

# **ACADEMIC RULES AND REGULATIONS**

For Four Year  
**BACHELOR OF ENGINEERING**  
Degree Programme

## **SCHEME OF INSTRUCTIONS AND SYLLABI**

**B.E. I Year**  
**CSE (AI & ML)**

(With Effect from the Academic Year 2021-22)



**METHODIST COLLEGE OF ENGINEERING AND TECHNOLOGY**  
**(AN AUTONOMOUS INSTITUTION)**

Accredited by NAAC with A+ Grade and Accredited by NBA  
Approved by AICTE, New-Delhi - Affiliated to Osmania university  
Abids, HYDERABAD-500001, Telangana.

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**Estd : 2008**

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# **B.E. PROGRAMME**

**(Full - time)**

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# **ACADEMIC RULES AND REGULATIONS FOR FOUR YEAR B.E PROGRAMME UNDER AUTONOMY EFFECTIVE FROM THE ACADEMIC YEAR 2021-22**

## **1. PREAMBLE**

Methodist College of Engineering and Technology (MCET) was established in the year 2008 on a sprawling 5.0 acre of historic Methodist campus at Abids, Hyderabad. The college provides a serene and tranquil environment to the students boosting their mental potential and preparing them in all aspects to face the global competition with a smile and emerge victorious. The MCET has been established with the support of Executive board of Methodist Church in India that has been gracious and instrumental in making the vision of an Engineering College a reality. The MCET is approved by AICTE, New Delhi and affiliated to Osmania University, Hyderabad. The College is Accredited by NAAC with A+ Grade and all eligible Under Graduate – B.E Programmes are accredited by National Board of Accreditation (NBA). The UGC has granted autonomy to the college for ten years w.e.f Academic Year 2021-22.

The College offers following UG and PG Programmes.

## **UG-B.E PROGRAMMES**

- Artificial Intelligence & Data Science
- Computer Science & Engineering
- CSE (Artificial Intelligence & Machine Learning)
- Electronics and Communication Engineering
- Electrical and Electronics Engineering
- Civil Engineering
- Mechanical Engineering

## **PG-PROGRAMMES**

- M.E in Mechanical Engineering (CAD/CAM)
- Masters Degree in Business Administration, MBA

## 2. PRELIMINARY DEFINITIONS AND NOMENCLATURE

These rules are applicable to the students who are admitted to B.E Eight Semesters Programme under Autonomy with effect from the academic year 2021-22. The preliminary definitions and nomenclature are furnished in the following table.

S.No	Keywords	Definition
1	Programme	An educational Programme leading to the award of Degree B.E
2	Admission Procedure	The process of admissions as prescribed by Government of Telangana
3	Academic Year	Two consecutive (Odd+Even) semesters constitute one academic year.
4	Semester	Each semester will consist of 16 weeks of academic work equivalent to 90 actual working days. The odd semester may be scheduled from July to December and even semester from January to June.
5	Course	A course usually means an individual subject either theory / laboratory. The Courses shall define learning objectives and Learning outcomes.
6	Course Content	Any informational material that is required for participation / understanding the content such as assigned readings, video recordings, examinations and any other material needed for learning
7	Credit	A unit by which the course work is measured. It determines the number of hours of instructions required per week.
8	Letter Grade	It is an index of the performance of students in a said course, grades are denoted by letters like S,A,B,C,D,E etc.
9	Grade Point	It is a numerical weight allotted to each letter grade on a 10-point scale.
10	Credit Points	It is the product of grade point and number of credits for a course
11	SGPA	Semester Grade Point Average (SGPA) is a measure of performance of work done in a semester. It is the ratio of total creditpoints secured by a student in various courses registered in a semester and the total course credits obtained during that semester. It shall be expressed up to two decimal places.

12	CGPA	Cumulative Grade Point Average (CGPA) is a measure of overall cumulative performance of a student over all the semesters. The CGPA is the ratio of sum of product of SGPA in a semester and credits of that semester to the total credits of all semesters. It is expressed up to two decimal places.
13	Grade Sheet	Grade sheet shows the grades earned in all the courses registered in a semester. The grade sheet shall display the course details (course title, number of credits, grade secured etc) along with SGPA of that semester, in case the student passes all the courses in a semester.
14	MCET	Methodist College of Engineering and Technology

### 3. UNDER-GRADUATE DEGREE PROGRAMMES ON OFFER

MCET offers a Four Year B. E degree Programme in Engineering under autonomy with effect from the academic year 2021-22.

### 4. ADMISSION PROCESS

The eligibility criteria for admission into Engineering Programme offered at MCET shall be as prescribed by the Government of Telangana. The criteria are as mentioned below:

- The candidate shall be an Indian National /NRI.
- A candidate for admission to the Four Year Degree Programme in Engineering must have passed the Intermediate Examination (10 +2) or equivalent as on the date of admission as recognized by the Board of Intermediate Education (BIE), Government of Telangana with Mathematics, Physics and Chemistry as optional courses, or any other examination recognized by the Osmania University as equivalent there to.
- All the eligible applicants shall have to qualify at the Common Entrance Examination. The candidates will be admitted strictly in accordance with the merit secured at the Entrance Examination conducted by the State Government of Telangana, keeping in view the rules in force regarding the reservations of seats to various categories of candidates.
- Seats in each Programme in the Institute are classified into two categories i.e. Category–A and Category–B as per the GOs.

#### **4.1 Category – A Seats**

70% of the sanctioned seats shall be filled through counseling as per the rank secured by a candidate in the Common Entrance Test (TSEAMCET) conducted by the Government of Telangana and as per other admission criteria laid down in the GOs.

#### **4.2 Category – B Seats**

30% of sanctioned seats shall be filled by the Institute as per the GOs issued by the Government of Telangana from time to time.

#### **4.3 Direct Admission to third semester (Second Year) under Lateral Entry Scheme:**

A candidate shall be admitted into the third semester based on the rank secured by the candidate in the Engineering Common Entrance Test, TSECET (For Diploma Holders) conducted by the Government of Telangana and as per other admission criteria laid down in the GOs of the Government of Telangana.

### **5. MEDIUM OF INSTRUCTION**

The medium of instruction shall be English for all the Courses including their content delivery and examinations, seminars, presentations and project evaluation as prescribed in the Programme curriculum.

### **6. B.E PROGRAMME STRUCTURE**

The structure of the B.E. Programme on offer at MCET is based on the Choice Based Credit System (CBCS) and Credit Based Semester System (CBSS) as defined by the UGC and the curriculum /course structure as suggested by the AICTE in its Model Curriculum.

#### **6.1. Duration and Programme of Study**

The B.E. Programme offered at MCET follow semester scheme pattern. The duration of a B.E. Programme shall be of 4 academic years spread over 8 semesters. Each academic year shall have 2 semesters i.e., odd and even semesters and shall be counted as first semester, second semester, third semester and so on upto eighth semester.

Each semester shall have ‘Continuous Internal Evaluation (CIE)’ and ‘Semester End Examination (SEE)’.

Each semester shall consist of 16 weeks of academic work that includes internal tests and excludes End semester examinations and evaluation.

S.No	Duration	Particulars
1	16 weeks	Instruction per semester including continuous internal Examinations (CIE)
2	2 Weeks	Preparation Holidays including Practical examinations
3	2 Weeks	From Commencement of Semester End Examinations (SEE)
4	6 Weeks	Break/Supplementary/make-up examination/Mini Project / Internship etc

- Each student shall secure the prescribed credits for each Programme with aCGPA  $\geq 4.5$  required for the completion of the UG Programme and the award of the B.E degree.
- Admission / readmission / promotion are NOT entertained after four weeks of the commencement of instruction.
- In case there are any court cases consequent to which the authorities are compelled to admit any candidate after the announced last date of admissions, the admission (seat) of such a student would be reserved for the subsequent year on a supernumerary basis.
- No refund of Tuition fee will be made after the commencement of instruction for students who wish to cancel their admission. The schedule of study of all Programmes are regulated by the Academic Council of the Methodist College of Engineering and Technology.
- Under CBCS Programme, the duration shall be defined by the period in which a student earns the prescribed credits for the award of B.E degree.

## 6.2 Normal Duration

- a. The duration of the B.E degree Programme shall be Eight Semesters (four years)
- b. The duration of the B.E degree Programme under lateral entry scheme (LES) shall be six semesters (three years)



### **6.3 Maximum Duration**

- c. Candidate who fails to fulfill all the requirements for the award of the degree as specified here in after within (N+2) academic years from the time of admission, will forfeit his/her seat in the Programme and the admission will stand cancelled, where 'N' is the no. of years of Programme of study (four years for regular students and three years for lateral entry students)
- d. The maximum period for a Programme shall also be dictated by the fact that a student has to demonstrate the prescribed minimum academic performance by registering for the prescribed minimum number of credits in every semester, for continuing in the Programme. This period can be equal to or lesser than the maximum period indicated as above.

## **7. RULES AND REGULATION OF ATTENDANCE**

- 1. Candidates admitted to a particular Programme of study are required to pursue a "Regular Programme of Study" before they are permitted to appear for the Semester End Examination.
- 2. "A Regular Programme of Study" means putting in attendance of not less than 75% in each semester and registering for the examination.
- 3. In special cases and for sufficient cause shown, the Principal/Chairman Academic Council may, on the specific recommendations of the Head of the Department, condone the deficiency in attendance to the extent of 10% on medical grounds subject to submission of medical certificate and payment of condonation fee as prescribed by the Governing Body.
- 4. "Attendance of N.C.C / N.S.S Camps or Inter-collegiate or Inter University or Inter State or International matches or debates or Educational Excursions or such other Inter University activities as approved by the authorities involving journeys outside the city in which the college is situated will not be counted as absence. (i) Such 'absence shall not exceed four (4) weeks of the total period of instructions in a semester. (ii) Such leave should be availed with prior permission from the Principal and not be availed more than twice during the Programme of study. (iii) Without any prior permission, such leave shall be treated as absence. (iv) While calculating the attendance, the no. of classes not attended in each subject should be deleted in the denominator.

5. The attendance shall be calculated on the aggregate of the papers/ Courses from the date of commencement of classes / date of readmission in case of detained candidates as per the almanac communicated by MCET.
6. In case of the candidates who fail to put in the required attendance in a semester of study, they shall be detained in the same semester and will not be permitted to appear for the Semester End Examination. Such candidates shall have to seek readmission into the same semester during the subsequent year in order to appear for the examination after fulfilling the attendance requirements and on payment of requisite tuition fee.
7. a) Candidates admitted to the first year through an entrance test and do not have the requisite attendance but have more than 40% attendance in the first semester can seek readmission in the next academic year without once again appearing for the entrance test, such seat can be considered as supernumerary.  
  
b) In respect of candidates of such Programmes where the admissions are governed through an entrance test, candidates of First semester who do not have the minimum 40% attendance would lose their seat and they will have to seek admission afresh by appearing at the entrance test once again.

## **8. SCHEME OF INSTRUCTION AND EXAMINATION**

### **8.1 Assessment Procedures for Awarding Marks**

All Programmes consist of Theory Courses, Laboratory Courses and Employability Enhancement Courses which include Project Work, Seminar, Professional Practices, Case Studies and Industrial/Practical Training etc.

Appearance in Semester End Examination(SEE) is mandatory for all Courses including theory, laboratory and project work. Performance in each course of study shall be evaluated based on (i) Continuous Internal Evaluation (CIE) throughout the semester and (ii) SEE at the end of the semester. The evaluation shall be based on Outcome Based Education (OBE). For both Theory and Laboratory courses out of 100 marks, 40 marks are allocated for CIE and 60 marks for SEE.

### **8.2 Distribution of marks and evaluation methodology**

The performance of a student in each semester shall be evaluated course wise with a maximum of 100 marks for theory and 100 marks for practical Courses.

## **8.2.1 Theory Courses**

- The syllabus for the theory Courses shall be divided into FIVE units and each unit carries equal weightage in terms of marks distribution.
- For theory Courses, the distribution of marks shall be 40 marks for Continuous Internal Evaluation (CIE) and 60 marks for the Semester End Examination(SEE).

### **8.2.1.1 Continuous Internal Evaluation (CIE - 40M)**

- Continuous Internal Evaluation (CIE) shall consist of written examination (Internal Exam– 25 M), Quiz (Q-5M), Assignment (A-5M) Class Assessment (CA- 5M).

#### **i. Internal Examination (25 M):**

- For theory Courses, two written examinations shall be conducted in each semester as per the academic calendar. Each written examination shall be evaluated for 25marks.

- **Question paper pattern for internal examinations (25 Marks) shall be as follows:**

**PART-A : 5 X 2 M= 10 M** -All questions are compulsory

**PART-B: 3 X 5 M = 15 M**

In Part-B three out of four questions have to be answered. **Average of the two internal tests shall be calculated and used as the final internal marks for each course.**

#### **ii. Quiz (5 marks each):**

10 quiz questions for each unit /Course Outcome in MCQ. Average of all Quiz examinations for maximum of 5 marks will be considered

#### **iii. Assignments (5 marks):**

one Assignment for each unit/ Course Outcome is required to be submitted to a maximum of 5 marks and it will be evaluated by the concerned teacher. Average of all assignment marks will be considered

#### iv. Class Assessment (CA-5M):

The CA marks of each subject will be acquired by performing any one of the following activities during the semester.

<b>Activity</b>	<b>Max. Marks (5M) for any one of the activities.</b>
Technical Participations in inter College Competitions / Paper Presentations / Publications/Technical Seminars/Peer learning / Certification Courses (SWAYAM, NPTEL or Relevant online Recommended Course etc)/Project Based Learning (PBL) / Group learning <b>ANY ONE OF THE ACTIVITIES LISTED</b>	

V. The valuation and verification of answer scripts of CIE shall be completed within a week after the conduct of the examination.

#### 8.2.1.2. Semester End Examination (SEE - 60 M)

- The SEE shall be conducted at the end of semester for a total of 60 marks of 3 hours' duration.
- The syllabus for the theory Courses shall be divided into FIVE units and each unit carries equal weightage in terms of marks distribution.
- **Question paper pattern for SEE (60Marks) shall be as follows**  
**PART-A: 10 X 2 M = 20 M**
  - a. There shall be two questions from each unit.
  - b. All questions are compulsory.

#### **PART-B: 5 X 8 M = 40 M**

- Part B consists of 8 questions - one question from each of the five units and 6<sup>th</sup> question covering 1<sup>st</sup> and 2<sup>nd</sup> units, 7<sup>th</sup> question covering 3<sup>rd</sup> and 4<sup>th</sup> units and 8<sup>th</sup> question covering 5<sup>th</sup> unit and any other units from 1 to 4 having more

weightage. 5 questions are to be answered out of the eight and each question carries 8 marks.

- There could be a maximum of three sub divisions in each of the 8 questions in Part B.
- Course Out come, Blooms Taxonomy levels and Maximum marks are to be indicated against each question both in CIE and SEE question papers

### 8.2.2 Laboratory Courses

i) Continuous Evaluation method is adopted for laboratory courses of all semesters and 40 marks are allocated for CIE. At the end of each experiment, the student is evaluated by allocating marks as given under.

- Observation and Results -20 marks
- Viva-Voce—10 marks
- Record-10 marks

Average of marks obtained in all experiments is considered as the marks obtained in CIE

i. SEE for Laboratory courses will be conducted by internal and external Examiners, 60 marks are allocated for each Lab course and distribution of marks is as follows.

- Procedure – 10 marks
- Execution, Calculations and Results -30 marks
- Viva-voce-20 marks
- **Note:** i) For Programming Related SEE of Laboratory courses, the BOS-chairperson may take appropriate decision for distribution of 60 marks

ii) For all lab courses while awarding marks, the distribution of marks as per the scheme of evaluation is to be indicated in the answer booklet by the examiners



## 10. RANGE OF CREDITS

Credit system will be implemented in each semester. The credit hours for each theory course, laboratory sessions, Skill Development Courses and project work are clearly mentioned in the scheme of instruction.

Absolute grading system is adopted in awarding the letter grades. The marks are converted to grades based on pre-determined class interval. The following letter grades and grade points are used:

Academic Performance (%)	Letter Grade	Grade Points
$95 \leq \text{Marks} \leq 100$	S+	10
$90 \leq \text{Marks} \leq 95$	S	
$80 \leq \text{Marks} < 90$	A	9
$70 \leq \text{Marks} < 80$	B	8
$60 \leq \text{Marks} < 70$	C	7
$50 \leq \text{Marks} < 60$	D	6
$40 \leq \text{Marks} < 50$	E	5
$< 40$	F	0

## 11. RULES OF PROMOTION

S.No.	Semester /Class	Conditions to be fulfilled
1.	From I-Semester To II-Semester	Regular Programme of study of BE I Semester
2.	From II-Semester to III-Semester	Regular Programme of study of B.E. II-Semester and must have earned at least 50% of the total credits (rounded to the next nearest integer) prescribed for B.E. I- Semester and II-Semester, together.

3.	From III-Semester to IV-Semester	Regular Programme of study of B.E. III-Semester.
4.	From IV- Semester to V- Semester	Regular Programme of study of B.E. IV-Semester and No. of backlog credits, if any of B.E. I, II, III and IV-Semester put together shall not exceed 50% (rounded to the next nearest integer) of the total number of credits prescribed for the B.E.III and IV-Semester, together.
5.	From V-Semester to VI- Semester	Regular Programme of study of B.E. V-Semester
6.	From VI- Semester to VII- Semester	Regular Programme of study of B.E. VI-Semester and No. of backlogs, if any of B.E. I to VI-Semester put together shall not exceed 50% (rounded to the next nearest integer) of the total number of credits prescribed for the B.E. V and VI-Semester, together.
7.	From VII-Semester to VIII-Semester	Regular Programme of study of B.E. VII-Semester

**Note:**

- A. Regular Programme of Study means
  - i) Satisfying the attendance requirement and
  - ii) registering for the examination by paying the prescribed fees
- B. If a candidate has more than permitted number of credits as backlogs, he/she will be detained.
- C. The candidate who wishes to take readmission into the year in which he/she is detained have to pay the total tuition fee of that year and all the credits earned during that year shall become null and void.



## **12. GRADING SYSTEM**

### **a. Semester Grade Point Average (SGPA)**

Candidates who have passed all the courses in accordance with the grades secured by them in a semester including the CIE marks shall be awarded SGPA and it is calculated up to second decimal point

$$\text{SGPA} = \frac{\sum_i (\text{Letter Grade Points} \times \text{Credits})}{\sum_i (\text{Credits})},$$

where i ranges over all the Courses in that semester

### **b. Cumulative Grade Point Average (CGPA)**

Candidates who have passed all the courses of the B.E. Degree Programme shall be awarded CGPA in accordance with the grades secured by them in all eight Semesters taken together, including the CIE marks secured in those semesters.

$$\text{CGPA} = \frac{\sum_j (\text{SGPA} \times \text{Credits})}{\sum_j (\text{Credits})},$$

where j ranges overall semesters upto which the CGPA is computed.

- The grade secured shall be shown in the memorandum of marks/grade card as per the performance in CIE and SEE.
- A minimum Cumulative Grade Point Average (CGPA) of 4.5 is required for the award of Degree. The consolidated memorandum of marks will reflect the credits / grade scored in each subject.
- CGPA at a given point of Semester is calculated up to second decimal point. It is calculated only when total credits earned are equal to total credits prescribed as per scheme up to a semester in which the candidate has last appeared for SEE.

**Illustration of calculation of SGPA:**

<b>Course Name</b>	<b>Course Credits (C)</b>	<b>Letter Grade</b>	<b>Grade Point (GP)</b>	<b>Credit Point (CP = C x GP)</b>
Course 1	3	S	10	3 x 10 = 30
Course 2	4	A	9	4 x 9 = 36
Course 3	3	B	8	3 x 8 = 24
Course 4	3	C	7	3 x 7 = 21
Course 5	3	D	6	3 x 6 = 18
Course 6	4	E	5	4 x 5 = 20
<b>Total Credits</b>	<b>20</b>	<b>Total Credit Points</b>		<b>149</b>

Thus, SGPA = 149/20 = 7.45

**Illustration of calculation of CGPA upto II semester:**

<b>Sem-ester</b>	<b>CourseName</b>	<b>Course Credits (C)</b>	<b>Letter Grade Secured</b>	<b>Grade Point (GP)</b>	<b>Credit Point (CP = C x GP)</b>
<b>I</b>	Course 1	4	S	10	40
<b>I</b>	Course 2	4	A	9	36
<b>I</b>	Course 3	4	B	8	32
<b>I</b>	Course 4	1.5	C	7	10.5
<b>I</b>	Course 5	1.5	D	6	9
<b>I</b>	Course 6	3	E	5	15
<b>I</b>	Course 7	1	S	10	10
<b>II</b>	Course 8	4	A	9	36
<b>II</b>	Course 9	4	B	8	32
<b>II</b>	Course 10	2	C	7	14
<b>II</b>	Course 11	3	D	6	18
<b>II</b>	Course 12	1.5	E	5	7.5
<b>II</b>	Course 13	1	S	10	10
<b>II</b>	Course 14	2	A	9	18
<b>II</b>	Course 15	2.5	B	8	20

SGPA of I Sem =  $152.5/19=8.03$  SGPA of II Sem= $155.5/20=7.78$  CPGA upto II Sem =  $(8.03 \times 19 + 7.78 \times 20)/39=7.9$

The above illustrated process of calculation of CGPA shall be followed for each subsequent semester until eight semesters.

The CGPA obtained at the end of eight semesters shall be the final CGPA secured by the student for the entire B.E. Programme.

### **13. GRADE CARD**

**The grade card issued shall contain the following:**

- a. The credits for each course offered in that semester.
- b. The letter grade and grade point award in each course.
- c. The SGPA/CGPA as per eligibility.
- d. Total number of credits earned by the student up to the end of that semester.

### **14. REVALUATION**

- a. Student can register for the revaluation of SEE after the declaration of results by paying the Prescribed fee.
- b. The Controller of Examinations (COE) shall arrange for the revaluation and declare the results.
- c. Revaluation shall not be permitted to the Courses other than theory Courses.

### **15. CHALLENGE OF VALUATION**

After obtaining the photocopy of the corrected answer book of the theory subjects of SEE, the candidate can go for challenge of valuation within 10 days, on payment of the prescribed fees. The answer book of the candidates in such cases will be referred to an examiner outside the University. In case the candidate's claim is found to be correct, 90% of the fees paid by the candidate will be refunded.

## **16. CREDIT TRANSFER FROM ANOTHER INSTITUTION TO MCET**

- a) Credit transfer of a student from other Institution to MCET is permitted for under- graduate Programme as per the GOs from the Government of Telangana.
- b) A student studying in another Institution can take transfer to MCET against notification and orders issued by the Government of Telangana, under the following conditions:
  - When a student seeks transfer, equivalent credits shall be assigned to the student based on the Courses studied earlier by the student.
  - The student, when transferred from other Institution, must follow the rules and regulations of MCET.
  - To graduate from MCET a transferred student must study at least half of the minimum duration prescribed for a Programme at MCET.

## **17. WITHHOLDING OF RESULTS**

- a) If a student has not paid the pending dues to the institute OR in any case of indiscipline/malpractice is pending against him/her, the results of such student shall be with held.
- b) The issue of the award of the provisional certificate and the B.E. degree is liable to be with held in such cases.

## **18. AWARD OF DEGREE**

The degree of bachelor of engineering will be conferred on candidate who has pursued a regular Programme of study of four /three (Lateral Entry) academic years as herein after prescribed in the scheme of instruction and has passed all the examinations as prescribed in the scheme of examinations.

To obtain degree, the student shall have passed in all the Courses and secured the number of credits as prescribed in the course structure of the Programme offered by department concerned and should obtain a CGPA of at least 4.5 and shall not have any disciplinary actions pending against him/her.

- Only CGPA will be shown in the Consolidated grade sheet and Division is not shown. However on the back side of the Consolidated Grade sheet the cumulative percentage of marks is indicated using the conversion formula, Percentage of marks = ( CGPA – 0.5) \* 10, and also the division will be indicated based on the CGPA , by adhering to the norms and nomenclature followed by the affiliating University to facilitate the students to meet the requirements of recruiters.

Norms for indicating division based on the CGPA :

CGPA RANGE	DIVISION
7.5 and above	First Division with Distinction
6.5 and above but less than 7.5	First Division
5.5 and above but less than 6.5	Second Division
4.5 and above but less than 5.5	Pass Division

## 19. AWARD OF RANK CERTIFICATE/GOLD MEDAL

(a) A student securing highest CGPA in **single attempt** is eligible for award of RankCertificate / Gold Medal.

(b) A readmitted student is not eligible for award of Rank Certificate/Gold Medal.

## 20. ACADEMIC REGULATIONS FOR B.E. DEGREE WITH MINOR PROGRAMS

1. For B.E. with Minor degree, a student needs to earn additional 18 credits (over and above their respective credits weightage and semester-wise break-up of the courses will be finalized by the respective Boards of Studies. All these 18 credits are distributed in V, VI and VII Semesters.
2. These 18 credits are to be earned from the additional Courses offered by the host department in the college as well as from the MOOCS platform
3. There is no transfer of credits from Minor program courses to regular B.E. degree course & vice versa.
4. The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B.E program.
5. A student can graduate with a Minor if he/she fulfils the requirements for his/her regular B.E program as well as fulfils the requirements for Minor program.

6. After registering for Minor programme, only if a student earns 18 credits by the time he/she earns the prescribed number of credits of B.E programme, he/she shall be awarded B.E degree with Minors. Otherwise only B.E degree in the concerned branch will be awarded.
7. For the course selected under MOOCS platform following guidelines may be followed:
  - a) Prior to registration of MOOCS courses, formal approval of the courses, by the concerned Boards of Studies is necessary. The BOS considers the parameters like the institute / agency which is offering the course, syllabus, credits, duration of the course and mode of evaluation etc. before approval.
  - b) Minimum credits for MOOCS course must be equal to or more than the credits specified in the Minor course structure approved by the BOS.
  - c) Only Pass-grade/marks or above shall be considered for inclusion of grades in minor grade memo.
  - d) Any expenses incurred for the MOOCS courses are to be met by the students only.
8. The choice to opt / take a Minor program is purely left to the choice of the students.
9. The student shall be given a choice of withdrawing all the courses registered and/or the credits earned for Minor program at any time; and in that case the student will be awarded only B.E. degree in the concerned branch on earning the prescribed number of credits.
10. The student can choose only one Minor program along with his/her basic engineering degree.
11. A student who chooses BE Honours program is not eligible to choose a Minor program and vice-versa.
12. The students who are pursuing their V semester can register for the Minor program if they fulfill the other eligibility criteria.

13. The institute / department shall prepare the time-tables for each Minor course offered at their respective institutes without any overlap/clash with other courses of study in the respective semesters.

#### **20.1. ELIGIBILITY CRITERIA FOR THE STUDENTS TO REGISTER FOR MINOR COURSE**

- A student can opt for B. E degree with Minor program, in V Semester if he/she has no active backlogs till IV Semester
- Prior approval of mentor and Head of the Department for the enrolment into Minorprogram, before commencement of V Semester, is mandatory

#### **21. ACADEMIC REGULATIONS FOR B.E HONOURS DEGREE**

- 1) For B.E with Honors program, a student needs to earn additional 18 credits, over and above the stipulated number of credits for B.E degree. All these 18 credits need to be completed in III year and IV year only.
- 2) The weekly instruction hours, internal & external evaluation and award of grades are on par with regular 4-Years B.E program.
- 3) After registering for the Honours programme, if a student is unable to pass all courses in first attempt and earn the required 18 credits, he/she shall not be awarded Honours degree. However if the student earns all the stipulated number of credits of B.E, he/she will be awarded only B.E degree in the concerned branch.
- 4) There is no transfer of credits from courses of Honours program to regular B.E. degree course & vice versa.
- 5) These 18 credits are to be earned from the additional courses offered by the host department /allied departments in the college as well as from the MOOCS platform.
- 6) For the courses selected under MOOCS platform following guidelines may be followed:
  - a) Prior to registration of MOOCS courses, formal approval of the

courses, by the concerned Boards of Studies is necessary. The BOS considers the parameters like the institute / agency which is offering the course, syllabus, credits, duration of the course and mode of evaluation etc. before approval.

- b) Minimum credits for MOOCS course must be equal to or more than the credits specified in the honours course structure approved by the BOS.
  - c) Only Pass grade/marks or above shall be considered for inclusion of grades in honours grade card.
  - d) Any expenses incurred for the MOOCS courses are to be met by the students only.
- 7) The choice to opt/take the Honours program is purely left to the choice of the students.
  - 8) The student shall be given a choice of withdrawing all the courses registered and/or the credits earned for Honours program at any time; and in that case the student will be awarded only B.E. degree in the concerned branch on earning the stipulated number of credits.
  - 9) The students of every branch can choose Honours program in their respective branches subject to the eligibility criteria. A student who chooses an Honours program is not eligible to choose a Minor program and vice-versa.
  - 10) The B.E. with Honours program shall be offered from the AY 2023-24 onwards. The firstbatch of students under Autonomy who will be pursuing their V semester during 2023-24 can register for the Honours program.
  - 11) A student can graduate with Honours if he/she fulfils the requirements for his/her regular B.E. program as well as fulfils the requirements for Honours program.
  - 12) The department shall prepare the time-tables for each Honours program offered at their respective departments without any overlap/clash with other courses of study in the respective semesters.



### **21.1 Eligibility conditions of the students for the Honours degree**

- a) A student can opt for B.E. degree with Honours, if she/he passes all the courses in first attempt in all the 4 semesters and maintain a CGPA of 7.5 or more.
- b) If a student fails in any registered course of either B.E or Honours in any semester of four years program, he/she will not be eligible for obtaining Honors degree. He will be eligible for only B.E degree
- c) Prior approval of mentor and Head of the Department for the enrolment into Honours program, before commencement of V Semester, is mandatory.
- d) The department concerned should be preferably accredited by NBA/NAAC
- e) For CGPA calculation of B.E course, the 18 credits of Honours program will not be considered.

### **22. IMPROVEMENT OF OVERALL SCORE**

1. A Candidate who wishes to improve his/her Overall score may do so within one academic year immediately after having passed all the examinations of the B.E. Degree Programme, by reappearing in not more than two semesters (all courses including Laboratory pertaining to the semester taken together as per existing scheme of syllabus however CIE marks remain the same) examinations.
2. For the award of the Overall score, he/she will have the benefit of the higher of the two aggregates of marks/grades secured in the corresponding semester(s).

### **23. GENERAL RULES OF EXAMINATION**

- Procedures and the conduction of Exams will be as per the norms prescribed by the Governing body.
1. Application for registration to appear in any examination shall be made available in online through college website as per the notification.

2. When a candidate's application is found in order and he/she is eligible to appear in Semester End Examination (SEE), the Examination Branch of the College shall furnish him with a Hall-Ticket, enabling the candidate to appear in the Semester End Examination.
3. The Hall-Ticket shall have to be produced by the Candidate before he/she is admitted to the Examination Hall.
4. A Candidate who does not present himself/herself for examination for any reason whatsoever, excepting shortage of attendance, shall not be entitled to claim refund of the whole or part of the examination fee, for subsequent Examination(s).
5. A candidate after he/she has been declared successful in the all examinations, shall be given a provisional certificate stating the year of examination, the branch in which he/she was examined and, the overall CGPA secured.
6. However, the candidates have to obtain degree certificate from the University Examination Branch.
7. No candidate shall be allowed to put in attendance for a Programme or appear at examinations for different degrees and different faculties simultaneously.
8. Students who have appeared once in any examination of the Programme need not put in fresh attendance, if they wish to reappear at the corresponding examination, notwithstanding the fact that the college may have introduced new courses. They will, however, have to appear at the examinations according to the scheme of examination any syllabi in force.

## **24. TRANSITORY REGULATIONS**

1. Whenever a Course or Scheme of Instruction is revised / modified in a particular semester / year, two more examinations immediately following thereafter shall be conducted according to the old syllabus/regulations, provided the content in the course has changed more than 40%.

2. Candidates not appearing at the examinations or failing in them shall take the examination subsequently according to the revised syllabus and regulations.

## 25. MALPRACTICE AND AWARD OF PUNISHMENT

<b>S. No</b>	<b>Malpractice</b>	<b>Award of Maximum Punishment</b>
1.	Possession of the prohibited (write nor printed) papers, books, notes during the examination period but which were not used.	Shall be debarred from appearing at the subsequent papers of the examination apart from cancelling the result of the examination in which he/she had indulged in malpractice.
2.	Matter relevant to the examination being written on any part of the body or on the clothes worn, or in the instruments, wrappings, etc.	-do-
3.	Attempting to take help from any prohibited papers, notes, written or printed matter, writings on the walls, furniture and attempting to take help from or giving help to other regarding answer to any question or questions of the examination paper.	-do-

<b>S. No</b>	<b>Malpractice</b>	<b>Award of Maximum Punishment</b>
4.	Taking help from or consulting of prohibited written or printed material; consulting and/or taking help from or helping other examinee during the examination period inside the examination hall or outside it; with or without their consent, or helping other candidate to receive help from anyone else.	-do-
5	An examinee who attempts to disclose his/her identity to the paper valuator by writing his/her roll number at a place other than the place prescribed for it, or by writing his/her name or any coded message or an examinee who makes an appeal to the paper valuator in the answer book	Cancelling the result of that paper

<b>S. No</b>	<b>Malpractice</b>	<b>Award of Maximum Punishment</b>
6	Writing such as invocation of GOD's name in any form.	To be ignored
7	Writing on the question paper or other papers; the answer to questions, rough work, etc., with no intention of passing it on to another examinee.	warned not to do so
8	Using abusive and obscene language in the answer book.	Cancellation of the result of that paper
9	Examinee allowing or destroying prohibited material found in his possession or acting in any other manner with a view to destroy evidence.	Cancellation of the result of all Examinations taken or proposed to be taken during that session and prohibiting his/her admission to or continuation in any course of the University for a period of one year
10	Refusing to obey instructions of the Chief Superintendent/Invigilator	Cancelling the result of that paper
11	Smuggling an answer book /additional answer book/matter into or out of the examination hall.	Cancellation of the result of all examinations taken or proposed to be taken during that session and prohibiting his / her admission to or continuation in any course of the Institution for a period of the year.
12	Inserting in or removing from the answer book/additional answer book of any sheet.	-do-

<b>S. No</b>	<b>Malpractice</b>	<b>Award of Maximum Punishment</b>
13	Substituting wholly or partly an answer book / additional answer book.	-do-
14	Impersonation even at a single examination.	To be dealt with as per law
15	Cases of examinees when conspiring to interchange in Roll Nos.	Cancellation of the result of all examinations taken or proposed to be taken during that session and Prohibiting their Admission or constitution in any course of the University for a period of one year
16	Creation of disturbance or otherwise misbehaving in and around the examination hall during or before the examination	Cancelling the results of all examinations taken or proposed to be taken during that session and prohibiting admission in to or continuation in any course of study for a period of two years.
17	Guilty of assaulting/abusing intimidating any person connected with the examination work any time before, during or after the examination	Cancelling the result of all examinations taken or proposed to be taken during that session and the next session and prohibiting admission into or continuation in any course for a period of two years.
18	Punishments for malpractices not defined here would be recommended on the merits of the individual cases by the Malpractices committee.	

## 26. SCHEME OF STUDY

- a. **Types of Courses in the Programme will be of the following kinds**

<b>Course Work and Subject Area</b>	
<b>HS</b>	Humanities, Social Sciences and Management
<b>BS</b>	Basic Sciences including Mathematics, Physics and Chemistry
<b>ES</b>	Engineering Sciences including Workshop, Drawing, Basic Electrical/ Electronics
<b>PC</b>	Professional Core Subjects
<b>PE</b>	Professional Elective Subjects relevant to be chosen based on specialization/branch
<b>OE</b>	Open Elective Subjects from other technical subjects
<b>PW</b>	Project Work, Seminars, Internship in industry or relevant
<b>MC</b>	Mandatory (non-credit) Courses
<b>TOTAL OF ABOUT 160 CREDITS</b>	

- b. **Contact hours and credits (Courses and Credit Structure)**

The norms for course credits are as follows:

Lecture (L) / Tutorials (T): One (1) hour per week is assigned one

credit (C) Practical (P): Two (2) hours session per week is assigned

one (1) credit(C).

For example, a theory course with L-T-P schedule of 2-1-0 will be assigned three (3) credits.

L	T	P	C
2	1	0	3

A laboratory /practical course with L-T-P schedule of 1-0-3 will be assigned two and half(2.5)credits.

L	T	P	C
1	0	3	2.5

**c. Structure**

Every B.E. Programme of study shall be designed to have theory and laboratory Courses. In addition, a student shall carry out internship, industry oriented mini and major project, design sensitization, design thinking and other Courses as prescribed in the curriculum of the Programme.

**d. Registration of Courses**

- Every admitted student shall be assigned to a Faculty advisor who shall advice and counsel the student about the details of the academic Programme, rules and regulations and the choice of Courses considering the students’ academic background and career objectives.
- Each student on admission shall register for all the Courses prescribed in a semester of study including open and professional electives.
- Every student shall enroll for the Courses of the succeeding semester at the end of the current semester. However, the student shall confirm the enrolment by registering for the Courses before the three working days of the commencement of next semester. Online registration of Courses including electives, extracurricular and co- curricular activities will be provided and students can visit the college website for details.
- The registration of the Courses (such as professional electives, open electives etc)by the students in each semester apart from the compulsory Professional Courses as



prescribed by the department concerned shall be completed within the stipulated period. Change of professional electives and open electives will not be entertained after the due date.

- No course shall be offered by a Department unless a minimum of 20 students have opted for an elective course. After registering for a course, a student shall attend the classes, to satisfy the academic requirements for attending the semester end examinations.
- The enrolment for all the Courses of the even Semester will commence 15 working days prior to the last working day of odd Semester. The student shall confirm the enrolment by registering for the Courses before the commencement of the even semester. No change of course under any circumstances will be entertained once registration of Courses is completed.

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**Scheme of Instruction & Examination**  
**B.E. I – YEAR**  
**CSE – Artificial Intelligence and Machine Learning**  
**CSE (AI & ML)**

<b>Semester - I</b>									
S · N o	Course Code	Course Title	Scheme of Instruction				Scheme of Examination		Credit s
			Hours Per week			D u r a t i o n i n H r s	Maximum Marks		
			L	T	P/D		CIE	SEE	
<b>Theory Courses</b>									
1	BS101HS	Engineering Mathematics - I	3	1	0	4	40	60	4
2	BS106HS	Chemistry	3	1	0	4	40	60	4
3	HS101HS	English	2	0	0	2	40	60	2
4	ES101CS	Programming for Problem Solving	3	0	0	3	40	60	3
<b>Laboratories</b>									
5	BS153HS	Chemistry Lab	0	0	3	3	40	60	1.5
6	HS151HS	English Lab	0	0	2	2	40	60	1
7	ES151CS	Programming for Problem Solving Lab	0	0	2	2	40	60	1
8	ES152ME	Engineering Workshop Practice	0	0	1	4	40	60	2
9	MC151SP	Yoga/NSS/Sports	0	0	2	2	50	-	0
Total Credits									18.5

<b>Semester - II</b>									
S . N o	Course Code	Course Title	Scheme of Instruction				Scheme of Examinati on		Credits
			Hours Per week			Du rati on in Hr s	Maximu m Marks		
			L	T	P/D		CIE	SEE	
<b>Theory Courses</b>									
1	BS202HS	Engineering Mathematics - II	3	1	0	4	40	60	4
2	BS204HS	Applied Physics	3	1	0	4	40	60	4
3	ES202CS	Data Structures	3	0	0	3	40	60	3
4	ES202EE	Elements of Electrical and Electronics Engineering	3	0	0	3	40	60	3
5	MC201CE	Environmental Science	2	0	0	2	40	60	0
<b>Laboratories</b>									
6	BS251HS	Applied Physics Lab	0	0	3	3	40	60	1.5
7	ES252CS	Data Structures lab	0	0	2	2	40	60	1
8	ES252EE	Elements of Electrical and Electronics Engineering Lab	0	0	2	2	40	60	1
9	ES252CE	Engineering Graphics Lab	1	0	4	5	40	60	3
		Total							20.5

BS: Basic Sciences

ES: Engineering Sciences

HS: Humanities and Sciences

MC: Mandatory Courses

CIE: Continuous Internal Evaluation

SEE: Semester End Examination

L: Lectures T : Tutorials P: Practicals D : Drawing

Note: 1). Each Contact Hour is a Clock hour

Course code	Course Title	Core/ Elective					
BS101HS	Engineering Mathematics – 1	Core					
		L	T	P/D	Credits	CIE	SEE
		3	1	0	4	40	60
<p><b>Prerequisite:</b> Basics of Matrices, Differentiation, Integration and Trigonometric results</p> <p><b>Course Objectives:</b> The objective of this course is to make the student</p> <ul style="list-style-type: none"> <li>➤ Study matrix algebra and its use in solving system of linear equations and solving eigen value problems.</li> <li>➤ study mean value theorems and their application to mathematical problems.</li> <li>➤ introduce the concepts of functions of several variables and multiple integrals</li> <li>➤ introduce the concepts of Multiple Integrals</li> <li>➤ study vector differential and integral calculus.</li> </ul> <p><b>Course Outcomes:</b> After completion of the course, the student will be able to</p> <ul style="list-style-type: none"> <li>➤ Find the rank of matrix and its use to find solution of linear equations, eigen value problem, Quadratic forms.</li> <li>➤ Explain the concepts of derivatives using mean value theorems and their generalization. Concepts of curvature, evolutes, involutes, envelopes of family of curves</li> <li>➤ Find Partial derivatives of functions of two variables using concept of limits and continuity and study the concepts of maximum and minimum of functions of two variables.</li> <li>➤ Identify the key concepts, theories and mathematical fundamentals to derive mathematical relations involved in evaluation of double integrals and triple integrals and solving Engineering problems.</li> <li>➤ Evaluate gradient of a scalar field, divergence, curl of a vector field to find the values of line, surface and volume integrals and establish their relation using Green, Gauss and Stokes theorems.</li> </ul>							
<p><b>Unit-I (10Hrs)</b></p> <p><b>Matrices:</b> Rank of a matrix, Echelon form, System of linear equations, Linear dependence, independence of vectors, Linear transformation, Orthogonal transformation, Eigen values, Eigen vectors, Properties of eigen values, Cayley-Hamilton theorem, Quadratic forms, Reduction of quadratic form to canonical form by orthogonal transformation, Nature of quadratic form.</p> <p><b>Unit-II (10Hrs)</b></p> <p><b>Calculus of one variable:</b> Rolle's theorem, Lagrange's, Cauchy's Mean value theorems, Taylor's series, Curvature, Radius of curvature, Circle of Curvature, Envelope of family of curves, Evolutes and Involutives.</p>							

**Unit-III (10Hrs)**

**Multivariable Calculus (Differentiation):** Functions of two variables, Limits and continuity, Partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions (Chain rule), Change of variables, Jacobian, Higher order partial derivatives, Taylor's series of functions of two variables, Maximum and minimum of values of functions of two variables, Lagrange's method of undetermined multipliers.

**Unit-IV (8Hrs)**

**Multivariable Calculus (Integration):** Double Integrals, Change of order of integration, Change of variables from cartesian to plane polar coordinates, Triple Integrals.

**Unit-V (12Hrs)**

**Vector Calculus:** Scalar and vector fields, Gradient of a scalar field, Directional derivative, Divergence and Curl of a vector field, Line, Surface and Volume integrals, green's theorem in a plane, Gauss's divergence theorem, Stoke's theorem (without proofs) and their verification.

**TEXT BOOKS :**

- T1. Dr.B.S. Grewal, Higher. Engineering Mathematics, Khanna Publications, 43<sup>rd</sup> Edition,2014. (Unit 1-5)
- T2. Advance Engineering Mathematics by Jain and Iyengar,5<sup>th</sup> Edition, Narosa Publications (Unit 1-5)
- T3.B. V. Ramana, Higher Engineering Mathematics,3<sup>rd</sup> Edition 2015. (Unit 1-5)

**REFERENCES/ SUGGESTED READING:**

- R1. M.D Raisinghania, Ordinary Differential Equations, 11<sup>th</sup> Revised Edition
- R2. S.S. Sastry, Engineering mathematics, 3<sup>rd</sup> Edition, Paperback
- R3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley, 9<sup>th</sup> Edition, 2012.
- R4. Peter. V. O' Neil, Advance Engineering Mathematics, ' Publisher, Global Engineering 7<sup>th</sup> Edition, 2012

Course code	Course Title	Core/ Elective					
BS106HS	Chemistry	Core					
		L	T	P/D	Credits	CIE	SEE
		3	1	0	4	40	60
<p><b>Prerequisite:</b> Electrochemistry &amp; Batteries, Water &amp; Corrosion, Polymers, Energy Sources, Inorganic Engineering Materials</p> <p><b>Course Objectives:</b> The objective of this course is to make the student</p> <ul style="list-style-type: none"> <li>➤ Apply the principals of electrochemistry in storage of electrical energy in batteries.</li> <li>➤ Rationalize bulk properties and processes using thermodynamic considerations.</li> <li>➤ Gains knowledge in causes of corrosion and its prevention. Attains knowledge about the disadvantages of hard water and treatment of water for drinking purpose.</li> <li>➤ Explain the influence of chemical structure on properties of materials and their choice in engineering applications.</li> <li>➤ Exposed to qualitative and quantitative parameters of chemical fuels.</li> </ul> <p><b>Course Outcomes:</b> After completion of the course, the student will be able to</p> <ul style="list-style-type: none"> <li>➤ Apply concept of electrode potential in identifying feasibility of electrochemical reaction; illustrate electro analytical techniques and working of batteries</li> <li>➤ Identify the mechanism of corrosion of materials on basis of electrochemical approach and devise corrosion control methods. Estimate the physical &amp; chemical parameters of quality of water and explain the process of water treatment.</li> <li>➤ Explain the influence of chemical structure on properties of materials and their choice in engineering applications.</li> <li>➤ Classify chemical fuels and grade them through qualitative analysis.</li> <li>➤ Relate the concept of green chemistry to modify engineering processes and materials. Understand the function of drugs.</li> </ul>							
<p><b>Unit-I: (10 Hrs)</b></p> <p><b>Electrochemistry and Batteries :</b></p> <p>Electrochemistry: Electrochemical cells, Electrolytic and Galvanic cells-notation, cell notation, cell reaction and cell potentials. Electrodes: Electrode potential and Standard Electrode Potential (SEP). Construction and function of Calomel Quinhydrone and Glass electrodes. Determination of pH of a solution by using Quinhydrone electrode. Thermodynamics of emf, Nernst equation and its derivation. Applications of Nernst equation to electrode potential and emf of cells. Numerical problems.</p> <p>Batteries: Primary batteries: Zn - Carbon battery. Secondary batteries: Pb-Acid cell &amp; battery and Li-Ion cell battery, Applications. Flow batteries (Fuel cells): Hydrogen-Oxygen fuel cells &amp; functioning. Applications of</p>							

batteries.

### **Unit-II: (10 Hrs)**

#### **Water Chemistry--its treatment and corrosion:**

Water Chemistry: Hardness of Water-Types and units of hardness, estimation of temporary and permanent hardness of water by EDTA method. Alkalinity of water and its determination. Water softening by Ion exchange process and desalination of water by reverse osmosis method. Numerical problems. Specifications of potable water--Steps involved in treatment of water – Sterilization by Chlorination -Disinfection of water by chlorination and ozonation. Break Point Chlorination – advantages. Corrosion: Causes and effects of corrosion. Types of Corrosion-Dry corrosion – its types or Chemical corrosion and Wet or Electrochemical corrosion and their mechanism.

Concentration cell corrosion. Waterline, Pitting and galvanic corrosion. Factors effecting rate of corrosion.

### **Unit-III: (10 Hrs)**

Polymers: Basics of terms polymers: Monomer functionality, degree of polymerization. Types of Polymerization (i) Addition--Mechanism of free radical polymerization (ii) Condensation (iii) Co-Polymerization with examples.

Classification of polymers - Thermoplastics & Thermosetting resins.

Plastics, Fibres and Elastomers and their characteristics. Preparation, Properties & Uses of the following polymers: Plastics - PVC and Bakelite, Fibres - Nylon 6:6, and Dacron. Elastomers - Buna-S, Butyl Rubbers.

Conducting polymers: Concept, Classification and Mechanism of conduction in Trans Poly-acetylene, Doped Conducting Polymers. Applications of conducting polymers.

Biodegradable polymers: Concept. preparation, properties and applications of polylactic acid

### **Unit-IV: (10 Hrs)**

Chemical Fuels: Concept, definition and classification of fuels- Primary and secondary fuels. Solid, liquid and gaseous fuels. Characteristics of a good fuel. Calorific Value – High Calorific Value(HCV) and Low Calorific Value (LCV). Numerical problems.

Solid Fuels: Coal and its types. Analysis of coal - Proximate and Ultimate analysis. Numerical Problems.

Liquid Fuels: Petroleum. Composition of Gasoline, Diesel and Kerosene. Cracking & its Significance- Catalytic cracking by moving bed method, Knocking. Fuel rating – Octane and Cetane numbers.

Gaseous Fuels: LPG, CNG –Composition, characteristics and applications.

**Unit-V: (10 Hrs)**

Green Chemistry, Green Engineering Principles: Concept, Principles of green chemistry –.

Principles of Green Engineering.

Biodiesel: Sources, Concept of Trans esterification. Properties and significance

**Text Books:**

- T1. PC Jain, M Jain Engineering Chemistry, Dhanpat Rai & sons, 16<sup>th</sup> edition, 2015, New Delhi. (Unit: 1,4,5)
- T2. B.R. Puri, L.R. Sharma and M.S. Pathania, “Principles of Physical Chemistry”, S. S. Chand & Company Ltd., Revised edition (2013). (Unit 2)
- T3. Sashi Chawla,—Engineering Chemistry, Dhanpat Rai & Sons, New Delhi, 2017 (1st January 2017) (Unit 3 )
- T4. O G Palanna, —Engineering Chemistry, Tata Mc Graw Hill, New Delhi, First Edition 2009.(Unit 2&4)

**Reference Books :**

- R1. J D Lee, Concise inorganic chemistry, Blackwell science ltd, USA, Fifth edition
- R2. P.W. Atkins, Physical Chemistry .
- R3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, “Organic Chemistry”, Wiley, 12th edition (2017).



Course code	Course Title	Core/ Elective					
HS101HS	English	Core					
		L	T	P/D	Credits	CIE	SEE
		2	0	0	1	40	60

**Prerequisite: Know the basic functions of the Language**

**Course Objectives:** The following are the Objectives of the Course:

To enable and enhance the English language abilities of engineering students, especially in reading and writing, by –

- Using authentic material for language learning and gaining proficiency in it (Knowledge) (Comprehension)
- Exposing them to a variety of content-rich text.
- Strengthening their grammar and vocabulary.
- Improving their reading and comprehension skill.
- Honing their writing skills.
- Encouraging them to think creatively and critically.

**Course Outcomes:**

After completion of the course, the student will be able to

- **CO.1.** Read, understand, interpret and comprehend a variety of written texts and develop positive attitude and commitment towards their (students’) goal and society.
- **CO.2** Remember and recognize the significance of vocabulary (roots and affixes, homonyms, one- word substitutes, etc.) and use language accurately for effective communication.
- **CO.3** Apply appropriate grammatical concepts (tenses, articles, prepositions, etc.) to spoken and written English in informal and formal ambience.
- **CO.4** Compile information of various aspects of English diction – Develop creativity in writing skills by framing Paragraphs, Essays, Letters, Emails and SOPs.
- **CO.5** Analyze different ways of life through reading prose and poetry, each symbolizing a particular virtue and the learners develop the ability to be creative.

**Unit – I : (6 Hrs)**

Reading : Amitav Ghosh “Coming Home”

Vocabulary : Word Formation – Prefixes, Suffixes , Root words

Grammar : Articles, Prepositions, Determiners

Writing : Types of Sentences; Guided Writing (Expanding the Outline / Writing from verbal cues)

**Unit – II : (6 Hrs)**

Reading : Rudyard Kipling, “If”

Vocabulary : Word Formation – Compounding and Blending, Contractions

Grammar : Transitions, Connectives, Question Tags

Writing : Précis & Paragraph Writing

**Unit – III : (6 Hrs)**

Reading : Martin Luther King Jr. “I have a Dream”

Vocabulary : Synonyms, Antonyms, One-Word Substitutes

Grammar : Voice

Writing : Letter Writing

**Unit – IV : (6 Hrs)**

Reading : Robert Frost, “Road Not Taken”

Vocabulary : Homophones, Homonyms, Homographs

Grammar : Narration (Direct – Indirect Speech)

Writing : Reporting Events (Swearing in, Poll-Address, News Events, Visit to Book Exhibition, Annual /Farewell Day)

**Unit – V : (6 Hrs)**

Reading : George Orwell’ “ The Sporting Spirit” ( Excerpt)

Vocabulary : Inclusive Language, Euphemism

Grammar : Tense

Writing : SOP

**Text Books :**

**T1.** E. Suresh Kumar, *Engineering English*, Orient Black Swan, 2014.

**References / Suggested Reading:**

**R1. Modern English Grammar**

**R2. “Grammar in Use”** Raymond Murpphy

**R2.** Sudharshana, NP and C Savitha, *English for Engineers*. Cambridge University Press 2018.

Course code	Course Title	Core/ Elective					
ES101CS	Programming for Problem Solving	Core					
		L	T	P/D	Credits	SEE	CIE
		3	0	0	3	40	60
<p><b>Prerequisite:</b> Mathematical Knowledge, Logical and Analytical Thinking</p> <p><b>Course Objectives:</b> The objective of this course is to make the student</p> <ul style="list-style-type: none"> <li>To introduce the basic concepts of Computing environment, algorithms and flowcharts</li> <li>To acquire knowledge about the basic concept of writing a program</li> <li>To understand modular and structured programming constructs in C</li> <li>To learn the usage of structured data types, data handling and memory management using pointers</li> </ul> <p><b>Course Outcomes:</b></p> <p>After completion of the course, the student will be able to</p> <ol style="list-style-type: none"> <li>Formulate algorithms and learn fundamental program methodologies of C programming.</li> <li>Understand control statements and interpret derived data types with mathematical and engineering problems.</li> <li>Develop modular programming techniques to solve searching, sorting and file system problems.</li> <li>Recognize pre-processor directives and user defined usage.</li> </ol>							
<p><b>Unit – I (11)</b></p> <p><b>Introduction to Computers:</b> Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.). Algorithm, Flowchart / Pseudo code with examples</p> <p><b>Introduction to C Language:</b> History of C, Features, Structure of C program, Character set, Tokens, Variables, Data types, I/O statements, Type conversion Syntax and Logical Errors in compilation, object and executable code.</p> <p><b>Unit – II (11)</b></p> <p><b>Operators and Control Structures:</b> Operators, Operator precedence, Arithmetic expressions, Conditional Branching and Loops, Writing and valuation of conditionals and consequent branching</p> <p><b>Arrays:</b> Arrays (1-D, 2-D), Strings and its library functions.</p> <p><b>Unit – III (10)</b></p> <p><b>Basic Algorithms:</b> Searching, Basic Sorting Algorithms (Bubble and Selection).</p> <p><b>Functions:</b> Functions, storage classes, Parameter passing techniques Passing arrays to functions, Recursion Concept, Command line arguments.</p> <p><b>Unit – IV (10)</b></p> <p><b>Pointers:</b> Idea of pointers, Defining pointers, array of pointers, pointer arithmetic,</p>							

dynamic memory allocation,

**Structure:** Structures, Defining structures and Array of Structures, self – referential structures, Union’s concept, Functions and structures, Enum, Bitfields.

**Unit – V (8)**

**Pre-processor Directives:** File Inclusion, Macros Substitutions, Conditional Compilation.

**File Handling:** Introduction to File Handling, Types of files, File operations, File input/output statements.

**Text Books:**

- T1. Computer Science A structured programming approach using C, Behrouz Forouzan and Richard F. Gilberg , Cengage Learning , 2007 ,Third Edition (Unit 1-5)
- T2. Schaum's Outline of Programming with C, Byron Gottfried, McGraw-Hill 2019, Fourth Edition (Unit 1-5)
- T3. Data Structures and Program Design in C, Robert Kruse, Bruce Leung, Tondo, Pearson, II Edition

**References/ Suggested Reading**

- R1. C Programming Language, Brian W Kenningham, Dennis M Ritchie, Pearson, II Edition
- R2. How to solve it by Computer, R G Dromey, Pearson Edition

Course code	Course Title	Core/ Elective					
BS253HS	Chemistry Lab	Core					
		L	T	P/D	Credits	CIE	SEE
		0	0	3	1.5	40	60
<p><b>Prerequisite:</b> Higher secondary level Chemistry</p> <p><b>Course Objectives:</b> The objective of this course is to make the student</p> <ul style="list-style-type: none"> <li>➤ Conduct experiments, take measurements and analyze the data through hands-on experience in order to demonstrate understanding of the theoretical concepts of quantitative Analysis while working in small group.</li> <li>➤ Interpret the electro analytical principles with experimental results graphically</li> <li>➤ Demonstrate writing skills through clear laboratory reports</li> </ul> <p><b>Course Objectives:</b> After completion of the course, the student will be able to</p> <ul style="list-style-type: none"> <li>➤ CO1. Apply the principles of volumetric analysis in quantitative estimations.</li> <li>➤ CO2. Analyse the parameters of water by titration method.</li> <li>➤ CO3. Understand the principle, concept, working and applications of Conductivity Meter to determine the concentration of chemicals.</li> <li>➤ CO4. Understand the principle, concept, working and applications of Potentiometer to determine the concentration of chemicals.</li> <li>➤ CO5. To apply the law for determining the concentration of a given chemical.</li> </ul>							
<p><b>List of Experiments</b></p> <ol style="list-style-type: none"> <li>1. Introduction to Chemical Analysis and Techniques of Weighing. <b><u>Volumetric Analysis:</u></b></li> <li>2. Preparation of Standard Mohr's salt solution, Standardization of <math>\text{KMnO}_4</math> and estimation ferrous ion.</li> <li>3. Preparation of Standard <math>\text{K}_2\text{Cr}_2\text{O}_7</math> solution, Standardization of Mohr's Salt Solution and estimation of dichromate ion. (<math>\text{Cr}_2\text{O}_7^{2-}</math>) <b><u>Complexometry</u></b></li> <li>4. Preparation of Standard Magnesium sulphate solution, standardization of EDTA and estimation of Total Hardness of water. Preparation of Standard Sodium Carbonate Solution, Standardization of HCl and Estimation of Carbonate and Bicarbonate Alkalinity of water sample. <b><u>Conductometry:</u></b></li> <li>5. Estimation of HCl by conductometry. <b><u>Potentiometry</u></b></li> <li>6. Estimation of HCl by potentiometry (acid base titration)</li> <li>7. Estimation of <math>\text{Fe}^{2+}</math> by potentiometry (redox titration) <math>\text{pH}</math> metry</li> </ol>							

8. Estimation of HCl by  $P^H$  Metry.
9. Colorimetry
10. Verification of Beers Law using potassium permanganate and estimation of amount  $KMnO_4$  in the given sample solution.

**List of Additional Experiments**

1. Estimation of  $CH_3COOH$  by conductometry

**References :**

1. B.D. Khosla, A. Gulati and V. Garg , —Senior Practical Physical Chemistry, R. Chand & Co., Delhi, 2011.
2. K. K. Sharma and D.S. Sharma , —An Introduction to Practical Chemistry, Vikas publishers, New Delhi, 1982.

Course code	Course Title	Core/ Elective					
HS251HS	English Lab	Core					
		L	T	P/D	Credits	CIE	SEE
			0	2	1	40	60
<p><b>Prerequisite:</b> Understanding of the English Alphabet and the Corresponding Sounds</p> <p><b>Course Objectives:</b> The objective of this course is to enable the student to :</p> <ul style="list-style-type: none"> <li>➤ Learn the Sound Systems, Word Stress, Intonation of English</li> <li>➤ Gain the knowledge of the appropriate use of Language and Body Language</li> <li>➤ Acquire the Techniques to Participate in Group Discussions</li> <li>➤ Hone their Participation and Presentation Skills</li> <li>➤ Comprehend how Interviews are conducted and faced</li> </ul> <p><b>Course Outcomes:</b> After completion of the course, the student will be able to</p> <ul style="list-style-type: none"> <li>➤ Enhance Pronunciation, Stress, Intonation and Articulation Skills</li> <li>➤ Speak the Language coherently, with a lesser MTI</li> <li>➤ Employ Language and Body Language intelligibly</li> <li>➤ Engage in Group Discussions efficiently</li> <li>➤ Prepare and Produce Decent Presentations to Fare, Well in Interviews</li> </ul>							
<p><b>LIST OF EXPERIMENTS</b></p> <ol style="list-style-type: none"> <li>1. <b>Ice-Breaking Session</b></li> <li>2. <b>Introduction to English Phonetics :</b> Organs of Speech : Speech Mechanism</li> <li>3. <b>Sounds of English :</b> Introduction to International Phonetic Alphabet, Classification and Description of English Phonetic Sounds – Vowel Sounds &amp; Consonant Sounds; Minimal Pairs; The Syllable</li> <li>4. <b>Word Stress :</b> Primary Stress, Secondary Stress, Functional Stress, Rules of Word Stress</li> <li>5. <b>Intonation :</b> Major Patterns of Intonation in English</li> <li>6. <b>Speaking Activity: JAM :</b> an impromptu speech where the speaker is supposed to express the idea (s) on the given topic, within the duration of a <b>minute</b>.</li> <li>7. <b>Role Play:</b> Use of dialogues in a variety of situations and settings</li> <li>8. <b>Group Discussion:</b> Initiating, continuing and concluding a GD, Components and Types of GDs,</li> <li>9. <b>Power-Point Presentation: (General Topics)</b> Making effective presentations, Expressions which can be used in presentations, Use of non-verbal communication, Coping with stage fright, Handling questions and answer session</li> </ol>							

10. **Interview Skills:** Facing interviews confidently, Use of suitable expressions during interviews; Mock interviews

**Text Books:**

T1. E. Suresh Kumar. *A Handbook for English Language Laboratories (with CD)*. Revised edition, Cambridge University Press India Pvt. Ltd. 2014

**Reference / Suggested Reading:**

R1. T. Balasubramanian. *A Text book of English Phonetics for Indian Students*. Macmillan, 2008.

R2. Edgar Thorpe. *Winning at Interviews*. Pearson Education, 2006.

R3. J. Sethi et al., *A Practical Course in English*

R4. Pronunciation (with CD). PrenticeHall of India,2005.

R5.Hari Mohan Prasad. *How to Prepare for Group Discussions and Interviews*. TataMcGraw Hill,2006.



Course code	Course Title	Core/ Elective					
		Core					
ES151CS	Programming for Problem Solving Lab	L	T	P/D	Credits	CIE	SEE
		0	0	2	1	40	60
<p><b>Prerequisite:</b> Mathematical Knowledge, Logical and Analytical Thinking</p> <p><b>Course Objectives:</b> The objective of this course is to make the student</p> <ul style="list-style-type: none"> <li>➤ Understand the fundamentals of programming in C Language.</li> <li>➤ Write, compile and debug programs in C.</li> <li>➤ Formulate solution to problems and implement in C.</li> <li>➤ Effectively choose programming components to solve computing problems</li> <li>➤ Plot graphs between different physical parameters.</li> </ul> <p><b>Course Outcomes:</b> After completion of the course, the student will be able to</p> <ul style="list-style-type: none"> <li>➤ Choose appropriate data type for implementing programs in C language</li> <li>➤ Design and implement modular programs involving input output operations, decision making and looping constructs</li> <li>➤ Apply derived data types and implement programs to store data in structures and files</li> <li>➤ Develop confidence for self-education and ability towards lifelong learning need of computer languages</li> </ul>							
<b>LIST OF EXPERIMENTS</b>							
<ol style="list-style-type: none"> <li>1. Finding maximum and minimum of given set of numbers, finding roots of quadratic equation.</li> <li>2. Sin x and Cos x values using series expansion.</li> <li>3. Generating Pascal triangle, pyramid of numbers.</li> <li>4. Factorial, Fibonacci, GCD recursive and non-recursive procedures</li> <li>5. Linear search and binary search using recursive and non-recursive procedures.</li> <li>6. Bubble sort and selection sort.</li> <li>7. Matrix addition and multiplication using arrays,</li> <li>8. Programs on pointers: pointer to arrays, pointer to functions.</li> <li>9. Programs on structures, union, enum and string manipulations.</li> <li>10. File handling programs (Reading, Writing, Copying files)</li> <li>11. Program illustrating using Command Line Arguments</li> </ol>							

Course code	Course Title	Core/ Elective					
		Core					
		L	T	P/D	Credits	CIE	SEE
ES252ME	Engineering Workshop Practice	0	0	4	2	40	60
<p><b>Prerequisite: Practical skill</b></p> <p><b>Course Objectives:</b> The objective of this course is to make the student</p> <ul style="list-style-type: none"> <li>Identify and use marking out tools, hand tools, measuring equipment and to work to prescribed tolerances.</li> <li>To provide hands on experience about use of different engineering materials, tools, equipments and processes those are common in the engineering field.</li> <li>To gain basic knowledge on various manufacturing processes used for the production of various engineering products.</li> <li>To gain hands on exposure on computer hardware and working knowledge on computers and software.</li> </ul> <p>Adopt safety practices while working with various tools.</p> <p><b>Course Outcomes:</b> After completion of the course, the student will be able to</p> <ul style="list-style-type: none"> <li>➤ <b>CO.1.</b> Identify and demonstrate the usage of different tools to be used in various manufacturing trades with safety measures.</li> <li>➤ <b>CO.2.</b> Apply the skills developed to undertake the jobs connected to various engineering workshop trades including fitting, carpentry, sheet metal, house wiring, welding, and foundry.</li> <li>➤ <b>CO.3.</b> Demonstrate the knowledge of various machine tools and their operations such as machining, injection moulding, casting and 3D printing and basic electronics lab instruments.</li> <li>➤ <b>CO.4.</b> Illustrate the advanced machining processes like CNC, rapid prototyping.</li> <li>➤ <b>CO.5</b> Apply the basic knowledge of computers to assemble and disassemble various components of computer and able to install various operating systems such as windows or Linux.</li> </ul>							
<b>LIST OF EXPERIMENTS</b>							
<b>A. TRADES FOR EXERCISES:</b>							
<i>At least two exercises to be done from each trade.</i>							
1. <b>CARPENTRY:</b> Sawing and Grooving, T-lap joint, Dove-tail Joint.							

2. **FITTING:** Step Cutting & Filing, Drilling & Tapping, V-Fitting
3. **HOUSE WIRING:** Parallel & Series, Two-Way Switch, Tube light Connections.
4. **SHEET METAL WORKING:** Open Scoop, Funnel, Rectangle Tray.
5. **BLACK SMITHY:** Upsetting, Fullering, S-Hook
6. **WELDING:** Lap joint, Single V-butt joint, Corner joint
7. **PLUMBING:** Practice of Internal & External Pipe Threading, Pipe Fitting, Tap and Shower connections.

**B. TRADES FOR DEMONSTRATION AND EXPOSURE:**

1. Machines (lathe and drilling)
2. Injection Molding
3. Mould making and Casting
4. Basic Electronics Lab Instruments
5. 3D Printing

**C. PRESENTATIONS AND VIDEOS LECTURES:**

1. Manufacturing Methods
2. Glass Cutting
3. 3D Printing
4. CNC Lathe

**D. IT-WORKSHOP:** Computer hardware, Identification of parts, disassembling and assembling of computer to working condition. Operating System Installation

**Text Book:**

1. P. Kannaiah, K.L.Narayana “Workshop Manual” Scitech Publications; 2<sup>nd</sup> Edition.

**References:**

1. Venugopal,K, “Workshop Manual”, Anuradha Publications; 2012<sup>th</sup> edition.
2. K.C.John, “Mechanical Workshop” 2<sup>nd</sup> Edition, PHI, 2010.
3. Hajra Choudhury, “Elements of Workshop Technology” Vol.1, Asian Publishers, Edu., 2010.

Course code	Course Title	Core/ Elective					
BS202HS	Engineering Mathematics – II	Core					
		L	T	P/D	Credits	CIE	SEE
		3	1	0	4	40	60
<p><b>Prerequisite:</b> Basics of Differentiation, Integration and Trigonometric results.</p> <p><b>Course Objectives:</b> The objective of this course is to make the student</p> <ul style="list-style-type: none"> <li>➤ Study the concepts of sequences, series, and their properties.</li> <li>➤ Provide the over view of ordinary differential equations of first order and their application to mathematical problems.</li> <li>➤ Solving higher order ordinary differentiation by various mathematical methods.</li> <li>➤ Evaluate improper integrals using Beta and Gamma functions</li> <li>➤ Study Laplace transforms and its applications to differential equations.</li> </ul> <p><b>Course Outcomes:</b></p> <p>After completion of the course, the student will be able to</p> <ul style="list-style-type: none"> <li>➤ <b>CO.1.</b> To Test for the convergence and divergence of infinite series using the comparison test, Ratio test, Cauchy's nth root test, Leibnitz's test, and also analyzing the nature of series.</li> <li>➤ <b>CO.2.</b> Solve the ordinary differential equations of first order and their physical and geometrical applications.</li> <li>➤ <b>CO.3</b> Solve the ordinary differential equations of second and higher with constant and variable coefficient by different methods. Solution of non-homogeneous equations, Euler-Cauchy equation. Method of variation of parameters.</li> <li>➤ <b>CO.4</b> Evaluate the improper integrals using beta and gamma functions. Solution of Legendre polynomials.</li> <li>➤ <b>CO.5</b> Evaluate Laplace Transforms, Inverse Laplace Transforms of functions and their applications to ordinary differential equations.</li> </ul>							
<p><b>Unit-I (10Hrs)</b></p> <p><b>Sequence and series:</b> Sequences—General properties of series, Series of positive terms, Comparison test, tests of convergence-D'Alembert's Ratio test, Cauchy's nth root test, Raabe's test, Logarithmic test, Alternating series, Series of positive and negative terms, Absolute convergence, and Conditional convergence.</p> <p><b>Unit-II (10Hrs)</b></p> <p><b>Differential Equations of First Order:</b> Exact Differential Equations, Integrating Factors, Linear differential Equations, Bernoulli's Equation, Riccati's and Clairaut's differential equations, Orthogonal Trajectories of a Given Family of Curves, Applications of differential equations-L-C,L-R</p>							

circuit.

**Unit-III (12Hrs)**

**Differential Equations of Higher Order:** Solutions of second and higher order linear Homogenous Equations with Constant Coefficients, Solutions of non-homogeneous linear differential equations, Method of Variation of Parameters, solution of Euler-Cauchy Equation, Applications of differential equations-L-CR circuit.

**Unit-IV (8Hrs)**

**Special functions:** Gamma Function, Beta Function, Relation between Gamma and Beta Functions, Error Function, Power Series Method, Legendre's Differential Equations and Legendre's Polynomial  $P_n(x)$ , Orthogonal property of Legendre's Polynomial Rodrigue's Formula (with proof).

**Unit-V (10Hrs)**

Laplace Transforms: Laplace Transforms, Inverse Laplace Transforms, Properties of Laplace Transforms and inverse Laplace Transforms, Convolution Theorem (without proof). Solution of ordinary differential Equations using Laplace Transforms.

**TEXT BOOKS:**

- T1. Dr.B.S. Grewal, Higher. Engineering Mathematics, Khanna Publications, 43<sup>rd</sup> Edition,2014. (Unit 1-5)
- T2. Advance Engineering Mathematics by Jain and Iyengar,5<sup>th</sup> Edition, Narosa Publications (Unit 1-5)
- T3.B. V. Ramana, Higher Engineering Mathematics,3<sup>rd</sup> Edition 2015. (Unit 1-5)

**REFERENCES/ SUGGESTED READING:**

- R1. M.D Raisinghania, Ordinary Differential Equations, 11<sup>th</sup> Revised Edition
- R2. S.S. Sastry, Engineering mathematics, 3<sup>rd</sup> Edition, Paperback
- R3. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley, 9<sup>th</sup> Edition, 2012.
- R4. Peter. V. O' Neil, Advance Engineering Mathematics,' Publisher, Global Engineering 7<sup>th</sup> Edition, 2012

Course code	Course Title	Core/ Elective					
BS204HS	APPLIED PHYSICS (Common for CSE, AI&DS)	Core					
		L	T	P/D	Credits	CIE	SEE
		3	1	0	4	40	60
<p><b>Prerequisite:</b> Basics of electron theory, Semiconductors, magnetic materials, basics of black body radiation.</p> <p><b>Course Objectives:</b> The objective of this course is to make the student</p> <ul style="list-style-type: none"> <li>➤ Familiarize with classical and quantum electron theories and use band theory to classify solids.</li> <li>➤ To explain various types of semiconductors and their applications.</li> <li>➤ Understand the properties of dielectric and Magnetic materials.</li> <li>➤ Understand the Superconductivity phenomena and explain the dual nature of the particles.</li> <li>➤ Know the construction of lasers and optical fibers and apply their basic principles to various laser systems and optical fibers</li> <li>➤ Acquire knowledge of preparation of thin films and basic concepts of Nano materials</li> </ul> <p><b>Course Outcomes:</b> After completion of the course, the student will be able to</p> <ul style="list-style-type: none"> <li>➤ Classify solids based on their energy band structures. Identify semiconductors for engineering applications.</li> <li>➤ Classify magnetic and dielectric materials</li> <li>➤ Explain the fundamental concepts on superconductivity and Quantum behavior of matter waves.</li> <li>➤ Explain the lasing action in lasers, propagation of light in optical fibers and compile their applications different fields.</li> <li>➤ Knowledge about preparation they're of thin film and Nano material, this helps the students to prepare new materials.</li> </ul>							
<p><b>Unit-I: (11 Hrs)</b></p> <p><b>Band theory of solids:</b> Classical free electron theory and its limitations, Band theory – Kronig penny model (qualitative treatment), Energy bands in solids, Classification of materials as conductors, semiconductors and insulators.</p> <p><b>Semiconductors:</b> Introduction, Intrinsic and extrinsic semiconductors, carrier concentration and conductivity in intrinsic semiconductors, formation of P-N junction diode and its I-V characteristics, Thermistor, Hall effect and its applications.</p> <p><b>Unit-II: (11 Hrs)</b></p> <p><b>Dielectric materials:</b> Introduction, Types of dielectric polarizations – Expression for electronic polarizability, Frequency and temperature dependence of dielectric polarizations, Determination of dielectric constant by Capacitance bridge method, Ferro electricity – Structure of Barium Titanate – Applications of ferroelectrics.</p> <p><b>Magnetic materials:</b> Introduction, Magnetization, Magnetic Flux, Magnetic Susceptibility, Classification of magnetic materials – Dia, para, ferro, antiferro and ferri magnetic materials. Ferrites - properties and its applications, Domain theory of Ferromagnetism, Hysteresis curve, Soft and hard magnetic materials and their</p>							

applications.

**Unit-III: (10 Hrs)**

**Superconductivity:** Introduction, General properties of superconductors- persistent current, critical current, critical magnetic field, critical temperature, Meissner effect, Type I and Type II superconductors, Applications of superconductor, BCS theory (qualitative), High Temperature superconductors and its applications.

**Quantum Mechanics:** Introduction to Planck's Theory, de-Broglie's concept – wave nature of particles (de-Broglie wavelength), properties of wave function and its physical significance, Schrodinger's Time independent and Time dependent wave equations, Application of Schrodinger's Time independent - Particle in a 1D box.

**Unit-IV: (9 Hrs)**

**Lasers:** Characteristics of Lasers – monochromatic, directionality, coherence, divergence, Basic concepts of transitions - absorption, spontaneous and stimulated emissions, Einstein's theory of matter and radiation interaction (A & B coefficients), Concepts of meta stable states, population inversion and pumping, Components of lasers, Types of lasers- Ruby laser, He-Ne laser, Semiconductor laser and Applications of laser.

**Fiber optics:** Introduction to Optical fiber, structure of an optical fiber, Basic principle – total internal reflection, Concept of Numerical Aperture (NA) and acceptance angle, Derivation of Numerical Aperture, Types of optical fibers – Step Index and Graded Index fibers (w.r.t to refractive index and mode of propagation), Fiber drawing process (Double crucible method), Applications of optical fibers.

**Unit-V: (9 Hrs)**

**Thin Films:** Distinction between bulk and thin films – Thin films preparation Techniques- Thermal evaporation method, Electron beam evaporation method, Pulsed laser deposition, Solar cell- Construction, working – and its applications.

**Nano materials:** Introduction, Properties of materials at reduced size, Surface to volume ratio at Nano scale, Classification of Nano materials, Preparation of Nano materials – Bottom-up methods (sol-gel & CVD) and Top-down method (ball milling), Basic ideas of carbon nanotubes, Applications of Nano materials and their health hazards

**Text Books:**

- T1. S.L.Gupta and Sanjeev Gupta, Modern Engineering Physics, Dhanpat Rai publications, 2011Edition, Reprint 2012.(Unit 1-4)
- T2. B.K.Pandey and S.Chaturvedi, Engineering physics, Cengage Publications, 2012, 1<sup>st</sup> Edition. (Unit 1-5)
- T3. M.N.Avadhanulu, P.G. Kshirsagar and TVS Arun Murthy, A Text Book Engineering Physics, 11<sup>th</sup> Edition, S.Chand, 2018.(Unit 1-4).

**References/ Suggested Reading**

- R1. Charles Kittel, Introduction to Solid State Physics, Wiley India Edition Paperback – 1 January 2019
- R2. V. Raghavan, Materials Science and Engineering, Prentice Hall India Learning Private Limited; 6<sup>th</sup> Revised Edition, 2015.
- R3. K.L. Chopra, Thin film Phenomena, New York, McGraw – Hill, 1969.



Course code	Course Title	Core/ Elective					
ES202CS	Data Structures	Core					
		L	T	P/D	Credits	CIE	SEE
		3	0	0	3	40	60
<p><b>Prerequisite: Programming for Problem Solving</b></p> <p><b>Course Objectives:</b> The objective of this course is to make the student</p> <ul style="list-style-type: none"> <li>To study the importance of structuring the data for easy access and storage.</li> <li>To know the implementation of various data structures.</li> <li>To acquire skills in using generic principles for data representation and manipulation with a view for efficiency, maintainability and code reuse.</li> <li>To understand the basic concepts of advanced data structures</li> </ul> <p><b>Course Outcomes:</b> After completion of the course, the student will be able to</p> <ol style="list-style-type: none"> <li>Understand the concept of Dynamic memory management, data types, algorithms, Asymptotic notation.</li> <li>Describe how arrays, records, linked structures, stacks, Queue, and Graphs are represented in memory</li> <li>Develop applications using Linear and Non-linear data structures.</li> <li>Apply the suitable data structure for a real world problem and think critically for improvement in solutions.</li> </ol>							
<p><b>UNIT-I</b></p> <p><b>Introduction to Algorithms:</b> Introduction, Algorithm Specifications, Recursive Algorithms, Performance Analysis of an algorithm- Time and Space Complexity, Asymptotic Notations, Amortized Analysis</p> <p><b>UNIT-II</b></p> <p><b>Linked Lists ADT:</b> Singly linked lists: Representation in memory, Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list; Linked representation of Stack and Queue</p> <p><b>Doubly linked list:</b> Operations like traversing, searching, insertion, deletion, Circular Linked Lists: operations like traversing, searching, insertion, deletion.</p> <p><b>UNIT-III</b></p> <p><b>Stacks and Queues:</b> ADT Stack, operations and its applications like Expression Conversion and evaluation, Queue ADT and its operations: Linear Queue, Circular Queue, Dequeue</p> <p><b>UNIT-IV</b></p> <p><b>Trees:</b> Basic Tree Terminologies, Different types of Trees: Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree and their operations, Heaps.</p> <p><b>UNIT-V</b></p> <p><b>Sorting and Searching:</b> Objective and properties of different sorting algorithms: Selection Sort, Insertion Sort, Quick Sort, Merge Sort, Heap Sort, Linear and</p>							

Binary Search algorithms, Hashing (linear probing, random probing, quadratic probing, rehashing, double hashing), Dictionaries

**Graph:** Basic Terminologies and Representations, Graph traversal techniques.

***Suggested Readings:***

T1. “Fundamentals of data structure in C” Horowitz, Sahani & Freed, Computer Science Press.

T2. Gilberg and Forouzan: “Data Structure- A Pseudo code approach with C” by Thomson publication

T3. “Data structure in C” by Tanenbaum, PHI publication / Pearson publication.

***Reference Books:***

R1. Introduction to Data Structures with Applications, Jean-Paul Tremblay, Paul G Sorenson, II Edition,

R2. Data structures and Algorithm Analysis in C, 2nd edition, M.A.Weiss, Pearson.

R3. Data Structures & Algorithms; Concepts, Techniques & Algorithms”, Pai, Tata McGraw Hill.

R4. Aho, Hopcroft and Ullman, —Data Structures and Algorithms, Pearson Education, 1983.

Course code	Course Title	Core/ Elective					
ES202EE	Elements of Electrical and Electronics Engineering	Core					
		L	T	P/D	Credits	CIE	SEE
		2	0	0	nil	40	60
<p><b>Prerequisite:</b> Basics of networks, circuits, and Semiconductor's materials.</p> <p><b>Course Objectives:</b> The objective of this course is to make the student</p> <ul style="list-style-type: none"> <li>➤ Familiarize with electrical networks, circuits and different Laws used to solve electrical circuits.</li> <li>➤ Understand various network reduction techniques to analyze electrical circuits.</li> <li>➤ Understand the concept of network theorems for reducing complex networks.</li> <li>➤ Understand the characteristics of diodes and transistor configurations.</li> <li>➤ Understand the design concepts of biasing of BJT and FET.</li> </ul> <p><b>Course Outcomes</b></p> <p>After completion of the course, the student will be able to</p> <ul style="list-style-type: none"> <li>➤ <b>CO.1</b> Understand the concepts of electrical circuits and Analyze complex electrical circuits with the help of different network theorems.</li> <li>➤ <b>CO.2</b> Understand the basic concepts of Electrical DC Machines.</li> <li>➤ <b>CO.3</b> Understand the basic concepts of transformers and three phase induction motors.</li> <li>➤ <b>CO.4</b> Analyze the rectifiers and regulator circuits.</li> <li>➤ <b>CO.5</b> Analyze the performance of BJTs, FETs on the basis of their operation and working.</li> </ul>							
<p><b>Unit-I: (08 Hrs)</b></p> <p><b>Introduction to Electrical Circuits:</b> Circuit Concept, R-L-C Parameters, Voltage and Current Sources, Source Transformation, Voltage – Current relationship for Passive Elements, Ohm's Law, Kirchhoff's Laws, Series, Parallel, Series Parallel Combinations, Superposition, Thevenin's, Norton's theorems.</p> <p><b>Unit-II: (08 Hrs)</b></p> <p><b>DC Machines:</b> Principle of operation of Generator and Motor-construction of DC machine- EMF equation-Torque equation- Armature circuit equation for motoring and generation, Types of field excitations. Open circuit characteristic of separately excited DC generator. Speed control methods, Losses and Efficiency.</p> <p><b>Unit-III: (09 Hrs)</b></p> <p><b>Introduction to AC fundamentals, Transformers:</b> Principle of operation, construction and operation of single-phase transformers, ideal and practical transformers, equivalent circuit, phasor diagram, voltage regulation, losses and efficiency. Autotransformers - construction, principle of operation applications, Three-phase transformer - construction, types of connection and their comparative</p>							

features.

**Three-phase induction motors:** Three-phase induction motors–Construction, types, production of a rotating magnetic field-principle of operation. Losses and efficiency.

**Unit-IV: (07 Hrs)**

**P-N Junction Diode:** Characteristics, Half wave rectifier, Full wave rectifier, filters, ripple, regulation, TUF and efficiency, Zener diode and Zener diode regulators. CRT construction and CRO applications.

**Unit-V: (07 Hrs)**

**Transistors:** BJT construction and working, modes of operation, configurations of BJT (CB, CE, CC), small signal h-parameter model of CE, CE amplifier analysis. Construction and working of JFET, V-I characteristics of JFET.

**Introduction to Oscillators:** LC oscillators, RC oscillators (Qualitative Treatment only).

**Text Books:**

- T1. Electrical Circuit Analysis, William H Hayt and Jack Kemmerly , 8<sup>th</sup> Edition, 2014 (Unit 1-3)
- T2. Electronic Devices, Floyd, Pearson Publications, Seventh Edition, 2019. (Unit 4-5)

**References/ Suggested Reading:**

- R1. “Basic Electrical Engineering”, N. K. De, Universities Press, 2015.
- R2. “Fundamentals of Electrical Engineering and Electronics”, J.B. Gupta, S. K. Kataria & Sons Publications, 2002.
- R3. “Electronic Devices and Circuits”, Theodore F Bogart, Pearson Publications, 2004.
- R4. “Electronics Devices and Circuits”, J B Gupta, Katson Educational Series, 6<sup>th</sup> Edition.
- R5. Circuit Theory Analysis and Synthesis by Abhijit Chakrabarti, Dhanpat Raj & Co., 2018. (Unit 1-3).

Course code	Course Title	Core/ Elective					
MC201CE	Environmental Science	Core					
		L	T	P/D	Credits	CIE	SEE
		2	0	0	Nil	40	60

**Prerequisite:**

**Course Objectives:** The objective of this course is to make the student

- Describe various types of natural resources available on the earth surface.
- Explain the concepts of an ecosystem and the biotic and abiotic components of various aquatic ecosystems.
- Identify the values, threats of biodiversity, endangered and endemic species of India along with the conservation of biodiversity.
- Explain the causes, effects and control measures of various types of environmental pollutions.
- Describe the methods for water conservation, the causes, effects of global warming, climate change, acid rain, ozone layer depletion, population explosion.

**Course Outcomes** After completion of the course, the student will be able to

- CO.1. Describe the various types of natural resources.
- CO.2 Differentiate between various biotic and abiotic components of ecosystem.
- CO.3 Examine the values, threats of biodiversity, the methods of conservation, endangered and endemic species of India.
- CO.4 Illustrate causes, effects, control measures of various types of environmental pollutions.
- CO.5 Explain the methods of water conservation, causes, effects of climate change, global warming, acid rain and ozone layer depletion, population explosion.

**Unit-I: (08 Hrs)**

**The Multidisciplinary Nature of Environmental Studies:** Definition, scope and importance, need for public awareness.

**Natural Resources:** Water Resources – Use and over utilization of surface and ground water, flood, drought, conflicts over water, Dams: Benefits and Problems. Food Resources – World Food Problems, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, Forest Resources – Use and over exploitation, deforestation & its effect on tribal people. Land Resources – Land Degradation, environmental effect of mining, man induced landslides, soil erosion and desertification. Energy Resources – Growing energy needs, Renewable and Non-renewable energy resources.

**Unit-II: (06 Hrs)**

**Ecosystems:** Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in ecosystem, food chains, ecological pyramids, ecological succession, types of ecosystems (marine, pond, river,

forest, grassland, desert)

**Unit-III: (06 Hrs)**

**Biodiversity:** Levels of Biodiversity, Bio-geographical classification of India, Value of biodiversity, Threats to biodiversity, endangered and endemic species of India, Conservation of biodiversity, global and national efforts.

**Unit-IV: (07 Hrs)**

**Environmental Pollution:** Definition, Causes, effects and control measures of air pollution, water pollution, soil pollution, noise pollution, thermal pollution, solid waste management.

**Environment Protection Act:** Air, water, forest and wildlife Acts, issues in the enforcement of environmental legislation

**Unit-V: (06 Hrs)**

**Social Issues and the Environment:** Watershed management and environmental ethics. Climate change, global warming, acid rain, ozone layer depletion.

**Environmental Disaster Management:** Types of disasters, impact of disasters on environment, infrastructure, and development. Basic principles of disaster mitigation, disaster management, and methodology. Disaster management cycle and disaster management in India.

**Field Work:**

- Visit to a local area to document
- Visit to a local polluted area- market/slum area/Industrial area/traffic area

**Text Books:**

T1. Deswal S. and Deswal A., A Basic Course on Environmental studies, Dhanpat Rai & Co Pvt. Ltd. 2018. (Unit 1-5)

T2. Perspectives In Environmental Studies, Anubha Kaushik & C.P Kaushik, New Age International Publishers, 6<sup>th</sup> Edition 2018). (Unit 1–5).

**References/ Suggested Reading**

R1. Benny Joseph, —Environmental Studies”, Tata McGraw Hill (3<sup>rd</sup> Edition, 2017).

R2. Suresh K. Dhameja, Environmental Studies, S.K. Kataria & Sons, 2010.

R3. Rajagopalan R., Environmental Studies, Second Edition, Oxford University Press, 2013.

R4. V.K. Sharma, Disaster Management, National Centre for Disaster Management, IIPE, 1999.

R5. Environmental studies by Erach Bharucha 2005, University Grants Commission, University Press.

Course code	Course Title	Core/ Elective					
BS251HS	Applied Physics Lab	Core					
		L	T	P/D	Credits	CIE	SEE
		0	0	3	1.5	40	60
<p><b>Prerequisite:</b> Higher secondary level Physics</p> <p><b>Course Objectives:</b> The objective of this course is to make the student</p> <ul style="list-style-type: none"> <li>➤ Apply the theoretical knowledge in doing practical experiments.</li> <li>➤ Acquire skills to handle instruments.</li> <li>➤ Understand the behavior of semiconductors and opto-electronic devices.</li> <li>➤ Analyze errors in experimental data.</li> <li>➤ Plot graphs between different physical parameters.</li> </ul> <p><b>Course Objectives:</b> After completion of the course, the student will be able to</p> <ul style="list-style-type: none"> <li>➤ <b>CO151.1.</b> Develop analytical/experimental skills and impart prerequisite hands-on experience for engineering laboratories.</li> <li>➤ <b>CO151.2.</b> Understand the need for precise measurement practices for data recording.</li> <li>➤ <b>CO151.3.</b> Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations.</li> <li>➤ <b>CO151.4.</b> Analyze the techniques and skills associated with modern scientific tools such as lasers and fiber optics</li> <li>➤ <b>CO151.5</b> Acquire knowledge in communication skills through working in groups in performing the laboratory experiments and by interpreting the results</li> </ul>							
<p><b>LIST OF EXPERIMENTS</b></p> <ol style="list-style-type: none"> <li>1. Determination of wavelength of laser using diffraction grating.</li> <li>2. Determination of Numerical Aperture (NA) and Acceptance angle of an optical fiber</li> <li>3. To find the dielectric constant of a given material</li> <li>4. To draw the I-V characteristics of solar cell and to calculate fill factor.</li> <li>5. To draw the I-V characteristics of P-N junction diode and to evaluate series resistance in forward and reverse bias conditions.</li> <li>6. To determine the rigidity modulus of the material of the given wire using Torsional Pendulum.</li> <li>7. To study the Thermistor characteristics, determine the constants A and B.</li> <li>8. To find the value of energy gap of a given semiconductor.</li> <li>9. To draw the curve between the magnetic field and Intensity of magnetization for a given specimen and to find out Coercivity and Retentivity of the specimen.</li> <li>10. Determination of carrier concentration, mobility and Hall co-efficient in a semiconductor using Hall Effect experiment.</li> </ol> <p><b>Note: A minimum of eight experiments to be done.</b></p>							
<p><b>References:</b></p> <p>R1. S. L. Gupta and Dr. V. Kumar, "Practical physics with viva voice", Pragati Prakashan Publishers, Revised Edition, 2009</p> <p>R2. M.N. Avadhanulu, A. A. Dani and Pokely P.M, "Experiments in Engineering Physics", S. Chand &amp;Co,2008</p>							

Course code	Course Title	Core/ Elective					
ES252CS	Data Structures lab	Core					
		L	T	P/D	Credits	CIE	SEE
		0	0	2	1	40	60
<p><b>Prerequisite: Programming and Problem Solving</b></p> <p><b>Course Objectives:</b> The objective of this course is to make the student</p> <ul style="list-style-type: none"> <li>➤ Design and construct simple programs by using the concepts of structures as abstract data type.</li> <li>➤ To have a broad idea about how to use pointers to implement of data structures.</li> <li>➤ To enhance programming skills while improving their practical knowledge in data structures.</li> <li>➤ To strengthen the practical ability to apply suitable data structure for real time application</li> </ul> <p><b>Course Outcomes :</b> After completion of the course, the student will be able to</p> <ul style="list-style-type: none"> <li>➤ Implement linear data structures such as single Linked list, double linked list, stacks, queues using array</li> <li>➤ Understand and implements non-linear data structures such as trees, graphs.</li> <li>➤ Understanding and implementing hashing techniques.</li> <li>➤ Implement various kinds of searching, sorting and traversal techniques and know when to choose which technique</li> </ul>							
<p><b>Programming Exercise:</b></p> <ol style="list-style-type: none"> <li>1. Implementation of Stacks, Queues ADT using arrays</li> <li>2. Implementation of Stacks, Queues ADT using linked lists.</li> <li>3. Implementation of Singly Linked List, Doubly Linked List and Circular List ADT.</li> <li>4. Implementation of stack and use it to convert infix to postfix expression and postfix evaluation</li> <li>5. Implementation of Binary search tree and its operations (creation, traversal, min &amp; max, search)</li> <li>6. Implementation of operations on AVL trees ADT</li> <li>7. Implementation of Linear search and Binary Search</li> <li>8. Implementation of Hashing collision resolution techniques.</li> <li>9. Implementation of Insertion Sort, Selection Sort</li> <li>10. Implementation of Merge Sort, Quick Sort</li> <li>11. Implementation of Heap Sort.</li> <li>12. Implementation of DFS and BFS</li> </ol>							



Course code	Course Title	Core/ Elective					
ES252EE	Elements of Electrical and Electronics Engineering Lab	Core					
		L	T	P/D	Credits	CIE	SEE
		0	0	2	1	40	60
<p><b>Prerequisite:</b> Basics of networks, circuits, and Semiconductors devices.</p> <p><b>Course Objectives:</b> The objective of this course is to make the student</p> <ul style="list-style-type: none"> <li>➤ Apply the theoretical knowledge in doing practical experiments and acquire skills to handle instruments.</li> <li>➤ Understand the behavior of semiconductors and electronic devices.</li> <li>➤ Understand the performance of DC and AC machines.</li> <li>➤ Understand the practical verification of different laws and theorems.</li> </ul> <p><b>Course Outcomes:</b></p> <p>After completion of the course, the student will be able to</p> <ul style="list-style-type: none"> <li>➤ <b>CO.1.</b> Explain common electrical components and their ratings.</li> <li>➤ <b>CO.2.</b> Analyze performance of DC and AC electrical circuits.</li> <li>➤ <b>CO.3.</b> Analyze performance of electrical machines</li> <li>➤ <b>CO.4.</b> Design diode circuit and understand application of zener diode.</li> <li>➤ <b>CO.5.</b> Analyze characteristics of BJTs and FETs.</li> </ul>							
<b>LIST OF EXPERIMENTS</b>							
<ol style="list-style-type: none"> <li>1. CRO- applications, measurements of R, L, C using LCR meter, color coding method.</li> <li>2. Verification of KVL, KCL, Superposition Theorem.</li> <li>3. Verification of Thevenin's and Norton's theorem.</li> <li>4. Loading of transformer- measurement of primary and secondary voltages and currents and power.</li> <li>5. Three phase transformers- star and delta connections. Voltage and current relations.</li> <li>6. OCC characteristics of DC Generator.</li> <li>7. Load test on DC shunt Motor.</li> <li>8. Measurement of phase voltage/ current, line voltage/current and power in a balanced three phase circuit connected in star and delta.</li> <li>9. V-I Characteristics of silicon and Germanium diodes and measurement of static and dynamic resistances.</li> <li>10. V-I Characteristics of silicon and Germanium diodes of Zener diode and measurement of static and dynamic resistances.</li> </ol>							

11. Zener diode application as regulator.
12. Input and output Characteristics of BJT in CB configuration.
13. Input and output V-I Characteristics of BJT in CB configuration.
14. Transfer Characteristics of JFET in CS configuration.
15. Hartley and Collpits oscillator (LC Oscillator).
16. RC Phase shift oscillator (RC oscillator).

**Note: A minimum of ten experiments to be done.**

**References:**

- R1. J.B. Gupta, —Fundamentals of Electrical Engineering and Electronics| S.K. Kataria & Sons Publications, 2002.
- R2. Satish Kumar Peddapelli, G. Sridhar, —Electrical Machines – A Practical Approach|, De Gruyter Publications, 2020.
- R3. Hughes, —"Electrical Technology", VII Edition, International Student -on, Addison Welsey Longman Inc., 1995
- R4. Maheshwari and Anand, Laboratory Experiments and PSPICE Simulations in Analog Electronics, 1st edition, Prentice Hall of India, 2006.
- R5. David Bell A., Laboratory Manual for Electronic Devices and Circuits, Prentice Hall of India, 2001.

Course code	Course Title	Core/ Elective					
ES252CE	Engineering Graphics Lab	Core					
		L	T	P/D	Credits	CIE	SEE
		1	0	4	3	40	60

**Prerequisite:****Course Objectives: The objective of this course is to make the student**

- To inculcate a good understanding of engineering drawing conventions & their significance.
- To impart skills to make technical drawings.
- To impart capability to identify and draw engineering curves to scale.
- To develop skills of drafting projections of standard geometric entities (points, lines, planes, solids with section).
- To develop 3D visualization skills to understand 2D drawings in 3D space & vice versa

**Course Outcomes:**

- After completion of the course, the student will be able to
- **CO-1.** Use appropriate instruments and apply the engineering conventions to draw engineering objects to scale on a drawing sheet.
  - **CO-2.** Make use of AutoCAD software to draft engineering curves like conics, involutes & cycloids.
  - **CO-3.** Make use of AutoCAD software to draft projections of lines, planes, solids and determine unknown lengths & angles in lines
  - **CO-4.** Make use of AutoCAD software to draft sections of solids and development of surfaces.
  - **CO-5.** Convert isometric views to orthographic & vice versa.

Sheet No	Description of the Topic	Contact Hours	
		Lecture	Drawing
2.	Principles of Engineering Graphics and their significance, Usage of drawing instruments. Lettering	1	2
3.	Conic Sections – I Construction of ellipse, parabola and hyperbola given focus and eccentricity.	1	2
4.	Conic Sections – II Construction of ellipse (given major and minor axis), parabola (given base and height),	1	2

	rectangular hyperbola.		
5.	Cycloids (cycloid & epicycloid) and Involutés (involute of triangle, square & circle)	1	2
6.	Scales (plain & diagonal scales)	1	2
7.	Introduction to AutoCAD Basic commands and simple drawings.	1	2 + 2
8.	Orthographic Projections - Projections of points placed in different quadrants.	1	2
9.	Projections of straight lines. Lines parallel to both the planes, line perpendicular to or inclined to one reference plane, Line inclined to both the reference planes.	1	2+2
10.	Projections of planes – I: Orthographic projection of planes in different positions	1	2+2
11.	Projections of solids – I: Regular Prism/Pyramids, cylinders & cones, Projections of solids in simple positions.	1	2
12.	Projection of solids – II: Projections of solids when the axes inclined to one or both the reference planes.	1	2
13.	Section of solids – I: When the sectional plane is parallel or perpendicular to one reference plane.	1	2
14.	Section of solids – II: When the sectional plane is inclined to one reference plane.	1	2
15.	Development of surfaces-I Prism and Cylinders	1	2
16.	Development of Surfaces-II Pyramids and Cones	1	2
17.	Isometric projection – I: Conversion of 3D Isometric/oblique views of compound solids to 2D Orthographic views	1	2

18.	Isometric projection – II: Isometric projection of Stacked regular solids" regular solids being prisms, pyramids, spheres & their frustum	1	2
<p><b>Note: A minimum of Fourteen Drawing Work Sheets to be completed.</b></p> <p><b>Text Books:</b></p> <p>T1. Engineering Drawing, ND Bhatt, Charotar Publication, 53 rd Edition, 2014 (All sheets)</p> <p>T2. Engineering Drawing, KL Narayana &amp; P Kannaya, Scitech publications, 3<sup>rd</sup> Edition, 2013 (All sheets)</p> <p><b>References:</b></p> <p>R1 Engineering Drawing and Graphic Technology, T.E French et al, McGraw Hill International, 14 th Edition, 2012</p> <p>R2. Engineering Drawing Graphics &amp; AutoCAD, K Venugopal, New Age International, 5 th Edition, 2009</p> <p>R3. Engineering Drawing with a primer on AutoCAD, AN Siddique et al, Prentice Hall of India Ltd., Eastern Economy Edition, 2004</p> <p>R4: Engineering Drawing, Basant Agrawal &amp; C M Agrawal, McGraw Hill Publications, Third edition 2019</p>			