpret different psychrometric process, cooling and heating load calculations and grand sensible heat factor. | |
| **CO5.** | **Creating** refrigeration and air conditioning models and prototypes of air washer cooling tower ice plant and water cooler | |
| **Course Content:** | | |
| **Unit-1:** | **Refrigeration:** Introduction to refrigeration system; Methods of refrigeration; Carnot refrigeration cycle; Unit of refrigeration; Refrigeration effect & C.O.P.<br>**Air Refrigeration cycle**: Open and closed air refrigeration cycles; Reversed Carnot cycle; Bell Coleman or Reversed Joule air refrigeration cycle; Aircraft refrigeration system; Classification of aircraft refrigeration system: Boot strap refrigeration, Regenerative, Reduced ambient; Dry air rated temperature (DART). | **8 Hours** |
| **Unit-2:** | **Vapour Compression System:** Single stage system; Analysis of vapour compression cycle; Use of T-S and P- H charts; Effect of change in suction and discharge pressures on C.O.P; Effect of sub cooling of condensate & superheating of refrigerant vapour on C.O.P of the cycle; Actual vapour compression refrigeration cycle; Multistage vapour compression system requirement; Removal of flash gas; Inter-cooling; Different configuration of multistage system; Cascade system. | **8 Hours** |
| **Unit-3:** | **Vapour Absorption System**: Working principle of vapour absorption refrigeration system; Comparison between absorption & compression systems; Elementary idea of refrigerant absorbent mixtures; Temperature- concentration diagram, Enthalpy- concentration diagram; Adiabatic mixing of two streams; Ammonia-water vapour absorption system; Lithium Bromide water vapour absorption system and its comparison; Refrigerants: Classification, nomenclature and desirable properties of refrigerants; Common refrigerants; Secondary refrigerants and CFC free refrigerants. | **8 Hours** |
| **Unit-4:** | **Air-Conditioning:** Introduction to air-conditioning; Psychometric properties and their definitions; Psychometric chart; Different Psychometric processes; Thermal analysis of human body; Effective temperature and comfort chart; Cooling and heating load calculations; Selection of inside & outside design conditions; Heat transfer through walls & roofs; Infiltration & ventilation; Internal heat gain; Sensible heat factor (SHF); By pass factor; Grand Sensible heat factor (GSHF); Dew point apparatus. | **8 Hours** |
| **Unit-5:** | **Refrigeration Equipment & Applications**: Basic components of refrigeration & air-conditioning equipments; Air washers; Cooling towers; Humidifying efficiency; Food preservation; Cold storage; Refrigerators; Freezers; Ice plant; Water coolers; Elementary knowledge of transmission and distribution of air through ducts and fans; Basic difference between comfort and industrial air-conditioning**.** | **8 Hours** |
| **Text Books:** | 1. R.S. Khurmi , J.K. Gupta Refrigeration and Air conditioning by S Chand publications | |
| **Reference Books:** | 1. Prasad Manohar, Refrigeration and Air Conditioning, New Age International<br>2. Arora C.P., Refrigeration and Air Conditioning, McGraw Hill<br>3. Arora & Domkundwar, Refrigeration and Air Conditioning, Tata mcgraw-Hill<br><br>*** Latest editions of all the suggested books are recommended.** | |
| **E-Contents** | https://youtu.be/GkMWz8RjkJs?list=PLZLWfsg0DactGFKdAY6z_u1DwN7JNc5TD<br>https://youtu.be/SjFYiymA5ZY?list=PLZLWfsg0DactGFKdAY6z_u1DwN7JNc5TD | |

| Course Code: EME661 | B. Tech (Mechanical)- Semester-VI<br>**Refrigeration & Air Conditioning (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the construction and working of a domestic refrigerating system and window air conditioner. | |
| **CO2.** | **Understanding** different parts of automobile AC test rig and air washer. | |
| **CO3.** | **Evaluating** the volumetric efficiency of semi sealed, open type and Reciprocating compressors. | |
| **CO4.** | **Evaluating** the coefficient of performance by performing experiment on vapour compression refrigeration systems. | |
| **CO5.** | **Evaluating** the refrigeration effect by using the different diameters expansion devices used in refrigeration system. | |
| **Course Content:** | | |
| | **Note: Minimum ten experiments should be performed:** | |
| **Experiment-1:** | To study & determination of volumetric efficiency of Reciprocating compressor. | **2 Hours** |
| **Experiment-2:** | To study & determination of volumetric efficiency of Semi Sealed compressor. | **2 Hours** |
| **Experiment-3:** | To study & determination of volumetric efficiency of Open type compressor. | **2 Hours** |
| **Experiment-4:** | To determine refrigeration effect using the different diameters expansion devices used in refrigeration system. | **2 Hours** |
| **Experiment-5:** | To study and determination of cooling effect using window air conditioner | **2 Hours** |
| **Experiment-6:** | To determine the COP of vapour compression refrigeration system. | **2 Hours** |
| **Experiment-7:** | To Study Air Washer. | **2 Hours** |
| **Experiment-8:** | To identify different parts of evaporators (Forst Free) used in refrigeration systems. | **2 Hours** |
| **Experiment-9:** | To determine COP of see through freeze (Direct cooled). | **2 Hours** |
| **Experiment-10:** | To identify different parts of automobile AC test rig. | **2 Hours** |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EME612 | B. Tech (Mechanical)- Semester-VI<br>**Mechanical Vibrations** | L-3 T-0 P-0 C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the need and importance of vibration analysis in mechanical design of machine parts that operate in vibratory conditions | |
| **CO2.** | **Applying** linear mathematical models to real life engineering systems. | |
| **CO3.** | **Applying** Lagrange's equations for linear and nonlinear vibratory systems. | |
| **CO4.** | **Analysing** the mathematical model of a linear vibratory system. | |
| **CO5.** | **Evaluating** vibratory responses of SDOF and MDOF systems to harmonic, periodic and non-periodic excitation. | |
| **Course Content:** | | |
| **Unit-1:** | **Introduction:**<br>Periodic motion; Harmonic motion; Superposition of simple harmonic motions; Beats;Fourier analysis.<br>**Single Degree Freedom System**: Free vibration; Natural frequency; Equivalent Systems; Energymethod for determining natural frequency; Response to an initial disturbance; Torsional vibrations; Damped vibrations; Damping models: Structural, Coulomb and Viscous damping; Vibrations of system with viscous damping; Logarithmic decrement; Viscous dampers | **8 Hours** |
| **Unit-2:** | **Single-Degree of Freedom**: Forced vibration; Harmonic excitation with viscous damping; Steadystate vibrations; Forced vibrations with rotating and reciprocating unbalance; Support excitation; Vibration isolation; Transmissibility; Vibration measuring instruments: Displacement, Velocity, Acceleration and Frequency measuring instrument, characteristic curve, Magnification factor. | **8 Hours** |
| **Unit-3:** | **Two-Degree Freedom System:** Introduction; Principal modes; Double pendulum; Torsional systemwith damping; Coupled System; Un-damped dynamic system; Vibration absorbers; Centrifugal pendulum absorber; Dry friction damper; Un-tuned viscous damper. | **8 Hours** |
| **Unit-4:** | **Multi-degree Freedom System-I**: Exact Analysis: Un-damped free and forced vibrations of multi-degree system; Influence numbers; Reciprocal Theorem; Vibration of geared system; Principal coordinates; Continuous systems: Longitudinal vibration of bars; Torsional vibrations of Circular shafts; Lateral vibration of beams | **8 Hours** |
| **Unit-5:** | **Multi-degree Freedom System-II**: Critical Speed of Shafts; Shafts with one disc with and without damping; Multi-disc shafts; Secondary critical speed; | **8 Hours** |
| **Text Books:** | **1.** Grover G. K., Mechanical Vibration, Jain Bros. Roorkee. | |
| **Reference Books:** | **1.** Srinivasan P., Mechanical Vibration, TMH<br>**2.** Rao J. S. & Gupta K., Introduction Course on Theory and Practice of Mech. Vibration, New Age Publishers.<br>**3.** Rama Murthy V., Mechanical Vibration Practice with Basic Theory, Narosa Publishers.<br><br>*** Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://www.youtube.com/playlist?list=PLAC668A0566953FB5<br>https://www.youtube.com/playlist?list=PLSGws_74K01_pG3R7rgtDtrDZBjcTgPdR<br>https://youtu.be/4DF5qCxhxpM | |

| Course Code EME613 | B.Tech (Mechanical)- Semester-VI<br>**Design of Machine Elements** | L-3<br>T-0<br>P-0<br>C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** design process, design standards & selection of preferred size. | |
| **CO2.** | **Applying** theories of failure, Soderberg & Goodman criteria on machine elements. | |
| **CO3.** | **Analysing** problems related to design of machine elements based on permissible load (for given operating conditions), required element life, manufacturing considerations. | |
| **CO4.** | **Evaluating** design of machine elements against static and fatigue loads. | |
| **CO5.** | **Creating** designs for different machine elements like joints, shafts, bearings, gears, screws etc. | |
| **Course Content:** | | |
| **Unit-1:** | **Introduction**: Definition of Design; Design Process; Analysis; Need based developments; Design by evolution; Technology based developments; Brain-storming. Standards in design & selection of preferred size; Different stages of creep; BIS system of designation of steels. | **8 Hours** |
| **Unit-2:** | **Design for Static and Dynamic loads**: Modes of failure; Factor of safety; Stress-strain relationship; Principal stresses; Theories of failure; Design against fluctuating load; Stress concentration; Stress concentration factors; Fluctuating/alternating stresses, Fatigue failure; Endurance limit; Design for finite & infinite life; Soderberg & Goodman criteria. | **8 Hours** |
| **Unit-3:** | **Joints:** Welded joints, Screwed joints, Eccentric loading of welded and screwed joints; Design for fatigue loading; Design of riveted joints. | **8 Hours** |
| **Unit-4:** | Design of Shaft and keys. Selection of square & flat keys &splines; Design against static and fatigue loads; Strength & rigidity design; Design of Rigid & flexible couplings. Design of sliding contact bearings, Journal bearing, foot step bearing. | **8 Hours** |
| **Unit-5:** | **Gears:** Gear nomenclature; Tooth profiles; Systems of gear teeth; Gear materials; Design of Structure; Spur gear; Design consideration.<br>**Mechanical springs**: Design of Helical and leaf springs against static & fatigue loading; Design Analysis of Power Screws; Form of threads: Square threads, trapezoidal threads; Stresses in a screw; Design of screw jack. | **8 Hours** |
| **Text Books:** | **1.** Bhandari, Design of Machine Elements, TMH | |
| **Reference Books:** | **1.** Shigley, Machine Design, Mcgraw Hill<br>**2.** Sharma &Agarwal, Machine Design, Kataria Spotts, Design of Machine Elements, Prentice Hall of India Pvt. Ltd<br>**3.** Sharif Abdulla, Design Data Book, Dhanpat Rai & Sons<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://nptel.ac.in/courses/112/105/112105125/<br>https://nptel.ac.in/courses/112/106/112106137/<br>https://www.youtube.com/playlist?list=PL3D4EECEFAA99D9BE | |

| Course Code EEE614 | B.Tech (Mechanical)- Semester-VI<br>**Non-Conventional Energy Resources** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | Understanding about non-conventional sources of energy technologies. | |
| **CO2.** | Applying knowledge for development based upon different energy resources. | |
| **CO3.** | Analysing the various concepts behind renewable energy resources. | |
| **CO4.** | Evaluating the need of different renewable energy sources and their importance | |
| **CO5.** | Creating awareness about the major environmental issues based on Non-Conventional Energy Resources for a sustainable development. | |
| **Course Content:** | | |
| **Unit-1:** | Introduction: World energy use; Reserves of energy resources; Energy cycle of the earth; Environmental aspects of energy utilization; Renewable energy resources and their importance. | **8 Hours** |
| **Unit-2:** | Solar Energy: Introduction; Extra-terrestrial solar radiation; Radiation at ground level; Collectors; Solar cells; Applications of solar energy. Biomass Energy: Introduction; Biomass Conversion; Biogas Production; Ethanol Production; Pyrolysis and Gasification; Direct Combustion; Applications. | **8 Hours** |
| **Unit-3:** | Wind, Geo-Thermal and Hydro Energy Sources: Introduction; Basic theory; Types of turbines; Geothermal Energy Resources; Resource based applications for heating and electricity generation; Hydropower basic concepts; Site selection; Types of turbines; Small scale hydropower. | **8 Hours** |
| **Unit-4:** | Tidal Energy: Introduction; Origin of tides; Power generation schemes; Basic theory of Wave energy; Wave power Devices; Open and Closed OTEC cycles. | **8 Hours** |
| **Unit-5:** | Other Renewable Energy Sources: Ocean Currents; Salinity Gradient Devices; Environmental Aspects; Potential impacts of harnessing the different renewable energy resources. | **8 Hours** |
| **Text Books:** | **1.** G D Rai, Non-Conventional Energy Sources, Khanna publishers. | |
| **Reference Books:** | **1.** A. Duffie and W. A. Beckmann, "Solar Engineering of Thermal Processes", John Wiley<br>**2.** F. Kreith and J. F. Kreider, "Principles of Solar Engineering", McGraw-Hill<br>**3.** T. N. Veziroglu, "Alternative Energy Sources", McGraw-Hill.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://youtu.be/7Ry643d3deE<br>https://youtu.be/2M_r1S6yT2M<br>https://youtu.be/GExTwRNkQBg | |

| Course Code EMH611 | B.Tech(Mechanical)- Semester-VI<br>**Operations Management** | L-3 T-0 P-0 C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** basic concepts of operations management and various types of production systems. | |
| **CO2.** | **Applying** various techniques of forecasting and aggregate planning. | |
| **CO3.** | **Applying** inventory management techniques. | |
| **CO4.** | **Analyzing** job sequencing problems with different priority sequencing rules. | |
| **CO5.** | **Evaluating** problems related to facility location decisions. | |
| **CO6.** | **Creating** facility layouts as per the requirement of the organization. | |
| **Course Content:** | | |
| **Unit-1:** | **Operations Management**: Overview; Definition of production and operations management; **Transformation process model**: Inputs, Process and outputs; Classification of operations;Responsibilities of Operations Manager; New Product Development; Product Design; **Process types in manufacturing**: Project; Jobbing, Batch, Line, Mass, Continuous; Process types in services: Professional services, Services shops, Mass services. | **8 Hours** |
| **Unit-2:** | **Forecasting Methods & Aggregate Planning**: Forecasting as a planning tool; Time horizon inforecasting; Characteristics of forecasts; Subjective and objective forecasting methods: Casual methods; time series methods, methods for forecasting stationery series; exponential smoothing, Measurement of Errors; Monitoring and Controlling forecasting models.<br>The aggregate planning problem; Aggregate planning techniques; Evaluation of chase strategy & constant work force plan; Solution of aggregate problem. | **8 Hours** |
| **Unit-3:** | **Inventory Control & MRP**: Inventory Management: Objectives, Factors, Process, Relevant costs;The EOQ model; Selective Inventory control techniques: ABC, VED, SED, FSN analysis; MRP: Overview; Process; Use of MRP in real world. | **8 Hours** |
| **Unit-4:** | **Operation Scheduling**: Characteristics of job shop scheduling problems; Theory of sequencing forsingle machine sequencing rules: FCFS, SPT, EDD, critical ratio, Minimum number of tardy jobs (NT). | **8 Hours** |
| **Unit-5:** | **Facility Location & Layout**: Factors affecting location decisions; Techniques for locating newfacilities; Subjective, Semi quantitative &quantitative techniques; Centre of gravity problem; Facility layout principles; Systematic layout planning procedure; Types of layout; Activity relationship chart; From/to chart; Line balancing. | **8 Hours** |
| **Text Books:** | **1.** Ashwathappa K. & Bhatt K, Production & Operations Management, Himalaya Publication. | |
| **Reference Books:** | **1.** Adam Jr & Everett E. R J, Production and Operations Management, Prentice-Hall.<br>**2.** Richard B Chase, Operations Management, Tata McGraw Hill.<br>**3.** Gaither Norman & Greg Fraizer, Operations Management, Thomson South Western.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://www.youtube.com/watch?v=aXWw1hlhevY&list=PLLy_2iUCG87A-kHGx4YUY97ShTTqBfA6-&index=2<br>https://www.youtube.com/watch?v=2OBKUR5cjIM&list=PLLy_2iUCG87A-kHGx4YUY97ShTTqBfA6-&index=5<br>https://www.youtube.com/watch?v=-U7ThcYnJ_E&list=PLLy_2iUCG87A-kHGx4YUY97ShTTqBfA6-&index=18 | |

| Course Code TMUGE601 | B.Tech (Electrical)- Semester-V<br>**English Communication – IV** | L-2<br>T-0<br>P-2<br>C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Remembering** adequate knowledge of grammar and vocabulary through prescribed text to address competitive exams. | |
| **CO2.** | **Understanding** the value of listening to understand the basic content. | |
| **CO3.** | **Understanding** the usage of English grammar in day to day context. | |
| **CO4.** | **Understating** about the skills required in corporate world. | |
| **CO5.** | **Applying** writing and comprehensive skills in English. | |
| **CO6.** | **Creating** a simple proposal and report. | |
| **Course Content:** | | |
| **Unit-1:** | **Vocabulary & Grammar**<br>• Homophones and Homonyms<br>• Correction of Common Errors (with recap of English Grammar with its usage in practical context.)<br>• Transformation of sentences | **12 Hours** |
| **Unit-2:** | **Essence of Effective listening & speaking**<br>• Listening short conversation/ recording (TED talks / Speeches by eminent personalities) *Critical Review of these abovementioned*<br>• Impromptu | **5 Hours** |
| **Unit-3:** | **Professional Writing**<br>• Proposal: Significance, Types, Structure & AIDA<br>• Report Writing: Significance, Types, Structure& Steps towards Report writing | **8 Hours** |
| **Unit-4:** | **Job Oriented Skills**<br>• Cover Letter<br>• Preparing Resume and Curriculum-Vitae<br>• Interview: Types of Interview, Tips for preparing for Interview and Mock Interview<br>• Corporate Expectation & Professional ethics: Skills expected in corporate world. | **10 Hours** |
| **Unit-5:** | **Value based text reading:** Short story<br>• A Bookish Topic - R.K. Narayan | **5 Hours** |
| **Text Books:** | **1.** Singh R.P., An Anthology of English Essay, O.U.P. New Delhi | |
| **Reference Books:** | **1.** Joseph, Dr C.J. & Myall E.G. "A *Comprehensive Grammar of Current English*" Inter University Press, Delhi<br>**2.** Chaudhary Sarla "Basic Concept of Professional Communication" Dhanpat Rai Publication, New Delhi.<br>**3.** Kumar Sanjay &Pushplata "Communication Skills" Oxford University Press, New Delhi.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional Electronics Reference Material** | 1-https://www.youtube.com/watch?v=dpYltVtsS_Q<br>2 - https://www.youtube.com/watch?v=QthdqIB0WS8<br>3 -https://www.youtube.com/watch?v=MrgHfK8Pcfk<br>4 -https://www.youtube.com/watch?v=860LtRxP3rw<br>5 - https://www.youtube.com/watch?v=0nN7Q7DrI6Q | |
| **Methodology** | **1.** The content will be conveyed through Real life situations, Pair Conversation, Group Talk and Class Discussion.<br>**2.** Language Lab software.<br>**3.** Sentence transformation on daily activities and conversations. | |

| | | |
|---|---|---|
| | **4.** Conversational Practice will be effectively carried out by Face to Face & Via Media (Audio-Video Clips)<br>**5.** Modern Teaching tools (PPT Presentation & Motivational videos with sub-titles) will be utilized. | |

## Evaluation Scheme

| **Internal Evaluation** | | | **External Evaluation** | | **Total Marks** |
|---|---|---|---|---|---|
| **40 Marks** | | | **60 Marks** | | |
| 20 Marks (Best 2 out of Three CTs) ***(From Unit - I, III, IV & V)*** | 10 Marks (Oral Assignments) ***(From Unit - II & IV)*** | 10 Marks (Attendance) | 40 Marks (External Written Examination) ***(From Unit -I, III, IV & V)*** | 20 Marks (External Viva)* ***(From Unit -II & IV)*** | **100** |

## *Parameters of External Viva

| **Content** | **Body Language** | **Communication skills** | **Confidence** | **TOTAL** |
|---|---|---|---|---|
| 05 Marks | 05 Marks | 05 Marks | 05 Marks | 20 Marks |

***Note**: External Viva will be conducted by 2-member committee comprising*

- ***a)*** *One Faculty teaching the class*
- ***b)*** *One examiner nominated by University Examination cell.*

*Each member will evaluate on a scale of 20 marks and the average of two would be the 20 marks obtained by the students.*

| Course Code: EME662 | B. Tech (Mechanical)- Semester-VI<br>**Solid Works (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts and commands of solid modeling with SOLIDWORKS software. | |
| **CO2.** | **Applying** the commands to draw the simple and complex machine parts and components with dimensional specifications. | |
| **CO3.** | **Analyzing** the designs of machine components and assembly products based on kinematics using SOLIDWORKS motion. | |
| **CO4.** | **Evaluating** and interpreting the designs of machine parts and assemblies using software simulation. | |
| **CO5.** | **Creating** the final design of engineering products like coupling shaft, flange and drum assembly, elbow and suspension assembly etc. using SOLIDWORKS parametric modeling software. | |
| **Course Content:** | **Note: All experiments should be performed:** | |
| **Experiment-1:** | Introduction to modeling software and detail discussion & familiarization about SOLIDWORKS. | **2 Hours** |
| **Experiment-2:** | Practice sketch Tools and Relations with in stipulated duration. | **2 Hours** |
| **Experiment-3:** | Practice sketcher tool, relation and dimensioning and prepare Bracket Drawing with SOLIDWORKS sketcher. | **2 Hours** |
| **Experiment-4:** | To prepare coupling shaft using revolve command. | **2 Hours** |
| **Experiment-5:** | To create a machine component from the views using extrude, fillet & instant 3D. | **2 Hours** |
| **Experiment-6:** | To prepare the detail model of Wing Nut, Snap Head Rivet, Grub Screw & Set Screw. | **2 Hours** |
| **Experiment-7:** | To prepare the assembly of given experiment no. 6. | **2 Hours** |
| **Experiment-8:** | File Management- New, Open, Save, Save As, Page Setup, Printing, Import and Export. | **2 Hours** |
| **Experiment-9:** | Introduction of kinematics using SOLIDWORKS MOTION. | **2 Hours** |
| **Experiment-10:** | Introduction of joints using SOLIDWORKS MOTION. | **2 Hours** |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EGP611 | B.Tech- Semester-VI<br>**Discipline & General Proficiency** | L-0<br>T-0<br>P-0<br>C-0 |
|---|---|---|

There shall be continuous evaluation of the student on the following broad parameters:

**1.** Observance of dress code.

**2.** Participation in Conferences /Workshops / Seminars.

**3.** Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

**4.** Participation in community projects including NSS.

**5.** Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

**6.** Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

**7.** Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

**8.** General behavior

**9.** Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

| S No | | Enroll No. | Student Name | Dress code | Participation in Conferences /Workshops / Seminars | Participation in guest lectures, invited talks and special technical sessions | Participation in community Services | Participation in Culture & extra curriculum activities, Department Club Activities | Participation in sports/ co-curricular activities | General Behavior | Any Extra Achievement |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **(5)** | **(15)** | **(20)** | **(10)** | **(20)** | **(20)** | **(5)** | **(5)** |
| | **Responsible for marks** | | | Mentor | Head | Head | Mentor | Cultural Events Coordinator & Department Club Coordinator | Sports Coordinator | Mentor | Director or Principal |

| Course Code: TMUGA-601 | Value Added Course<br>B.Tech.- Semester-VI<br>**Advance Algebra and Geometry** | L-2<br>T-1<br>P-0<br>C-0 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | Recognizing the rules of Crypt-arithmetic and relate them to find out the solutions. | |
| **CO2.** | Illustrating the different concepts of Height and Distance and Functions. | |
| **CO3.** | Employing the concept of higher level reasoning in Clocks, Calendars and Puzzle Problems. | |
| **CO4.** | Correlating the various arithmetic and reasoning concepts in checking sufficiency of data. | |
| **Course Content:** | | |
| **Unit-1:** | **Clocks and calendars**<br>Introduction , Angle based , faulty Clock, Interchange of hands, Introduction of Calendars, Leap Year , Ordinary Year | **5 Hours** |
| **Unit-2:** | **Set theory**<br>Introduction , Venn Diagrams basics, Venn Diagram – 3 sets, 4-Group Venn Diagrams | **4 Hours** |
| **Unit-3:** | **Heights and Distance**<br>Basic concept, Word problems | **3 Hours** |
| **Unit-4:** | **Functions**<br>Introduction to Functions, Even and Odd Functions, Recursive | **3 Hours** |
| **Unit-5:** | **Problem Solving**<br>Introduction, Puzzle based on 3 variable, Puzzle based on 4 variable | **6 Hours** |
| **Unit-6:** | **Data Sufficiency**<br>Introduction, Blood relation based, direction based, ranking based | **5 Hours** |
| **Unit-7:** | **Crypt Arithmetic**<br>Introduction of Crypt Arithmetic, Mathematical operations using Crypt Arithmetic, Company Specific Pattern | **4 Hours** |
| **Reference Books:** | • R1:-Arun Shrama:- How to Prepare for Quantitative Aptitude<br>• R2:-Quantitative Aptitude by R.S. Agrawal<br>• R3:-M Tyra: Quicker Maths<br>• R4:-Nishith K Sinha:- Quantitative Aptitude for CAT<br>• R5:-Reference website:- Lofoya.com, gmatclub.com, cracku.in, handakafunda.com, tathagat.mba, Indiabix.com<br>• R6:-Logical Reasoning by Nishith K Sinha<br>• R7:-Verbal and Non Verbal Reasoning by R.S. Agrawal<br><br>*** Latest editions of all the suggested books are recommended.** | |

| Course Code: TMUGS-601 | B.Tech - Semester-VI<br>**Managing Work and Others** | L-2<br>T-1<br>P-0<br>C-0 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | Communicating effectively in a variety of public and interpersonal settings. | |
| **CO2.** | Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of Change. | |
| **CO3.** | Analyzing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships. | |
| **CO4.** | Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust. | |
| **CO5.** | Handling difficult situations with grace, style, and professionalism. | |
| **Course Content:** | | |
| **Unit-1:** | **Intrapersonal Skills:**<br>Creativity and Innovation<br>Understanding self and others (Johari window)<br>Stress Management<br>Managing Change for competitive success<br>Handling feedback and criticism | **8 Hours** |
| **Unit-2:** | **Interpersonal Skills:**<br>Conflict management<br>Development of cordial interpersonal relations at all levels<br>Negotiation<br>Importance of working in teams in modern organisations<br>Manners, etiquette and net etiquette | **12 Hours** |
| **Unit-3:** | **Interview Techniques:**<br>Job Seeking<br>Group discussion (GD)<br>Personal Interview | **10 Hours** |
| **Reference Books:** | 1. Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behaviour (2018), 18th ed., Pearson Education<br>2. Burne, Eric, Games People Play (2010), Penguin UK<br>3. Carnegie, Dale, How to win friends and influence people (2004), RHUK<br>4. Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan<br>5. Steinburg, Scott, Nettiquette Essentials (2013), Lulu.com<br>6. https://www.hloom.com/resumes/creative-templates/<br>7. https://www.mbauniverse.com/group-discussion/topic.php<br>8. https://www.indeed.com/career-advice/interviewing/job-interview-tips-how-to-make-a-great-impression<br><br>*** Latest editions of all the suggested books are recommended.** | |

| Course Code: EME711 | B. Tech (Mechanical)- Semester-VII<br>**Computer Aided Design (CAD)** | L-3<br>T-0<br>P-0<br>C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the principles of engineering design and the role of graphics & software to generate computer models. | |
| **CO2.** | **Applying** parametric modeling to manufacturing and engineering concepts. | |
| **CO3.** | **Analyzing** computer aided design models and assemblies. | |
| **CO4.** | **Evaluating** and interpreting engineering technical drawings of parts and assemblies according to engineering design standards and finite element methods. | |
| **CO5.** | **Creating** parametric 3-D models and prototypes to design and build mechanical parts and assemblies using parametric software and 3-D printers. | |
| **Course Content:** | | |
| **Unit-1:** | Introduction: Introduction to CAD/CAE; Element of CAD, Essential requirements of CAD, Concepts of integrated CAD/CAM; Importance of CAD& their necessity; CAD Engineering applications, Computer aided Inspection (CAI), Computer aided Testing (CAT), Co-ordinate measuring machine (CMM), Machine Vision, 3D-printing. | **8 Hours** |
| **Unit-2:** | Computer Graphics: Graphics input devices, Graphics display devices, Graphics standards, Graphics Software, Software Configuration, Graphics Functions, Output primitives- Bresenham's line drawing algorithm and Bresenham's and mid-point circle generating algorithm Geometric Transformations: World/device Coordinate Representation, Windowing and clipping, 2-D Geometric transformations- Translation, Scaling, Shearing, Rotation & Reflection, Matrix representation, Composite transformation, 3-D transformations. | **8 Hours** |
| **Unit-3:** | Curves: Curves representation, Interpolation vs approximation, Properties of curve design, Parametric representation curves, Parametric continuity conditions, Synthetic curves-Hermite cubic splines-Blending function formulation and its properties, Bezier curves-Blending function formulation and its properties, Composite Bezier curves, B-spline curves and its properties. | **8 Hours** |
| **Unit-4:** | 3D Graphics: Polygon Surfaces-Polygon mesh representations, Quadric and Super-quadric surfaces, Blobby objects; Fractals, Solid modeling-Regularized set operations; Boundary representation (B-rep), Constructive solid geometry (CSG), Sweep representation, Color models. Basic commands for 2-D drafting software like AutoCAD and 3-D solid modeling software PTC Creo and Solidworks. | **8 Hours** |
| **Unit-5:** | Finite Element Methods: Introduction, Basic concept of the finite element method (FEM), Stages in finite element analysis, Shape functions, Development of elemental stiffness matrix and their assembly, Finite Element analysis of 1-D problems like spring, bar, truss and beam elements formulation with elimination and penalty approaches, 1-D thermal and fluid problems. | **8 Hours** |
| **Text Books:** | **1.** Hearn D. & Baker M. P., Computer Graphics, Prentice Hall | |
| **Reference Books:** | **1.** Zeid Ibrahim, CAD/CAM theory and practice, McGraw Hill International.<br>**2.** Groover M. P.&Zimmers E. W., CAD/CAM: computer-aided design and manufacturing, Prentice Hall of India Pvt Ltd. | |

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|---|---|---|
| | **3.** S.S. Bhavikatti, Finite Element Analysis, New Age International Publishers.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://nptel.ac.in/courses/112/102/112102101/<br>https://nptel.ac.in/courses/112/102/112102102/<br>https://nptel.ac.in/courses/112/104/112104193/ | |

| Course Code: EME761 | B. Tech (Mechanical)- Semester-VII<br>**Computer Aided Design (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts of drafting and modeling with the PTC Creo and ANSYS software. | |
| **CO2.** | **Applying** parametric modeling to prepare complex mechanical parts and assembly. | |
| **CO3.** | **Analyzing** the machine components and assembly drawings based on mesh generation using finite element methods (FEM). | |
| **CO4.** | **Evaluating** and interpreting engineering technical drawings of parts and assemblies according to engineering design standards. | |
| **CO5.** | **Creating** parametric 3-D designs to build mechanical parts and assemblies like Flange and Drum, elbow and suspension, connecting rod and piston assembly, Plummer Block and Assembly using PTC Creo parametric software. | |
| **Course Content:** | **Note: All experiments should be performed:** | |
| **Experiment-1:** | Introduction to Drafting/Modeling/Analysis/Management. Example- Creo, Solidworks, ANSYS, MSP/PPM | **2 Hours** |
| **Experiment-2:** | To prepare the given sketch using Creo Sketcher. | **2 Hours** |
| **Experiment-3:** | To prepare Bracket using Creo Sketcher. | **2 Hours** |
| **Experiment-4:** | To prepare the given machine component using Creo. | **2 Hours** |
| **Experiment-5:** | To prepare the Flange and Drum using Creo Sketcher. | **2 Hours** |
| **Experiment-6:** | To prepare elbow and suspension component using Creo Sketcher. | **2 Hours** |
| **Experiment-7:** | To prepare the connecting rod and piston assembly using Creo. | **2 Hours** |
| **Experiment-8:** | To prepare the component of Plummer Block and Assembly using Creo. | **2 Hours** |
| **Experiment-9:** | Finite Element Methods: Introduction, principle of FEM, types of element-Introduction to FEM - 1D, 2D and 3D elements - shape functions – preprocessing - boundary conditions, structured. (ANSYS) | **2 Hours** |
| **Experiment-10:** | Exercises on finite element analysis- free mesh generation - analysis - linear and nonlinear analysis - static and dynamic analysis, post processing- setup, solution and result. (ANSYS) | **2 Hours** |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EME712 | B. Tech (Mechanical)- Semester-VII<br>**IC Engines** | L-3<br>T-0<br>P-0<br>C-3 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding**the operating characteristics and thermodynamic analysis of common internal combustion engine cycles using air standard Otto, Diesel and dual cycles. | |
| **CO2.** | **Understanding** the physical properties of common fuels and their combustion characteristics. | |
| **CO3.** | **Applying** the understanding of the generation of undesirable exhaust emissions to solve the environmental pollution problems. | |
| **CO4.** | **Analyzing** the working of various types of cooling, lubricating and ignition systems associated with internal combustion engines. | |
| **CO5.** | **Evaluating** the heat balance to measure performance parameters like thermal efficiency, fuel consumption, indicated power and brake power of internal combustion engine. | |
| **Course Content:** | | |
| **Unit-1:** | **Introduction to I.C Engines**: Engine classification; Air standard cycles; Otto, Diesel, Stirling,Ericsson cycles; Actual cycle analysis; Two and four stroke engines; SI and CI engines; Valve timing diagram; Rotary engines; Stratified charge engine.<br>**Fuels**: Fuels for SI and CI engine; Important qualities of SI engine fuels; Rating of SI engine fuels;Important qualities of CI engine fuels, Dopes, Additives; Gaseous fuels; Alternative fuels for IC engines: LPG, CNG, Biogas, Producer gas. | **8 Hours** |
| **Unit-2:** | SI Engines: Carburetion; Mixture requirement, Carburettor type; Theory of Carburetttor; MPFI Combustion in SI engine; Flame speed; Ignition delay; Abnormal combustion and its control.<br>Combustion chamber design for SI engines; Ignition system requirement; Magneto and battery ignition system; Ignition timing and spark plug; Electronic ignition system. | **8 Hours** |
| **Unit-3:** | **CI Engine**: Fuel injection in CI engines; Types of injection systems; Fuel pumps; Fuel injectors;Injection timings; Combustion in CI engines; Ignition delay; Knock and its control; Combustion chamber design of CI engines; Scavenging in 2 Stroke engines; Pollution and its control. | **8 Hours** |
| **Unit 4** | **Supercharging:** Types of supercharging; Effect of altitude on power output; Testing and performance measurement of SI and CI engines.<br>**Engine Cooling:** Different cooling systems; Radiators and cooling fans; Lubrication: Engine<br>Friction; Lubrication principal; Type of lubrication; Lubrication oils. Crankcase ventilation; | |
| **Unit-5:** | **Compressors**: Classification; Reciprocating compressors: Single and multi-stage; Inter cooling;volumetric efficiency; Rotary compressors: Centrifugal compressor; Elementary theory; Vector diagram; Efficiencies; Elementary analysis of axial compressors; Surging and stalling; Roots blower; Waned compressor; Performance analysis. | **8 Hours** |
| **Text Books:** | **1.** Ganeshan, I.C Engine, Tata Mc Graw Hill Publishers. | |
| **Reference Books:** | **1.** Chlumsky, Reciprocating and Rotary Compressors, SNTI Publications Czechoslovakia.<br>**2.** Obert E.F., I.C Engine Analysis & Practice, Tata Mc Graw Hill Publishers | |

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|---|---|---|
| | **3.** Mathur & Sharma, A Course in International Combustion Engines, Dhanpat Rai & Sons.<br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://nptel.ac.in/courses/112/103/112103262/<br>https://nptel.ac.in/courses/112/104/112104033/<br>https://www.vssut.ac.in/lecture_notes/lecture1429900545.pdf | |

| Course Code: EME762 | B. Tech (Mechanical)- Semester-VII<br>**IC Engines (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the working of various systems employed in internal combustion engine like fuel supply system and ignition system. | |
| **CO2.** | **Applying** theoretical and practical limits to engine performance and fuel economy. | |
| **CO3.** | **Analysing**the differences among different types of internal combustion engine designs. | |
| **CO4.** | **Analysing** the working and tuning of carburetor used in SI engine. | |
| **CO5.** | **Creating** knowledge to solve real world engine design issues. | |
| **Course Content:** | **Note: All experiments should be performed:** | |
| **Experiment-1:** | To identify the different part of a 2-stroke petrol engine | **2 Hours** |
| **Experiment-2:** | To identify the different part of a 4-stroke diesel engine | **2 Hours** |
| **Experiment-3:** | To measure the fuel consumption in four stroke petrol engines. | **2 Hours** |
| **Experiment-4:** | To measure the fuel consumption in four stroke diesel engines. | **2 Hours** |
| **Experiment-5:** | To determine the brake thermal efficiency of 4 stroke petrol engine | **2 Hours** |
| **Experiment-6:** | To do tuning and servicing of carburetor. | **2 Hours** |
| **Experiment-7:** | To determine the indicated power of multi cylinder 4 stroke petrol engine | **2 Hours** |
| **Experiment-8:** | To compare features of common small cars (such as fiat, Maruti, Centro and Indica) | **2 Hours** |
| **Experiment-9:** | To analyze fuel saving by application of MPFI system. | **2 Hours** |
| **Experiment-10:** | To analyze the power transmission of a car. | **2 Hours** |
| **Experiment-11:** | Industrial visit to automobile industry. | **2 Hours** |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EME792 | B. Tech (Mechanical)- Semester-VII<br>**Industrial Training & Presentation** | L-0<br>T-0<br>P-0<br>C-2 |
|---|---|---|
| **Course Procedure:** | | |
| | Students will have to undergo industrial training of six weeks in any industry or reputed organization after the VI semester examination in summer. The evaluation of this training shall be included in the VII semester evaluation.<br>The student will be assigned a faculty guide who would be the supervisor of the student. The faculty would be identified before the end of the VI semester and shall be the nodal officer for coordination of the training.<br>Students will prepare an exhaustive technical report of the training during the VII semester which will be duly signed by the officer under whom training was undertaken in the industry/ organization. The covering format shall be signed by the concerned office in-charge of the training in the industry. The officer-in-charge of the trainee would also give his rating of the student in the standard University format in a sealed envelope to the Director/Principal of the college.<br>The student at the end of the VII semester will present his report about the training before a committee constituted by the Director/Principal of the College which would comprise of at least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director/Principal. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director/Principal.<br>The marks by the external examiner would be based on the report submitted by the student which shall be evaluated by the external examiner and cross examination done of the student concerned.<br>Not more than three students would form a group for such industrial training/ project submission. | |
| | **The marking shall be as follows.** | |
| **Internal: 50 marks** | By the Faculty Guide – 25 marks.<br>By Committee appointed by the Director/Principal – 25 marks. | |
| **External:50 marks** | By Officer-in-charge trainee in industry – 25 marks.<br>By External examiner appointed by the University – 25 marks | |
| | **Technical report will consist five chapter as per given format:** | |
| **Chapter 1:** | Brief about organization | |
| **Chapter 2:** | Detail of business carried out by organization | |
| **Chapter 3:** | Specific contribution during the industrial training (not more than 500 words) | |
| **Chapter 4:** | Learning during the industrial training (not more than 200 words) | |
| **Chapter 5:** | Conclusion | |

| Course Code: EME798 | B. Tech (Mechanical)- Semester-VII<br>**Project Work Phase-I** | L-0<br>T-0<br>P-10<br>C-5 |
|---|---|---|
| **Course Procedure:** | | |
| | A group of students, not more than three, will be assigned a faculty guide who would be the supervisor of the group. The faculty would be identified in the starting of the VII semester.<br><br>The group will carry out the literature search and collect required material for carrying out the project.<br><br>The group will prepare a report not exceeding 15 pages at the end of semester.<br><br>The assessment of performance of students should be made at least twice in each semester i.e. VII and VIII. In this semester, the student shall present the progress of project live as also using overheads project (30% Project completion) or power point presentation on LCD to the internal committee.<br><br>The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director/Principal. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director/Principal. | |
| | **The marking shall be as follows.** | |
| **Internal: 100 marks** | By the Faculty Guide - 50 marks<br>By Committee appointed by the Director/Principal – 50 marks | |

| Course Code: EGP711 | B.Tech- Semester-VII<br>**Discipline & General Proficiency** | L-0<br>T-0<br>P-0<br>C-0 |
|---|---|---|

There shall be continuous evaluation of the student on the following broad parameters:

**1.** Observance of dress code.

**2.** Participation in Conferences /Workshops / Seminars.

**3.** Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

**4.** Participation in community projects including NSS.

**5.** Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

**6.** Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

**7.** Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

**8.** General behavior

**9.** Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

| S No | | Enroll No. | Student Name | Dress code | Participation in Conferences /Workshops / Seminars | Participation in guest lectures, invited talks and special technical sessions | Participation in community Services | Participation in Culture & extra curriculum activities, Department Club Activities | Participation in sports/ co-curricular activities | General Behavior | Any Extra Achievement |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **(5)** | **(15)** | **(20)** | **(10)** | **(20)** | **(20)** | **(5)** | **(5)** |
| | **Responsible for marks** | | | Mentor | Head | Head | Mentor | Cultural Events Coordinator & Department Club Coordinator | Sports Coordinator | Mentor | Director or Principal |

| | | |
|---|---|---|
| **Course Code: EME713** | **Program Elective- I**<br>**B.Tech (Mechanical)- Semester-VII**<br>**Power Plant Engineering** | **L-3 T-1 P-0 C-4** |
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the concepts of power, energy, andbasic working principles of steam, gas turbine, diesel engine, nuclear and non-conventional power plants. | |
| **CO2.** | **Applying** the methods of depreciation, replacement, economics of plant selection. | |
| **CO3.** | **Analyzing** different types of steam cycles and estimate efficiencies in a steam power plant. | |
| **CO4.** | **Evaluating** cycle efficiency and performance of a gas cooled reactor power plant. | |
| **CO5.** | **Evaluating** the electrical system required for power plants. | |
| **Course Content:** | | |
| **Unit-1:** | **Introduction**: Power and energy; Sources of energy; Review of thermodynamic cycles related topower plants; Fuels and combustion; Calculations; **Variable Load Problem**: Industrial production and power generation compared; Ideal and realizedload curves; Terms and factors; Effect of variable load on power plant operation; Methods of meeting the variable load problem; **Power Plant Economics and Selection**: Effect of plant type on costs, rates, fixed elements, energyelements, Depreciation and replacement; Theory of rates; Economics of plant selection; Other considerations in plant selection. | **8 Hours** |
| **Unit-2:** | **Steam Power Plant**: Power plant boilers including critical and super critical boilers; Fluidized bedboilers; Boilers mountings and accessories; General layout of steam power plant; Different systems such as fuel handling system, pulverisers and coal burners, combustion system, Draft, Ash handling system, Feed water treatment and condenser and cooling system; Turbine auxiliary systems such as governing, Feed heating, reheating ,Operation and maintenance of steam power plant; Heat balance and efficiency. | **8 Hours** |
| **Unit-3:** | **Diesel Power Plant**: General layout; Performance of diesel engine; Fuel system; Lubrication system;Air intake and admission system; Supercharging system; Exhaust system; Diesel plant operation and efficiency; Heat balance.<br>**Gas Turbine Power Plant**: Elements of gas turbine power plants; Gas turbine fuels; Cogeneration;Auxiliary systems such as fuel, controls and lubrication; Operation and maintenance; Combined cycle power plants. | **8 Hours** |
| **Unit-4:** | **Nuclear Power Plant**: Principles of nuclear energy; Basic components of nuclear reactions; Nuclearpower station; **Hydro Electric Station**: Principles of working; Applications; Site selection; Classification andarrangements; Hydro- electric plants; Run off size of plant and choice of units; Operation and maintenance; Hydro systems; Inter connected systems; **Non-Conventional Power Plants**: Non-conventional power plants (Solar, wind, geothermal, tidal). | **8 Hours** |
| **Unit-5:** | Electrical System: Generators and generator cooling; Transformer and their cooling; Bus bar Instrumentation: Classification; Selection and application; Recorders and their use; Listing of various control rooms. **Pollution**: Pollution due to power generation. | **8 Hours** |
| **Text Books:** | **1.** Nag, P.K., Power Plant Engineering, Tata McGraw Hill. | |
| **Reference Books:** | **1.** Yadav R., *Steam & Gas Turbines & Power Plant Engineering*, Central Publishers.<br>**2.** Verma Mahesh, Power Plant Engineering, Metropolitan Book Company Pvt. Ltd. New Delhi.<br>**3.** El-Vakil, Power Plant Technology, McGraw Hill.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | **4.** https://www.youtube.com/playlist?list=PLwdnzlV3ogoV0lD0LHaprmm0sRHIOANe6<br>**5.** https://www.youtube.com/playlist?list=PLwdnzlV3ogoV0lD0LHaprmm0sRHIOANe6<br>**6.** https://youtu.be/Rf5S714-7SI | |

| Course Code: EME714 | Program Elective- I<br>B.Tech (Mechanical)- Semester-VII<br>**Hydraulic Machines** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the impact of jet, principle of working of water turbines. | |
| **CO2.** | **Understanding** the concepts of centrifugal pump, reciprocating pump and other hydraulic devices. | |
| **CO3.** | **Applying** the velocity diagrams, work done and efficiency calculations for water turbines and different pumps. | |
| **CO4.** | **Analyzing** the performance characteristics of centrifugal pumps. | |
| **CO5.** | **Evaluating** the discharge, and power required to drive a reciprocating pump. | |
| **Course Content:** | | |
| **Unit-1:** | **Impact of Jet**: Impulse momentum equation; Force generation due to impact of jet; Impact of jet onfixed flat plate (vertical, inclined); Impact of jet on moving flat plates (vertical, inclined); Impact of jet on curved fixed and moving vanes. | **8 Hours** |
| **Unit-2:** | **Water Turbines**: Layout of hydroelectric power plant; Features of Hydroelectric power plant;Classification and selection of hydraulic turbines on the basis of head and discharge available; Construction and working principle of Impulse and Reaction turbines (Pelton wheel, Francis and Kaplan turbine); Velocity diagrams, work done, efficiencies and its calculation. | **8 Hours** |
| **Unit-3:** | **Centrifugal Pump**: Construction; Principle of working and applications; Types of casings andimpellers; Manometric head; Velocity diagram; Work done; Manometric efficiency; Mechanical efficiency; Overall efficiency; Discharge of centrifugal pump; NPSH; Performance characteristics of centrifugal pumps; Concept of multistage of centrifugal pump; Priming and cavitation. | **8 Hours** |
| **Unit-4:** | **Reciprocating Pump**: Construction, working principle and applications of single and double actingreciprocating pumps; Concept of Slip; Negative slip; Use of Air Vessel; Indicator diagram with effect of acceleration head & frictional head (no derivations); Discharge of reciprocating pump; Power required to drive a reciprocating pump; Separation and maximum speed of operation | **8 Hours** |
| **Unit-5:** | **Pumping and Hydraulic Devices**: Construction and working of following of air lift pump, jet pump,rotary pumps, external gear pump, internal gear pump, lobe pump, vane pump, hydraulic press, hydraulic accumulator, hydraulic intensifier. | **8 Hours** |
| **Text Books:** | **1.** Bansal R.K., Fluid Mechanics and hydraulic machines, Laxmi Publications<br>**2.** Lal Jagadish, Fluid Machinery, Metropolitan Book Co. Pvt Ltd | |
| **Reference Books:** | **2.** Modi P.N. & Seth, Fluid Mechanics and hydraulic machines, Standard Book House<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://nptel.ac.in/courses/112/104/112104117/<br>https://nptel.ac.in/courses/112/105/112105206/<br>https://nptel.ac.in/courses/112/105/112105182/ | |

| Course Code: EME715 | Program Elective- I<br>B.Tech (Mechanical)- Semester-VII<br>**Gas Dynamics** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding**fundamentals of compressible flow. Isentropic flow, Rayleigh flow and Fanno flow | |
| **CO2.** | **Applying** the concepts for determiningthe effect of Mach number on compressibility. | |
| **CO3.** | **Applying** the working charts and gas tables for determining the parameters of one-dimensional isentropic flow. | |
| **CO4.** | **Analyzing** the normal shock waves in Fanno and Rayleigh flows. | |
| **CO5.** | **Evaluating** the Fanno and Rayleigh flows with the help of tables and charts. | |
| **Course Content:** | | |
| **Unit-1:** | **Fundamentals of compressible flow:**<br>Continuity, momentum and energy equation, control volume, sonic velocity, Mach number and its significance, Mach waves, Mach cone and Mach angle, Von Karman rules of supersonic flow, static and stagnation states, relationship between stagnation temperature, pressure, density and enthalpy in terms of Mach number, stagnation velocity of sound, reference speeds, various regions of flow, Effect of Mach number on compressibility. | **8 Hours** |
| **Unit-2:** | **Isentropic flow with variable area**:<br>One dimensional isentropic flow in ducts of varying cross-section-nozzles and diffusers, mass flow rate in nozzles, critical properties and choking, area ratio as function of Mach number, Impulse function, effect of back pressure variation of convergent and convergent divergent nozzles, non dimensional mass flow rate in terms of pressure ratio, area ratio and Mach number, flow through diffusers, use of gas tables. | **8 Hours** |
| **Unit-3:** | **Flow in constant area duct with friction (Fanno flow):**<br>Fanno curve and Fanno flow equations, solution of Fanno flow equations, variation of flow properties, variation of Mach no. with duct length, isothermal flow in constant area duct with friction, tables and charts for Fanno flow | **8 Hours** |
| **Unit-4:** | **Flow in constant area duct with heat transfer (Rayleigh flow):**<br>Rayleigh curve and Rayleigh flow equations, variations of flow properties, maximum heat transfer, tables and charts for Rayleigh flow. | **8 Hours** |
| **Unit-5:** | **Normal shock:**<br>Development of shock wave, governing equations, Prandtl-Mayer relation, Rankine-Hugoniot relation, strength of shock wave, Mach number in the downstream of normal shock, variation of flow parameters across the normal shock, normal shock in Fanno and Rayleigh flows, impossibility of a rarefaction shock, supersonic diffusers.<br>**Wind tunnel:**<br>Types of wind tunnels - sub sonic wind tunnel, supersonic wind tunnel, projectile obstruction and shadow graph technique | **8 Hours** |
| **Text Books:** | Dynamics of compressible flow – S.M. Yahya, New Age Publishers, Delhi. | |
| **Reference Books:** | **1.** Fundamentals of compressible fluid dynamics- P. Balachandran, PHI Learning, New Delhi.<br>**2.** Gas Dynamics and Jet Propulsion- P. Murugaperumal, Scitech Publication, Chennai. | |

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| | **3.** Gas Dynamics – James John and Theo Keith, Pearson, New Delhi<br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://nptel.ac.in/courses/112/106/112106166/<br>https://nptel.ac.in/courses/101/106/101106044/<br>https://nptel.ac.in/courses/112/106/112106056/ | |

| Course Code: EHM735 | Program Elective- II<br>B.Tech - Semester-VII<br>**Industrial Sociology** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, students will be:** | |
| **CO1.** | **Understanding** the concepts of sociology, trace its historical development, and social impact of industrialization. | |
| **CO2.** | **Understanding** the nature of modern societies, significance of the current service sector, and importance of work experience in Industry | |
| **CO3.** | **Understanding** the concepts related the industrial work. | |
| **CO4.** | **Analyzing** the problems of business Ethics. | |
| **CO5.** | **Creating** corporate culture, reputation and ethical leadership in organizational settings. | |
| **Course Content:** | | |
| **Unit-1:** | **Sociology in the industrial Perspective:** Concept of Sociology, Sociology as a Science, Sociology of work & industry, Perspectives for sociological analysis of work, Class- Conflict in Industry, Social impact of industrialization, Corporate skills in the fast growing multinational set up. | **8 Hours** |
| **Unit-2:** | **Work and Social change:** Nature of modern societies, emergence of industrial capitalism, Technology & Social change, the information society after the industrial society, post-modernity, globalization & Convergence, Significance of the service sector today, work restructuring and corporate management. | **8 Hours** |
| **Unit-3:** | **Work experience in Industry:** The concept of alienation, Work satisfaction, Technology & work experience, and Social background of workers, Work orientations, Stress & anxiety of the worker, Work & Leisure, Unemployment, Conflicts in the work place. | **8 Hours** |
| **Unit-4** | **General and Applied Ethics**- Ethics and the professions – Standard of right and wrong, problems of Ethical Certainty, Significance of professional Ethics for Engineers, New Technology and Ethics, Applied Ethics - Cases in professional Engineering Practice, Principles of business ethics, Individual in the organization. | **8 Hours** |
| **Unit-5** | **Ethical Leadership:** Decision making, corporate culture and reputation management, corporate social responsibility and social reporting. | **8 Hours** |
| **Text Books:** | 1. Sheth N.R., Social Frame Work of Indian Factory, O.U.P. Bombay. | |
| **Reference Books:** | 1. Fleddermann Charles, Engineering Ethics, Upper Saddle River- N.J. Prentice Hall.<br>2. Miller & Form, Industrial Sociology, London Harper & Row.<br>3. Parsons Richard D., The Ethics of Professional Practice- Allyn& Bacon, London.<br>4. Govindarajan- Engineering Ethics- Prentice Hall (India) New Delhi.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://www.youtube.com/watch?v=zVi5hx37yvw&list=PLbMVogVj5nJR94vAUYzC_V6pZhMwlTnSa<br>https://www.youtube.com/watch?v=vX6Mye3PA_c&list=PLbMVogVj5nJR94vAUYzC_V6pZhMwlTnSa&index=2<br>https://www.youtube.com/watch?v=PnkuKRUkQw&list=PLbMVogVj5nJR94vAUYzC_V6pZhMwlTnSa&index=3 | |

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| **Course Code:**<br>**EHM736** | **Program Elective- II**<br>**B.Tech - Semester-VII**<br>**Principles of Management and Organizational Behaviour** | **L-3**<br>**T-1**<br>**P-0**<br>**C-4** |
| **Course Outcomes:** | **On completion of the course, students will be:** | |
| **CO1.** | **Understanding** the concept, evolution and current trends of management and organizational behaviour | |
| **CO2.** | **Applying** managerial functions like planning, organizing, staffing, leading & controlling in decision making. | |
| **CO3.** | **Applying** theories of motivation, leadership, personality and learning in organizational settings. | |
| **CO4.** | **Analyzing** methods of conflict and stress management | |
| **CO5.** | **Evaluating** budgetary and non-budgetarycontrolling techniques-. | |
| **Course Content:** | | |
| **Unit-1:** | **Introduction to Management And Organizatioal Behaviour:** Definition of Management – Science or Art,Types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches. Current trends and issues in Management.<br>Organizational Behaviour: Concept, Nature, Characteristics, Models of Organizational Behaviour. | **8 Hours** |
| **Unit-2:** | **Planning:**<br>Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques –Decision making steps andprocess.<br>**Organising:**<br>Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization. | **8 Hours** |
| **Unit-3:** | **Directing:**<br>Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques. Leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication.<br>**Controlling:**<br>System and process of controlling – budgetary and non-budgetary control techniques | **8 Hours** |
| **Unit-4** | **Perception**: Concept, Nature, Process, Importance. Attitudes and Workforce Diversity.<br>**Personality**: Concept, Nature, Types and Theories of Personality Shaping.<br>**Learning**: Concept and Theories of Learning. | **8 Hours** |
| **Unit-5** | **Conflict:** Concept, Sources, Types, Functionality and Dysfunctional of Conflict, Classification of Conflict Intra, Individual, Interpersonal, Intergroup and Organizational, Resolution of Conflict, Stress: Understanding Stress and Its Consequences, Causes of Stress, Managing Stress. | **8 Hours** |
| **Text Books:** | **1.** Harold Koontz & Heinz Weihrich "Essentials of Management" Tata McGraw Hill. | |
| **Reference Books:** | **1.** Stephen A. Robbins & David A. Decenzo& Mary Coulter, "Fundamentals of Management" 7th Edition, Pearson Education.<br>**2.** Robert Kreitner&MamataMohapatra, "Management", Biztantra. | |

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| | **3.** Tripathy PC &ReddyuPn," Principles of Management", Tata McGraw Hill.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://www.youtube.com/watch?v=Ov5jnJ1nqsA<br>https://www.youtube.com/watch?v=-sLHfYnxh8s&list=PLbMVogVj5nJQYXoO3foSZ6CrU7aCCwTsb<br>https://www.youtube.com/watch?v=Mrms1YmloWM&list=PLbMVogVj5nJQYXoO3foSZ6CrU7aCCwTsb&index=13 | |

| Course Code: EHM734 | Program Elective- II<br><br>B.Tech - Semester-VII<br>**Engineering and Managerial Economics** | L-3 T-1 P-0 C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, students will be:** | |
| **CO1.** | **Understanding** the role of managerial economics in engineering perspective. | |
| **CO2.** | **Understanding** different market structures and price determination in different market conditions. | |
| **CO3.** | **Understanding** the concepts of national income, inflation, and business cycles. | |
| **CO4.** | **Applying** the concepts of demand analysis. | |
| **CO5.** | **Evaluating** fixed cost, variable cost, average cost, marginal cost, Opportunity cost. | |
| **Course Content:** | | |
| **Unit-1:** | **Introduction:** Meaning, Nature and Scope of Economics, Meaning of Science, Engineering and Technology; Managerial Economics and its scope in engineering perspective. | **8 Hours** |
| **Unit-2:** | **Demand:** Basic Concepts Demand Analysis; Law of Demand; Determinates of Demand; Elasticity of Demand-Price, Income and cross Elasticity; Uses of concept of elasticity of demand in managerial decisions. | **8 Hours** |
| **Unit-3:** | **Forecasting:** Demand forecasting; Meaning, significance and methods of demand forecasting; production function; Laws of returns to scale & Law of Diminishing returns scale.<br>**Short and Long run Cost curves:** fixed cost, variable cost, average cost, marginal cost, Opportunity cost. | **8 Hours** |
| **Unit-4** | **Market Study:** Market Structure Perfect Competition; Imperfect competition: Monopolistic competition, Monopoly, Oligopoly, Duopoly Sorbent features of price determination and various market conditions. | **8 Hours** |
| **Unit-5** | **Inflation:** National Income; Concept of N.I. and Measurement; Inflation: Meaning of Inflation; Type, causes& prevention methods; Business Cycles, Phases of business cycle. | **8 Hours** |
| **Text Books:** | **1.** Maheshwari, Y., Managerial Economics, Prentice Hall of India. | |
| **Reference Books:** | **1.** Dwivedi, D.N., Managerial Economics, Vikas Publishing.<br>**2.** Koutsoyiannis, A., Modern Microeconomics, ELBS.<br>**3.** Kakkar, D.N., Managerial Economics for Engineering, New Age International Publication<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://www.youtube.com/watch?v=HKklVr2dBu8&list=PLbMVogVj5nJRTAVF4tueujAFiLKIV3Mo&index=8<br>https://www.youtube.com/watch?v=lwQBVTd5rlY&list=PLbMVogVj5nJRTAVF4tueujAFiLKIV3Mo&index=17<br>https://www.youtube.com/watch?v=b_t-VyR55Ic&list=PLbMVogVj5nJRTAVF4-tueujAFiLKIV3Mo&index=25 | |

| Course Code: EME811 | B.Tech (Mechanical)- Semester-VIII<br>**Computer Aided Manufacturing (CAM)** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** types of automation, production concepts and CNC machine. | |
| **CO2.** | **Applying** the concept of Computer aided process planning, MRP and CNC part programming to the automated manufacturing systems. | |
| **CO3.** | **Analysing** various automated flow lines, machine cells, various robot configurations and their motions. | |
| **CO4.** | **Evaluating** the part programming and machining parameters for the automated production flow lines problems. | |
| **CO5.** | **Creating** appropriate automated assembly systems using automation manufacturing techniques and robot applications. | |
| **Course Content:** | | |
| **Unit-1:** | Introduction to CAM; Automated Manufacturing system; Need of automation; Basic elements of automation; Levels of automation; Advantages & disadvantages of automation.<br>NC Machines: Features of NC Machines; Fundamental of Numerical Control; CNC machines; Direct Numerical Control (DNC); Elements of NC machine tools; Classification of NC machine tools; Advantages; and limitations of NC machine tools; Application of NC system; Factors affecting selection of components for machining on CNC machine tools. | **8 Hours** |
| **Unit-2:** | NC Part Programming:<br>(a) Manual programming; Examples of Drilling; Turning and Milling operations; Canned cycles; Subroutine and macro.<br>(b) APT programming, Geometry; Motion and additional statements; Macro- statement.<br>Control of NC Systems: Open and closed loops; Control of point to point systems; Incremental and absolute systems; Control loop in contouring systems; Adaptive control. | **8 Hours** |
| **Unit-3:** | Group Technology: Introduction, part families, part classification and coding; Machining cells; Benefits of group technology; Computer aided process planning: Retrieval and generative types. | **8 Hours** |
| **Unit-4:** | Computer Integrated Manufacturing System: Introduction to CIM, Elements of CIM, CIM wheel, Benefits of CIM.<br>Flexible Manufacturing System: Introduction & Component of FMS; Needs of FMS; General FMS consideration; Objectives, types and advantages of FMS, Automatic storage and retrieval system, Automated guided vehicles; Computer aided inspection. | **8 Hours** |
| **Unit-5:** | Robotics: Introduction; Basic elements of a robot; Classification of robot; Physical configuration of robot; Basic robot motions; Technical features; Actuators; Sensors; Robot application; Robot applications; economics, Intelligent robots, interfacing of a vision system with a Robot, Robot programming methods. | **8 Hours** |
| **Text Books:** | **1.** Groover Mikell P., Automation, Production Systems and Computer Integrated Manufacturing, Prentice Hall. | |
| **Reference Books:** | **1.** Adithan M. &Pabla B. S., CNC Machines, New Age Publishers Groover, CAD/CAM, Prentice Hall<br>**2.** Sinha S.K. CNC programming, Golgotia publications.<br>**3.** Rao P. N., CAD/CAM, Principles and Applications, McGraw Hill.<br><br>***Latest editions of all the suggested books are recommended.** | |

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| **Additional electronic reference material** | https://nptel.ac.in/courses/112/104/112104289/<br>https://nptel.ac.in/courses/112/102/112102103/<br>https://nptel.ac.in/content/storage2/courses/112103174/pdf/mod7.pdf | |

| Course Code: EME861 | B. Tech (Mechanical)- Semester-VIII<br>**Computer Aided Manufacturing (CAM) (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the basic concept of CNC turning, drilling and milling programming. | |
| **CO2.** | **Applying** the concept of CNC programming to prepare the part program of various machine components. | |
| **CO3.** | **Analyzing** the part programs based on the simulation using CNC Mach3 turn and mill and Lazycam software. | |
| **CO4.** | **Evaluating** the CNC part programming and machining parameters on the automated production flow lines problems. | |
| **CO5.** | **Creating** an appropriate automated process plan using group technology techniques and robot configurations. | |
| **Course Content:** | **Note: All experiments should be performed:** | |
| **Experiment-1:** | To write a part-program for a given job for lathe and running on NC machine. | **2 Hours** |
| **Experiment-2:** | To write a part-program for a job for drilling operation (point-to-point) and running on NC machine. | **2 Hours** |
| **Experiment-3:** | To write a part program for a job for milling operation and running on NC machine. | **2 Hours** |
| **Experiment-4:** | To generate a part program for lathe operation using software. | **2 Hours** |
| **Experiment-5:** | To generate a part program for drilling operation using software. | **2 Hours** |
| **Experiment-6:** | To generate a part program for milling operation using software. | **2 Hours** |
| **Experiment-7:** | To obtain different types of motion for Robots. | **2 Hours** |
| **Experiment-8:** | To identify the differences between conventional lathe machine and NC lathe machine. | **2 Hours** |
| **Experiment-9:** | To generate automatic process plan for a given diagram. | **2 Hours** |
| **Experiment-10:** | To learn the grouping of parts according to Group Technology philosophy. | **2 Hours** |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EME898 | B. Tech (Mechanical)- Semester-VIII<br>**Project Work Phase-II** | L-0<br>T-0<br>P-6<br>C-3 |
|---|---|---|
| **Course Procedure:** | | |
| | Students should devote themselves to prepare something tangible, which could be a working model of their thoughts based on their subject of choice.<br>The project shall be finalized by the students based on the VII semester project work report and shall be completed (100% working condition) and submitted at least one month before the last teaching day of the VIII semester, date of which shall be notified in the academic calendar.<br>The assessment of performance of students should be made at least twice in each semester i.e. VII and VIII. In this semester student shall present the final project live as also using overheads project or power point presentation on LCD to the internal committee as also the external examiner.<br>The evaluation committee shall consist of faculty members constituted by the college which would comprise of at-least three members comprising of the Department Coordinator, Class Coordinator and a nominee of the Director/Principal. The students guide would be a special invitee to the presentation. The seminar session shall be an open house session. The internal marks would be the average of the marks given by each member of the committee separately in a sealed envelope to the Director/Principal. | |
| | **The marking shall be as follows.** | |
| **Internal: 50 marks** | By the Faculty Guide - 25 marks<br>By Committee appointed by the Director/Principal – 25 marks | |
| **External: 50 marks** | By External examiner appointed by the University – 50 marks. | |

| Course Code: EGP811 | B.Tech- Semester-VIII<br>**Discipline & General Proficiency** | L-0<br>T-0<br>P-0<br>C-0 |
|---|---|---|

There shall be continuous evaluation of the student on the following broad parameters:

**1.** Observance of dress code.

**2.** Participation in Conferences /Workshops / Seminars.

**3.** Attendance in guest lectures, invited talks and special technical sessions organized from time to time.

**4.** Participation in community projects including NSS.

**5.** Exhibiting team spirit in different Culture & extra curriculum activities, Department Club activities of the University and College organized from time to time.

**6.** Observance of rule & regulations in the College/University, Behavior in Campus Premises, Bus, hostel mess and hostel.

**7.** Performance and awards received in different events (sports/ co-curricular activities) organized at College / University and other level.

**8.** General behavior

**9.** Any extraordinary achievement.

The above is an indicative list of parameters on which the students shall be continuously evaluated. The college may evaluate the student on the specific parameters by informing them through a notice displayed on the notice board before evaluation. There shall be no external examination for this course; however, the marks shall be included for calculation of cumulative Performance Index (CPI).

Head of Department would be display GP marks on notice board in prescribed format after IInd & IIIrd CT in semester:

| S No | | Enroll No. | Student Name | Dress code | Participation in Conferences /Workshops / Seminars | Participation in guest lectures, invited talks and special technical sessions | Participation in community Services | Participation in Culture & extra curriculum activities, Department Club Activities | Participation in sports/ co-curricular activities | General Behavior | Any Extra Achievement |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | **(5)** | **(15)** | **(20)** | **(10)** | **(20)** | **(20)** | **(5)** | **(5)** |
| | **Responsible for marks** | | | Mentor | Head | Head | Mentor | Cultural Events Coordinator & Department Club Coordinator | Sports Coordinator | Mentor | Director or Principal |

| Course Code: EME812 | Program Elective- III<br>B.Tech (Mechanical)- Semester-VIII<br>**Unconventional Manufacturing Process** | L-3 T-1 P-0 C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the limitations of conventional/traditional manufacturing Processes. | |
| **CO2.** | **Applying** the best suitable machining process for a workpiece based on its material properties. | |
| **CO3.** | **Analyzing** working principles and processing characteristics of ultra-precision machining processes. | |
| **CO4.** | **Evaluating** the precision using high-speed machining methods, and nontraditional machining to the production of precision components. | |
| **CO5.** | **Creating** an in-depth approach regarding application of unconventional manufacturing processes for industrial production. | |
| **Course Content:** | | |
| **Unit-1:** | **Introduction:** Limitations of conventional manufacturing processes; Need of unconventionalmanufacturing processes and its classification. | **8 Hours** |
| **Unit-2:** | **Unconventional Machining Process**: Principles, working and applications of unconventionalmachining process such as Electro-Discharge machining, Electro-chemical machining, Ultrasonic machining, Abrasive jet machining. | **8 Hours** |
| **Unit-3:** | Principles, working and application of unconventional machining processes such as Laser beam machining, Electron beam machining, Ultrasonic machining | **8 Hours** |
| **Unit-4:** | **Unconventional welding processes**: Explosive welding and cladding; Under-water welding;Metalizing; Plasma arc welding/cutting | **8 Hours** |
| **Unit-5:** | **Unconventional Forming processes**: Principles, working and applications of High energy formingprocesses such as explosive forming, electromagnetic forming, electro-discharge forming, water hammer forming, and Explosive compaction. | **8 Hours** |
| **Text Books:** | 1. Pandey P.C., Modern Machining Processes, Tata McGraw Hill. | |
| **Reference Books:** | Jain V.K., Unconventional Machining, Allied Publishers Pvt. Ltd.<br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | http://biet.ac.in/pdfs/UCMP.pdf<br>http://home.iitk.ac.in/~nsinha/Non-traditional-machining.pdf<br>https://nptel.ac.in/courses/112/103/112103202/ | |

| Course Code: EME813 | Program Elective- III<br>B.Tech (Mechanical)- Semester-VIII<br>**Mechatronics** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** the basic concepts of Mechatronics and its applications. | |
| **CO2.** | **Understanding** the concepts of Electronic Interface Subsystems. | |
| **CO3.** | **Applying** the techniques of signal conditioning. | |
| **CO4.** | **Analyzing** various actuation systems. | |
| **CO5.** | **Analyzing** various electromechanical drives. | |
| **Course Content:** | | |
| **Unit-1:** | **Introduction**: Definition, trends, control methods; Stand alone, PC based (Real Time OperatingGraphical User Interface, Simulation); Applications: SPM, Robot, CNC, FMS, CIM. | **8 Hours** |
| **Unit-2:** | **Signal Conditioning**: Introduction; Hardware; Digital I/O; Analog input: ADC, resolution, speedchannels; Filtering noise using passive components; Resistors, Capacitors; Amplifying signals using OP amps; Software; Digital Signal Processing; Low pass, high pass, notch filtering. | **8 Hours** |
| **Unit-3:** | **Precision Mechanical Systems**: Pneumatic actuation systems; Electro-pneumatic actuation systems;Hydraulic actuation systems; Electro-hydraulic actuation systems; Timing belts, Ball screw and nuts; Linear motion guides; Linear bearings, Harmonic transmission; Bearings; Motor drive selection. | **8 Hours** |
| **Unit-4:** | **Electronic Interface Subsystems**: TTL, CMOS interfacing; Sensor interfacing; Actuator interfacing;<br>Solenoids; Motors isolation schemes: Opto coupling, Buffer IC's, Protection schemes: Circuit breakers, over current sensing, reset able fuses; Thermal dissipation; Power Supply; Bipolar transistors; mosfets. | **8 Hours** |
| **Unit-5:** | **Electromechanical Drives**: Relays and solenoids; Stepper Motors; DC brushed motors; DC brushlessmotors; DC servo motors; 4-quadrant servo drives; PWM's: Pulse width modulation, VariableFrequency Drives; Vector Drives; Drive System load calculation. | **8 Hours** |
| **Text Books:** | **1.** Bolton W., Mechatronics Electronics Control Systems in Mechanical and Electrical Engineering, Pearson Education Press. | |
| **Reference Books:** | **1.** Newton C Braga, Mechatronics Source Book, Thomson Publications, Chennai.<br>**2.** Shanmugam N. & Anuradha, Mechatronics, Agencies Publishers.<br>**3.** Devdas Shetty, Richard & Thomson, Mechatronics System Design, PWS Publishing<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://nptel.ac.in/courses/112/103/112103174/<br>https://nptel.ac.in/content/storage2/courses/112103174/module1/lec1/1.html<br>https://www.cet.edu.in/noticefiles/259_Lecturer%20Note%20on%20Mechatronics-ilovepdf-compressed.pdf | |

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| **Course Code:** EME814 | **Program Elective- IV**<br>**B. Tech (Mechanical)- Semester-VIII**<br>**Product design and Value Engineering** | **L-3 T-1 P-0 C-4** |
| **Course Outcomes:** | **On completion of the course, the students will be:** | |
| **CO1.** | **Understanding** the concepts of design and development products. | |
| **CO2.** | **Applying** the steps of product planning and value engineering. | |
| **CO3.** | **Analysing**tool and techniques for product development and value engineering job plan. | |
| **CO4.** | **Evaluating**methods for material selection for the development of product. | |
| **CO5.** | **Evaluating** function, worth and value of products. | |
| **Course Content:** | | |
| **Unit-1:** | **Product Design:**<br>Introduction, Product life cycles, Characteristics of Successful Product development, Design and development of Products, Types of Design and Redesigns, Engineering Designs, Duration and cost of product development, the challenges of Product development. | **8 Hours** |
| **Unit-2:** | **Product Development Processes and Product Planning:**<br>A Generic development process, concept development, the front-end process, adopting the generic product development process, The Product Planning Process. | **8 Hours** |
| **Unit-3:** | **Product Analysis and Material Selection:**<br>Tools and charts used for product analysis like bill of materials, gozinto chart, performance characteristics of materials, material selection process, sources of information on material properties, economics of materials, evaluation methods for material selection | **8 Hours** |
| **Unit-4:** | **Value Engineering Introduction:**<br>Definition, value engineering recommendations, programmes, advantages,Evaluation of function, determining function, classifying function, evaluationof costs, evaluation of worth, determining worth, evaluation of value. | **8 Hours** |
| **Unit-5:** | **Value Engineering Job Plan:**<br>Introduction, orientation, information phase, Function phase, creation phase, evaluation phase, Investigation phase, implementation phase, speculation phase, analysis phase. | **8 Hours** |
| **Text Books:** | 1. Product Design, by Kevin Otto, Kristin wood, Pearson Education Inc | |
| **Reference Books:** | 1. Product design and development, by K.T. Ulrich and S.D. Eppinger, Tata McGraw Hill<br>2. Techniques of Value Analysis and Engineering-Lawrence D. Miles-McGraw Hill Book Company-2ndEdn.<br>3. Value engineering for Cost Reduction and Product Improvement-M.S. Vittal-Systems Consultancy Services<br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://www.youtube.com/watch?v=G0V4nfvMUdg<br>https://www.youtube.com/watch?v=uc45DrID-HQ<br>https://www.youtube.com/watch?v=pukn_fmJwuw | |

| Course Code: EHM832 | Program Elective- IV<br>B. Tech (Mechanical)- Semester-VIII<br>**Total Quality Management** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding** basic and modern concepts of quality and TQM. | |
| **CO2.** | **Understanding** importance of human factor in quality | |
| **CO3.** | **Understanding** the concept of TPM and six sigma along with their applications. | |
| **CO4.** | **Applying** quality control techniques like control charts, 7 QC and 7 New QC tools. | |
| **CO5.** | **Analysing** quality related costs. | |
| **Course Content:** | | |
| **Unit-1:** | **Quality Concepts**: Introduction; Meaning; Quality characteristics of goods and services; Evolution of Quality control, TQM; Modern concept, Basic concepts of quality; Dimensions of quality; Juran's quality trilogy; Deming's 14 principles; PDCA cycle; Total quality management (TQM) models. | **8 Hours** |
| **Unit-2:** | **Quality Management**: Organizational structure and design; Quality function; Decentralization; Designing and fitting organization for different types products and company; Human Factor in Quality: Attitude of top management; Co-operation of groups; Operators attitude, responsibility; Causes of operators error and corrective methods; Quality circles. | **8 Hours** |
| **Unit-3:** | **Quality improvement and cost reduction**: 7 QC tools and new QC tools; Economics of quality value and contribution; Quality cost; Optimizing quality cost; Quality assurance. | **8 Hours** |
| **Unit-4:** | **Control Charts**: Theory of control charts; Control charts construction: Construction of Mean & Range charts, fraction defective chart and number of defective charts; Attributes control charts: Defects, construction and analysis of c-chart. | **8 Hours** |
| **Unit-5:** | **IS0-9000, Six sigma and TPM**: ISO 9000 series; Concept of Six Sigma and its application; Total Productive Maintenance (TPM). | **8 Hours** |
| **Text Books:** | **1.** LaI H., Total Quality Management, Wiley Eastern Limited. | |
| **Reference Books:** | **1.** Sharma D. D Total Quality Management, S. Chand.<br>**2.** Greg Bounds, Beyond Total Quality Management, McGraw Hill.<br>**3.** Menon, H.G., TQM in New Product Manufacturing, McGraw Hill.<br><br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://www.youtube.com/watch?v=5pMWmU_8lfI&list=PLPjSqlTyvDeUUUwunyiwq41yJZofQEzMI&index=1<br>https://www.youtube.com/watch?v=e71AIpPCir4&list=PLPjSqlTyvDeUUUwunyiwq41yJZofQEzMI&index=7<br>https://www.youtube.com/watch?v=6JVHv5djIc&list=PLPjSqlTyvDeUUUwunyiwq41yJZofQEzMI&index=11 | |

| Course Code: EME816 | Program Elective- IV<br>B. Tech (Mechanical)- Semester-VIII<br>**Maintenance Engineering** | L-3<br>T-1<br>P-0<br>C-4 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be :** | |
| **CO1.** | **Understanding**principles and practices of maintenance planning | |
| **CO2.** | **Applying**policies of preventive maintenance. | |
| **CO3.** | **Applying**methods of condition monitoring | |
| **CO4.** | **Analysing**repair methods for basic machine elements. | |
| **CO5.** | **Analysing**repair methods for material handling equipments. | |
| **Course Content:** | | |
| **Unit-1:** | **Principles and practices of maintenance planning:**<br>Basic Principles of maintenance planning – Objectives and principles of planned maintenance activity.<br>– Importance and benefits of sound Maintenance systems – Reliability and machine availability – MTBF, MTTR and MWT – Factors of availability – Maintenance organization – Maintenance | **8 Hours** |
| **Unit-2:** | **Maintenance policies – preventive maintenance:**<br>Maintenance categories – Comparative merits of each category – Preventive maintenance, maintenance schedules, repair cycle - Principles and methods of lubrication – TPM. | **8 Hours** |
| **Unit-3:** | **Condition monitoring:**<br>Condition Monitoring – Cost comparison with and without CM – On-load testing and offload testing – Methods and instruments for CM – Temperature sensitive tapes – Pistol thermometers – wear-debris analysis | **8 Hours** |
| **Unit-4:** | **Repair methods for basic machine elements:**<br>Repair methods for beds, slide ways, spindles, gears, lead screws and bearings – Failure analysis – Failures and their development – Logical fault location methods – Sequential fault location. | **8 Hours** |
| **Unit-5:** | **Repair methods for material handling equipment:**<br>Repair methods for Material handling equipment - Equipment records – Job order systems -Use of computers in maintenance. | **8 Hours** |
| **Text Books:** | **1.** Srivastava S.K., "Industrial Maintenance Management", S. Chand and Co. | |
| **Reference Books:** | 1.Bhattacharya S.N., "Installation, Servicing and Maintenance", S. Chand and Co<br>2.Deep Learning (Adaptive Computation and Machine Learning series) by Ian Good fellow, Yoshua Bengio and Aaron Courville, MIT Press.<br>3.Davies, "Handbook of Condition Monitoring", Chapman & Hall<br>***Latest editions of all the suggested books are recommended.** | |
| **Additional electronic reference material** | https://www.youtube.com/watch?v=f58SW0Hwcf0<br>https://www.youtube.com/watch?v=UOuTBCrW2kY<br>https://www.youtube.com/watch?v=VSaExwBJGaw | |

| Course Code: EME862 | Program Elective- V<br>B. Tech (Mechanical)- Semester-VIII<br>**Unconventional Manufacturing Process (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be:** | |
| **CO1.** | **Understanding** the limitations of conventional/traditional manufacturing Processes. | |
| **CO2.** | **Applying** the best suitable machining process for a workpiece based on its material properties. | |
| **CO3.** | **Analyzing** working principles and processing characteristics of ultra-precision machining processes. | |
| **CO4.** | **Evaluating** the precision using high-speed machining methods, and nontraditional machining to the production of precision components. | |
| **CO5.** | **Creating** an indepth approach regarding application of unconventional manufacturing processes for industrial production. | |
| **Course Content:** | **Note: All experiments should be performed:** | |
| **Experiment-1:** | To prepare a cavity with Abrasive jet machining. | |
| **Experiment-2:** | To study effect of parameters of EDM on MRR. | |
| **Experiment-3:** | To study effect of parameters of EDM on surface finish. | |
| **Experiment-4:** | To prepare hole in mild steel plate on EDM. | |
| **Experiment-5:** | To prepare a given profile in mild steel plate using Laser beam machining. | |
| **Experiment-6:** | To prepare a weld joint using Plasma arc welding | |
| **Experiment-7:** | To cut the given shape in a mild steel plate using Plasma arc machine | |
| **Experiment-8:** | To prepare a given shape with the help of water hammer forming. | |
| **Experiment-9:** | To prepare a given job using ultrasonic machining. | |
| **Experiment-10:** | To compare the surface roughness of the surface prepared on EDM and ultrasonic machining. | |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|

| Course Code: EME863 | Program Elective- V<br>B. Tech (Mechanical)- Semester-VIII<br>**Mechatronics (Lab)** | L-0<br>T-0<br>P-2<br>C-1 |
|---|---|---|
| **Course Outcomes:** | **On completion of the course, the students will be:** | |
| **CO1.** | **Understanding** the principles of sensors, actuators, thermocouple etc. used in the mechatronics system. | |
| **CO2.** | **Applying** the principles to make relationship between mechanical, electronics, control and computer engineering. | |
| **CO3.** | **Analysing** the electrical and mechanical systems and their interconnection in real time. | |
| **CO4.** | **Evaluating** a system by interfacing with automation devices for a set of specifications. | |
| **CO5.** | **Creating** a model with complete design, building, interfacing and actuation of a mechatronics system using PLC programming. | |
| **Course Content:** | **Note: All experiments should be performed:** | |
| **Experiment-1:** | To measure speed using Inductive pickup/Proximity sensor | |
| **Experiment-2:** | To measure temperature using thermocouple/thermistor/RTD | |
| **Experiment-3:** | To measure displacement using LVDT | |
| **Experiment-4:** | To measure position and velocity encoders | |
| **Experiment-5:** | To measure angles using capacitive transducer. | |
| **Experiment-6:** | To control speed of DC motor using PLC. | |
| **Experiment-7:** | To test Relays using PLC. | |
| **Experiment-8:** | To identify amplified signals using OP amps | |
| **Experiment-9:** | Linear actuation of hydraulic cylinder with counter and speed control. | |
| **Experiment-10:** | Hydrometer rotation with timer and speed control. | |
| **Experiment-11:** | Sequential operation of pneumatic cylinders. | |

**Evaluation Scheme of Practical Examination:**

**Internal Evaluation (50 marks)**
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

**Evaluation scheme:**

| PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS) | | | | ON THE DAY OF EXAM (15 MARKS) | | TOTAL INTERNAL (50 MARKS) |
|---|---|---|---|---|---|---|
| EXPERIMENT (5 MARKS) | FILE WORK (10 MARKS) | VIVA (10 MARKS) | ATTENDANCE (10 MARKS) | EXPERIMENT (5 MARKS) | VIVA (10 MARKS) | |

**External Evaluation (50 marks)**

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

| EXPERIMENT (20 MARKS) | FILE WORK (10 MARKS) | VIVA (20 MARKS) | TOTAL EXTERNAL (50 MARKS) |
|---|---|---|---|