**KARPAGAM ACADEMY OF HIGHER EDUCATION**
***(Deemed to be University Established under Section 3 of UGC Act 1956)***
**Eachanari, Coimbatore-641 021. INDIA**

**FACULTY OF ENGINEERING**
**DEGREE OF BACHELOR OF ENGINEERING / TECHNOLOGY**
**REGULAR PROGRAMME**
**REGULATIONS 2018**
**CHOICE BASED CREDIT SYSTEM**

**These regulations are effective from the academic year 2018 - 2019and applicable tothe candidates admitted to B. E. / B. Tech. during 2018 - 2019 and onwards.**

## 1. ADMISSION

**1.1** Candidates seeking admission to the first semester of the eight semesters B. E./B.Tech Degree Programme:

Should have passed the Higher Secondary Examination (10+2) (Academic Stream) prescribed by the Government of Tamil Nadu with Mathematics, Physics and Chemistry as three of the four subjects of study under Part-III or any similar Examination of any other University or authority accepted by the Karpagam University as equivalent thereto.

**(OR)**

Should have passed the Higher Secondary Examination of Vocational stream (Vocational groups in Engineering / Technology) as prescribed by the Government of Tamil Nadu.

**1.2** Candidates seeking admission to the first semester of the eight semesters B. Tech. (Bio-Technology) Degree Programme:

Should have passed the Higher Secondary Examination (10+2) (Academic Stream) prescribed by the Government of Tamil Nadu with Mathematics, Physics and Chemistry (or) Physics, Chemistry and Biology as three of the four subjects (or) Physics, Chemistry, Botany and Zoology as subjects of study under Part-III or any similar Examination conducted by any other authority accepted by the Karpagam University as equivalent thereto.

**(OR)**

Should have passed the Higher Secondary Examination of Vocational stream (Vocational groups in Engineering / Technology) as prescribed by the Government of Tamil Nadu.

### 1.3 Lateral Entry Admission

Candidates who possess Diploma in Engineering / Technology (10+3 or 10+2+2) awarded by the Directorate of Technical Education, Tamil Nadu or its equivalent and candidates who possess a Bachelor Degree in Science (10+2+3) with Mathematics as one of the subjects, awarded by any University or its equivalent are eligible to apply for admission to the third semester of B. E./B. Tech.. Such candidates shall undergo two additional engineering subjects in the 3$^{rd}$ and 4$^{th}$ semester as prescribed by the University.

**Eligibility criteria for admission in the first semester is given in the table below.**

| S. No. | Programme | Eligibility criteria |
|---|---|---|
| 1. | B. E.Automobile Engineering | Diploma in Automobile Engg./ Mechanical Engg / Metallurgy/ Mechanical and Rural Engg. / Machine Tool Maintenance and Repairs / Machine Design and Drafting / Refrigeration and Air-conditioning / Production Engg. / Tool and Die Design. |
| 2 | B.E Bio Medical Engineering | Diploma in Electrical & Electronics Engg. / Electronics & Communication Engg./ Computer Science Engg/ Mechatronics Engg/Computer Technology/Instrumentation Technology |
| 3. | B. E. Civil Engineering | Diploma in Civil Engg./ Sanitary Engg. / Civil and Rural Engg. |
| 4. | B. E. Computer Science and Engineering | Diploma in Computer Engg. / Electrical Engg./ Electronics Engg. / Electrical & Electronics Engg. / Electronics & Communication Engg. / Electronics & Telecommunication Engg./ Information Technology/ Computer Science / Instrumentation & Control Engg. / Electronics & Instrumentation. |
| 5. | B. E. Electrical and Electronics Engineering | Diploma in Electrical Engg./ Electronics Engg. / Electrical & Electronics Engg. / Electronics & Communication Engg. / Electronics & Telecommunication Engg./ Information Technology/ Computer Science / Instrumentation & Control Engg. / Electronics & Instrumentation. |
| 6. | B. E. Electronics and Communications Engineering | Diploma in Electronics Engg. / Electronics & Communication Engg. / Electrical Engg. / Instrument Technology / Electronics with specialization in Instrumentation / Electrical & Electronics Engg. / Information Technology/ Computer Science / Instrumentation & Control Engg./ Electronics & Telecommunication Engg. |
| 7. | B. E.Mechanical Engineering | Diploma in Mechanical Engg./ Metallurgy/Automobile Engg./ Mechanical and Rural Engg. / Machine Tool Maintenance and Repairs / Machine Design and Drafting / Refrigeration and Air-conditioning / Production Engg. / Tool and Die Design |
| 8. | B. Tech Bio - Technology | Diploma in Chemical Engineering / Leather Technology / Diploma in Petrochemical Engg. |
| 9. | B. Tech Chemical Engineering | Diploma in Chemical Engineering /Petrochemical |

| | | |
|---|---|---|
| | | Engg./ Chemical Technology/ Petroleum Engg/ Polymer Technology/ Plastic Technology/Sugar Technology/Pulp & Paper Technology/ Petro-Chemical Engg |
| 10. | B. Tech Food Technology | Diploma in Food Technology/Chemical Engineering / Leather Technology / Diploma in Petrochemical Engg. |

1.**4 Migration from other University**

Candidates who have completed their first to sixth semesters of B. E./B. Tech. study in any University are eligible to apply for admission to their next semester of B. E./B. Tech. in the branch corresponding to their branch of study. The student will be exempted from appearing for Examination of the equivalent courses passed in the earlier programme and will have to appear for courses which he/she has not done during the period of his/her earlier programme. Along with the request letter and mark sheets, he/she has to submit a copy of syllabus of the programme duly attested by the Registrar,Competent authority,he/she has undergone. Equivalence Certificate shall be provided by the "Students' Affairs Committee" of Karpagam University.Students' Affairs Committee comprises all the Heads of the Departments and Dean of the Faculty of Engineering and a nominee of the Registrar.

## 2 . PROGRAMMES OFFERED

A candidate may undergo a programme in any one of the branches of study approved by the University as given below.

**List of B. E. and B. Tech. Degree Programmes**

1. B. E. Automobile Engineering
2. B.E Bio Medical Engineering
3. B. E. Civil Engineering
4. B. E. Computer Science and Engineering
5. B. E. Electrical and Electronics Engineering
6. B. E. Electronics and Communications Engineering
7. B. E. Mechanical Engineering
8. B. Tech. Bio-Technology
9. B. Tech Chemical Engineering
10. B. Tech Food Technology

## 3. MODE OF STUDY

**3.1 Full-Time:**

In this mode of study, the candidates are required to attend classes regularly on the specified working days of the University.

**3.2** Conversion from full time mode of study to part time is not permitted.

**3.3** Change from one programme to another is not permitted.

**4. STRUCTURE OF PROGRAMMES**

**4.1** Every programme will have a curriculum with syllabus consisting of theory and practical courses such as:

(i) General core courses comprising Mathematics, Basic Sciences, Engineering Sciences and Humanities.

(ii) Core courses of Engineering/Technology.

(iii) Elective courses for specialization in related fields.

(iv) Workshop practice, computer practice, engineering graphics,laboratory work, in-plant training, seminar presentation, projectwork, industrial visits, camps, etc.

Every student is encouraged to participate in at least any one of the following programmes

- NSS / Sports/Physical exercise/NCC/YRC/Red Ribbon club/Environment club and Energy club
- Other Co-Curricular and Extra Curricular activities

(V) **Choice Based Credit System**

CBCS is introduced for students admitted in the academic year 2017-18. As per AICTE guidelines, CBCS is an approach in which students opt for courses of their choice. CBCS provides greater flexibility with multiple courses and enable students to undergo additional courses. CBCS is applicable to Full Time Undergraduate & Post Graduate Programmes of study. It provides a choice for students to select from the prescribed courses(Professional soft core, Professional Hard core, Professional Electives, Open Electives, Value added courses, Humanity Sciences, Basic sciences & Engineering sciences). A course designated as hard core for a particular programme of study must invariably be completed by the student to receive the degree in the programme. The Hardcore courses cannot be substituted by another courses. Students can exercise their choice among a set of Soft core courses from the list of Soft core courses specified for each Programme of study.The student should meet the criteria for prerequisites to become eligible to register for that course.The student should request for the course for every semester within the first week of semester. Maximum no of students to be registered in each course shall depend on availablility of physical facilities, classroom availability and lab capacity. Registration of already requested courses by students in previous semester is not allowed.

**4.2** Each course is normally assigned certain number of credits.

| | |
|---|---|
| No. of credits per lecture period per week | : 1 |
| No. of credits per tutorial period per week | : 1 |
| No. of credits for 3 periods of laboratory course per week | : 2 |
| No. of credits for 3 periods of project work per week | : 2 |
| No. of credits for 2 periods of Value added course per week | : 1 |
| No. of credits for 3 weeks of in-plant training during semester vacations | : 1 |

**4.3**Inevery semester, the curriculumshall normally have a blend of theory courses not

exceeding6and practicalcourses not exceeding 3. However, the total number of courses per semestershall not exceed 8.

**4.4** The prescribed credits required for the award of the degree shallbe within the limits specified below.

| PROGRAMME | PRESCRIBED CREDIT RANGE |
|---|---|
| B. E./B. Tech. | 160– 165 |

**4.5**The medium of instruction for all Courses, Examinations, Seminar presentations and Project/Thesis reports is English.

**4.6Value Added Course**

Besides core courses and elective courses, value added course is introduced. The blend of different courses is so designed that the student would be trained not only in his / her relevant professional field but also as a socially conscious human being.

**4.7** Evaluation in the courses comprises two parts, one is the Continuous Internal Assessment (CIA) and the other one is the End Semester Examination (ESE). Evaluation in few courses may be by Internal Assessment only.

## 5. DURATION OF THE PROGRAMME

**5.1**The prescribed duration of the programme shall be

| Programme | Min. No. of semesters | Max. No. of semesters |
|---|---|---|
| B. E./B. Tech. ( H. Sc. Candidates) | 8 | 14 |
| B. E./B. Tech. (Lateral Entry Candidates) | 6 | 12 |

**5.2** Each semester shall normally consist of 90 working days or 540 hours.

**5.3** Additional classes for improvement, conduct of model test, etc., over and above the specified periods shall be arranged, if required. But for the purpose of calculation of attendance requirement for eligibility to appear for the end semester Examinations (as per Clause 11) by the students, 540 hours conducted within the specified academic schedule alone shall be taken into account and the overall percentage of attendance shall be calculated accordingly.

## 6. REQUIREMENTS FOR COMPLETION OF THE SEMESTER

**6.1** Ideally every student is expected to attend all classes and secure 100% attendance. However, in order to allow for certain unavoidable circumstances, the student is expected to attend at least 75% of the classesand the conduct of the candidate has been satisfactory during the course.

**6.2** A candidate who has secured attendance between 65% and 74% (both included), due to medical reasons (Hospitalization / Accident / Specific Illness) or due to participation in University / District / State / National / International level sports or due to participation in Seminar / Conference / Workshop / Training Programme / Voluntary Service / Extension activities or similar

programmeswith prior permission from the Registrar shall be given exemption from prescribed attendance requirements and shall be permitted to appear for the Examination on the recommendation of the Head of the Department concerned and Dean to condone the lack of attendance. The Head of the Department has to verify and certify the genuineness of the case before recommending to the Dean. However, the candidate has to pay prescribed condonation fees.

**6.3** Candidates who are not recommended for condonation and those who have less than 65% attendance will not be permitted to proceed to the next semester and have to redo the course. However, they are permitted to write the arrear Examinations, if any.

## 7. CLASS ADVISOR

To help the students in planning their courses of study and for general advice on the academic programme, the Head of the Department will attach a certain number of students to a teacher of the Department who shall function as Class Advisor for those students throughout their period of study. Such Class Advisors shall advise the students and monitor the courses undergone by the students, check the attendance and progress of the students and counsel them periodically. If necessary, the Class Advisor may display the cumulative attendance particulars in the Department notice board and also discuss with or inform the Parents/Guardian about the progress of the students. Each student shall be provided with course plan for each course at the beginning of each semester.

## 8. CLASS COMMITTEE

**8.1**. Every class shall have a class committee consisting of teachers of the class concerned, Maximum of six student representatives [boys and girls] and the concerned Head of the Department. It is like the 'Quality Circle' with the overall goal of improving the teaching-learning process. The functions of the class committee include

- Clarifying the regulations of the degree programme and the details of rules therein particularly Clause 4 and 5 which should be displayed on Department Notice-Board.
- Informing the student representatives the details of Regulations regarding weight age used for each assessment. In the case of practical courses (laboratory / drawing / project work / seminar, etc.) the breakup of marks for each experiment / exercise /module of work, should be clearly discussed in the class committee meeting and informed to the students.
- Solving problems experienced by students in the class room and in the laboratories.
- Informing the student representatives the academic schedule, including the dates of assessments and the syllabus coverage for each assessment.
- Analyzing the performance of the students of the class after each test and finding the ways and means of solving problems, if any.
- Identifying the weak students, if any and requesting the teachers concerned to provide some additional academic support.

**8.2** The class committee for a class under a particular branch is normally constituted by the Head of the Department. However, if the students of different branches are mixed in a class (like the first

semester which is generally common to all branches), the class committee is to be constituted by the Dean.

**8.3** The class committee shall be constituted within the first week of each semester.

**8.4** The Chairperson of the Class Committee may convene the meeting of the class committee.

**8.5** The Dean may participate in any Class Committee of the Faculty.

**8.6** The Chairperson is required to prepare the minutes of every meeting, submit the same to Dean through the HOD within two days of the meeting and arrange to circulate it among the students and teachers concerned. If there are some points in the minutes requiring action by the Management, the same shall be brought to the notice of the Registrar by the HOD through Dean.

**8.7**The first meeting of the Class Committee shall be held within one week from the date of commencement of the semester, in order to inform the students about the nature and weightage of assessments within the framework of the regulations. Two subsequent meetings may be held in a semester at suitable intervals. During these meetings the student members representing the entire class, shall meaningfully interact and express their opinions and suggestions of the other students of the class in order to improve the effectiveness of the teaching-learning process.

## 9. COURSE COMMITTEE FOR COMMON COURSES

Each common theory course offered to more than one discipline or group, shall have a "Course Committee" comprising all the teachers handling the common course with one of them nominated as Course Coordinator. The nomination of the Course Coordinator shall be made by the Dean depending upon whether all the teachers teaching the common course belong to a single department or to several departments. The 'Course Committee' shall meet to arrive at a common scheme of evaluation for the test and shall ensure a uniform evaluation of the tests. Where ever feasible, the Course Committee may also prepare a common question paper for the Internal Assessment test(s).

## 10. PROCEDURE FOR AWARDING MARKS FOR INTERNAL ASSESSMENT

**10.1** Every teacher is required to maintain an 'ATTENDANCE AND ASSESSMENT RECORD' (Log book) which consists of attendance marked in each theory or practical or project work class, the test marks and the record of class work (topic covered), separately for each course.

**10.2** Continuous Internal Assessment (CIA): The performance of students in each subject will be continuously assessed by the respective teachers as per the guidelines given below:

**THEORY COURSES**:

| S. No. | CATEGORY | MAXIMUM MARKS |
|---|---|---|
| 1. | Assignment | 5 |
| 2. | Seminar * | 5 |
| 3. | Attendance | 5 |
| 4. | Test – I | 8 |
| 5. | Test – II | 8 |
| 6. | Test – III | 9 |
| **Continuous Internal Assessment : TOTAL** | | 40 |

*Evaluation shall be made by a committee.

**PATTERN OF TEST QUESTION PAPER (Test I & II)**

| INSTRUCTION | REMARKS |
|---|---|
| **Maximum Marks** | 60 |
| **Duration** | 2 Hours |
| **Part- A** | 1 to 9 Two Mark Questions, uniformly covering the two units of the syllabus. All the 9 Questions are to be answered.<br>(**9 x 2 =18Marks)**. |
| **Part- B** | Question 10 to 12 will be of either or type, covering two units of the syllabus. Each Question may have subdivision.<br>(**3 x 14 =42 Marks)**. |

**PATTERN OFTEST QUESTION PAPER(Test III)**

| INSTRUCTION | REMARKS |
|---|---|
| **Maximum Marks** | 100 |
| **Duration** | 3 Hours |
| **Part - A** | Part A will be online Examination. 20 Objective type Questions, Covering all the 5 units. **(20 x 1= 20 Marks) (Online Examination).** |
| **Part- B** | 21 to 25 Two Mark Questions, uniformly covering the Five units of the syllabus. All the 5 Questions are to be answered.<br>(**5 x 2= 10Marks)**. |
| **Part- C** | Question 26 to 30 will be of either or type, covering Five units of the syllabus. Each Question may have subdivision.<br>**(5 x 14=70 Marks).** |

**PRACTICAL COURSES:**

| S. No | CATEGORY | MAXIMUM MARKS |
|---|---|---|
| 1. | Attendance | 5 |
| 2. | Observation work | 5 |
| 3. | Record work | 5 |
| 4. | Model Examination | 15 |
| 5. | Viva – Voce [Comprehensive] | 10 |
| **Continuous Internal Assessment: TOTAL** | | 40 |

Every practical exercise / experiment shall be evaluated based on the conduct of exercise/ experiment and records maintained.

**INTEGRATED THEORY AND PRACTICAL COURSES**:

The Continous Internal Assessment for Integrated Theory Course is awarded for 40 Marks with mark split up similar to regular theory course.

The external evaluation of integrated practical component from End semester Examinatiion by internal mode is awarded for 50 Marks and later scaled down to 15 Marks and similarly the external evaluation for integrated theory from End semester Examinatiion is awarded for 100 Marks and later scaled down to 45 Marks. Hence the external assessment for Integrated theory and practical components contribute to 60 Marks.

**10.3 ATTENDANCE**

**Attendance carries a maximum of 5 marks and the distribution is as under:**

| S. No. | Attendance % | Marks |
|---|---|---|
| 1 | 91 and above | 5.0 |
| 2 | 81-90 | 4.0 |
| 3 | 76-80 | 3.0 |

**10.4 PROJECT WORK:**

Final year project work will be always in-house. However, as a special case, if a student is able to get a project from a government organization or private or public sector company with a turn over about Rs. 50 crore, the student may be permitted to do his/her project work in institution/research organization/industry.

**11. REQUIREMENTS FOR APPEARING FOR END SEMESTER EXAMINATION(ESE)**

A candidate shall normally be permitted to appear for the ESE of any semester commencing from I semester if he/she has satisfied the semester completion requirements (Subject to Clause 5) and has registered for Examination in all courses of the semester. Registration is mandatory for Semester Examinations as well as arrearExaminations failing which the candidate will not be permitted to attend the next semester. A candidate already appeared for a subject in a semester and

passed the Examination is not entitled to reappear in the same subject of the semester for improvement of grade.

**12. END SEMESTER EXAMINATION**

ESE will be held at the end of each semester for each subject, for 100 marks, later scaled down to 60 marks.

**PATTERN OF ESE QUESTION PAPER:**

| INSTRUCTION | REMARKS |
|---|---|
| **Maximum Marks** | 100 |
| **Duration** | 3 Hours |
| **Part - A** | Part A will be online Examination. 20 Objective type Questions. Covering all the 5 units. **20*1= 20 Marks (Online Examination)** |
| **Part- B** | 21 to 25 Two Mark Questions, uniformly covering the Five units of the syllabus. All the 5 Questions are to be answered. (**5 *2= 10Marks)**. |
| **Part- C** | Question 26 to 30 will be of either or type, covering Five units of the syllabus. Each Question may have subdivision. **(5*14=70 Marks)** |

**13. PASSING REQUIREMENTS**

**13.1** Passing minimum: The passing minimum for CIA is 20 (i.e. out of 40 marks). The passing minimum for ESE is 30 (i.e. out of 60 marks). The overall passing minimum for theory/laboratory course is 50 (Sum of his/her score in CIA and ESE) out of 100 marks.

**13.1.1** The passing minimum for value added course is 50 marks out of 100marks. Therewill be two tests, the first covering 50% of syllabus for 50 marks and the other for 50 marks.

**13.2**If the candidate fails to secure a pass in a particular course ESE, itis mandatory that candidate shall register and reappear for the Examination in that course during the subsequent semester when Examination is conducted in that course. Further the candidate should continue to register and reappear for the Examination till a pass is secured in such supplementary Examination within the stipulated maximum duration of the programme (Clause 5.1).

The CIA marks obtained by the candidate in his/her first or subsequent appearance where he/she secures a pass shall be retained by the office of the Controller of Examinations and considered valid for all remaining attempts till the candidate secures a pass in his/her ESE.

**13.3** If the candidate fails to secure a pass in a particular course in CIA, it is mandatory that candidate shall register and reappear for the CIA in that course during the subsequent semester when CIA is conducted in that course by the faculty member assigned for that particular course during that semester by the concerned HOD. Further, the candidate should continue to register and

reappear for the CIA till a pass is secured in such subsequent Examination within the stipulated maximum duration of the programme (Clause 5.1).

**13.3.1** If a candidate fails to secure a pass in value added course, he/she has to appear for the testswhen course is conducted subsequently.

### 13.4 ONLINE COURSE COORDINATOR

To help students in planning their online courses and for general advice on online courses, the HOD shall nominate a coordinator for the online courses. The Online course coordinator shall identify the courses which students can select for their programme from the available online courses offered by the different agencies periodically and inform the same to the students. Further, the coordinator shall advice the students regarding the online courses and monitor their course.

**13.4.1** Student Shall study atleast one online course from Sawayam/NPTEL in anyone of the first seven semesters for which examination shall be conducted at the end of the course by the respective organization.body. The student can register to the course which are approved by the department. The student shall produce a pass certificate from the respective body befiorethe end of the seventh semester.

## 14. AWARD OF LETTER GRADES

**14.1** All assessments of a course will be done on absolute mark basis. However, for the purpose of reporting the performance of a candidate letter grades, each carrying certain number of points will be awarded as per the range of total marks (out of 100) obtained by the candidate in each subject as detailed below:

| Letter grade | Marks Range | Grade Point | Description |
|---|---|---|---|
| O | 91 - 100 | 10 | OUTSTANDING |
| A+ | 81- 90 | 9 | EXCELLENT |
| A | 71-80 | 8 | VERY GOOD |
| B+ | 66- 70 | 7 | GOOD |
| B | 61 – 65 | 6 | ABOVE AVERAGE |
| C | 55 - 60 | 5 | AVERAGE |
| D | 50 - 54 | 4 | PASS |
| RA | <50 | - | REAPPEARANCE |
| AB | | 0 | ABSENT |

### 14.2 GRADE SHEET

After results are declared, Grade sheet will be issued to each student which will contain the following details:

i. The list of courses enrolled during the semester and the grade scored,
ii. The Grade Point Average (**GPA**) for the semester and
iii. The Cumulative Grade Point Average (**CGPA**) of all courses enrolled from first semester onwards.

**GPA** is the ratio of the sum of the products of the number of Credits (**C**) of courses enrolled and the Grade Points (**GP**) corresponding to the grades scored in those courses, taken for all the courses to the sum of the number of credits of all the courses in the semester.

$$GPA = \frac{\text{Sum of } [C*GP]}{\text{Sum of } C}$$

**CGPA** will be calculated in a similar manner, considering all the courses enrolled from First semester. **RA** grade and value added course will be excluded for calculating **GPA** and **CGPA**.

**14.3REVALUATION**

Revaluation and Re-totaling is allowed on representation. A candidate can apply for revaluation of his/her semester Examination answer paper in a theory course, within 2 weeks from the declaration of results, on payment of a prescribed fee through proper application to the Controller of Examinations through the Head of the Department and Dean. A candidate can apply for revaluation of answer scripts for not exceeding 5 subjects at a time. The Controller of Examinations will arrange for the revaluation and the results will be intimated to the candidate through the Head of the Department and Dean. Revaluation is not permitted for Supplementary Examinations, Practical Examinations, Technical Seminars, In-plant Training and Project Work.

**14.4 TRANSPARENCY AND GRIEVANCE COMMITTEE**

A student may get the Photostat copy of the answer script on payment of prescribed fee, if he/she wishes. The students can represent the grievance, if any, to the Grievance Committee, which consists of Dean of the Faculty, (if Dean is HOD, the Dean of another Faculty nominated by the University), HOD of the Department concerned, the faculty of the course and Dean from other discipline nominated by the University and the COE. If the Committee feels that the grievance is genuine, the script may be sent for external valuation; the marks awarded by the External Examiner will be final. The student has to pay prescribed fee for the same.

**15. ELIGIBILITY FOR AWARD OF DEGREE**

**A student shall be declared to be eligible for award of Degree if he/she has**

- Successfully gained the required number of total credits as specified in the curriculum corresponding to his/her programme within the stipulated time.
- No disciplinary action is pending against him/her.

The award of the degree must be approved by the Board of Management of Karpagam University.

**16. CLASSIFICATION OF THE DEGREE AWARDED**

**16.1**A candidate who qualifies for the award of the Degree (vide Clause 15) having passed the Examination in all the courses in his/her first appearance within the specified minimum number of semesters (vide Clause 5.1) securing a CGPA of not less than**8**shall be declared to have passed the Examination in First Class with Distinction.

**16.2** A regular candidate or a lateral entrant is eligible to register for BE(Honors),B.Tech(Honors). If, he / she has passed all the courses in the first appearance and holds / maintains a CGPA of 7.5 at VI Semester. He / she has to take an additional 20 credits by studying online courses through Swayam/NPTEL . Such a candidate is eligible for the award of BE (Honor),B.Tech(Honor). However, is he / she fails in securing 20 additional credits butmaintains CGPA of 7.5 and above is not eligible for Honors degree but eligible for First class with Distinction.

**16.3**A candidate who qualifies for the award of the Degree (vide Clause 15) having passed the Examination in all the courses within the specified minimum number of semesters (vide Clause 5.1) plus one year (two semesters), securing CGPA of not less than **6.5**shall be declared to have passed the Examination in First Class.

**16.3**All other candidates (not covered in Clauses 17.1 and 17.2) who qualify for the award of the degree (vide Clause 15) shall be declared to have passed the Examination in Second Class.

## 17. PROVISION FOR WITHDRAWAL FROM END-SEMESTER EXAMINATION

**17.1** A candidate may for valid reasons and on prior application, be granted permission to Withdraw from appearing for the examination of any one course or consecutive examinations of more than one course in a semester examination. .

**17.2** Such withdrawal shall be permitted only once during the entire duration of the degree programme. Withdrawal application shall be valid only if the candidate is otherwise eligible to write the Examination

.**17.3** Withdrawal application is valid only if it is made within 10 days prior to the commencementof the Examination in that course or courses and recommended by the Head of the Department, Dean and approved by the Registrar.

**17.3.1** Notwithstanding the requirement of mandatory TEN daysnotice,applications forwithdrawal for special cases under extraordinary conditions may be considered on the merit of the case.

**17.4** Withdrawal shall not be construed as an appearance for the eligibility of a candidate for First Class with Distinction. This provision is not applicable to those who seek withdrawal during III semester.

**17.5** Withdrawal from the ESE is NOTapplicable to arrearExaminations.

**17.6** The candidate shall reappear for the withdrawn courses during the Examination conducted in the subsequent semester.

## 18. PROVISION FOR AUTHORISED BREAK OF STUDY

**18.1** Break of Study shall be granted only once for valid reasons for a maximum of one year during the entire period of study of the degree programme.However, in extraordinary situation the candidate may apply for additional break of study not exceeding another one year by paying prescribed fee for break of study. If a candidate intends to temporarily discontinue the programme in the middle of the semester for valid reasons and to rejoin the programme in a subsequent year, permission may be granted based on the merits of the case provided he/she applies to the Registrar,

through the Head of the Department and Dean stating reasons thereof and the probable date of rejoining the programme.

**18.2** The total number of semesters for completion of the programme from the commencement of the first semester to which the candidate was admitted shall not exceed the maximum no. of semesters specified in Clause 5.1 irrespective of the period of break of study (vide Clause 18) in order that he/she may be eligible for the award of the degree (vide Clause 15). The candidate thus permitted to rejoin the programme at the commencement of the semester after the break shall be governed by the curriculum and regulations in force at the time of rejoining. Such candidates may have to do additional courses as per the curriculum and regulations in force at that period of time.

**18.3** The authorized break of study (for a maximum of one year) will not be counted for the duration specified for passing all the courses for the purpose of classification (vide Clause17). However, additional break of study granted will be counted for the purpose of classification.

**18.4** The total period for completion of the programme reckoned from, the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in Clause 5.1 irrespective of the period of break of study (vide Clause 18.3) in order that he/she may be eligible for the award of the degree.

**18.5** If any student is detained for want of requisite attendance, progress and good conduct, the period spent in that semester shall not be considered as permitted 'Withdrawal' or 'Break of Study' (Clause18 and 18 respectively).

**19. SUPPLEMENTARY ESE:** After the publication of VIII semester results,if a student has **ONE** arrear in any theory course of the entire programme, he/she will be permitted to apply within 15 days of the publication of results, and appear for supplementary Examination.

**20. INDUSTRIAL VISIT**

Every student is required to undergo one industrial visit for every semester, starting from the third semester of the programme.

**21. DISCIPLINE**

Every student is required to observe discipline and decorous behavior both inside and outside the University and not to indulge in any activity which will tend to bring down the prestige of the University. The erring student will be referred to the Disciplinary Committee constituted by the University, to enquire into acts of indiscipline and recommend to the University about the disciplinary action to be taken.

If a student indulges in malpractice in any of the ESE/CIA he/she shall be liable for punitive action as prescribed by the University from time to time.

**22. REVISION OF REGULATION AND CURRICULUM**

The University may from time to time revise, amend or change the Regulations, Scheme of Examinations and syllabi, if found necessary on the recommendations of Board of Studies, Academic Council and Board of Management of Karpagam University.

**KARPAGAM ACADEMY OF HIGHER EDUCATION**
**(Deemed to be University Established Under Section 3 of UGC Act 1956)**
**FACULTY OF ENGINEERING**
**B.E (AUTOMOBILE ENGINEERING)**
**COURSE OF STUDY AND SCHEME OF EXAMINATION**
**(2018 BATCH ONWARDS)**

| SEMESTER I | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Course Title** | **Objectives & Outcomes** | | **Instruction hours/week** | | | **Credits** | **Maximum Marks** | | |
| | | **PEO** | **PO** | **L** | **T** | **P** | | **CIA** | **ESE** | **Total** |
| | | | | | | | | **40** | **60** | **100** |
| 18BEAE101 | Mathematics-I (Calculus and Linear Algebra for Mechanical and Automobile Engineering) | 1 | a,b,c,h | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BEAE102 | Electro Magnetism | 1,3 | a,b,c,d,h,i | 3 | 1 | 3 | 5 | 40 | 60 | 100 |
| 18BEAE103 | Basic Electrical Engineering | 1,3 | a,b,c,h,i,k | 3 | 1 | 2 | 5 | 40 | 60 | 100 |
| 18BEAE104 | Engineering Graphics & Design | 1,2 | a,b,c,d,i | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| | | | TOTAL | 10 | 3 | 9 | 17 | 160 | 240 | 400 |

| SEMESTER II | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Course Title** | **Objectives & Outcomes** | | **Instruction hours/week** | | | **Credits** | **Maximum Marks** | | |
| | | **PEO** | **PO** | **L** | **T** | **P** | | **CIA** | **ESE** | **Total** |
| | | | | | | | | **40** | **60** | **100** |
| 18BEAE201 | Mathematics-II (Calculus, Ordinary Differential Equations and Complex variable for Mechanical and Automobile Engineering) | 1 | a,b,c,h | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BEAE202 | Chemistry-I | 1 | a,b,e,i | 3 | 1 | 3 | 6 | 40 | 60 | 100 |
| 18BEAE203 | English | 2 | e,f,i | 2 | 0 | 2 | 3 | 40 | 60 | 100 |
| 18BEAE204 | Programming For Problem Solving | 1 | a,b,c | 3 | 0 | 4 | 5 | 40 | 60 | 100 |
| 18BEAE205 | Workshop/Manufacturing Practice Laboratory | 1,2 | a,b,d,i | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| 18BEAE206 | Constitution Of India | | | 1 | - | - | - | | | 100 |
| | | | TOTAL | 13 | 2 | 13 | 21 | 200 | 300 | 600 |

**KARPAGAM ACADEMY OF HIGHER EDUCATION**
**(Deemed to be University Established Under Section 3 of UGC Act 1956)**
**FACULTY OF ENGINEERING**
**B.E (BIOMEDICAL ENGINEERING)**
**COURSE OF STUDY AND SCHEME OF EXAMINATION**
**(2018 BATCH ONWARDS)**

**SEMESTER I**

| Course Code | Course Title | Objectives & Outcomes | | Instruction hours/week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PEO | PO | L | T | P | | CIA | ESE | Total |
| | | | | | | | | 40 | 60 | 100 |
| 18BEBME101 | Mathematics-I | 1,2,4 | a,f,h,j,k | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BEBME102 | Chemistry-I | 4 | a,b,h,j,k | 3 | 1 | 3 | 6 | 40 | 60 | 100 |
| 18BEBME103 | Basic Electrical Engineering | 1,4 | a,c,h,j,k | 3 | 1 | 2 | 5 | 40 | 60 | 100 |
| 18BEBME104 | Programming For Problem Solving | 1,4 | a,b,d,e,j | 3 | 0 | 4 | 5 | 40 | 60 | 100 |
| | | | TOTAL | 12 | 3 | 9 | 20 | 160 | 240 | 400 |

**SEMESTER II**

| Course Code | Course Title | Objectives & Outcomes | | Instruction hours/week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PEO | PO | L | T | P | | CIA | ESE | Total |
| | | | | | | | | 40 | 60 | 100 |
| 18BEBME201 | Mathematics-II | 1,4 | a,f,h,j,k | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BEBME202 | Engineering Physics | 2,4 | a,c,f,h,j,l | 3 | 1 | 3 | 5 | 40 | 60 | 100 |
| 18BEBME203 | English | 1,4 | f,g,h,j,l | 2 | 0 | 2 | 3 | 40 | 60 | 100 |
| 18BEBME204 | Introduction To Biomedical Engineering | 1,2,4 | a,b,d,e,h,j,k | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 18BEBME205 | Electronic Devices And Circuits | 1,2,3,4, | a,b,e,h,j,k | 3 | 1 | 2 | 5 | 40 | 60 | 100 |
| | TOTAL | | | 14 | 3 | 7 | 20 | 200 | 300 | 500 |

**KARPAGAM ACADEMY OF HIGHER EDUCATION**
**(Deemed to be University Established Under Section 3 of UGC Act 1956)**
**FACULTY OF ENGINEERING**
**B.Tech ( BIOTECHNOLOGY)**
**COURSE OF STUDY AND SCHEME OF EXAMINATION**
**(2018 BATCH ONWARDS)**

| SEMESTER I | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Course Title** | **Objectives & Outcomes** | | **Instruction hours/week** | | | **Credits** | **Maximum Marks** | | |
| | | **PEO** | **PO** | **L** | **T** | **P** | | **CIA** | **ESE** | **Total** |
| | | | | | | | | **40** | **60** | **100** |
| 18BTBT101 | Mathematics-I | 2,3 | a,b,e,h,i | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BTBT102 | Chemistry-I | 2,3 | a,b,c,d,e,f,i,k | 3 | 1 | 3 | 6 | 40 | 60 | 100 |
| 18BTBT103 | Basic Electrical Engineering | 2,3 | a,b,c,e,i,k | 3 | 1 | 2 | 5 | 40 | 60 | 100 |
| 18BTBT104 | Engineering Graphics &Design | 2 | a,d,e | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| | | | TOTAL | 10 | 3 | 9 | 18 | 160 | 240 | 4 |

| SEMESTER II | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Course Title** | **Objectives & Outcomes** | | **Instruction hours/week** | | | **Credits** | **Maximum Marks** | | |
| | | **PEO** | **PO** | **L** | **T** | **P** | | **CIA** | **ESE** | **Total** |
| | | | | | | | | **40** | **60** | **100** |
| 18BTBT201 | Mathematics –II | 2,3 | a,b,e,h,i | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BTBT202 | Engineering Physics | 2,3 | a,b,c,e,h,i,k | 3 | 1 | 3 | 5 | 40 | 60 | 100 |
| 18BTBT203 | English | 1,2,3 | h,i,k,l | 2 | 0 | 2 | 3 | 40 | 60 | 100 |
| 18BTBT204 | Programming for Problem Solving | 1 | a,b,d | 3 | 0 | 4 | 5 | 40 | 60 | 100 |
| 18BTBT205 | Biochemistry | 1,2 | a,b,c,e | 3 | 1 | 3 | 6 | 40 | 60 | 100 |
| | | | TOTAL | 14 | 3 | 12 | 23 | 200 | 300 | 500 |

**KARPAGAM ACADEMY OF HIGHER EDUCATION**
**(Deemed to be University Established Under Section 3 of UGC Act 1956)**
**FACULTY OF ENGINEERING**
**B.Tech (CHEMICAL ENGINEERING)**
**COURSE OF STUDY AND SCHEME OF EXAMINATION**
**(2018 BATCH ONWARDS)**

**SEMESTER I**

| Course Code | Course Title | Objectives & Outcomes | | Instruction hours/week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PEO | PO | L | T | P | | CIA | ESE | Total |
| | | | | | | | | 40 | 60 | 100 |
| 18BTCE101 | Mathematics-I | 3 | a,b,d,h,k | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BTCE102 | Physics | 2,3 | a,b,e,f,h,j,k | 3 | 1 | 3 | 5 | 40 | 60 | 100 |
| 18BTCE103 | English | 1,2,3 | i,k | 2 | 0 | 2 | 3 | 40 | 60 | 100 |
| 18BTCE104 | Chemistry-I | 2,3 | a,b,c,e,f,g,h,k | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BTCE105 | Engineering Graphics | 1,2 | a,c | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| | | | TOTAL | 12 | 3 | 9 | 19 | 200 | 300 | 500 |

**SEMESTER II**

| Course Code | Course Title | Objectives & Outcomes | | Instruction hours/week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PEO | PO | L | T | P | | CIA | ESE | Total |
| | | | | | | | | 40 | 60 | 100 |
| 18BTCE201 | Mathematics-II | 3 | a,b,d,h,k | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BTCE202 | Chemistry -II | 2,3 | a,b,c,e,f,g,h,k | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BTCE203 | Electrical And Electronics Engineering | 1,2 | a,b,c,e,f | 3 | 1 | 2 | 5 | 40 | 60 | 100 |
| 18BTCE204 | Thermodynamics-I | 1,2 | a,c,ef | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BTCE205 | Programming for Problem Solving | 1 | a,b,c | 3 | 0 | 4 | 5 | 40 | 60 | 100 |
| 18BTCE206 | Chemistry Lab | 1,3 | a,d,f,g,h,k | 0 | 0 | 3 | 2 | 40 | 60 | 100 |
| | | | TOTAL | 15 | 4 | 9 | 24 | 240 | 360 | 600 |

**KARPAGAM ACADEMY OF HIGHER EDUCATION**
**(Deemed to be University Established Under Section 3 of UGC Act 1956)**
**FACULTY OF ENGINEERING**
**B.E (CIVIL ENGINEERING)**
**COURSE OF STUDY AND SCHEME OF EXAMINATION**
**(2018 BATCH ONWARDS)**

**SEMESTER I**

| Course Code | Course Title | Objectives & Outcomes | | Instruction hours/week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PEO | PO | L | T | P | | CIA | ESE | Total |
| | | | | | | | | 40 | 60 | 100 |
| 18BECE101 | Mathematics-I (Calculus, Multivariable Calculus & Linear Algebra) | 3,4 | a,c,f,j | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BECE102 | Chemistry-I | 4,5 | a,b,f,j,k,l | 3 | 1 | 3 | 6 | 40 | 60 | 100 |
| 18BECE103 | Basic Electrical Engineering | 2,3 | a,b,c,f,k,l | 3 | 1 | 2 | 5 | 40 | 60 | 100 |
| 18BECE104 | Engineering Graphics & Design | 1,2,5 | b,c,g,j,k | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| | | | TOTAL | 10 | 3 | 9 | 18 | 160 | 240 | 400 |

**SEMESTER II**

| Course Code | Course Title | Objectives & Outcomes | | Instruction hours/week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PEO | PO | L | T | P | | CIA | ESE | Total |
| | | | | | | | | 40 | 60 | 100 |
| 18BECE201 | Mathematics-II (Differential Equations) | 3,4 | a,c,f,j | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BECE202 | Mechanics and Mechanics of Solids | 2,4,5,7, | a,d,f,g,j,k,l | 3 | 1 | 3 | 5 | 40 | 60 | 100 |
| 18BECE203 | English | 1,5 | f,g | 2 | 0 | 2 | 3 | 40 | 60 | 100 |
| 18BECE204 | Programming For Problem Solving | 3 | a,c,j,k | 3 | 0 | 4 | 5 | 40 | 60 | 100 |
| 18BECE205 | Workshop/ Manufacturing Process | 2,5 | j,k | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| | | | TOTAL | 12 | 2 | 13 | 20 | 200 | 300 | 500 |

**KARPAGAM ACADEMY OF HIGHER EDUCATION**
**(Deemed to be University Established Under Section 3 of UGC Act 1956)**
**FACULTY OF ENGINEERING**
**B.E (COMPUTER SCIENCE ENGINEERING)**
**COURSE OF STUDY AND SCHEME OF EXAMINATION**
**(2018 BATCH ONWARDS)**

| SEMESTER I | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Course Title** | **Objectives & Outcomes** | | **Instruction hours/week** | | | | **Maximum Marks** | | |
| | | **PEO** | **PO** | **L** | **T** | **P** | **C** | **CIA** | **ESE** | **Total** |
| | | | | | | | | **40** | **60** | **100** |
| 18BECS101 | Mathematics-I (Calculus and Linear Algebra for Computer Science Engineers) | 1,3 | a,f,i,j | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BECS102 | Semiconductor Physics | 1 | a,d,f,h,i,j,k | 3 | 1 | 3 | 5 | 40 | 60 | 100 |
| 18BECS103 | English | 2 | f,g,i | 2 | 0 | 2 | 3 | 40 | 60 | 100 |
| 18BECS104 | Programming For Problem Solving | 1 | a,j,k | 3 | 0 | 4 | 5 | 40 | 60 | 100 |
| | | | TOTAL | 11 | 2 | 9 | 17 | 160 | 240 | 400 |

| SEMESTER II | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Course Title** | **Objectives & Outcomes** | | **Instruction hours/week** | | | | **Maximum Marks** | | |
| | | **PEO** | **PO** | **L** | **T** | **P** | **C** | **CIA** | **ESE** | **Total** |
| | | | | | | | | **40** | **60** | **100** |
| 18BECS201 | Probability and Statistics | 1,3 | a,h,i,j | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BECS202 | Chemistry-I | 1,3 | a,b,c,d,e,f,i,j,k | 3 | 1 | 3 | 6 | 40 | 60 | 100 |
| 18BECS203 | Basic Electrical Engineering | 1,3 | j,l | 3 | 1 | 2 | 5 | 40 | 60 | 100 |
| 18BECS204 | Workshop/ Manufacturing Practices | 2 | c,i,j | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| 18BECS205 | Engineering Graphics& Design | 1,2 | g,j,k | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| | | | TOTAL | 11 | 3 | 13 | 21 | 200 | 300 | 500 |

**KARPAGAM ACADEMY OF HIGHER EDUCATION**
**(Deemed to be University Established Under Section 3 of UGC Act 1956)**
**FACULTY OF ENGINEERING**
**B.E(ELECTRONICS AND COMMUNICATION ENGINEERING)**
**COURSE OF STUDY AND SCHEME OF EXAMINATION**
**(2018 BATCH ONWARDS)**

**SEMESTER I**

| Course Code | Course Title | Objectives & Outcomes | | Instruction hours/week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PEO | PO | L | T | P | | CIA | ESE | Total |
| | | | | | | | | 40 | 60 | 100 |
| 18BEEC101 | Mathematics-I | 1,3 | a,e,g,j,k | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BEEC102 | Semiconductor Physics | 1,3 | a,b,d,e,g, j,k,l | 3 | 1 | 3 | 5 | 40 | 60 | 100 |
| 18BEEC103 | English | 2,3 | e,f,g,i | 2 | 0 | 2 | 3 | 40 | 60 | 100 |
| 18BEEC104 | Programming For Problem Solving | 2 | a,b,j | 3 | 0 | 4 | 5 | 40 | 60 | 100 |
| 18BEEC105 | Yoga | | | 1 | 0 | 0 | 0 | 100 | - | 100 |
| | | | TOTAL | 12 | 2 | 9 | 17 | 260 | 240 | 500 |

**SEMESTER II**

| Course Code | Course Title | Objectives & Outcomes | | Instruction hours/week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PEO | PO | L | T | P | | CIA | ESE | Total |
| | | | | | | | | 40 | 60 | 100 |
| 18BEEC201 | Mathematics-II | 1,3 | a,e,g, j,k | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BEEC202 | Chemistry-I | 1,3 | a,b,d, e,g,j | 3 | 1 | 3 | 6 | 40 | 60 | 100 |
| 18BEEC203 | Basic Electrical Engineering | 1,2 | a,b,e ,j | 3 | 1 | 2 | 5 | 40 | 60 | 100 |
| 18BEEC204 | Environmental Sciences | 1,2,5 | b,c,e, j | 3 | 0 | 0 | 3 | 40 | 60 | 100 |
| 18BEEC205 | Workshop/ Manufacturing Practices | 1,2 | a,b,e ,j | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| 18BEEC206 | Engineering Graphics &Design | 1,2 | a,b,e ,j | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| | | | TOTAL | 14 | 3 | 15 | 24 | 240 | 360 | 600 |

**KARPAGAM ACADEMY OF HIGHER EDUCATION**
**(Deemed to be University Established Under Section 3 of UGC Act 1956)**
**FACULTY OF ENGINEERING**
**B.Tech (FOOD TECHNOLOGY)**
**COURSE OF STUDY AND SCHEME OF EXAMINATION**
**(2018 BATCH ONWARDS)**

| SEMESTER I | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Course Title** | **Objectives & Outcomes** | | **Instruction hours/week** | | | **Credits** | **Maximum Marks** | | |
| | | **PEO** | **PEO** | **L** | **T** | **P** | | **CIA** | **ESE** | **Total** |
| | | | | | | | | **40** | **60** | **100** |
| 18BTFT101 | Mathematics-I | 2,3 | a,b,e,h,k | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BTFT102 | Chemistry-I | 3 | a,b,c,e,f,h,k | 3 | 1 | 3 | 6 | 40 | 60 | 100 |
| 18BTFT103 | Basic Electrical Engineering | 2,3 | a,b,d,h,k | 3 | 1 | 2 | 5 | 40 | 60 | 100 |
| 18BTFT104 | Engineering Graphics & Design | 1,2 | a,h,i | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| | | | TOTAL | 10 | 3 | 9 | 18 | 160 | 240 | 400 |

| SEMESTER II | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Course Code** | **Course Title** | **Objectives & Outcomes** | | **Instruction hours/week** | | | **Credits** | **Maximum Marks** | | |
| | | **PEO** | **PO** | **L** | **T** | **P** | | **CIA** | **ESE** | **Total** |
| | | | | | | | | **40** | **60** | **100** |
| 18BTFT201 | Mathematics-II | 2,3 | a,b,e,h,k | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BTFT202 | Engineering Physics | 2,3 | a,c,e,h,k | 3 | 1 | 3 | 5 | 40 | 60 | 100 |
| 18BTFT203 | English | 3 | i,j,k | 2 | 0 | 2 | 3 | 40 | 60 | 100 |
| 18BTFT204 | Programming for Problem Solving | 1 | a,b,c | 3 | 0 | 4 | 5 | 40 | 60 | 100 |
| 18BTFT205 | Food Chemistry | 1,2 | a,b,f | 3 | 1 | 3 | 6 | 40 | 60 | 100 |
| | | | TOTAL | 14 | 3 | 12 | 23 | 200 | 300 | 500 |

**KARPAGAM ACADEMY OF HIGHER EDUCATION**
**(Deemed to be University Established Under Section 3 of UGC Act 1956)**
**FACULTY OF ENGINEERING**
**B.E (MECHNAICAL ENGINEERING)**
**COURSE OF STUDY AND SCHEME OF EXAMINATION**
**(2018 BATCH ONWARDS)**

**SEMESTER I**

| Course Code | Course Title | Objectives & Outcomes | | Instruction hours/week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PEO | PO | L | T | P | | CIA | ESE | Total |
| | | | | | | | | 40 | 60 | 100 |
| 18BEME101 | Mathematics-I (Calculus and Linear Algebra for Mechanical and Automobile Engineering) | 1 | a,b,h,i | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BEME102 | Electro Magnetism | 1,3 | a,b,c,e,i,h | 3 | 1 | 3 | 5 | 40 | 60 | 100 |
| 18BEME103 | Basic Electrical Engineering | 1,3 | a,b,c,h,i,k | 3 | 1 | 2 | 5 | 40 | 60 | 100 |
| 18BEME104 | Engineering Graphics-I | 1,2 | a,b,c,e,i | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| | | | TOTAL | 10 | 3 | 9 | 17 | 160 | 240 | 400 |

**SEMESTER II**

| Course Code | Course Title | Objectives & Outcomes | | Instruction hours/week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PEO | PO | L | T | P | | CIA | ESE | Total |
| | | | | | | | | 40 | 60 | 100 |
| 18BEME201 | Mathematics-I (Calculus, Ordinary Differential Equations and Complex variable for Mechanical and Automobile Engineering) | 1 | a,b,h,i | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BEME202 | Chemistry I | 1 | a,b,e,j | 3 | 1 | 3 | 6 | 40 | 60 | 100 |
| 18BEME203 | English | 2 | d,e,j | 2 | 0 | 2 | 3 | 40 | 60 | 100 |
| 18BEME204 | Programming For Problem Solving | 1 | a,b,i | 3 | 0 | 4 | 5 | 40 | 60 | 100 |
| 18BEME205 | Workshop/ Manufacturing Practice | 1,2 | a,b,c,e | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| 18BEME206 | Engineering Graphics-II | 1,2 | a,b,c,e,i | 1 | 0 | 3 | 2 | 40 | 60 | 100 |
| 18BEME207 | Constitution Of India | | | 1 | - | - | - | | | 100 |
| | | | TOTAL | 14 | 2 | 16 | 23 | 240 | 360 | 700 |

**KARPAGAM ACADEMY OF HIGHER EDUCATION**
**(Deemed to be University Established Under Section 3 of UGC Act 1956)**
**FACULTY OF ENGINEERING**
**B.E (ELECTRICAL AND ELECTRONICS ENGINEERING)**
**COURSE OF STUDY AND SCHEME OF EXAMINATION**
**(2018 BATCH ONWARDS)**

**SEMESTER I**

| Course Code | Course Title | Objectives & Outcomes | | Instruction hours/week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PEO | PO | L | T | P | | CIA | ESE | Total |
| | | | | | | | | 40 | 60 | 100 |
| 18BEEE101 | Mathematics-I (Calculus and Differential Equations) | 2 | g,j,k,l | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BEEE102 | Waves, Optics and Introduction to Quantum Mechanics | - | a,g,j,k, l | 3 | 1 | 3 | 5 | 40 | 60 | 100 |
| 18BEEE103 | English | 2 | h,i,j | 2 | 0 | 2 | 3 | 40 | 60 | 100 |
| 18BEEE104 | Programming For Problem Solving (With C) | 1 | a,k,l | 3 | 0 | 4 | 5 | 40 | 60 | 100 |
| | | | TOTAL | 11 | 2 | 9 | 17 | 160 | 240 | 400 |

**SEMESTER II**

| Course Code | Course Title | Objectives & Outcomes | | Instruction hours/week | | | Credits | Maximum Marks | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | PEO | PO | L | T | P | | CIA | ESE | Total |
| | | | | | | | | 40 | 60 | 100 |
| 18BEEE201 | Mathematics-II (Linear Algebra, Transform calculus and Numerical Method) | 2 | g,j,k,l | 3 | 1 | 0 | 4 | 40 | 60 | 100 |
| 18BEEE202 | Chemistry-I | 1,3 | a,b,j,k | 3 | 1 | 3 | 6 | 40 | 60 | 100 |
| 18BEEE203 | Basic Electrical Engineering | 1,2 | a,d,k,l | 3 | 1 | 2 | 5 | 40 | 60 | 100 |
| 18BEEE204 | Workshop/ Manufacturing Practices | 1,2 | a,k | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| 18BEEE205 | Engineering Graphics& Design | 1,2 | a,k,l | 1 | 0 | 4 | 3 | 40 | 60 | 100 |
| | | | TOTAL | 11 | 3 | 13 | 21 | 200 | 300 | 500 |

**Semester-I**

**18BEAE101** **Mathematics I** **4H-4C**

**(Calculus and Linear Algebra for Mechanical & Automobile Engineering)**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- The objective of this course is to familiarize the prospective engineers with techniques in
- calculus, multivariate analysis and linear algebra.
- It aims to equip the students with standardconcepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in
- their disciplines.

**Course Outcomes**

The students will learn:

1. To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding ofBeta and Gamma functions.
2. The tool of power series and Fourier series for learning advanced Engineering Mathematics.
3. To deal with functions of several variables that are essential in most branches of engineering.
4. The essential tool of matrices and linear algebra in a comprehensive manner.

**UNIT I -Matrices**

Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric,skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors;Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation. Simple problems using Scilab.

**UNIT II-Calculus**

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gammafunctions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

**UNIT III-Calculus**

Taylor’s and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

**UNIT IV-Multivariable Calculus (Differentiation)**

Limit, continuity and partial derivatives, directional derivatives, total derivative; Maxima, minima and saddle points; Method of Lagrange multipliers;Gradient, curl and divergence.

**UNIT V- Sequences and series**

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

**SUGGESTED READINGS**


1. Hemamalini. P.T, (2014). Engineering Mathematics, McGraw Hill Education (India) Private Limited, New Delhi.
2. G.B. Thomas and R.L. Finney, (2002) Calculus and Analytic geometry, 9th Edition,Pearson,.
3. Erwin kreyszig, (2006).Advanced Engineering Mathematics, 9th Edition,John Wiley & Sons,
4. Veerarajan T, (2008).Engineering Mathematics for first year,Tata McGraw-Hill, New Delhi,
5. Ramana B.V, (2010) Higher Engineering Mathematics, 11th Reprint, Tata McGraw Hill New Delhi,.
6. D. Poole, (2005).Linear Algebra: A Modern Introduction, 2nd Edition,Brooks/Cole,
7. N.P. Bali and Manish Goyal, (2008). A text book of Engineering Mathematics, Laxmi Publications,
8. B.S. Grewal, (2010)Higher Engineering Mathematics, 36th Edition, Khanna Publishers

**Semester-I**

**18BEAE102** **Electromagnetism** **7H-5C**

**(Theory & Lab)**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objective:**

- To introduce the basic physics concepts relevant to different branches of Engineering and Technology and also to acquire the knowledge of Electromagnetic field theory that allows the student to learn scientific, mathematical and engineering principles.

**Course Outcomes**

- The student shall be able to formulate potential problems within electrostatics, magnetostatics and stationary current distributions in linear, isotropic media and also will acquire knowledge on properties of matter, quantum physics,basics of vacuum science, production and measurement

**Unit 1- Electrostatics in vacuum**

Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential and uniqueness of their solution and connection with steady state diffusion and thermal conduction; Practical examples like Farady's cage and coffee-ring effect.

**Electrostatics in a linear dielectric medium:**

Polarization-Field of a polarized object-Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement.

**Unit 2- Magnetostatics**

Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem

**Magnetostatics in a linear magnetic medium:**

Magnetization- diamagnets, paramagnets, ferromagnets- Field of a magnetized object-bound currents; auxiliary magnetic field $\vec{H}$ ; Boundary conditions on $\vec{B}$ and $\vec{H}$- magnetic susceptibility and permeability - Ferromagnetism.

**Unit 3 - Properties of Matter**

Elasticity –Three types of modulus of elasticity – basic definitions, relation connecting the moduli (Derivation)-factors affecting elastic modulus and tensile strength–Poisson's ratio-Torsional pendulum- bending of beams - bending moment – uniform and non-uniform bending - I-shaped girders - stress due to bending in beams.

**Unit 4 - Quantum Mechanics**

Introduction to quantum theory – Black body radiation - dual nature of matter and radiation – de Broglie wavelength, uncertainty principle –Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- physical significance of wave function, scanning electron microscope.

**Unit 5 -Vacuum science**

Introduction - Importance of vacuum in industries - Pumping speed and throughput - Types of pumps-Rotary vane type Vacuum pump(oil sealed), Diffusion Pump and Turbo Molecular Pump - Measurement of High Vacuum-McLeod Gauge-Pirani Gauge-Penning Gauge.

**SUGGESTED READINGS**


1. David Griffiths**,** (2017). Introductionto Electrodynamics**,** Cambridge publisher**,**
2. Ganesan.S and Baskar.T**,** (2015) Engineering Physics I**,** GEMS Publisher, Coimbatore-1
3. Ganesan S. Iyandurai N , (2007).,Applied Physics, KKS PublishersGaur,
4. R.K. and Gupta, S.C(2012).Engineering Physics, Dhanpat Rai Publications,
5. Halliday and Resnick, (2007).Physics, Wiley ($5^{th}$ edition),
6. W. Saslow, (2002) Electricity, magnetism and light, Academic Press

**(ii) Laboratory**

**Course Objective:**

- To learn the basic concepts in physics relevant to different branches of Engineering and Technology.
- To study the concept of semiconductor and conductivity.
- To learn the properties of materials.

**Course Outcome:**

1 Familiarize the properties of material and basic concepts in physics.

**LIST OF EXPERIMENTS – PHYSICS**

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young's modulus
3. Uniform bending – Determination of young's modulus
4. Lee's disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. Optical fibre -Determination of Numerical Aperture and acceptance angle
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Determination of Band gap of a semiconductor.
11. Spectrometer- Determination of wavelength using grating.
12. Viscosity of liquids-Determination of co-efficient of viscosity of a liquid by Poiseuille's flow

**Semester-I**

**18BEAE103** **Basic Electrical Engineering (Theory & Lab.)** **6H-5C**

**Instruction Hours/week: L:3 T:1 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.
- To understand the working of Power Converters and components of low-voltage electrical installations.

**Course Outcomes**

1. To understand and analyse basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low-voltage electrical installations.

**UNIT I - DC Circuits**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation.Superposition, Thevenin and Norton Theorems.Time-domain analysis of first-order RL and RC circuits.

**UNIT II - AC Circuits**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT III - Electrical Machines**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

**UNIT IV - Transformers And Power Converters**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.Auto-transformer and three-phase transformer connections. Overviews of DC-DC buck and boost converters, duty ratio control. Introduction to Single-phase and three-phase voltage source inverters.

**UNIT V - Electrical Installations**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, RCCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

**SUGGESTED READINGS**

1.V. D. Toro, 1989 Electrical Engineering Fundamentals, Prentice Hall India,
2. D. P. Kothari and I. J. Nagrath (2010)., Basic Electrical Engineering, Tata McGraw Hill,
3. D. C. Kulshreshtha, (2009).Basic Electrical Engineering, McGraw Hill,
4. L. S. Bobrow, (2011). Fundamentals of Electrical Engineering, Oxford University Press,
5. E. Hughes, (2010). Electrical and Electronics Technology, Pearson

**(ii) Laboratory**

**Course Objective**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.

**Course Outcomes (Cos)**

At the end of this course, students will demonstrate the ability

1. To understand and analyze basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.

**List of Experiments**

1. Experimental verification of electrical circuit problems using Ohms law and Kirchoff's law.
2. Measurement of electrical quantities – voltage, current, power & power factor in R load.
3. Speed control of DC shunt motor
4. Draw the equivalent circuit of single phase Transformer by conducting OC &SC Test.
5. Measurement of energy using single phase energy meter.

**SUGGESTED READING**


1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

**Semester-I**

**18BEAE104** **Engineering Graphics And Design** **5H-3C**

**Instruction Hours/week: L:1 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- to prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

**Course Outcomes**

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design and engineering graphics standards
3. Exposure to solid modeling ,computer-aided geometric design , creating working drawings and engineering communication

**UNIT I - INTRODUCTION -**

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Conic sections including the Ellipse, Parabola and Hyperbola (eccentricity method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales

**UNIT II - ORTHOGRAPHIC PROJECTIONS**

Principles of Orthographic Projections- Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

**UNIT III - PROJECTION OF POINTS, LINES AND PLANE SURFACES**

Projections of Points and lines located in the first quadrant inclined to both planes - Determination of true lengths and true inclinations; Projection of polygonal surface and circular lamina inclined to both reference planes

**UNIT IV- PROJECTION OF SOLIDS**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

## UNIT V - ISOMETRIC PROJECTIONS & COMPUTER GRAPHICS

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple solids, truncated prisms, pyramids, cylinders and cones; Conversion of Isometric Views to Orthographic Views and Vice-versa

Overview of Computer Graphics, listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software, Introduction to 3D modeling packages

## SUGGESTED READINGS


1. Venugopal K and Prabhu Raja V, Engineering Graphics,(2010) New Age International Publishers
2. C M Agrawal and Basant Agrawal,(2012) Engineering Graphics, Tata McGraw Hill, New Delhi
3. James D. Bethune,(2016) Engineering Graphics with AutoCAD , Pearson Education
4. Narayana, K.L. & P Kannaiah, (2008)Text book on Engineering Drawing, Scitech Publishers
5. Bureau of Indian Standards, Engineering Drawing Practices for Schools and Colleges SP 46, (2003), BIS, New Delhi,
6. Shah, M.B. & Rana B.C.(2008) Engineering Drawing and Computer Graphics, Pearson Education,
7. Bhatt N.D., Panchal V.M. & Ingle P.R,(2014) Engineering Drawing, Charotar Publishing House

**Semester-II**

**18BEAE201** **Mathematics II** **4H-4C**

**(Calculus, Ordinary DifferentialEquations and Complex Variable for Mechanical and Automobile Engineering)**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- The objective of this course is to familiarize the prospective engineers with techniques in Multivariate integration, ordinary and partial differential equations and complex variables.
- It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

**Course Outcome**

The students will learn:

1 The mathematical tools needed in evaluating multiple integrals and their usage.

2 The effective mathematical tools for the solutions of differential equations that model physical processes.

3 The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineering Problems.

**UNIT I - Multivariable Calculus (Integration)**

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Applications: areas and volumes, Center of mass and Gravity (constant and variable densities). Theorems of Green, Gauss and Stokes, Simple applications involving cubes and rectangular parallelepipeds.

**UNIT II -First order ordinary differential equations**

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree:equations solvable for p, equations solvable for y, equations solvable for x and Clairaut'stype.

**UNIT III -Ordinary differential equations of higher orders**

Second order linear differential equations with variable coefficients, method of variation ofparameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Besselfunctions of the first kind and their properties.

**UNIT IV-Analytic Functions**

Cauchy-Riemann equations, analytic functions, harmonic functions, findingharmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm)and their properties; Conformal mappings, Mobius transformations.

**UNIT V - Complex Integration**

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula(without proof), zeros of analytic functions, singularities, Taylor's series, Laurent's series, Residues, CauchyResidue theorem (without proof), Evaluation of definite integral involving sine and cosine.

**SUGGESTED READINGS**


1. Hemamalini. P.T., (2014). Engineering Mathematics, McGraw Hill Education (India) Private Limited,, New Delhi,
2. G.B. Thomas and R.L. Finney, (2002), Calculus and Analytic geometry, 9th Edition, Pearson.
3. Erwin kreyszig, (2006).Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons,
4. W. E. Boyce and R. C. DiPrima, (2009).Elementary Differential Equations and Boundary , Value Problems9th Edn., Wiley India,
5. S. L. Ross1984., Differential Equations, 3rd Ed., Wiley India,
6. E. A. Coddington, (1995).An.Introduction to Ordinary Differential Equations, Prentice Hall, India,
7. E. L. Ince1958., Ordinary Differential Equations, Dover Publications,
8. J. W. Brown and R. V. Churchill.2004., Complex Variables and Applications, 7th Ed., Mc-Graw Hill,
9. N.P. Bali and Manish Goyal (2008)., A text book of Engineering Mathematics, Laxmi Publications,
10. B.S. Grewal, (2010). Higher Engineering Mathematics, 36th Edition, Khanna Publishers,

**Semester-II**

**18BEAE202** **CHEMISTRY-I** **7H-6C**

**(Theory & Lab.)**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Concepts in chemistry for engineering**

**Course Objective**

- To understand the terminologies of atomic and molecular structure
- To study the basics of Periodic properties, Intermolecular forces
- To study about spectroscopic technique
- To understand the thermodynamic functions
- To comprehend the basic organic chemistry and to synthesis simple drug.

**Course Outcomes**

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. Rationalise bulk properties and processes using thermodynamic considerations.
5. List major chemical reactions that are used in the synthesis of molecules.

**UNIT I - Atomic and molecular structure**

Schrodinger equation. Particle in a box solutions and their applications. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules. Pi-molecular orbitals of butadiene and benzene and aromaticity.Introduction to Crystal field theory.

**UNIT II - Periodic properties, Intermolecular forces and potential energy surfaces**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers. Ionic, dipolar and van Der Waals interactions.Equations of state of real gases and critical phenomena. Potential energy surfaces of $H_2F$ and HCN and trajectories on these surfaces.

**UNIT III - Spectroscopic techniques and applications**

Spectroscopy (Principles and Instrumentation only).Electronic spectroscopy.Vibrational and rotational spectroscopy.Applications.Surface characterization techniques. Diffraction and scattering.Fluorescence and its applications in medicine.

**UNIT IV - Use of free energy in chemical equilibria**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications.Acid base, oxidation reduction and solubility equilibria.Use of free energy considerations in metallurgy through Ellingham diagrams.

**UNIT V - Organic reactions and synthesis of a drug molecule**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.Synthesis of a commonly used drug molecule.

**SUGGESTED READINGS**


1. B. H. Mahan, (2010).University chemistry, Pearson Education,
2. M. J. Sienko and R. A. Plane, Chemistry: Principles and Applications.
3. C. N. Banwell, (1994)Fundamentals of Molecular Spectroscopy, McGraw-Hill,.
4. B. L. Tembe, Kamaluddin and M. S. Krishnan, Engineering Chemistry (NPTEL Web-book)
5. P. W. Atkins, (2009).Physical Chemistry, Oxford University Press,
6. K. P. C. Volhardt and N. E. Schore, (2014).5th Edition, Organic Chemistry: Structure and Function, W.H. Freeman,
7. P C Jain & Monica Jain, (2015).Engineering Chemistry, Dhanpat Rai Publishing Company,

**(ii) Chemistry Laboratory**

**Course Objectives**

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

**Course Outcomes**

1. The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:
2. Estimate rate constants of reactions from concentration of reactants/products as a function of time
3. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
4. Synthesize a small drug molecule and analyse a salt

Choice of 10 experiments from the following:

1. Determination of surface tension and viscosity
2. Determination of Sodium Carbonate and Sodium Hydrogen Carbonate in a mixure using volumetric titration
3. Determination of Ca / Mg using complexometric titration
4. Thin layer chromatography
5. Determination of chloride content of water
6. Determination of the rate constant of a reaction
7. Conductometry - Determination of cell constant and conductance of solutions
8. pH Metry – Determination of Acid / Base
9. Potentiometry - determination of redox potentials and emfs
10. Saponification/acid value of an oil
11. Determination of the partition coefficient of a substance between two immiscible liquids
12. Adsorption of acetic acid by charcoal
13. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

**B.E Automobile Engineering** **2018-2019**

**Semester-II**

**18BEAE203** **English** **4H-3C**

**Instruction Hours/week: L:2 T:0 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.

**Course Outcomes**

Students undergoing this course will be able to

1. Use English language for communication: verbal & non –verbal.
2. Enrich comprehension and acquisition of speaking & writing ability.
3. Gain confidence in using English language in real life situations.
4. Improve word power: lexical, grammatical and communication competence.

**Unit**I -**Basic Writing Skills**

Sentence Structures - Use of phrases and clauses in sentences - Importance of proper punctuation - Creating coherence- Organizing principles of paragraphs in documents - Techniques for writing precisely

**Unit 1I - Vocabulary Building**

The concept of Word Formation - Root words from foreign languages and their use in English - Acquaintance, with prefixes and suffixes from foreign languages in English to form derivatives. - Synonyms, antonyms, and standard abbreviations.

**Unit III - Grammar and Usage**

Subject-verb agreement - Noun-pronoun agreement - Misplaced modifiers – Articles – Prepositions – Redundancies - Clichés

**Unit IV - Listening and Reading Skills**

Note taking- viewing model interviews – listening to informal conversations – improving listening / reading comprehension – reading model prose / poems – reading exercise

**Unit**V.-**Writing Practices**

Comprehension - Précis Writing - Essay Writing Listening Comprehension - Common Everyday Situations: Conversations and Dialogues - Communication at Workplace – Interviews - Formal Presentations.

**Note:** Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

## SUGGESTED READINGS


1. Sangeeta Sharma , Meenakshi Raman, (2015), Technical Communication: Principles And Practice, 2nd Edition, OUP, New Delhi..
2. Sanjay Kumar and PushpLata(2011)., Communication Skills , Oxford University Press,
3. Liz Hamp - Lyons and Ben Heasly(2006)., Study Writing, Cambridge University Press,
4. F.T. Wood., (2007).Remedial English Grammar, Macmillan,
5. Michael Swan, (1995), Practical English Usage, OUP.,.

**Semester-II**

**18BEAE204** **Programming For Problem Solving (Theory & Lab.)** **7H-5C**

**Instruction Hours/week: L:3 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- Identify and understand the working of key components of a computer program.
- Identify and understand the various kinds of keywords and different data types of C programming
- Understand, analyze and implement software development tools like algorithm,
- pseudo codes and programming structure
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in "C" language

**Course Outcomes**

The course will enable the students

1. To formulate simple algorithms for arithmetic and logical problems
2. To translate the algorithms to programs (in C language)
3. To test and execute the programs and correct syntax and logical errors
4. To implement conditional branching, iteration and recursion
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach
6. To use arrays, pointers and structures to formulate algorithms and programs
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems
8. To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

**Unit I – Introduction to Programming, Arithmetic expressions and precedence**

Introduction to Programming-Flowchart / pseudocode, compilation, Variables including data types, Arithmetic expressions and precedence.

**Unit II – Conditional Branching and Loops**

Conditional Branching – Loops Writing and evaluation of conditionals and consequent branching, Iteration and loops.

**Unit III – Arrays and Basic Algorithms**

Arrays1-D,2-D,Characterarraysand Strings **Basic Algorithms**: Searching, Basic Sorting Algorithms, Finding roots of equations, idea of time complexity.

**Unit IV – Function and Recursion**

Functions (including using built in libraries), Recursion with example programs such as Quick sort, Ackerman function etc.

**Unit V - Structure, Pointers and File Handling**

Pointers, Structures including self-referential structures e.g., linked list, notional introduction, File handling in C.

**SUGGESTED READINGS**


1. E. Balagurusamy,(2017) Computing Fundamentals and C Programming, 5th Edition, TMH Education
2. E. Balaguruswamy (2017), Programming in ANSI C, 7th Edition, Tata McGraw-Hill,
3. Byron Gottfried (2017), Schaum's Outline of Programming with C, 3rd Edition, McGraw-Hill
4. Brian W. Kernighan and Dennis M. Ritchie,(2015) The C Programming Language, 2nd Edition, Prentice Hall of India

**(ii) Laboratory**

**Course Objectives**

- To provide an awareness to Computing and C Programming
- To know the correct and efficient ways of solving problems
- To learn to develop algorithm for simple problem solving

**Course Outcomes**

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use the mind defining self-referential structures.
8. To be able to create, read and write to and from simple text files.

**List of Experiments**

**Tutorial 1:** Problem solving using computers:

**Lab 1:** Familiarization with programming environment

**Tutorial 2:** Variable types and type conversions:

**Lab 2:** Simple computational problems using arithmetic expressions

**Tutorial 3:** Branching and logical expressions:

**Lab 3:** Problems involving if-then-else structures

**Tutorial 4:** Loops, while and for loops:

**Lab 4:** Iterative problems e.g., sum of series

**Tutorial 5:**1DArrays: searching, sorting:

**Lab 5:**1DArray manipulation

**Tutorial 6:**2D arrays and Strings, memory structure:

**Lab 6:** Matrix problems, String operations

**Tutorial 7:** Functions, call by value:

**Lab 7:** Simple functions

**Tutorial 8 & 9**: Numerical methods (Root finding, numerical differentiation, numerical integration):

**Lab 8and 9:**Numerical methods problems

**Tutorial 10:** Recursion, structure of recursive calls:

**Lab 10:** Recursive functions

**Tutorial 11:** Pointers, structures and dynamic memory allocation

**Lab 11:** Pointers and structures

**Tutorial 12:** File handling:

**Lab 12:** File operations

**Semester-II**

**18BEAE205** **Workshop / Manufacturing Practices Laboratory** **5H-3C**

**Instruction Hours/week: L:1 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To know the correct and efficient ways of solving problems
- To learn to develop algorithm for simple problem solving

**Course Outcomes**

1. Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.
2. Students will be able to fabricate components with their own hands.
3. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
4. By assembling different components, they will be able to produce small devices of their interest.

**i) Lectures & videos: (10 PERIODS)**

**Detailed contents**

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods**(3 lectures)**
2. CNC machining, Additive manufacturing **(1 lecture)**
3. Fitting operations & power tools **(1 lecture)**
4. Electrical &Electronics **(1 lecture)**
5. Carpentry **(1 lecture)**
6. Plastic moulding, glass cutting **(1 lecture)**
7. Metal casting **(1 lecture)**
8. Welding (arc welding & gas welding), brazing **(1 lecture)**

**ii) Workshop Practice: (60 PERIODS)**

1. Machine shop **(10 Periods)**
2. Fitting shop **(8 Periods)**
3. Carpentry **(6 Periods)**
4. Electrical & Electronics**(8 Periods)**
5. Welding shop **( 8 hours (Arc welding 4 Periods + gas welding 4 Periods)**
6. Casting **(8 Periods)**
7. Smithy **(6 Periods)**
8. Plastic moulding & Glass Cutting **(3 Periods)**
9. Plumbing Exercises **(3 Periods)**

**SUGGESTED READINGS**


1. Jeyachandran, K. and Balasubramanian, S, (2007).A Premier on Engineering Practices Laboratory, Anuradha Publications, Kumbakonam,
2. Jeyapoovan, T., Saravanapandian, M, (2006). Engineering Practices Lab Manual, Vikas Puplishing House Pvt. Ltd, Chennai,
3. Bawa, H.S, (2007).Workshop Practice, Tata McGraw – Hill Publishing Company Limited, New Delhi,
4. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K, Elements ofWorkshop Technology", Vol. I (2008) and Vol. II (2010),Media promoters and publishers private limited.
5. Gowri P. Hariharan and A. Suresh Babu, (2008). Manufacturing Technology – I, Pearson Education,.
6. Kalpakjian S. And Steven S. Schmid, (2002). Manufacturing Engineering and Technology, Pearson Education India Edition,
7. Roy A. Lindberg, 1998.Processes and Materials of Manufacture, Prentice Hall India,.
8. Rao P.N., (2017)..Manufacturing Technology, Vol. I and Vol. II, Tata McGrawHill House,

**Semester-II**

**18BEAE206** **Constitution of India** **1H-0C**

**Instruction Hours/week: L:1 T:0 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To know about Indian constitution.
- To know about central and state government functionalities in India.
- To know about Indian society.

**Course Outcomes**

Upon completion of the course, students will be able to:

1. Understand the functions of the Indian government.
2. Understand and abide the rules of the Indian constitution.
3. Understand and appreciate different culture among the people.

**UNIT I - INTRODUCTION**

Historical Background – Constituent Assembly of India – Philosophical foundations of the IndianConstitution – Preamble – Fundamental Rights – Directive Principles of State Policy – FundamentalDuties – Citizenship – Constitutional Remedies for citizens.

**UNIT II - STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT**

Union Government – Structures of the Union Government and Functions – President – Vice President– Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

**UNIT III - STRUCTURE AND FUNCTION OF STATE GOVERNMENT**

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – StateLegislature – Judicial System in States – High Courts and other Subordinate Courts.

**UNIT IV - CONSTITUTION FUNCTIONS**

Indian Federal System – Center – State Relations – President‟s Rule – Constitutional Amendments –Constitutional Functionaries - Assessment of working of the Parliamentary System in India.

**UNIT V- INDIAN SOCIETY**

Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India;Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women,Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

**SUGGESTED READINGS**

1. Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India, New Delhi

2. R.C.Agarwal, (1997).Indian Political System ,S.Chand and Company, New Delhi,

3. Maciver and Page, Society: An Introduction Analysis, Mac Milan India Ltd, New Delhi

4. K.L.Sharma(1997)., Social Stratification in India: Issues and Themes , Jawaharlal Nehru University, New Delhi,

5. Sharma, Brij Kishore,(2011)., Introduction to the Constitution of India, Prentice Hall of India, New Delhi,

6. U.R.Gahai, (1998).Indian Political System, New Academic Publishing House, New Delhi,.

7. R.N. Sharma, (1987).Indian Social Problems, Media Promoters and Publishers Pvt. Ltd, New Delhi,

**Semester-I**

**18BBME101** **Mathematics –I** **4H-4C**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.

**Course Outcomes**

1. Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
2. Improved facility in algebraic manipulation.
3. Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
4. Understanding the ideas of differential equations and facility in solving simple standard examples.

**UNIT I - DIFFERENTIAL CALCULUS**

Representation of functions, New functions from old functions, Limit of a function, Limits at infinity, Continuity , Derivatives, Differentiation rules, Polar coordinate system , Differentiation in polar coordinates, Maxima and Minima of functions of one variable.

**UNIT II - FUNCTIONS OF SEVERAL VARIABLES**

Partial derivatives, Homogeneous functions and Euler's theorem, Total derivative, Differentiation of implicit functions, Change of variables, Jacobians, Partial differentiation of implicit functions, Taylor's series for functions of two variables, Errors and approximations, Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.

**UNIT III - INTEGRAL CALCULUS**

Definite and Indefinite integrals, Substitution rule, Techniques of Integration, Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions, Improper integrals.

**UNIT IV - MULTIPLE INTEGRALS**

Double integrals, Change of order of integration, Double integrals in polar coordinates, Area enclosed by plane curves, Triple integrals , Volume of solids, Change of variables in double and triple integrals.

**UNIT V - DIFFERENTIAL EQUATIONS**

Method of variation of parameters, Method of undetermined coefficients, Homogenous equation of Euler's and Legendre's type, System of simultaneous linear differential equations with constant coefficients.

**SUGGESTED READINGS**


1. Hemamalini. P.T, (2014)&(2017). Engineering Mathematics, McGraw Hill Education (India) Private, Limited, New Delhi.
2. James Stewart, (2008).Calculus with Early Transcendental Functions, Cengage Learning,
3. Narayanan S. and Manicavachagom Pillai T. K., (2007).Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd,
4. Erwin kreyszig, (2014).Advanced Engineering Mathematics, 9th Edition,John Wiley & Sons,
5. B.S. Grewal, (2014)Higher Engineering Mathematics, 43rd Edition, Khanna Publishers,
6. Ramana B.V, (2010), Higher Engineering Mathematics, 11th Reprint,., Tata McGraw Hill New Delhi,
7. Jain R.K. and Iyengar S.R.K, (2007). Advanced Engineering Mathematics , 3rd Edition, Narosa Publications,
8. Bali N., Goyal M. and Watkins C, (2009). Advanced Engineering Mathematics, 7th Edition, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd),
9. Greenberg M.D.,5th Reprint, (2009). Advanced Engineering Mathematics, 2nd Edition,5th ReprintPearson Education,
10. O'Neil, (2007).P.V, Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd,.

**Semester-I**

**18BEBME102** **Chemistry – I** **7H-6C**

**(Theory & Lab.)**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Concepts in chemistry for engineering**

**Course Objective**

- To understand the terminologies of atomic and molecular structure
- To study the basics of Periodic properties, Intermolecular forces
- To study about spectroscopic technique
- To understand the thermodynamic functions
- To comprehend the basic organic chemistry and to synthesis simple drug.

**COURSE OUTCOMES:**

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. Rationalise bulk properties and processes using thermodynamic considerations.
5. List major chemical reactions that are used in the synthesis of molecules.

**UNIT I - Atomic and molecular structure**

Schrodinger equation. Particle in a box solutions and their applications. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules. Pi-molecular orbitals of butadiene and benzene and aromaticity.Introduction to Crystal field theory.

**UNIT II - Periodic properties, Intermolecular forces and potential energy surfaces**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers. Ionic, dipolar and van Der Waals interactions.Equations of state of real gases and critical phenomena. Potential energy surfaces of $H_2F$ and HCN and trajectories on these surfaces.

**UNIT III - Spectroscopic techniques and applications**

Spectroscopy (Principles and Instrumentation only).Electronic spectroscopy.Vibrational and rotational spectroscopy.Applications.Surface characterization techniques. Diffraction and scattering.Fluorescence and its applications in medicine.

**UNIT IV - Use of free energy in chemical equilibria**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications.Acid base,

oxidation reduction and solubility equilibria.Use of free energy considerations in metallurgy through Ellingham diagrams.

**UNIT V - Organic reactions and synthesis of a drug molecule**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.Synthesis of a commonly used drug molecule.

**SUGGESTED READINGS**


1. B. H. Mahan, (2010).University chemistry, Pearson Education,
2. M. J. Sienko and R. A. Plane, Chemistry: Principles and Applications.
3. C. N. Banwell, (1994).Fundamentals of Molecular Spectroscopy, McGraw-Hill,
4. B. L. Tembe,.Kamaluddin and M. S. Krishnan(2009), Engineering Chemistry (NPTEL Web-book)
5. P. W. Atkins, Physical Chemistry, Oxford University Press,
6. K. P. C. Volhardt and N. E. Schore, (2014).5th Edition, Organic Chemistry: Structure and Function, W.H. Freeman,
7. P C Jain & Monica Jain, (2015), Engineering Chemistry, Dhanpat Rai Publishing Company,

**(ii) Chemistry Laboratory**

**Course Objectives**

To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

**Course Outcomes**

1. The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:
2. Estimate rate constants of reactions from concentration of reactants/products as a function of time
3. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
4. Synthesize a small drug molecule and analyse a salt

Choice of 10 experiments from the following:

1. Determination of surface tension and viscosity
2. Determination of Sodium Carbonate and Sodium Hydrogen Carbonate in a mixure using volumetric titration
3. Determination of Ca / Mg using complexometric titration
4. Thin layer chromatography
5. Determination of chloride content of water
6. Determination of the rate constant of a reaction
7. Conductometry - Determination of cell constant and conductance of solutions
8. pH Metry – Determination of Acid / Base
9. Potentiometry - determination of redox potentials and emfs
10. Saponification/acid value of an oil
11. Determination of the partition coefficient of a substance between two immiscible liquids
12. Adsorption of acetic acid by charcoal
13. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

**Semester-I**

**18BEBME103** **Basic Electrical Engineering** **6H-5C**

**(Theory & Lab.)**

**Instruction Hours/week: L:3 T:1 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.
- To understand the working of Power Converters and components of low-voltage electrical installations.

**Course Outcomes**

1. To understand and analyse basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low-voltage electrical installations.

**UNIT I - DC Circuits**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation.Superposition, Thevenin and Norton Theorems.Time-domain analysis of first-order RL and RC circuits.

**UNIT II - AC Circuits**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT III - Electrical Machines**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

**UNIT IV - Transformers And Power Converters**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.Auto-transformer and three-phase transformer connections. Overviews of DC-DC buck and boost converters, duty ratio control. Introduction to Single-phase and three-phase voltage source inverters.

**UNIT V - Electrical Installations**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, RCCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

**SUGGESTED READINGS**


1. D. P. Kothari and I. J. Nagrath, (2010). Basic Electrical Engineering, Tata McGraw Hill,
2. D. C. Kulshreshtha, (2009).Basic Electrical Engineering, McGraw Hill,
3. L. S. Bobrow, (2011).Fundamentals of Electrical Engineering, Oxford University Press,
4. E. Hughes, (2010).Electrical and Electronics Technology, Pearson,
5. V. D. Toro, 1989.Electrical Engineering Fundamentals, Prentice Hall India,

**(ii) Laboratory**

**Course Objective**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.

**Course Outcomes (Cos)**

At the end of this course, students will demonstrate the ability

1. To understand and analyze basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.

**List of Experiments**

1. Experimental verification of electrical circuit problems using Ohms law and Kirchoff's law.
2. Measurement of electrical quantities – voltage, current, power & power factor in R load.
3. Speed control of DC shunt motor
4. Draw the equivalent circuit of single phase Transformer by conducting OC &SC Test.
5. Measurement of energy using single phase energy meter.

**SUGGESTED READING**


1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

**Semester-I**

**18BEBME104** **Programming For Problem Solving (Theory & Lab.)** **7H-5C**

**Instruction Hours/week: L:3 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- Identify and understand the working of key components of a computer program.
- Identify and understand the various kinds of keywords and different data types of C programming
- Understand, analyze and implement software development tools like algorithm,
- pseudo codes and programming structure
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in "C" language

**Course Outcomes**

The course will enable the students

1. To formulate simple algorithms for arithmetic and logical problems
2. To translate the algorithms to programs (in C language)
3. To test and execute the programs and correct syntax and logical errors
4. To implement conditional branching, iteration and recursion
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach
6. To use arrays, pointers and structures to formulate algorithms and programs
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems
8. To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

**Unit I - IntroductiontoProgramming**

Introduction to components of a computer system disks, memory, processor, where a program is stored and executed, operating system, compilers - Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart / Pseudocode with examples. From algorithms to programs; source code, variables with data types variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

**Unit II – Arithmetic expressions, precedence, Conditional Branching and Loops**

**[Arithmetic expressions and precedence** – Conditional Branching- Loops-Writing and evaluation of conditionals and consequent branching-Iteration and loops.

**Unit III - Array and BasicAlgorithms**

Arrays-Arrays1-D, 2-D,Character arrays and Strings, Searching, Basic Sorting Algorithms-Bubble Insertion and Selection sorting, Finding roots of equations, notion of order of complexity through example programs (no formal definition required).

**Unit IV - Function and Recursion**

Functions including using built in libraries Parameter passing in functions, call by value, Passing arrays to functions:idea of call by reference, **Recursion:** Recursion,as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function. Quick sort or Merge sort.

**Unit V - Structure, Pointers and File Handling**

**[**Structures, Defining structures and Array of Structures,

**Pointers:** Idea of pointers,Defining pointers,Use of Pointers in self-referential structures, notion of linked list (no implementation), File handling.

**SUGGESTED READINGS**


1. E. Balagurusamy, (2017) Computing Fundamentals and C Programming, TMH Education, 5th Edition,
2. E. Balaguruswamy, (2017). ProgramminginANSIC, TataMcGraw-Hill, 7th Edition,
3. ByronGottfried, Schaum's (2017) OutlineofProgrammingwithC, McGraw-Hill, 3rd Edition,
4. BrianW.KernighanandDennisM.Ritchie, (2015).TheCProgrammingLanguage, Prentice HallofIndia, 2nd Edition,

**(ii) Laboratory**

**Course Objectives**

- To provide an awareness to Computing and C Programming
- To know the correct and efficient ways of solving problems
- To learn to develop algorithm for simple problem solving

**Course outcomes**

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use the mind defining self-referential structures.
8. To be able to create, read and write to and from simple text files.

**List of Experiments**

**Tutorial 1:** Problem solving using computers:

**Lab 1:** Familiarization with programming environment

**Tutorial 2:** Variable types and type conversions:

**Lab 2:** Simple computational problems using arithmetic expressions

**Tutorial 3:** Branching and logical expressions:

**Lab 3:** Problems involving if-then-else structures

**Tutorial 4:** Loops, while and for loops:

**Lab 4:** Iterative problems e.g., sum of series

**Tutorial 5:**1DArrays: searching, sorting:

**Lab 5:**1DArray manipulation

**Tutorial 6:**2D arrays and Strings, memory structure:

**Lab 6:** Matrix problems, String operations

**Tutorial 7:** Functions, call by value:

**Lab 7:** Simple functions

**Tutorial 8 & 9**: Numerical methods (Root finding, numerical differentiation, numerical integration):

**Lab 8and 9:**Numerical methods problems

**Tutorial 10:** Recursion, structure of recursive calls:

**Lab 10:** Recursive functions

**Tutorial 11:** Pointers, structures and dynamic memory allocation

**Lab 11:** Pointers and structures

**Tutorial 12:** File handling:

**Lab 12:** File operations**Course Objectives**

**Semester-II**

**18BEBME201** **Mathematics – II** **4H-4C**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as fluid dynamics and flow of the electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

**CourseOutcomes:**

The students will learn:

1. To Evaluate complex integrals using the Cauchy integral formula and the residue Theorem
2. To Appreciate how complex methods can be used to prove some important theoretical results.
3. To Evaluate line, surface and volume integrals in simple coordinate systems
4. To Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
5. To Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

**UNIT I - MATRICES**

Eigen values and Eigenvectors of a real matrix, Characteristic equation, Properties of eigenvalues and eigenvectors, Cayley-Hamilton theorem, Diagonalization of matrices , Reduction of a quadratic form to canonical form by orthogonal transformation, Nature of quadratic forms. Simple Problems using Scilab.

**UNIT II - VECTOR CALCULUS**

Gradient and directional derivative, Divergence and Curl, Irrotational and Solenoidal vector fields, Line integral over a plane curve, Surface integral, Area of a curved surface, Volume integral, Green's, Gauss divergence and Stoke's theorems, Verification and application in evaluating line, surface and volume integrals.

**UNIT III - ANALYTIC FUNCTION**

Analytic functions, Necessary and sufficient conditions for analyticity, Properties, Harmonic conjugates, Construction of analytic function, Conformal mapping, Mapping by Functions w =z+c, cz, 1/z, $z^2$ , Bilinear transformation.

**UNIT IV- COMPLEX INTEGRATION**

Line integral, Cauchy's integral theorem, Cauchy's integral formula, Taylor's and Laurent's series, Singularities, Residues, Residue theorem, Application of residue theorem for evaluation of real integrals, Use of circular contour and semicircular contour with no pole on real axis.

**UNIT V - LAPLACE TRANSFORMS**

Existence conditions, Transforms of elementary functions, Transform of unit step function and unit impulse function, Basic properties, Shifting theorems, Transforms of derivatives and integrals, Initial and final value theorems, Inverse transforms, Convolution theorem , Transform of periodic functions, Application to solution of linear ordinary differential equations with constant coefficients.

**SUGGESTED READINGS**


1. Hemamalini. P.T, (2014)&(2017)Engineering Mathematics, McGraw Hill Education (India) Private Limited, New Delhi,
2. Erwin kreyszig, (2014).Advanced Engineering Mathematics, 9th Edition,John Wiley & Sons,
3. B.S. Grewal, (2014). Higher Engineering Mathematics, 43rd Edition, Khanna Publishers
4. Ramana B.V, (2010).Higher Engineering Mathematics, Tata McGraw Hill,
5. Glyn James, Advanced Modern Engineering Mathematics, Pearson Education, (2007)
6. Jain R.K. and Iyengar S.R.K, (2007).Advanced Engineering Mathematics , 3rd Edition, Narosa Publications,
7. Bali N., Goyal M. and Watkins C, (2009).Advanced Engineering Mathematics, 7th Edition, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd),
8. O'Neil, P.V, (2007).Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd,

**Semester-II**

**18BEBME202** **Engineering Physics** **7H-5C**

**(Theory and lab.)**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objective:**

- To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

**Course Outcomes**

1 The students will acquire knowledge on the basics of physics related to properties of matter, optics, acoustics etc., and they will apply these fundamental principles to solve practical problems related to materials used for engineering applications.

**UNIT I - PROPERTIES OF MATTER**

Elasticity –Three types of modulus of elasticity – basic definitions, relation connecting the moduli (Derivation)-factors affecting elastic modulus and tensile strength–Poisson's ratio-Torsional pendulum- bending of beams - bending moment – uniform and non-uniform bending - I-shaped girders - stress due to bending in beams.

**UNIT II - ACOUSTICS AND ULTRASONICS**

Classification of sound - loudness and intensity - standard intensity and intensity level - decibel - reverberation- reverberation time- sound absorbing materials - factors affecting acoustics of buildings: focusing, interference, echo, echelon effect, resonance,noise and their remedies. Ultrasonics: production - magnetostriction and piezoelectric methods - industrial applications – Non-destructive testing- pulse echo system through transmission and reflection modes – scan displays.

**UNIT III - THERMAL AND MODERN PHYSICS**

Thermal expansion - thermal stress - expansion joints - bimetallic strips - thermal conductivity- heat conductions in solids – flow of heat through compound media – Forbe's and Lee's disc method: theory and experiment- Introduction to quantum theory – Black body radiation - dual nature of matter and radiation – de Broglie wavelength, uncertainty principle –Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box-physical significance of wave function.

**UNIT IV - APPLIED OPTICS**

Interference - Michelson interferometer: construction, working, determination of wave length and thickness - anti-reflection coating - air wedge and its applications - Lasers – principle and applications – Einstein's coefficients – $CO_2$ laser - semiconductor lasers: homo junction construction and working – applications. Optical fibres – classification (index & mode based) - principle and propagation of light in optical fibres - acceptance angle and numerical aperture - fibre optic communication system.

**UNIT V - CRYSTAL**

Single crystalline, polycrystalline and amorphous materials – Single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices - interplanar distance for a cubic crystal - coordination number and packing factor for SC, BCC, FCC, HCP-crystal imperfections: point defects, line defects,surface defects.

**SUGGESTED READINGS**


1. Gaur R.K. and Gupta S.L, 2013 Engineering Physics, Dhanpat Rai Publications,
2. Palanisamy P.K, (2006)Engineering Physics, Scitech Publications (P) Ltd,
3. Arumugam M , (2000)Engineering Physics, Anuradha Publications,
4. Serway R.A and Jewett J.W, (2010)Physics for Scientists and Engineers with Modern Physics, Thomson Brooks/Cole Publishing Co.
5. Tipler P.A. and Mosca G.P, (2007)Physics for Scientists and Engineers with Modern Physics, W.H.Freeman,
6. Markert J.T., Ohanian, H. and Ohanian M., (2007)Physics for Engineers and Scientists, W.W.Norton & Co.

**(ii) Laboratory**

**Course Objective:**

- To learn the basic concepts in physics relevant to different branches of Engineering and Technology.
- To study the concept of semiconductor and conductivity.
- To learn the properties of materials.

**Course Outcome:**

1. Familiarize the properties of material and basic concepts in physics.

**LIST OF EXPERIMENTS – PHYSICS**

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young's modulus
3. Uniform bending – Determination of young's modulus
4. Lee's disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. Optical fibre -Determination of Numerical Aperture and acceptance angle
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Determination of Band gap of a semiconductor.
11. Spectrometer- Determination of wavelength using grating.
12. Viscosity of liquids-Determination of co-efficient of viscosity of a liquid by Poiseuille's flow

**Semester-II**

**18BEBME203** **English** **4H-3C**

**Instruction Hours/week: L:2 T:0 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.

**Course Outcomes**

Students undergoing this course will be able to

1 Use English language for communication: verbal & non –verbal.
2 Enrich comprehension and acquisition of speaking & writing ability.
3 Gain confidence in using English language in real life situations.
4 Improve word power: lexical, grammatical and communication competence.

**Unit: I - Basic Writing Skills**

Sentence Structures - Use of phrases and clauses in sentences - Importance of proper punctuation - Creating coherence- Organizing principles of paragraphs in documents - Techniques for writing precisely

**Unit: 1I - Vocabulary Building**

The concept of Word Formation - Root words from foreign languages and their use in English - Acquaintance, with prefixes and suffixes from foreign languages in English to form derivatives. - Synonyms, antonyms, and standard abbreviations.

**Unit: III - Grammar and Usage**

Subject-verb agreement - Noun-pronoun agreement - Misplaced modifiers – Articles – Prepositions – Redundancies - Clichés

**Unit: IV - Listening and Reading Skills**

Note taking- viewing model interviews – listening to informal conversations – improving listening / reading comprehension – reading model prose / poems – reading exercise

**Unit:** V - **Writing Practices**

Comprehension - Précis Writing - Essay Writing Listening Comprehension - Common Everyday Situations: Conversations and Dialogues - Communication at Workplace – Interviews - Formal Presentations

**Note:** Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

## SUGGESTED READINGS


1. Sangeeta Sharma , Meenakshi Raman, (2015).Technical Communication: Principles And Practice, 2nd Edition, OUP,New Delhi.
2. Sanjay Kumar and PushpLata, (2011).Communication Skills ,Oxford University Press,
3. Liz Hamp - Lyons and Ben Heasly, (2006).Study Writing, Cambridge University Press,.
4. F.T. Wood., (2007).Remedial English Grammar, Macmillan,
5. Michael Swan, (1995).Practical English Usage, OUP.,

**Semester-II**

**18BEBME204** **Introduction To Biomedical Engineering** **3H-3C**

**Instruction Hours/week: L:3 T:0 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To provide students with a broad overview of the Biomedical Engineering field
- To haveabasic knowledgeon medical devices and equipment
- To provide an overview of common areas available to BME graduates
- To be aware of ethical conduct and professional accountability.

**Course Outcomes**

1 Abilitytounderstand the concepts of medical devices and equipments
2 The student will learn about professional and ethical responsibility
3 The student will learn about contemporary BME research

**UNIT I - Introduction**

HistoricalPerspective-Evolutionofmodernhealthcare system,Rolesplayedby Biomedical engineers, recent advance in biomedical engineering, Professionalstatusof biomedicalengineering, Professional societies. Physiological origins of bio signals and Imaging- Physiological Modeling - Linear Homeomorphic saccadic eye movement

**UNIT II - Bio Medical Devices**

Basicmedicalinstrumentation system-Bio-potential measurements – Bioanalytical sensors- Diagnostic devices- ECG,EEG, EHG, EOG, EMG, bloodpressuremeasurement, Audiometry,Temperatureand Respiration ratemeasurement, Blood cell counters, optical pulse oximetry,Biochemical measurement techniques using light- General constraints in design of medical instrumentation systems.

**UNIT III - Bio Imaging Systems**

Principle and working of X-rays, Nuclear Imaging Techniques: -Positron Emission Tomography, SPECT, Optical imaging, microscopy, MagneticResonanceImaging, Scanners, Photo acoustic imaging, Ultrasound, Thermal imaging systems.

**UNIT IV - Therapeutic and Assistive Instruments**

Cardiac Pacemakers,Cardiac Defibrillators,Artificialheart,Instrumentsfor Surgery, HaemodialysisMachines-ArtificialKidney,Dialyzers, Ventilators-Humidifiers, Nebulizers and Aspirators, AnaesthesiaMachine, Prosthetic devices

**UNIT V - Ethicsfor Biomedical Engineers**

Morality andEthics-A Definitionofterms,HumanExperimentation,Ethicalissuesinfeasibility studies,Ethicalissuesinemergency use,Ethicalissuesintreatmentuse, Codesofethicsforbio engineers.

**SUGGESTED READINGS**


1. Enderle,John, D., Bronzino, JosephD.,,Blanchard, SusanM, (2012).Introductionto Biomedical, Engineering, ElsevierInc, 3rdedition,
2. R. S. Khandpur, (2014) HandbookofBiomedical, Instrumetation, McGraw-Hill PublishingCompany Limited, 3rdedition,.
3. DanielA Vallero, (2013)., Biomedicalethics forEngineers, Elsevierpublication, 2ndedition,
4. Leslie, Cromwell, Fred, J.Weibell,Erich, (2002)BiomedicalInstrumentation andMeasurement, Prentice HallofIndia, New Delhi, 2ndedition,
5. John GWebster, (2010). Medical Instrumentation:, Applicationand Design, John WileyandsonsNewYork, 4thedition,
6. JosephJCarr, John M Brown, (2008), Introduction to Biomedical, EquipmentTechnology, John Wiley& Sons, New York, 4thedition,

**Semester-II**

**18BEBME205** **Electronic Devices And Circuits** **6H-5C**

**(Theory & Lab.)**

**Instruction Hours/week: L:3 T:1 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- To understand the operational characteristics of a Semiconductor in Equilibrium and Non-Equilibrium conditions.
- To understand the working of PN junction diodes and special purpose diodes.
- To understand the basic working of BJT and FET both in ideal and non- ideal conditions.
- To understand the working of Rectifiers and Voltage regulators.

**Course Outcomes**

1 Ability to understand the fundamental concepts of electronic devices
2 Ability to build an electronic circuits
3 Ability to logically analyze any electronic circuits

**UNIT I - Semiconductor Diodes And Special Purpose Diodes**

Semiconductors: Intrinsic semiconductor – extrinsic semiconductor – Fermi level in an intrinsic semiconductor Semiconductor diodes : Formation of PN junction – working principle – VI characteristics – diode current equation – diode resistance – transition and diffusion capacitance. Special purpose diodes: Tunnel, Varactor, Pin contact, Zener diode, schottky diode- Clippers and clampers

**UNIT II - Bipolar Transistors**

Bipolar Transistors: NPN-PNP- Construction – working – transistor currents –transistor configurations (CB,CE,CC) and input- output characteristics – Early effect (base width modulation) – transistor as an amplifier Transistor as a switch.

**UNIT III - Field Effect Transistors**

Field-Effect Transistors: construction, working principle and VI characteristics of JFET – comparison of BJT and JFET – MOSFET : working principle and VI characteristics, enhancement MOSFET, depletion MOSFET - comparison of MOSFET with JFET.

**UNIT IV - DC Power Supplies**

Rectifiers – Half wave, full wave and Bridge -Block schematic of a typical DC power supply, single phase HWR, FWR, filters - ripple factor and efficiency analysis , Voltage regulators: voltage regulation, Zener diode shunt regulator, transistor series regulator, transistor shunt regulator, switching regulators. Low dropout Regulators (LDO)

**UNIT V - Oscillators And Multi vibrators**

Types of Oscillators: RC phase shift, Wein-bridge, Hartley, Colpitt, Crystal; types of multivibrators: Astable, mono and bi-stable

**(ii) Laboratory**

**Course Objective:**

- To understand the Biasing network for BJT and FET, transient analysis and frequency response of BJT and FET in single stage and Oscillator
- Develop the ability to analyze and design analog electronic circuits using discrete components.
- Observe the amplitude and frequency responses of electronic circuits
- To understand the operation of Oscillators and waveform generators

**Course Outcome:**

1. Ability to understand the fundamental concepts of electronic devices
2. Ability to build basic electronic circuits with BJT and FET
3. Ability to diagnose the circuit defects

**LIST OF EXPERIMENTS:**

1. V-I Characteristics of PN diode
2. V-I Characteristics of Zener diode
3. V-I Characteristics of Clippers and Clampers
4. Input and Output Characteristics of BJT
5. Drain and transfer characteristics of JFET
6. Hartley Oscillator
7. Colpitt Oscillator
8. AstableMultivibrator
9. Half wave rectifier– with and without filter
10. Full wave rectifier – with and without filter

**SUGGESTED READINGS**


1. Millman and Halkias, (2010)., Electronic devices and Circuits, Tata McGraw Hill International,
2. David A.Bell (2009).. Fundamental of electronic devices and circuits, Oxford press,
3. Thomas L. Floyd, (2012),Electron Devices, Charles andMessilPublications,
4. G.K.Mithal, 2013Electronic Devices andCircuits, KhannaPublishers,
5. Robert L. Boylestad and Louis Nashelsky, (2009) Electronic Devices and Circuit Theory, Pearson Education, 9th Edition,.

**Semester-I**

**18BTBT101** **Mathematics-I** **4H-4C**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.

**Course Outcomes**

1 Understanding of the ideas of limits and continuity and ability to calculate with them and apply them.
2 Improved facilities in algebraic manipulation.
3 Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
4 Understanding the ideas of differential equations and facility in solving simple standard examples.

**UNIT I - DIFFERENTIAL CALCULUS**

Representation of functions, New functions from old functions, Limit of a function, Limits at infinity, Continuity , Derivatives, Differentiation rules, Polar coordinate system , Differentiation in polar coordinates, Maxima and Minima of functions of one variable.

**UNIT II - FUNCTIONS OF SEVERAL VARIABLES**

Partial derivatives, Homogeneous functions and Euler's theorem, Total derivative, Differentiation of implicit functions, Change of variables, Jacobians, Partial differentiation of implicit functions, Taylor's series for functions of two variables, Errors and approximations, Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.

**UNIT III - INTEGRAL CALCULUS**

Definite and Indefinite integrals, Substitution rule, Techniques of Integration, Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions, Improper integrals.

**UNIT IV - MULTIPLE INTEGRALS**

Double integrals, Change of order of integration, Double integrals in polar coordinates, Area enclosed by plane curves, Triple integrals , Volume of solids, Change of variables in double and triple integrals.

**UNIT V - DIFFERENTIAL EQUATIONS**

Method of variation of parameters, Method of undetermined coefficients, Homogenous equation of Euler's and Legendre's type, System of simultaneous linear differential equations with constant coefficients.

**SUGGESTED READINGS:**


1. Hemamalini. P.T, (2014)&(2017),Engineering Mathematics, McGraw Hill Education (India) Private Limited, New Delhi.
2. James Stewart, (2008) Calculus with Early Transcendental Functions, Cengage Learning,
3. Narayanan S. and Manicavachagom Pillai T. K., (2007), Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd,
4. Erwin kreyszig, (2014), Advanced Engineering Mathematics, 9th Edition,John Wiley & Sons,
5. B.S. Grewal, (2014) Higher Engineering Mathematics, 43rd Edition, Khanna Publishers,.
6. Ramana B.V, (2010) Higher Engineering Mathematics, 11th Reprint,.Tata McGraw Hill New Delhi,.
7. Jain R.K. and Iyengar S.R.K, (2007), Advanced Engineering Mathematics, 3rd Edition, Narosa Publications,.
8. Bali N., Goyal M. and Watkins C, (2009), Advanced Engineering Mathematics, 7th Edition, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd),.
9. Greenberg M.D., 5th Reprint, (2009)., Advanced Engineering Mathematics, 2nd Edition,5th Reprint, Pearson Education.
10. O'Neil, P.V, (2007), Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd,

**Semester-I**

**18BTBT102** **Chemistry-I** **7H-6C**

**(Theory & Lab.)**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Concepts in chemistry for engineering** \

**Course Objective**

- To understand the terminologies of atomic and molecular structure
- To study the basics of Periodic properties, Intermolecular forces
- To study about spectroscopic technique
- To understand the thermodynamic functions
- To comprehend the basic organic chemistry and to synthesis simple drug.

**Course Outcomes:**

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. Rationalise bulk properties and processes using thermodynamic considerations.
5. List major chemical reactions that are used in the synthesis of molecules.

**UNIT I - Atomic and molecular structure**

Schrodinger equation. Particle in a box solutions and their applications. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules. Pi-molecular orbitals of but adiene and benzene and aromaticity. Introduction to Crystal field theory.

**UNIT II - Periodic properties, Intermolecular forces and potential energy surfaces**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers. Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Potential energy surfaces of $H_2F$ and HCN and trajectories on these surfaces.

**UNIT III - Spectroscopic techniques and applications**

Spectroscopy (Principles and Instrumentation only).Electronic spectroscopy.Vibrational and rotational spectroscopy.Applications.Surface characterization techniques. Diffraction and scattering.Fluorescence and its applications in medicine.

**UNIT IV - Use of free energy in chemical equilibria**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications.Acid base, oxidation reduction and solubility equilibria.Use of free energy considerations in metallurgy through Ellingham diagrams.

**UNIT V - Organic reactions and synthesis of a drug molecule**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.Synthesis of a commonly used drug molecule.

**SUGGESTED READINGS**


1. B. H. Mahan, (2010), University chemistry, Pearson Education,.
2. M. J. Sienko and R. A. Plane, Chemistry: Principles and Applications.
3. C. N. Banwell, (1994), Fundamentals of Molecular Spectroscopy, McGraw-Hill,.
4. B. L. Tembe, Kamaluddin and M. S. Krishnan, Engineering Chemistry (NPTEL Web-book)
5. P. W. Atkins, (2009), Physical Chemistry, Oxford University Press,.
6. K. P. C. Volhardt and N. E. Schore, (2014), 5th Edition, Organic Chemistry: Structure and Function, W.H. Freeman,.
7. P C Jain & Monica Jain, (2015), Engineering Chemistry, Dhanpat Rai Publishing Company,.

**(ii) Chemistry Laboratory**

**Course Objectives**

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

**Course Outcomes**

1. The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:
2. Estimate rate constants of reactions from concentration of reactants/products as a function of time
3. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
4. Synthesize a small drug molecule and analyse a salt

Choice of 10 experiments from the following:

1. Determination of surface tension and viscosity
2. Determination of Sodium Carbonate and Sodium Hydrogen Carbonate in a mixure using volumetric titration
3. Determination of Ca / Mg using complexometric titration
4. Thin layer chromatography
5. Determination of chloride content of water
6. Determination of the rate constant of a reaction
7. Conductometry - Determination of cell constant and conductance of solutions
8. pH Metry – Determination of Acid / Base
9. Potentiometry - determination of redox potentials and emfs
10. Saponification/acid value of an oil
11. Determination of the partition coefficient of a substance between two immiscible liquids
12. Adsorption of acetic acid by charcoal
13. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

**Semester-I**

**18BTBT103** **Basic Electrical Engineering** **6H-5C**

**(Theory & Lab.)**

**Instruction Hours/week: L:3 T:1 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.
- To understand the working of Power Converters and components of low-voltage electrical installations.

**Course Outcomes**

1. To understand and analyse basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low-voltage electrical installations.

**UNIT I - DC Circuits**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation.Superposition, Thevenin and Norton Theorems.Time-domain analysis of first-order RL and RC circuits.

**UNIT II - AC Circuits**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT III - Electrical Machines**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

**UNIT IV - Transformers And Power Converters**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.Auto-transformer and three-phase transformer connections. Overviews of DC-DC buck and boost converters, duty ratio control. Introduction to Single-phase and three-phase voltage source inverters.

**UNIT V - Electrical Installations**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, RCCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

**SUGGESTED READINGS**

1 D. P. Kothari and I. J. Nagrath,((2010)), Basic Electrical Engineering, Tata McGraw Hill
2 D. C. Kulshreshtha(2009),Basic Electrical EngineeringMcGraw Hill
3 L. S. Bobrow,((2011)),Fundamentals of Electrical Engineering, Oxford University Press
4 E. Hughes,((2010)), Electrical and Electronics, TechnologyPearson
5 V. D. Toro(1989),Electrical Engineering Fundamentals, prentice Hall India

### (ii) Laboratory

**Course Objective**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.

**Course Outcomes (Cos)**

At the end of this course, students will demonstrate the ability

1. To understand and analyze basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.

**List of Experiments**

1. Experimental verification of electrical circuit problems using Ohms law and Kirchoff's law.
2. Measurement of electrical quantities – voltage, current, power & power factor in R load.
3. Speed control of DC shunt motor
4. Draw the equivalent circuit of single phase Transformer by conducting OC &SC Test.
5. Measurement of energy using single phase energy meter.

**SUGGESTED READING**


1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

**Semester-I**

**18BTBT104** **Engineering Graphics And Design** **5H-3C**

**Instruction Hours/week: L:1 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- to prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

**CourseOutcomes:**

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design and engineering graphics standards
3. Exposure to solid modeling ,computer-aided geometric design , creating working drawings and engineering communication

**UNIT I INTRODUCTION**

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Conic sections including the Ellipse, Parabola and Hyperbola (eccentricity method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales

**UNIT II ORTHOGRAPHIC PROJECTIONS**

Principles of Orthographic Projections- Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

**UNIT III PROJECTION OF POINTS, LINES AND PLANE SURFACES**

Projections of Points and lines located in the first quadrant inclined to both planes - Determination of true lengths and true inclinations; Projection of polygonal surface and circular lamina inclined to both reference planes

**UNIT IV PROJECTION OF SOLIDS**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

## UNIT V ISOMETRIC PROJECTIONS & COMPUTER GRAPHICS

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple solids, truncated prisms, pyramids, cylinders and cones; Conversion of Isometric Views to Orthographic Views and Vice-versa

Overview of Computer Graphics, listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software, Introduction to 3D modeling packages

## SUGGESTED READINGS


1. Venugopal K and Prabhu Raja V, (2010),Engineering Graphics, New Age International Publishers,.
2. C M Agrawal and Basant Agrawal, (2012), Engineering Graphics, Tata McGraw Hill, New Delhi,.
3. James D. Bethune, (2016), Engineering Graphics with AutoCAD (2015), Pearson Education,.
4. Narayana, K.L. & P Kannaiah, (2008),Text book on Engineering Drawing, Scitech Publishers,.
5. Bureau of Indian Standards, Engineering Drawing Practices for Schools and Colleges SP 46, (2003), BIS, New Delhi, (2003).
6. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education.
7. Bhatt N.D., Panchal V.M. & Ingle P.R, (2014), Engineering Drawing, Charotar Publishing House,.

**Semester-II**

**18BTBT201** **Mathematics-II** **4H-4C**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as fluid dynamics and flow of the electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

**Course Outcomes**

The students will learn:

1 To Evaluate complex integrals using the Cauchy integral formula and the residue Theorem
2 To Appreciate how complex methods can be used to prove some important theoretical results.
3 To Evaluate line, surface and volume integrals in simple coordinate systems
4 To Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
5 To Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

**UNIT I - MATRICES**

Eigen values and Eigenvectors of a real matrix, Characteristic equation, Properties of eigenvalues and eigenvectors, Cayley-Hamilton theorem, Diagonalization of matrices , Reduction of a quadratic form to canonical form by orthogonal transformation, Nature of quadratic forms. Simple Problems using Scilab.

**UNIT II - VECTOR CALCULUS**

Gradient and directional derivative, Divergence and Curl, Irrotational and Solenoidal vector fields, Line integral over a plane curve, Surface integral, Area of a curved surface, Volume integral, Green's, Gauss divergence and Stoke's theorems, Verification and application in evaluating line, surface and volume integrals.

**UNIT III - ANALYTIC FUNCTION**

Analytic functions, Necessary and sufficient conditions for analyticity, Properties, Harmonic conjugates, Construction of analytic function, Conformal mapping, Mapping by Functions w =z+c, cz, 1/z, $z^2$ , Bilinear transformation.

**UNIT IV- COMPLEX INTEGRATION**

Line integral, Cauchy's integral theorem, Cauchy's integral formula, Taylor's and Laurent's series, Singularities, Residues, Residue theorem, Application of residue theorem for evaluation of real integrals, Use of circular contour and semicircular contour with no pole on real axis.

**UNIT V - LAPLACE TRANSFORMS**

Existence conditions, Transforms of elementary functions, Transform of unit step function and unit impulse function, Basic properties, Shifting theorems, Transforms of derivatives and integrals, Initial and final value theorems, Inverse transforms, Convolution theorem , Transform of periodic functions, Application to solution of linear ordinary differential equations with constant coefficients.

**SUGGESTED READINGS**


1. Hemamalini. P.T, (2014 & 2017), Engineering Mathematics, McGraw Hill Education (India) Private Limited, New Delhi.
2. Erwin kreyszig, (2014), Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
3. B.S. Grewal, (2014), Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
4. Ramana B.V, (2010), Higher Engineering Mathematics, Tata McGraw Hill.
5. Glyn James, (2007), Advanced Modern Engineering Mathematics, Pearson Education.
6. Jain R.K. and Iyengar S.R.K, (2007), Advanced Engineering Mathematics , 3rd Edition, Narosa Publications.
7. Bali N., Goyal M. and Watkins C, (2009), Advanced Engineering Mathematics, 7th Edition, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd).
8. O'Neil, P.V, (2007), Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd.

**Semester-II**

**18BTBT202** **Engineering Physics** **7H-5C**

**(Theory & Lab.)**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i)Theory**

**Course Objectives**

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

**Course Outcomes**

Upon completion of this course,

1 The students will gain knowledge on the basics of properties of matter and its applications,
2 The students will acquire knowledge on the concepts of Laser and optical devices,
3 The students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchanges,
4 The students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and
5 The students will understand the basics of crystals, their structures and different crystal growth techniques.

**UNIT I – PROPERTIES OF MATTER**

Elasticity –Three types of modulus of elasticity – basic definitions, relation connecting the moduli (Derivation)-factors affecting elastic modulus and tensile strength–Poisson's ratio- Torsional pendulum- bending of beams – bending moment – uniform and non-uniform bending – I-shaped girders - stress due to bending in beams.

**UNIT II – LASER AND FIBER OPTICS**

Introduction – emission and absorption process- Einstein's coefficients derivation. Types of LASER – $CO_2$, Semiconductor LASER- Applications of LASER in industry and medicine.

Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram).

**UNIT III – THERMAL PHYSICS**

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints – bimetallic strips - thermal conduction, convection and radiation – heat conductions in solids – thermal conductivity – Forbe's and Lee's disc method: theory and experiment – conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

## UNIT IV – QUANTUM PHYSICS

Introduction to quantum theory – Black body radiation – dual nature of matter and radiation – de Broglie wavelength, uncertainty principle –Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- physical significance of wave function, scanning electron microscope.

## UNIT V – CRYSTAL PHYSICS

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances – Coordination number and packing factor for SC, BCC, FCC, HCP – crystal Imperfections: point defects, line defects

## SUGGESTED READINGS


1. Bhattacharya D.K. & Poonam T., (2015) Engineering Physics, Oxford University Press.
2. Gaur R.K. andGupta S.L, (2012), Engineering Physics, Dhanpat Rai Publications
3. Pandey .B.K. & Chaturvedi .S, (2012), Engineering Physics, Cengage Learning India
4. Halliday.D., Resnick R. & Walker. J, (2015), Principles of Physics, Wiley
5. Serway R.A and Jewett J.W., (2010), Physics for Scientists and Engineers with Modern Physics, Thomson Brooks/Cole Publishing Co
6. Tipler P.A. and Mosca G.P,(2007)., Physics for Scientists and Engineers with Modern Physics, W.H.Freeman

**(ii) Laboratory**

**Course Objective:**

- To learn the basic concepts in physics relevant to different branches of Engineering and Technology.
- To study the concept of semiconductor and conductivity.
- To learn the properties of materials.

**Course Outcome:**

1 Familiarize the properties of material and basic concepts in physics.

**LIST OF EXPERIMENTS – PHYSICS**

1. Torsional pendulum – Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending – Determination of young's modulus
3. Uniform bending – Determination of young's modulus
4. Lee's disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge – Determination of thickness of a thin sheet/wire
8. Optical fibre –Determination of Numerical Aperture and acceptance angle
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Determination of Band gap of a semiconductor.
11. Spectrometer- Determination of wavelength using grating.
12. Viscosity of liquids-Determination of co-efficient of viscosity of a liquid by Poiseuille's flow

**Semester-II**

**18BTBT203** **English** **4H-3C**

**Instruction Hours/week: L:2 T:0 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.

**Course Outcomes**

Students undergoing this course will be able to

1 Use English language for communication: verbal & non –verbal.
2 Enrich comprehension and acquisition of speaking & writing ability.
3 Gain confidence in using English language in real life situations.
4 Improve word power: lexical, grammatical and communication competence.

**Unit:** I – **Basic Writing Skills**

Sentence Structures – Use of phrases and clauses in sentences – Importance of proper punctuation – Creating coherence- Organizing principles of paragraphs in documents – Techniques for writing precisely

**Unit: 1I – Vocabulary Building**

The concept of Word Formation – Root words from foreign languages and their use in English – Acquaintance, with prefixes and suffixes from foreign languages in English to form derivatives. – Synonyms, antonyms, and standard abbreviations.

**Unit: III – Grammar and Usage**

Subject-verb agreement – Noun-pronoun agreement – Misplaced modifiers – Articles – Prepositions – Redundancies – Clichés

**Unit: IV – Listening and Reading Skills**

Note taking- viewing model interviews – listening to informal conversations – improving listening / reading comprehension – reading model prose / poems – reading exercise

**Unit:** V. – **Writing Practices**

Comprehension – Précis Writing – Essay Writing Listening Comprehension – Common Everyday Situations: Conversations and Dialogues – Communication at Workplace – Interviews – Formal Presentations

**Note:** Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

**SUGGESTED READINGS**

1. Sangeeta Sharma , Meenakshi Raman (2015).Technical Communication: Principles And Practice, 2nd Edition, OUP, New Delhi.
2. Sanjay Kumar and PushpLata, (2011), Communication Skills ,Oxford University Press.
3. Liz Hamp – Lyons and Ben Heasly, (2006), Study Writing, Cambridge University Press.
4. F.T. Wood. (2007)., Remedial English Grammar, Macmillan,
5. Michael Swan, (1995).Practical English Usage, OUP.,

**Semester-I**

**18BTBT204** **Programming For Problem Solving (Theory & Lab.)** **7H-5C**

**Instruction Hours/week: L:3 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(iii) Theory**

**Course Objectives**

- Identify and understand the working of key components of a computer program.
- Identify and understand the various kinds of keywords and different data types of C programming
- Understand, analyze and implement software development tools like algorithm,
- pseudo codes and programming structure
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in "C" language

**Course Outcomes**

The course will enable the students

1. To formulate simple algorithms for arithmetic and logical problems
2. To translate the algorithms to programs (in C language)
3. To test and execute the programs and correct syntax and logical errors
4. To implement conditional branching, iteration and recursion
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach
6. To use arrays, pointers and structures to formulate algorithms and programs
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems
8. To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

**Unit I – Introduction to Programming, Arithmetic expressions and precedence**

Introduction to Programming-Flowchart / pseudocode, compilation, Variables including data types, Arithmetic expressions and precedence.

**Unit II – Conditional Branching and Loops**

Conditional Branching – Loops Writing and evaluation of conditionals and consequent branching, Iteration and loops.

**Unit III – Arrays and Basic Algorithms**

Arrays1-D,2-D,Characterarraysand Strings **Basic Algorithms**: Searching, Basic Sorting Algorithms, Finding roots of equations, idea of time complexity.

**Unit IV – Function and Recursion**

Functions (including using built in libraries), Recursion with example programs such as Quick sort, Ackerman function etc.

**Unit V - Structure, Pointers and File Handling**

Pointers, Structures including self-referential structures e.g., linked list, notional introduction, File handling in C.

**SUGGESTED READINGS**


1. E. Balagurusamy,(2017) Computing Fundamentals and C Programming, 5th Edition, TMH Education
2. E. Balaguruswamy (2017), Programming in ANSI C, 7th Edition, Tata McGraw-Hill,
3. Byron Gottfried (2017), Schaum's Outline of Programming with C, 3rd Edition, McGraw-Hill
4. Brian W. Kernighan and Dennis M. Ritchie,(2015) The C Programming Language, 2nd Edition, Prentice Hall of India

**(ii) Laboratory**

**Course Objectives**

- To provide an awareness to Computing and C Programming
- To know the correct and efficient ways of solving problems
- To learn to develop algorithm for simple problem solving

**Laboratory Outcomes:**

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use the mind defining self- referential structures.
8. To be able to create, read and write to and from simple text files.

**List of Experiments**

**Tutorial 1:** Problem solving using computers:
**Lab 1:** Familiarization with programming environment
**Tutorial 2:** Variable types and type conversions:
**Lab 2:** Simple computational problems using arithmetic expressions
**Tutorial 3:** Branching and logical expressions:
**Lab 3:** Problems involving if-then-else structures
**Tutorial 4:** Loops, while and for loops:
**Lab 4:** Iterative problems e.g., sum of series
**Tutorial 5:**1DArrays: searching, sorting:
**Lab 5:**1DArray manipulation
**Tutorial 6:**2D arrays and Strings, memory structure:
**Lab 6:** Matrix problems, String operations
**Tutorial 7:** Functions, call by value:
**Lab 7:** Simple functions
**Tutorial 8 & 9**: Numerical methods (Root finding, numerical differentiation, numerical integration):
**Lab 8and 9:**Numerical methods problems
**Tutorial 10:** Recursion, structure of recursive calls:
**Lab 10:** Recursive functions
**Tutorial 11:** Pointers, structures and dynamic memory allocation
**Lab 11:** Pointers and structures
**Tutorial 12:** File handling:
**Lab 12:** File operations

**Semester-II**

**18BTBT205** **Biochemistry (Theory & Lab.)** **7H-6C**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- To enable students learn the fundamentals of Biochemical Processes and Biomolecules.
- To study the metabolic pathways of various biomolecules.
- To learn and understand the principles behind the qualitative and quantitative estimation of biomolecules (proteins, carbohydrates, lipids, metabolites)

**Course Outcomes**

1. To ensure students have a strong foundation in the structureof biomolecules.
2. To introduce them to metabolic pathways of the major biomolecules and relevance to clinical conditions.
3. To understand the chemical reactions during the estimation of various biomolecules.

**UNIT I - Introduction To Biomolecules - Carbohydrates**

Basic principles of organic chemistry, role of carbon, types of functional groups, chemical, nature of water, pH and biological buffers, biomolecules. Structure and properties of Carbohydrates (mono, di, oligo & polysaccharides) Proteoglycans, glucosaminoglycans.mutarotation, glycosidic bond, reactions of monosaccharides, reducing sugars. Starch, glycogen, cellulose and chitin.Proteoglycans, glycosaminoglycans.hyaluronic acid, chondroitin sulfate.

**UNIT II - Structure And Properties Of Other Biomolecules**

Structure and properties of important biomolecules: Lipids: fatty acids, glycerol, saponification, iodination, hydrogenation, phospholipids, glycolipids, sphingolipids, cholesterol, steroids, prostaglandins.

**Protein:** Amino Acids, Peptides, Proteins, measurement, structures, hierarchy of organization primary, secondary, tertiary and quaternary structures, glycoproteins, lipoproteins. Steps in sequencing polypeptide. Chemical synthesis of peptides.

**Nucleic acids**: purines, pyrimidines, nucleoside, nucleotide, RNA, DNA-Watson-Crick structure of DNA.

**UNIT III - Bioenergetics And Carbohydrate Metabolism**

Metabolism-Energy relationship between the catabolic and anabolic pathways,Five major reactions in livingcells, Ping-Pong mechanismof nucleosidediphosphate kinase. Major path waysof glucose utilization: glycolysis, gluconeogenesis. Pentosephosphatepathway; TCAcycle: Reactions and regulations, geneticdisordersaffectingcarbohydratemetabolism

**UNIT IV - Metabolism Of Aminoacids And Nucleic Acids**

Biosynthesis of aminoacids from acetylcoA, Biosynthesis of essential aminoacids(Met,Thr,Lys,Ile, Val,Leu,Phe,Trp,Tyr).Glucose-alanine cycle, Ureacycle. Pathways of degradation of aromatic, glucogenic and ketogenic aminoacids. Inbornerrors of aminoacid metabolism.

Biosynthesis of nucleotides,denovoandsalvage pathways for purines and pyrimidines,regulatory mechanisms;catabolism of purine&pyrimidine;Metabolicdis or dersassociated with nucleicacid metabolism.

**UNIT V - METABOLISM OF LIPIDS**

Digestion, mobilization , and transport of fats,fatty acid entry into mitchondria via the acyl- carnitine / carnitine transporter. Biosynthesis of fatty acid, Tri cylglycerol andcholesterol.Theβ-oxidationpathway. Oxidation of amonounsaturated and polyunsaturated fattyacid.Genetic defectsin fatty Acyl–CoA dehydrogenases causing serious diseases.

**(ii) Laboratory**

**Course Objectives**

- To learn and understand the principles behind the qualitative and quantitative estimation of biomolecules (proteins, carbohydrates, lipids, metabolites)

**Course Outcomes**

1. To understand the chemical reactions during the estimation of various biomolecules.

**LABORATORY COMPONENT**

1. Qualitative tests for carbohydrates – distinguishing reducing from non-reducing sugars and keto from aldo sugars.
2. Quantitative method for amino acid estimation using ninhydrin – distinguishing amino from imino acid.
3. Quantification of proteins (Lowry' s and Bradford's method)
4. Quantification of lipids (Zak's method)
5. Analysis of oil (Acid number, Saponification number and iodine Value)
6. Separation of Oleic acid
7. Preparation of Casein from Milk

**SUGGESTED READINGS:**


1. D.L. Nelson, M.Cox &M.,M.Cox,(2004), LehningerPrinciplesof Biochemistry4$^{th}$Edition Freeman,W.H. &Company, New York
2. Murray,R.K.,Granner, B.K., Mayes,P.A.,andRodwell. V.W.((2000)), Harper's Biochemistry, PrenticeHall, International
3. Creighton.T.E.(1993), Proteins, Structureand Molecular PropertiesFreemanand Co
4. Salway,J.G.((2000)),Metabolismat a Glance, BlackwellScienceLtd
5. Boyer,R.((2000)), ExperimentalBiochemistry,BenjaminCummings, Redwood City,USA
6. Palanivelu,P. (2001), AnalyticalBiochemistry and SeparationTechniques, KalaimaniPrinters,Madurai,
7. Zubay,G.L(1996),PrinciplesofBiochemistry, WCB Publishers,,London
8. Herg,J.M.,J.L. Tymoczko&L.Stryer((2002)), Biochemistry.VEdition, WH-Freeman andCo,New York
9. Voet,G.&A.Voet(2015), Fundamentalsof Biochemistry.IIEdition, JohnWiley&Sons, Inc.NY

**Semester-I**

**18BTCE101** **Mathematics-I** **4H-4C**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

The objective of this course is to familiarize the Basic concepts of linear algebra, vector calculus and Fourier Series.

**Course Outcome**

Students will be able to solve

1. System of linear algebraic equations
2. Vector algebra, vector differential calculus, vector integral calculus and Fourier Series
3. The essential tools of matrices and linear algebra including linear transformations, Eigen values and diogonalization.

**Unit I - Linear Algebra**

Matrices, Vectors: Addition and Scalar Multiplication, Matrix Multiplication, Linear Systems of Equations, Gauss Elimination, Linear Independence. Rank of a Matrix. Vector Space, Solutions of Linear Systems: Existence, Uniqueness, Determinants, Cramer's Rule, Inverse of a Matrix. Gauss-Jordan Elimination.Simple problems using Scilab.

**Unit II - Linear Algebra**

Eigenvalues, Eigenvectors, Applications of Eigenvalue Problems, Symmetric, Skew-Symmetric, and Orthogonal Matrices

**Unit III - Vector Differential Calculus**

Vectors in 2-Space and 3-Space, Inner Product (Dot Product), Vector Product (Cross Product), Vector and Scalar Functions and Fields, Derivatives, Curves, Arc Length. Curvature, Gradient of a Scalar Field, Directional Derivative, Divergence of a Vector Field, Curl of a Vector Field.

**Unit IV - Vector Integral Calculus**

Line Integrals, Path Independence of Line Integrals, Green's Theorem in the Plane, Surface Integrals.

**Unit V - Fourier Series**

Dirichlet's conditions, General Fourier series, Odd and even functions, Half range sine series, Half range cosine series, Parseval's identity, Harmonic Analysis.

**SUGGESTED READINGS**


1. Hemamalini. P.T.(2017)**,** Engineering Mathematics**,** McGraw Hill Education (India) Private Limited, New Delhi.
2. Erwin kreyszig, (2006)**,** Advanced Engineering Mathematics, 9th Edition,John Wiley & Sons**,**.
3. Veerarajan T**,** (2008), Engineering Mathematics for first year,Tata McGraw-Hill, New Delhi,.
4. Ramana B.V,(2010), Higher Engineering Mathematics, 11th Reprint, Tata McGraw Hill New Delhi
5. N.P. Bali and Manish Goyal, (2008), A text book of Engineering Mathematics, Laxmi Publications.
6. B.S. Grewal, (2000), Higher Engineering , Khanna Publishers.

**Semester-I**

**18BTCE102** **Physics** **7H-5C**

**(Theory & Lab.)**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objective:**

- To introduce Basic concepts of optics and its applications, electricity and magnetism, and quantum physics.

**Course Outcomes**

Students will be familiar with

1 Bragg's Law and introduced to the principles of lasers, types of lasers and applications
2 Various terms related to properties of materials such as, permeability, polarization, etc.
3 Some of the basic laws related to quantum mechanics as well as magnetic and dielectric properties of materials

**UNIT I - DIFFRACTION**

**Diffraction:** Introduction to interference and example; concept of diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits; diffraction grating, characteristics of diffraction grating and its applications.

**UNIT II - LASER & FIBER OPTICS**

**Fibre Optics:**

Introduction, optical fibre as a dielectric wave guide: total internal reflection, numerical aperture and various fibre parameters, losses associated with optical fibres, step and graded index fibres, application of optical fibres.

**Lasers:**

Introduction to interaction of radiation with matter, principles and working of laser: population inversion, pumping, various modes, threshold population inversion, types of laser: $CO_2$laser, semiconductor laser, application of lasers.

**UNIT III - ELECTROMAGNETISM & POLARIZATION**

Laws of electrostatics, electric current and the continuity equation, laws of magnetism.Ampere's Faraday's laws, Maxwell's equations.

**Polarisation:**

Introduction, polarisation by reflection, polarisation by double refraction, scattering of light, circular and elliptical polarisation, optical activity.

## UNIT IV - DIELECTRICS & MAGNETIC PROPERTIES OF MATERIALS

Permeability and dielectric constant, polar and non-polar dielectrics, internal fields in a solid, Clausius-Mossotti equation, applications of dielectrics.Magnetisation, permeability and susceptibility, classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.

## UNIT V - QUANTUM MECHANICS

Introduction to quantum theory – Black body radiation - dual nature of matter and radiation – de Broglie wavelength, uncertainty principle –Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- physical significance of wave function, scanning electron microscope.

## SUGGESTED READINGS


1. Bhattacharya D.K. & Poonam T., (2015), Engineering Physics, Oxford University Press
2. Gaur R.K. and Gupta S.L, (2012), Engineering Physics, Dhanpat Rai Publications
3. Ganesan.S and Baskar.T,(2015), Engineering Physics, GEMS Publisher, Coimbatore.

**(ii) Laboratory**

**Course objective:**

- To learn the basic concepts in physics relevant to different branches of Engineering and Technology.
- To study the concept of semiconductor and conductivity.
- To learn the properties of materials.

**Course Outcome:**

1 Familiarize the properties of material and basic concepts in physics.

**LIST OF EXPERIMENTS – PHYSICS**

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young's modulus
3. Uniform bending – Determination of young's modulus
4. Lee's disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. Optical fibre -Determination of Numerical Aperture and acceptance angle
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Determination of Band gap of a semiconductor.
11. Spectrometer- Determination of wavelength using grating.
12. Viscosity of liquids-Determination of co-efficient of viscosity of a liquid by Poiseuille's flow

**Semester-I**

**18BTCE103** **English** **4H-3C**

**Instruction Hours/week: L:2 T:0 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.

**Course Outcomes**

Students undergoing this course will be able to

1 Use English language for communication: verbal & non –verbal.
2 Enrich comprehension and acquisition of speaking & writing ability.
3 Gain confidence in using English language in real life situations.
4 Improve word power: lexical, grammatical and communication competence.

**Unit:** I - **Basic Writing Skills**

Sentence Structures - Use of phrases and clauses in sentences - Importance of proper punctuation - Creating coherence- Organizing principles of paragraphs in documents - Techniques for writing precisely

**Unit: 1I - Vocabulary Building**

The concept of Word Formation - Root words from foreign languages and their use in English - Acquaintance, with prefixes and suffixes from foreign languages in English to form derivatives. - Synonyms, antonyms, and standard abbreviations.

**Unit: III - Grammar and Usage**

Subject-verb agreement - Noun-pronoun agreement - Misplaced modifiers – Articles – Prepositions – Redundancies - Clichés

**Unit: IV - Listening and Reading Skills**

Note taking- viewing model interviews – listening to informal conversations – improving listening / reading comprehension – reading model prose / poems – reading exercise

**Unit:** V.- **Writing Practices**

Comprehension - Précis Writing - Essay Writing Listening Comprehension - Common Everyday Situations: Conversations and Dialogues - Communication at Workplace – Interviews - Formal Presentations

**Note:** Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

**SUGGESTED READINGS**


1. Sangeeta Sharma , Meenakshi Raman, .(2015),Technical Communication: Principles And Practice, 2nd Edition, OUP, New Delhi.
2. Sanjay Kumar and PushpLata, (2011), Communication Skills ,Oxford University Press.
3. Liz Hamp - Lyons and Ben Heasly, (2006), Study Writing, Cambridge University Press
4. F.T. Wood., (2007), Remedial English Grammar, Macmillan.
5. Michael Swan, (1995).Practical English Usage, OUP.

**Semester-I**

**18BTCE104** **Chemistry –I** **4H-4C**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objective**

- To understand the terminologies of quantum theory of chemical systems
- To study about various chemical bonding
- To understand the thermodynamic functions
- To comprehend the basic organic chemistry and to synthesis simple drug.

**Course Outcomes**

1. Appreciate quantum theory of chemical systems.
2. Appreciate aliphatic chemistry and stereochemistry
3. Write simple mechanisms
4. To synthesis of organic molecules

**UNIT I - Introduction to quantum theory for chemical systems:**

Schrodinger equation, Applications to Hydrogen atom, Atomic orbitals, many electron atoms

**UNIT II - Chemical bonding in molecules:**

MO theory, Structure, bonding and energy levels of bonding and shapes of many atom molecules, Coordination Chemistry, Electronic spectra and magnetic properties of complexes with relevance to bio-inorganic chemistry, organometallic chemistry

**UNIT III - Introduction to Stereochemistry:**

Stereodescriptors – R, S, E, Z.Enantiomers and Diastereomers.Racemates and their resolution.Conformations of cyclic and acyclic systems.

**UNIT IV - Reactivity of organic molecules:**

Factors influencing acidity, basicity, and nucleophilicity of molecules, kinetic vs. thermodynamic control of reactions

**UNIT IV - Strategies for synthesis of organic compounds:**

Reactive intermediates substitution, elimination, rearrangement, kinetic and thermodynamic aspects, role of solvents

**SUGGESTED READINGS**


1. B. H. Mahan, (2010), University chemistry, Pearson Education,
2. K. P. C. Volhardt and N. E. Schore, 5th Edition, Organic Chemistry: Structure and Function, W.H. Freeman, (2014)
3. B. L. Tembe, (2009), Kamaluddin and M. S. Krishnan, Engineering Chemistry (NPTEL Web-book)
4. Robert Neilson Boyd, Saibal Kanti Robert Thornton Morrison, Organic Chemistry,Pearson;7 edition
5. Michael B. Smith & Jerry March,, (2006)Advanced Organic Chemistry: Reactions, Mechanisms, and Structure, Wiely..
6. Arun Bahl and BS Bahl,(2014) AdvancedOrganic Chemistry, S Chand.

**Semester-I**

**18BTCE105** **Engineering Graphics** **5H-3C**

**Instruction Hours/week: L:1 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course objectives**

- To aid visualization of engineering objects and communicating the same to other professionals.
- To design simple assemblies involving theory of constraints, generation of assembly views from part drawings, animation of assemblies.

**Course Outcomes**

1. Students will be able to read drawing and can understand different views.

**UNIT I - INTRODUCTION**

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Scales – Plain, Diagonal and Vernier Scales

**UNIT II - ORTHOGRAPHIC PROJECTIONS**

Principles of Orthographic Projections-Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

**UNIT III - ISOMETRIC PROJECTIONS**

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple solids, truncated prisms, pyramids, cylinders and cones; Developing visualization skills through free hand sketching of Conversion of Orthographic Views to Isometric Views

**UNIT IV - SECTION OF SOLIDS AND ASSEMBLY DRAWINGS**

Sectioning of Prism, Cylinder, Pyramid, and Cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section.

Making free hand sketches of typical subassemblies like flange coupling, stuffing box, journal bearings, rolling element bearings, keyed joints, cotter joints, C clamp.

## UNIT V - COMPUTER GRAPHICS & ENGINEERING ANIMATION

Overview of Computer Graphics, listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software, Introduction to 3D modeling packages

Engineering animation including motion curves, coordinating multiple moving parts under joint-constraints and the notion and impact of lighting and camera, compositing and physics engines (gravity, dynamics, fluid animation)

## SUGGESTED READINGS


1. Venugopal K and Prabhu Raja V, (2010), Engineering Graphics, New Age International Publishers,
2. C M Agrawal and Basant Agrawal, (2012), Engineering Graphics, Tata McGraw Hill, New Delhi,
3. James D. Bethune, (2016),Engineering Graphics with AutoCAD (2015), Pearson Education,.
4. Narayana, K.L. & P Kannaiah, (2008), Text book on Engineering Drawing, Scitech Publishers,
5. Bureau of Indian Standards, (2003), Engineering Drawing Practices for Schools and Colleges SP 46, BIS, New Delhi,.
6. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education,
7. Bhatt N.D., Panchal V.M. & Ingle P.R, (2014), Engineering Drawing, Charotar Publishing House,.

**Semester-II**

**18BTCE201** **Mathematics-II** **4H-4C**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- The objective of this course is to familiarize the Basic concepts of transforms, ordinary and partial differential equations.

**Course Outcomes**

Students should be able to solve

1. Simple first and second order ODE by Analytical methods
2. First and second order differential equations
3. Partial differential equations numerically
4. Problems relating to Laplace transforms

**Unit I - Transforms**

Laplace Transforms: Transforms of elementary functions, Basic properties, Transforms of derivatives and integrals, Initial and final value theorems. Inverse Laplace transforms, Convolution theorem.Fourier Transforms: Fourier integral theorem (Statement Only), Fourier transform pair, Sine and Cosine transforms, Properties, Transforms of simple functions, Convolution theorem, Parseval's identity .

**Unit II - First-Order ODEs**

Basic Concepts, Solutions of Separable ODEs, Exact ODEs, Linear ODEs, Solving ODEs by Laplace Transforms

**Unit III - Second-Order Linear ODEs**

Homogeneous Linear ODEs of Second Order, Euler-Cauchy Equations, Wronskian, Nonhomogeneous ODEs, Solution by Variation of Parameters

**Unit IV - Series Solutions of ODEs, Special Functions**

Power Series Method, Legendre's Equation, Legendre Polynomials, Bessel's Equation, Bessel Functions.

**Unit V - Partial Differential Equations**

Classification of second order quasi linear partial differential equations, Solutions of one dimensional wave equation, One dimensional heat equation, Steady state solution of two-dimensional heat equation (Insulated edges excluded), Fourier series solutions in Cartesian coordinates.

**SUGGESTED READINGS**


1. Hemamalini. P.T, (2014&2017)Engineering Mathematics, McGraw Hill Education (India) Private Limited, New Delhi.
2. Erwin kreyszig, (2006), Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
3. B.S. Grewal, (2000), Higher Engineering Mathematics, 35rd Edition, Khanna Publishers.
4. Ramana B.V, (2010)Higher Engineering Mathematics, Tata McGraw Hill
5. N.P.Bali N., Goyal M. A ,(2008)Text Book Of Engineering Mathematics, Laxmi Publications
6. Veerarajan T,(2008)**,** Engineering Mathematics for first year,Tata McGraw-Hill, New Delhi

**Semester-II**

**18BTCE202** **Chemistry-II** **4H-4C**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objective**

- To understand the basic chemical reactions and its mechanism
- To understand the mechanism of lubricants
- To study about the nature of oils and fat
- To understand about the dye pigments

**Course Outcomes**

1. To apply the various unit process
2. To apply the knowledge on chemical reactions
3. To prepare soaps
4. To analyses the effect of pigments

**UNIT I - UNIT PROCESSES**

Nitration, Sulphonation, Halogenation, Esterification, Amination, Saponification and Hydrogenation – Role of the above unit processes in such industries as petroleum, drugs, pharmaceuticals and organic synthesis.

**UNIT II - REACTION MECHANISMS**

Free radical, substitutions, electrophilic, addition, aromatic electrophilic substitutions, nucleophilic additions, condensation reactions, nucleophilic substitutions in aliphatic and aromatic compounds, cyclo-additions, rearrangements-Beckmann and Fries rearrangement reactions.

**UNIT III - OILS, FATS, SOAPS & LUBRICANTS**

Chemical constitution, Chemical analysis of oils and fats – acid, saponification and iodine values, Definitions, determinations and significance. Definition, mechanism of lubrication, preparation of petrolubes, desirable characteristics – viscosity, viscosity index, carbon residue, oxidation stability, flash and fire points, cloud and pour points, aniline point. Semisolid lubricant – greases, preparation of sodium, lithium, calcium and axle greases and uses, consistency test and drop point test.Solid lubricants – graphite and molybdenum disulphide.

**UNIT IV - CHEMICALS AND AUXILIARIES**

Preparation, properties and uses of bleaching powder, sodium hypochlorite, hydrogen peroxide, chlorine dioxide. Estimation of available chlorine in hypochlorite bleach liquor. Determination of strength of hydrogen peroxide.

## UNIT V - COLORANTS

Theory of color and constitution: chromophore and auxochrome, classification of dyes based on application. Chemistry and synthesis of azo dye (Methyl red, Methyl orange and Congo red).

## SUGGESTED READINGS


1 Dhara S. S (2016), A Text Book of Engineering Chemistry, S. Chand & Co. Ltd., NewDelhi
2 Jain. P.C and Monica Jain (2012), Engineering Chemistry, Dhanpet Rai & Sons, New Delhi
3 Shikha Agarwal (2015), Engineering Chemistry-Fundamentals and Applications, CambridgeUniversity Press, Delhi
4 W.L. McCabe, J.C. Smith and P. Harriot (2005), Unit Operations of Chemical Engineering,7Edition, McGraw Hill Education
5 B.K. Sharma(2011), Industrial chemistry, Krishna Prakashan Media (P) Ltd, Meerut
6 Shore J (2002), Colourants and Auxiliaries: Volume II Auxiliaries, Wood head Publishing Ltd
7 Shenai V. A(1995), Chemistry of Dyes and Principles of Dyeing, Sevak Publications, Mumbai
8 Trotman E. R(1994), Dyeing and Chemical Technology of Textile Fibres, B.I Publishing Pvt. Ltd, New Delhi

**Semester-II**

**18BTCE203** **Electrical & Electronics Engineering (Theory & Lab.)** **6H-5C**

**Instruction Hours/week: L:3 T:1 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- To impart the basic knowledge about the Electric circuits.
- To understand the concept of Electro Mechanical Energy Conversion and Transformers.
- To understand the working of Semiconductor devices and Measuring Instruments.
- To impart the basic knowledge of Digital Circuits.

**Course Outcomes**

At the end of this course, students will demonstrate the ability

1. To understand and analyze basic electric and magnetic circuits.
2. To study the working principles of transformer and Measuring Instruments.
3. To understand the basic concepts of Digital Circuits.

**UNIT I - DC Circuits**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation.Superposition, Thevenin and Norton Theorems.Time-domain analysis of first-order RL and RC circuits.

**UNIT II - AC Circuits**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT III - Electro Mechanical Energy Conversion And Transformer**

Energy in magnetic system –singly and multiply excited magnetic field systems-mmf of distributed windings – Winding Inductances-, magnetic fields in rotating machines –Field energy and co energy-force and torque equations.BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.

**UNIT IV- Semiconductor Devices And Two Port Networks**

Bipolar Junction Transistor – Characteristics Introduction to operational Amplifier –Model– Applications.Two-Port Parameters: Relationship of Two-Port Variables, Short-Circuit Admittance parameters, The Open-circuit Impedance Parameters, Transmission parameters.

**UNIT V- Measuring Instruments And Digital Electronics**

Principle, construction, and operation of moving coil and moving iron meters-Measurement of Power. Number systems – binary codes - logic gates - Boolean algebra, laws & theorems

**SUGGESTED READINGS**


1. D. P. Kothari and I. J. Nagrath,(2010) Basic Electrical Engineering, Tata McGraw Hill,
2. D. C. Kulshreshtha,(2009) Basic Electrical Engineering, McGraw Hill
3. L. S. Bobrow,(2011) Fundamentals of Electrical Engineering, Oxford University Press,
4. E. Hughes(2010) , Electrical and Electronics Technology, Pearson,
5. V. D. Toro,(1989) Electrical Engineering Fundamentals, Prentice Hall India, 1989

**(ii) Laboratory**

**Course Objective**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.

**Course Outcomes (Cos)**

At the end of this course, students will demonstrate the ability

1. To understand and analyze basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.

**List of Experiments**

1. Experimental verification of electrical circuit problems using Ohms law and Kirchoff's law.
2. Measurement of electrical quantities – voltage, current, power & power factor in R load.
3. Speed control of DC shunt motor
4. Draw the equivalent circuit of single phase Transformer by conducting OC &SC Test.
5. Measurement of energy using single phase energy meter.

**SUGGESTED READING**


1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

**Semester-II**

**18BTCE204** **Thermodynamics I** **4H-4C**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objective**

- To introduce basic concepts of thermodynamics and laws of thermodynamics.
- To understand the principles and application of first and second law of thermodynamics.

**Course Outcomes**

On completion of the course the students are expected to

1. Understand the fundamental concepts of thermodynamics.
2. Apply mass and energy balances for open systems.
3. Evaluate the properties of non-ideal gases.
4. Solve problems involving liquefaction, refrigeration and different power cycles.

**UNIT I - INTRODUCTION**

Introduction- scope and Limitations of thermodynamics;Definitions and Fundamental Concepts; Dimensions and Units; Temperature, Pressure, Work, Energy, Force, Heat- Equilibrium state and the Phase Rule; Temperature and Zeroth Law of Thermodynamics; Heat Reservoirs and Heat Engines.

**UNIT II - FIRST LAW AND OTHER BASIC CONCEPTS**

Joule's experiment; Internal Energy; First Law; State functions; Equilibrium; Phase Rule, Reversible process; Constant P,V, T processes; Mass and Energy Balances for Open systems.

**UNIT III - PVT BEHAVIOUR AND HEAT EFFECTS**

PVT behavior; description of materials – Ideal gas law, van der Waals, virial and cubic equations of state; Reduced conditions & corresponding states theories; correlations in description of material properties and behavior- Heat effects-latent heat, sensible heat, standard heats of formation, reaction and combustion.

**UNIT IV - SECOND LAW OF THERMODYNAMICS**

Statements of the second law; Heat engines, Carnot's theorem; Thermodynamic Temperature Scales; Entropy; Entropy changes of an ideal gas; Mathematical statement of the second law; Entropy balance for open systems; Calculation of ideal work; Lost work; Thermodynamic property of fluids, Maxwell relations; Two-phase systems; graphs and tables of thermodynamic properties.

**UNIT V - APPLICATIONS OF THERMODYNAMICS**

Flow processes; Refrigeration-Carnot cycle, Vapor-compression cycle, Absorption Refrigeration; Liquefaction processes; Steam-Power plant-Rankine cycle; Internal Combustion Engines-Otto cycle, Diesel cycle, Jet Engines.

**SUGGESTED READINGS**


1. M. Smith, H.C. Van Ness and M.M. Abbott ((2005)), Introduction to Chemical Engineering Thermodynamics, 7th edition, McGraw-Hill International Edition
2. Narayanan K.V, (2013), A Text Book of Chemical Engineering Thermodynamics, 2nd Ed
3. Prentice Hall India
4. M J Moran, H N Shapiro, D D Boettner and M B Bailey(2015), Principles of Engineering Thermodynamics, 8th Edition, Wiley
5. Kyle, B.G.,(2006), Chemical and Process Thermodynamics III Edition, Prentice Hall India
6. Elliott J.R, Lira, C.T.(2012), Introductory chemical engineering thermodynamics, 2nd ed
7. Prentice Hall India(2012)
8. Pradeep Ahuja,(2009), Chemical Engineering Thermodynamics, PHI Learning Ltd
9. Gopinath Halder, (2009),Introduction to Chemical Engineering Thermodynamics, PHI Learning Ltd

**Semester-II**

**18BTCE205** **Programming For Problem Solving (Theory & Lab.)** **3H-5C**

**Instruction Hours/week: L:3 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- Identify and understand the working of key components of a computer program.
- Identify and understand the various kinds of keywords and different data types of C programming
- Understand, analyze and implement software development tools like algorithm,
- pseudo codes and programming structure
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in "C" language

**Course Outcomes**

The course will enable the students

1. To formulate simple algorithms for arithmetic and logical problems
2. To translate the algorithms to programs (in C language)
3. To test and execute the programs and correct syntax and logical errors
4. To implement conditional branching, iteration and recursion
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach
6. To use arrays, pointers and structures to formulate algorithms and programs
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems
8. To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

**Unit I – Introduction to Programming, Arithmetic expressions and precedence**

Introduction to Programming-Flowchart / pseudocode, compilation, Variables including data types, Arithmetic expressions and precedence.

**Unit II – Conditional Branching and Loops**

Conditional Branching – Loops Writing and evaluation of conditionals and consequent branching, Iteration and loops.

**Unit III – Arrays and Basic Algorithms**

Arrays1-D,2-D,Characterarraysand Strings **Basic Algorithms**: Searching, Basic Sorting Algorithms, Finding roots of equations, idea of time complexity.

**Unit IV – Function and Recursion**

Functions (including using built in libraries), Recursion with example programs such as Quick sort, Ackerman function etc.

**Unit V - Structure, Pointers and File Handling**

Pointers, Structures including self-referential structures e.g., linked list, notional introduction, File handling in C.

**SUGGESTED READINGS**


1. E. Balagurusamy,(2017) Computing Fundamentals and C Programming, 5th Edition, TMH Education
2. E. Balaguruswamy (2017), Programming in ANSI C, 7th Edition, Tata McGraw-Hill,
3. Byron Gottfried (2017), Schaum's Outline of Programming with C, 3rd Edition, McGraw-Hill
4. Brian W. Kernighan and Dennis M. Ritchie,(2015) The C Programming Language, 2nd Edition, Prentice Hall of India

**(ii) Laboratory**

**Course Objectives**

- To provide an awareness to Computing and C Programming
- To know the correct and efficient ways of solving problems
- To learn to develop algorithm for simple problem solving

**Course Outcomes:**

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use the mind defining self- referential structures.
8. To be able to create, read and write to and from simple text files.

**List of Experiments**

**Tutorial 1:** Problem solving using computers:
**Lab 1:** Familiarization with programming environment
**Tutorial 2:** Variable types and type conversions:
**Lab 2:** Simple computational problems using arithmetic expressions
**Tutorial 3:** Branching and logical expressions:
**Lab 3:** Problems involving if-then-else structures
**Tutorial 4:** Loops, while and for loops:
**Lab 4:** Iterative problems e.g., sum of series
**Tutorial 5:**1DArrays: searching, sorting:
**Lab 5:**1DArray manipulation
**Tutorial 6:**2D arrays and Strings, memory structure:
**Lab 6:** Matrix problems, String operations
**Tutorial 7:** Functions, call by value:
**Lab 7:** Simple functions
**Tutorial 8 & 9**: Numerical methods (Root finding, numerical differentiation, numerical integration):
**Lab 8and 9:**Numerical methods problems
**Tutorial 10:** Recursion, structure of recursive calls:
**Lab 10:** Recursive functions
**Tutorial 11:** Pointers, structures and dynamic memory allocation
**Lab 11:** Pointers and structures
**Tutorial 12:** File handling:
**Lab 12:** File operations

**Semester-II**

**18BTCE206** **Chemistry laboratory** **3H-1.5C**

**Instruction Hours/week: L:0 T:0 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

**Course Outcomes:**

1. List steps for identifying simple organic compounds
2. Use different analytical instruments
3. Identify reaction rate parameters

About 10 experiments to illustrate the concepts learnt in Chemistry-I, Chemistry-II
(No. of lab.Hours 3 per experiment).
Suitable number of experiments from the following categories:

1. Identification of an organic compounds through group detection, physical constants (m.p and b.p)
2. Synthesis of organic compounds involving reactions such as hydrogenation, oxidation, esterification, etc.
3. Use of analytical instruments for characterization and identification of compounds
4. Measurements of kinetics of simple reactions

**Semester-I**

**18BECS101** **Mathematics-I** **4H-4C**

**(Calculus and Linear Algebra for Computer Science Engineers)**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- The objective of this course is to familiarize the prospective engineers with techniques in basic calculus and linear algebra.
- It aims to equip the students with standard conceptsand tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

**Course Outcomes**

The students will learn:

1. To apply differential and integral calculus to notions of curvature and to improperintegrals. Apart from various applications, they will have a basic understanding ofBeta and Gamma functions.
2. The essential tools of matrices and linear algebra including linear transformations, Eigenvalues and diagonalization.

**UNIT I - Matrices**

Matrices, vectors: addition and scalar multiplication, matrix multiplication; Linear systems ofequations, linear Independence, rank of a matrix, determinants, Cramer's Rule, inverse of amatrix, Gauss elimination and Gauss-Jordan elimination. Simple problems using Scilab.

**UNIT II - Vector spaces**

Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps),range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, ranknullitytheorem, composition of linear maps, Matrix associated with a linearmap.

**UNIT III - Vector spaces**

Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices,Eigenbases.Diagonalization; Inner product spaces.

**UNIT IV - Calculus:**

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gammafunctions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

**UNIT V - Calculus:**

Taylor's and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

**SUGGESTED READINGS**


1. Hemamalini. P.T.(2014)**,** Engineering Mathematics**,** McGraw Hill Education (India) Private Limited, New Delhi.
2. G.B. Thomas and R.L. Finney**,** (2002), Calculus and Analytic geometry, 9th Edition,Pearson**,**.
3. Erwin kreyszig**,** (2006), Advanced Engineering Mathematics, 9th Edition,John Wiley & Sons.
4. Veerarajan T,(2008)**,** Engineering Mathematics for first year,Tata McGraw-Hill, New Delhi.
5. Ramana B.V,(2010)**,** Higher Engineering Mathematics, 11th Reprint, Tata McGraw Hill New Delhi.
6. D. Poole**,** (2005),Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole.
7. N.P. Bali and Manish Goyal, (2008), A text book of Engineering Mathematics, Laxmi Publications.
8. B.S. Grewal, (2000) Higher Engineering Mathematics, 35th Edition, Khanna Publishers,
9. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press.

**Semester-I**

**18BECS102** **Semi- Conductor Physics** **7H-5C**

**(Theory & Lab.)**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- To introduce students the physics of semiconductors and the inner working of semiconductor devices.
- Provide students the insight useful for understanding new semiconductor devices and technologies.

**Course Outcomes**

1. Students will be able to demonstrate a knowledge and broad understanding of Semiconductor Physics
2. The students will have the knowledge on the basic theory and operation of semiconductor devices used for integrated circuit applications.

**Unit I - Quantum Mechanics**

Introduction to quantum theory – Black body radiation - dual nature of matter and radiation – de Broglie wavelength, uncertainty principle –Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- physical significance of wave function, scanning electron microscope.

**Unit 2 - Electronic materials**

Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, Direct and indirect bandgaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass, Phonons.

**Unit 3 - Semiconductors**

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky).

**Unit 4 - Light-semiconductor interaction**

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; Transition rates (Fermi's golden rule), Optical loss and gain; Photovoltaic effect, Exciton, Drude model, LED,Solar cell, photo diode.

**Unit 5 - Engineered semiconductor materials**

Density of states in 2D, 1d and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, methods of fabrication (CVD,PVD) and characterization techniques.

**SUGGESTED READINGS**


1. Bhattacharya D.K. & Poonam T.,Engineering Physics, Oxford University Press, (2015)
2. Ganesan.S and Baskar.T,(2015)Engineering Physics I, GEMS Publisher, Coimbatore-641001
3. J. Singh, (1995)Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc.
4. B. E. A. Saleh and M. C. Teich,(2007) Fundamentals of Photonics, John Wiley & Sons, Inc.,
5. S. M. Sze, (2008)Semiconductor Devices: Physics and Technology, Wiley
6. A. Yariv and P. Yeh,(2007) Photonics: Optical Electronics in Modern Communications, Oxford University Press, New York

**(ii) Laboratory**

**Course Objective:**

- To learn the basic concepts in physics relevant to different branches of Engineering and Technology.
- To study the concept of semiconductor and conductivity.
- To learn the properties of materials.

**Course Outcome:**

1 Familiarize the properties of material and basic concepts in physics.

**LIST OF EXPERIMENTS – PHYSICS**

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young's modulus
3. Uniform bending – Determination of young's modulus
4. Lee's disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. Optical fibre -Determination of Numerical Aperture and acceptance angle
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Determination of Band gap of a semiconductor.
11. Spectrometer- Determination of wavelength using grating.
12. Viscosity of liquids-Determination of co-efficient of viscosity of a liquid by Poiseuille's flow

**Semester-I**

**18BECS103** **English** **4H-3C**

**Instruction Hours/week: L:2 T:0 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.

**Course Outcomes**

Students undergoing this course will be able to

1 Use English language for communication: verbal & non –verbal.
2 Enrich comprehension and acquisition of speaking & writing ability.
3 Gain confidence in using English language in real life situations.
4 Improve word power: lexical, grammatical and communication competence.

**Unit:** I - **Basic Writing Skills**

Sentence Structures - Use of phrases and clauses in sentences - Importance of proper punctuation - Creating coherence- Organizing principles of paragraphs in documents - Techniques for writing precisely

**Unit: 1I - Vocabulary Building**

The concept of Word Formation - Root words from foreign languages and their use in English - Acquaintance, with prefixes and suffixes from foreign languages in English to form derivatives. - Synonyms, antonyms, and standard abbreviations.

**Unit: III - Grammar and Usage**

Subject-verb agreement - Noun-pronoun agreement - Misplaced modifiers – Articles – Prepositions – Redundancies - Clichés

**Unit: IV - Listening and Reading Skills**

Note taking- viewing model interviews – listening to informal conversations – improving listening / reading comprehension – reading model prose / poems – reading exercise

**Unit:** V.- **Writing Practices**

Comprehension - Précis Writing - Essay Writing Listening Comprehension - Common Everyday Situations: Conversations and Dialogues - Communication at Workplace – Interviews - Formal Presentations

**Note:** Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

**SUGGESTED READINGS**


1. Sangeeta Sharma , Meenakshi Raman,(2015), Technical Communication: Principles And Practice, 2nd Edition, OUP, New Delhi.
2. Sanjay Kumar and PushpLata, (2011), Communication Skills ,Oxford University Press.
3. Liz Hamp - Lyons and Ben Heasly, (2006), Study Writing, Cambridge University Press.
4. F.T. Wood. , (2007), Remedial English Grammar, Macmillan.
5. Michael Swan,(1995)., Practical English Usage, OUP.

**Semester-I**

**18BECS104** **Programming for problem solving (Theory & Lab.)** **7H-5C**

**Instruction Hours/week: L:3 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(iii) Theory**

**Course Objectives**

- Identify and understand the working of key components of a computer program.
- Identify and understand the various kinds of keywords and different data types of C programming
- Understand, analyze and implement software development tools like algorithm,
- pseudo codes and programming structure
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in "C" language

**Course Outcomes**

The course will enable the students

1. To formulate simple algorithms for arithmetic and logical problems
2. To translate the algorithms to programs (in C language)
3. To test and execute the programs and correct syntax and logical errors
4. To implement conditional branching, iteration and recursion
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach
6. To use arrays, pointers and structures to formulate algorithms and programs
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems
8. To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

**Unit I - IntroductiontoProgramming**

Introduction to components of a computer system disks, memory, processor, where a program is stored and executed, operating system, compilers - Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart / Pseudocode with examples. From algorithms to programs; source code, variables with data types variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

**Unit II – Arithmetic expressions, precedence, Conditional Branching and Loops**

**[Arithmetic expressions and precedence** – Conditional Branching- Loops-Writing and evaluation of conditionals and consequent branching-Iteration and loops.

**Unit III - Array and BasicAlgorithms**

Arrays-Arrays1-D, 2-D,Character arrays and Strings, Searching, Basic Sorting Algorithms-Bubble Insertion and Selection sorting, Finding roots of equations, notion of order of complexity through example programs (no formal definition required).

**Unit IV - Function and Recursion**

Functions including using built in libraries Parameter passing in functions, call by value, Passing arrays to functions:idea of call by reference, **Recursion:** Recursion,as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function. Quick sort or Merge sort.

**Unit V - Structure, Pointers and File Handling**

**[**Structures, Defining structures and Array of Structures,

**Pointers:** Idea of pointers,Defining pointers,Use of Pointers in self-referential structures, notion of linked list (no implementation), File handling.

**SUGGESTED READINGS**


1. E. Balagurusamy, (2017) Computing Fundamentals and C Programming, TMH Education, 5th Edition,
2. E. Balaguruswamy, (2017). ProgramminginANSIC, TataMcGraw-Hill, 7th Edition,
3. ByronGottfried, Schaum's (2017) OutlineofProgrammingwithC, McGraw-Hill, 3rd Edition,
4. BrianW.KernighanandDennisM.Ritchie, (2015).TheCProgrammingLanguage, Prentice HallofIndia, 2nd Edition,

**(ii) Laboratory**

**Course Objectives**

- To provide an awareness to Computing and C Programming
- To know the correct and efficient ways of solving problems
- To learn to develop algorithm for simple problem solving

**Course outcomes**

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use the mind defining self- referential structures.
8. To be able to create, read and write to and from simple text files.

**List of Experiments**

**Tutorial 1:** Problem solving using computers:
**Lab 1:** Familiarization with programming environment
**Tutorial 2:** Variable types and type conversions:
**Lab 2:** Simple computational problems using arithmetic expressions
**Tutorial 3:** Branching and logical expressions:
**Lab 3:** Problems involving if-then-else structures
**Tutorial 4:** Loops, while and for loops:
**Lab 4:** Iterative problems e.g., sum of series
**Tutorial 5:**1DArrays: searching, sorting:
**Lab 5:**1DArray manipulation
**Tutorial 6:**2D arrays and Strings, memory structure:
**Lab 6:** Matrix problems, String operations
**Tutorial 7:** Functions, call by value:
**Lab 7:** Simple functions
**Tutorial 8 & 9**: Numerical methods (Root finding, numerical differentiation, numerical integration):
**Lab 8and 9:**Numerical methods problems
**Tutorial 10:** Recursion, structure of recursive calls:
**Lab 10:** Recursive functions
**Tutorial 11:** Pointers, structures and dynamic memory allocation
**Lab 11:** Pointers and structures
**Tutorial 12:** File handling:
**Lab 12:** File operations

**Semester-II**

**18BECS201** **Probability And Statistics** **4H-4C**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- The objective of this course is to familiarize the students with statistical techniques.
- It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.

**Course Outcomes**

The students will learn:

1 The ideas of probability and random variables and various discrete andcontinuous probability distributions and their properties.

2 The basic ideas of statistics including measures of central tendency, correlationand regression.

3 The statistical methods of studying data samples.

**UNIT I - Basic Probability**

Probability spaces, conditional probability,Bayes' rule, independence; Discrete random variables,Independent random variables, the multinomial distribution, sums of independent randomvariables; Expectation of Discrete Random Variables, Moments, Variance of a sum, Correlation coefficient, Chebyshev's Inequality.

**UNIT II - Random Variables**

Continuous random variables and their properties, distribution functions and densities,normal, exponential and gamma densities. Bivariate distributions and their properties, conditionaldensities,

**UNIT III - Basic Statistics**

Measures of Central tendency: Moments, skewness and Kurtosis - Probability distributions:Binomial, Poisson and Normal - evaluation of statistical parameters for these threedistributions, Correlation and regression – Rank correlation.

**UNIT IV - Applied Statistics**

Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for singleproportion, difference of proportions, single mean, difference of means, and difference ofstandard deviations.

**UNIT V - Small samples**

Test for single mean, difference of means and correlation coefficients, test for ratio of variances - Chi-square test for goodness of fit and independence of attributes.

**SUGGESTED READINGS**


1. Erwin kreyszig, (2014), Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
2. Bali N., Goyal M. (2010), A text book of Engineering Mathematics, 7th Edition, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd),
3. P.G.Hoel, S. C. Port and C. J. Stone,(2003) Introduction to Probability Theory, UniversalBook Stall
4. S. Ross, (2002)A First Course in Probability, 6th Edition, Pearson Education India
5. W. Feller, (1968)An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Edition, Wiley
6. Veerarajan T, (2010)Engineering Mathematics (for semester III), Tata McGraw-Hill

**Semester-II**

**18BECS202** **Chemistry – I (Theory & Lab.)** **7H-6C**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Concepts in chemistry for engineering** \

**Course Objective**

- To understand the terminologies of atomic and molecular structure
- To study the basics of Periodic properties, Intermolecular forces
- To study about spectroscopic technique
- To understand the thermodynamic functions
- To comprehend the basic organic chemistry and to synthesis simple drug.

**Course Outcomes:**

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. Rationalise bulk properties and processes using thermodynamic considerations.
5. List major chemical reactions that are used in the synthesis of molecules.

**UNIT I - Atomic and molecular structure**

Schrodinger equation. Particle in a box solutions and their applications. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules. Pi-molecular orbitals of butadiene and benzene and aromaticity.Introduction to Crystal field theory.

**UNIT II - Periodic properties, Intermolecular forces and potential energy surfaces**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers. Ionic, dipolar and van Der Waals interactions.Equations of state of real gases and critical phenomena. Potential energy surfaces of $H_2F$ and HCN and trajectories on these surfaces.

**UNIT III - Spectroscopic techniques and applications**

Spectroscopy (Principles and Instrumentation only).Electronic spectroscopy.Vibrational and rotational spectroscopy.Applications.Surface characterization techniques. Diffraction and scattering.Fluorescence and its applications in medicine.

**UNIT IV - Use of free energy in chemical equilibria**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications.Acid base, oxidation reduction and solubility equilibria.Use of free energy considerations in metallurgy through Ellingham diagrams.

**UNIT V - Organic reactions and synthesis of a drug molecule**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.Synthesis of a commonly used drug molecule.

**SUGGESTED READINGS**


1. B. H. Mahan, (2010)., University chemistry, Pearson Education
2. M. J. Sienko and R. A. Plane, Chemistry: Principles and Applications.
3. C. N. Banwell, (1994), Fundamentals of Molecular Spectroscopy, McGraw-Hill.
4. B. L. Tembe, Kamaluddin and M. S. Krishnan, Engineering Chemistry (NPTEL Web-book)
5. P. W. Atkins, (2009), Physical Chemistry, Oxford University Press.
6. K. P. C. Volhardt and N. E. Schore, (2014),5th Edition, Organic Chemistry: Structure and Function, W.H. Freeman.
7. P C Jain & Monica Jain, (2015).Engineering Chemistry, Dhanpat Rai Publishing Company.

**(ii) Laboratory**

**Course Objectives**

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

**Course Outcomes**

1. The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:
2. Estimate rate constants of reactions from concentration of reactants/products as a function of time
3. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
4. Synthesize a small drug molecule and analyse a salt

Choice of 10 experiments from the following:

1 Determination of surface tension and viscosity

2 Determination of Sodium Carbonate and Sodium Hydrogen Carbonate in a mixure using volumetric titration

3 Determination of Ca / Mg using complexometric titration

4 Thin layer chromatography

5 Determination of chloride content of water

6 Determination of the rate constant of a reaction

7 Conductometry - Determination of cell constant and conductance of solutions

8 pH Metry – Determination of Acid / Base

9 Potentiometry - determination of redox potentials and emfs

10 Saponification/acid value of an oil

11 Determination of the partition coefficient of a substance between two immiscible liquids

12 Adsorption of acetic acid by charcoal

13 Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

**Semester-II**

**18BECS203** **Basic Electrical Engineering (Theory & Lab.)** **6H-5C**

**Instruction Hours/week: L:3 T:1 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.
- To understand the working of Power Converters and components of low-voltage electrical installations.

**Course Outcomes**

1. To understand and analyse basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low-voltage electrical installations.

**UNIT I - DC Circuits**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation.Superposition, Thevenin and Norton Theorems.Time-domain analysis of first-order RL and RC circuits.

**UNIT II - AC Circuits**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT III - Electrical Machines**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

**UNIT IV - Transformers And Power Converters**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.Auto-transformer and three-phase transformer connections. Overviews of DC-DC buck and boost converters, duty ratio control. Introduction to Single-phase and three-phase voltage source inverters.

**UNIT V - Electrical Installations**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, RCCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

## SUGGESTED READINGS

1.V. D. Toro,(1989), Electrical Engineering Fundamentals, Prentice Hall India.
2. D. P. Kothari and I. J. Nagrath, (2010), Basic Electrical Engineering, Tata McGraw Hill.
3. D. C. Kulshreshtha, (2009), Basic Electrical Engineering, McGraw Hill.
4. L. S. Bobrow, (2011), Fundamentals of Electrical Engineering, Oxford University Press.
5. E. Hughes,, (2010), Electrical and Electronics Technology, Pearson.

**(ii) Laboratory**

**Course Objective**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.

**Course Outcomes (Cos)**

At the end of this course, students will demonstrate the ability

1. To understand and analyze basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.

**List of Experiments**

1. Experimental verification of electrical circuit problems using Ohms law and Kirchoff's law.
2. Measurement of electrical quantities – voltage, current, power & power factor in R load.
3. Speed control of DC shunt motor
4. Draw the equivalent circuit of single phase Transformer by conducting OC &SC Test.
5. Measurement of energy using single phase energy meter.

**SUGGESTED READING**


1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

**Semester-II**

**18BECS204 Workshop / Manufacturing practices Laboratory 5H-3C**

**Instruction Hours/week: L:1 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- to prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

**Course Outcomes**

1. Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.
2. Students will be able to fabricate components with their own hands.
3. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
4. By assembling different components, they will be able to produce small devices of their interest.

**i) Lectures & videos: (10 PERIODS)**

**Detailed contents**

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods **(3 lectures)**
2. CNC machining, Additive manufacturing **(1 lecture)**
3. Fitting operations & power tools **(1 lecture)**
4. Electrical &Electronics **(1 lecture)**
5. Carpentry **(1 lecture)**
6. Plastic moulding, glass cutting **(1 lecture)**
7. Metal casting **(1 lecture)**
8. Welding (arc welding & gas welding), brazing **(1 lecture)**

**ii) Workshop Practice: (60 PERIODS)**

1. Machine shop **(10 Periods)**
2. Fitting shop **(8 Periods)**
3. Carpentry **(6 Periods)**
4. Electrical & Electronics**(8 Periods)**
5. Welding shop **( 8 hours (Arc welding 4 Periods + gas welding 4 Periods)**
6. Casting **(8 Periods)**
7. Smithy **(6 Periods)**
8. Plastic moulding & Glass Cutting **(3 Periods)**
9. Plumbing Exercises **(3 Periods)**

**SUGGESTED READINGS**


1. Jeyachandran, K. and Balasubramanian, (2007), S, A Premier on Engineering Practices Laboratory, Anuradha Publications, Kumbakonam
2. Jeyapoovan, T., Saravanapandian, M, (2006), Engineering Practices Lab Manual, Vikas Puplishing House Pvt. Ltd, Chennai
3. Bawa, H.S, (2007), Workshop Practice, Tata McGraw – Hill Publishing Company Limited, New Delhi
4. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K, (2008 & 2010), Elements of Workshop Technology", Vol. I and Vol. II Media promoters and publishers private limited.
5. Gowri P. Hariharan and A. Suresh Babu, (2008) Manufacturing Technology – I, Pearson Education,
6. Kalpakjian S. And Steven S. Schmid, (2002), Manufacturing Engineering and Technology, Pearson Education India Edition.
7. Roy A. Lindberg,(1998), Processes and Materials of Manufacture, Prentice Hall India.
8. Rao P.N.,(2017), Manufacturing Technology, Vol. I and Vol. II, Tata McGrawHill House.

**Semester-II**

**18BECS205** **Engineering Graphics And Design** **5H-3C**

**Instruction Hours/week: L:1 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- to prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

**CourseOutcomes:**

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design and engineering graphics standards
3. Exposure to solid modeling ,computer-aided geometric design , creating working drawings and engineering communication

**UNIT I - INTRODUCTION**

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Conic sections including the Ellipse, Parabola and Hyperbola (eccentricity method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales

**UNIT II - ORTHOGRAPHIC PROJECTIONS**

Principles of Orthographic Projections- Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

**UNIT III - PROJECTION OF POINTS, LINES AND PLANE SURFACES**

Projections of Points and lines located in the first quadrant inclined to both planes - Determination of true lengths and true inclinations; Projection of polygonal surface and circular lamina inclined to both reference planes

**UNIT IV - PROJECTION OF SOLIDS**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

## UNIT V - ISOMETRIC PROJECTIONS & COMPUTER GRAPHICS

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple solids, truncated prisms, pyramids, cylinders and cones; Conversion of Isometric Views to Orthographic Views and Vice-versa

Overview of Computer Graphics, listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software, Introduction to 3D modeling packages

## SUGGESTED READINGS


1. Venugopal K and Prabhu Raja V, (2010), Engineering Graphics, New Age International Publishers.
2. C M Agrawal and Basant Agrawal, (2012), Engineering Graphics, Tata McGraw Hill, New Delhi.
3. James D. Bethune, (2015 &2016), Engineering Graphics with AutoCAD Pearson Education.
4. Narayana, K.L. & P Kannaiah, (2008),Text book on Engineering Drawing, Scitech Publishers.
5. Bureau of Indian Standards, (2003).Engineering Drawing Practices for Schools and Colleges SP 46, (2003), BIS, New Delhi.
6. Shah, M.B. & Rana B.C. (2008).Engineering Drawing and Computer Graphics, Pearson Education.
7. Bhatt N.D., Panchal V.M. & Ingle P.R, (2014), Engineering Drawing, Charotar Publishing House.

**Semester-I**

**18BECE101** **Mathematics –I** **4H-4C**

**(Calculus, Multivariable Calculus & Linear Algebra)**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- The objective of this course is to familiarize the prospective engineers with techniques in Calculus, Multivariable calculus and Linear Algebra.
- It aims to equip the students to deal with advanced level of mathematics and applications thatwould be essential for their disciplines.

**Course Outcomes**

The students will learn:
1 The essential tools of matrices and linear algebra including linear transformations, Eigen values, diagonalization and orthogonalization.
2 To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from various applications, they will have a basic understanding of Beta and Gamma functions.
3 The mathematical tools needed in evaluating multiple integrals and their usage.

**UNIT I - Matrices**

Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthogonal transformation.
Simple Problems using Scilab.

**UNIT II - Calculus:**

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

**UNIT III - Sequences and series:**

Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

**UNIT IV - Multivariable Calculus (Differentiation)**

Limit, continuity and partial derivatives, directional derivatives, total derivative, Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

**UNIT V - Multivariable Calculus (Integration)**

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Applications: areas and volumes , Center of mass and Gravity

(constant and variable densities). Theorems of Green, Gauss and Stokes, Simple applications involving cubes and rectangular parallelepipeds.

**SUGGESTED READINGS**


1. Hemamalini. P.T,(2014), Engineering Mathematics, McGraw Hill Education (India) Private Limited, New Delhi.
2. G.B. Thomas and R.L. Finney, (2002),Calculus and Analytic geometry, 9th Edition,Pearson,.
3. Erwin kreyszig, (2006),Advanced Engineering Mathematics, 9th Edition,John Wiley & Sons.
4. Veerarajan T, (2008),Engineering Mathematics for first year,Tata McGraw-Hill, New Delhi.
5. Ramana B.V, (2010), Higher Engineering Mathematics, 11th Reprint, Tata McGraw Hill New Delhi.
6. D. Poole, (2005), Linear Algebra: A Modern Introduction, 2nd Edition,Brooks/Cole.
7. N.P. Bali and Manish Goyal, (2010), A text book of Engineering Mathematics, Laxmi Publications.
8. B.S. Grewal, (2010), Higher Engineering Mathematics, 36th Edition, Khanna Publishers.
9. V. Krishnamurthy, (2005),V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East–West press.

**Semester-I**

**18BECE102** **Chemistry –I (Theory & Lab.)** **7H-6C**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Concepts in chemistry for engineering**

**Course Objective**

- To understand the terminologies of atomic and molecular structure
- To study the basics of Periodic properties, Intermolecular forces
- To study about spectroscopic technique
- To understand the thermodynamic functions
- To comprehend the basic organic chemistry and to synthesis simple drug.

**Course Outcomes:**

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. Rationalise bulk properties and processes using thermodynamic considerations.
5. List major chemical reactions that are used in the synthesis of molecules.

**UNIT I - Atomic and molecular structure**

Schrodinger equation. Particle in a box solutions and their applications. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules. Pi-molecular orbitals of butadiene and benzene and aromaticity.Introduction to Crystal field theory.

**UNIT II - Periodic properties, Intermolecular forces and potential energy surfaces**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers. Ionic, dipolar and van Der Waals interactions.Equations of state of real gases and critical phenomena. Potential energy surfaces of $H_2F$ and HCN and trajectories on these surfaces.

**UNIT III - Spectroscopic techniques and applications**

Spectroscopy (Principles and Instrumentation only).Electronic spectroscopy.Vibrational and rotational spectroscopy.Applications.Surface characterization techniques. Diffraction and scattering.Fluorescence and its applications in medicine.

**UNIT IV - Use of free energy in chemical equilibria**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications.Acid base, oxidation reduction and solubility equilibria.Use of free energy considerations in metallurgy through Ellingham diagrams.

**UNIT V - Organic reactions and synthesis of a drug molecule**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.Synthesis of a commonly used drug molecule.

**SUGGESTED READINGS**


1. B. H. Mahan, (2010), University chemistry, Pearson Education.
2. M. J. Sienko and R. A. Plane, Chemistry: Principles and Applications.
3. C. N. Banwell, (1994), Fundamentals of Molecular Spectroscopy, McGraw-Hill.
4. B. L. Tembe, Kamaluddin and M. S. Krishnan, Engineering Chemistry (NPTEL Web-book)
5. P. W. Atkins, (2009), Physical Chemistry, Oxford University Press.
6. K. P. C. Volhardt and N. E. Schore, (2014), 5th Edition, Organic Chemistry: Structure and Function, W.H. Freeman.
7. P C Jain & Monica Jain, (2015),Engineering Chemistry, Dhanpat Rai Publishing Company.

**(ii) Chemistry Laboratory**

**Course Objectives**

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

**Course Outcomes**

1 The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:

2 Estimate rate constants of reactions from concentration of reactants/products as a function of time

3 Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc

4 Synthesize a small drug molecule and analyse a salt

Choice of 10 experiments from the following:

1. Determination of surface tension and viscosity
2. Determination of Sodium Carbonate and Sodium Hydrogen Carbonate in a mixure using volumetric titration
3. Determination of Ca / Mg using complexometric titration
4. Thin layer chromatography
5. Determination of chloride content of water
6. Determination of the rate constant of a reaction
7. Conductometry - Determination of cell constant and conductance of solutions
8. pH Metry – Determination of Acid / Base
9. Potentiometry - determination of redox potentials and emfs
10. Saponification/acid value of an oil
11. Determination of the partition coefficient of a substance between two immiscible liquids
12. Adsorption of acetic acid by charcoal
13. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

**Semester-I**

**18BECE103** **Basic Electrical Engineering (Theory & Lab.)** **6H-5C**

**Instruction Hours/week: L:3 T:1 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.
- To understand the working of Power Converters and components of low-voltage electrical installations.

**Course Outcomes**

1. To understand and analyse basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low-voltage electrical installations.

**UNIT I - DC Circuits**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation.Superposition, Thevenin and Norton Theorems.Time-domain analysis of first-order RL and RC circuits.

**UNIT II - AC Circuits**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT III - Electrical Machines**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

**UNIT IV - Transformers And Power Converters**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.Auto-transformer and three-phase transformer connections. Overviews of DC-DC buck and boost converters, duty ratio control. Introduction to Single-phase and three-phase voltage source inverters.

**UNIT V - Electrical Installations**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, RCCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

**SUGGESTED READINGS**

1.V. D. Toro,(1989),Electrical Engineering Fundamentals, Prentice Hall India.
2. D. P. Kothari and I. J. Nagrath, (2010), Basic Electrical Engineering, Tata McGraw Hill.
3. D. C. Kulshreshtha, (2009), Basic Electrical Engineering, McGraw Hill.
4. L. S. Bobrow, (2011), Fundamentals of Electrical Engineering, Oxford University Press.
5. E. Hughes, (2010), Electrical and Electronics Technology, Pearson.

**(ii) Laboratory**

**Course Objective**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.

**Course Outcomes (Cos)**

At the end of this course, students will demonstrate the ability

1. To understand and analyze basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.

**List of Experiments**

1. Experimental verification of electrical circuit problems using Ohms law and Kirchoff's law.
2. Measurement of electrical quantities – voltage, current, power & power factor in R load.
3. Speed control of DC shunt motor
4. Draw the equivalent circuit of single phase Transformer by conducting OC &SC Test.
5. Measurement of energy using single phase energy meter.

**SUGGESTED READING**


1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

**Semester-I**

**18BECE104** **Engineering Graphics And Design** **5H-3C**

**Instruction Hours/week: L:1 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- to prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

**Course Outcomes:**

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design and engineering graphics standards
3. Exposure to solid modeling ,computer-aided geometric design , creating working drawings and engineering communication

**UNIT I - INTRODUCTION**

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Conic sections including the Ellipse, Parabola and Hyperbola (eccentricity method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales

**UNIT II - ORTHOGRAPHIC PROJECTIONS**

Principles of Orthographic Projections- Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

**UNIT III - PROJECTION OF POINTS, LINES AND PLANE SURFACES**

Projections of Points and lines located in the first quadrant inclined to both planes - Determination of true lengths and true inclinations; Projection of polygonal surface and circular lamina inclined to both reference planes

**UNIT IV - PROJECTION OF SOLIDS**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

## UNIT V - ISOMETRIC PROJECTIONS & COMPUTER GRAPHICS

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple solids, truncated prisms, pyramids, cylinders and cones; Conversion of Isometric Views to Orthographic Views and Vice-versa

Overview of Computer Graphics, listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software, Introduction to 3D modeling packages

## SUGGESTED READINGS


1. Venugopal K and Prabhu Raja V, (2010),Engineering Graphics, New Age International Publishers.
2. C M Agrawal and Basant Agrawal, (2012), Engineering Graphics, Tata McGraw Hill, New Delhi.
3. James D. Bethune, (2015), Engineering Graphics with AutoCAD Pearson Education.
4. Narayana, K.L. & P Kannaiah, (2008), Text book on Engineering Drawing, Scitech Publishers.
5. Bureau of Indian Standards, (2003), Engineering Drawing Practices for Schools and Colleges SP 46, BIS, New Delhi.
6. Shah, M.B. & Rana B.C., (2008),Engineering Drawing and Computer Graphics, Pearson Education.
7. Bhatt N.D., (2014), Panchal V.M. & Ingle P.R, Engineering Drawing, Charotar Publishing House.

**Semester-II**

**18BECE201** **Mathematics –II (Differential Equations)** **4H-4C**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- The objective of this course is to make the students acquire sound knowledge and techniques in solving Ordinary differential equations, Partial differential equations and complex integration.

**Course Outcomes**

The students will learn:

1. To develop fundamentals and basic concepts in Ordinary differential equations, Partial differential equations and complex integration.
2 To solve problems related to engineering applications b using these techniques.

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**UNIT I - First order ordinary differential equations**

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

**UNIT II - Ordinary differential equations of higher orders**

Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

**UNIT III - Partial Differential Equations**

First order partial differential equations, solutions of first order linear and non-linear PDEs-Solution to homogenous and non-homogenous linear partial differential equations second and higher order by complimentary function and particular integral method.

**UNIT IV - Partial Differential Equations**

Flows, vibrations and diffusions, second-order linear equations and their classification, Initial and boundary conditions (with an informal description of well posed problems), D'Alemberts solution of wave equation. Boundary-value problems: Solution of boundary-value problems for various linear PDEs in various geometries.

**UNIT V - Complex Integration**

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), zeros of analytic functions, singularities, Taylor's series, Laurent's series, Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine.

**SUGGESTED READINGS**


1. Hemamalini. P.T**,** (2014), Engineering Mathematics**,** McGraw Hill Education (India) Private Limited, New Delhi.
2. G.B. Thomas and R.L. Finney**,** (2002), Calculus and Analytic geometry, 9th Edition,Pearson.
3. Erwin kreyszig**,** (2006), Advanced Engineering Mathematics, 9th Edition,John Wiley & Sons.
4. W. E. Boyce and R. C. DiPrima**,(2009),** Elementary Differential Equations and BoundaryValue Problems, 9th Edition**,** Wiley India.
5. S. L. Ross**, (1984),**Differential Equations, 3rd Ed.,**,** Wiley India.
6. Veerarajan T**,** (2008),Engineering Mathematics for first year,Tata McGraw-Hill, New Delhi.
7. E. A. Coddington,(1995), An Introduction to Ordinary Differential Equations, Prentice Hall India.
8. E. L. Ince**, (1958),**Ordinary Differential Equations**,** Dover Publications.
9. G.F. Simmons and S.G. Krantz,(2007),Differential Equations,Tata McGraw Hill.
10. S. J. Farlow, (1993),Partial Differential Equations for Scientists and Engineers, Dover Publications
11. R. Haberman, (1998),Elementary Applied Partial Differential equations with Fourier Series and Boundary Value, Problem4th Ed., Prentice Hall.
12. Ian Sneddon,(1964), Elements of Partial Differential Equations, McGraw Hill
13. J. W. Brown and R. V. Churchill,(2004),Complex Variables and Applications, 7th Ed., McGraw Hill.

**Semester-II**

**18BECE202** **Mechanics and Mechanics of Solids (Theory &lab.)** **7H-5C**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objective:**

This course is designed for science or engineering majors in related areas, The main goal of the course is to learn the fundamentals of this important topic.

**Course Outcome:**

The students will have the knowledge on how to use Newton's laws of motion to solve advanced problems involving the dynamic motion of classical mechanical systems.

**Unit 1- Vector mechanics of a particle**

Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton's laws and its completeness in describing particle motion; Solving Newton's equations of motion in polar coordinates.Potential energy function; F = - Grad V, equipotential surfaces and meaning of gradient.

**Unit 2- Planar rigid body mechanics**

Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane;Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion. Introduction to three-dimensional rigid body motion.

**Unit 3 - Statics**

Free body diagrams with examples on modelling of typical supports and joints; Condition for equilibrium in three- and two- dimensions; Friction: limiting and non-limiting cases; Force displacement relationship; Geometric compatibility for small deformations.

**Unit 4 - Mechanics of solids**

Concept of stress at a point; Planet stress: transformation of stresses at a point, principal stresses and Mohr's circle; Displacement field; Concept of strain at a point; Plane strain:transformation of strain at a point, principal strains and Mohr's circle; Concepts of elasticity, plasticity, strain hardening, failure (fracture / yielding); Idealization of one dimensional stress-strain curve.

**Unit 5 - Stress and strain**

Bending stress; Shear stress; Cases of combined stresses; Concept of strain energy; Yield criteria; Deflection due to bending; Integration of the moment-curvature relationship for simple boundary conditions; Method of superposition (without using singularity functions); Strain energy and complementary strain energy for simple structural elements.

**SUGGESTED READINGS:**


1 MK Harbola,(2015),Engineering Mechanics ( 2nd ed.), Oxford University Press.
2 MK Verma, (2015),Introduction to Mechanics, GEMS Publisher, Coimbatore.
3 D Kleppner& R Kolenkow,(2012), An Introduction to Mechanics, Dhanpat Rai Publications
4 JL Synge & BA Griffiths,(2007), Principles of Mechanics, Milward Press
5 JL Meriam, (2012),Engineering Mechanics - Dynamics(7th ed), Wiley (7th Edition)
6 JP Den Hartog, (1985),Mechanical Vibrations, Courier Corporation.
7 SH Crandall, NC Dahl & TJ Lardner,(1978), An Introduction to the Mechanics of Solids(2nd ed.), McGraw-Hill Publishing Company.
8 EP Popov, (1998),Engineering Mechanics of Solids, Pearson.

**(ii) Laboratory**

**Course Objective**

- To learn the basic concepts in physics relevant to different branches of Engineering and Technology.
- To study the concept of semiconductor and conductivity.
- To learn the properties of materials.

**Course Outcome**

1. Familiarize the properties of material and basic concepts in physics.

**LIST OF EXPERIMENTS – PHYSICS**

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young's modulus
3. Uniform bending – Determination of young's modulus
4. Lee's disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. Optical fibre -Determination of Numerical Aperture and acceptance angle
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Determination of Band gap of a semiconductor.
11. Spectrometer- Determination of wavelength using grating.
12. Viscosity of liquids-Determination of co-efficient of viscosity of a liquid by Poiseuille's flow

**Semester-II**

**18BECE203** **English** **4H-3C**

**Instruction Hours/week: L:2 T:0 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.

**Course Outcomes**

Students undergoing this course will be able to

1 Use English language for communication: verbal & non –verbal.
2 Enrich comprehension and acquisition of speaking & writing ability.
3 Gain confidence in using English language in real life situations.
4 Improve word power: lexical, grammatical and communication competence.

**Unit** I - **Basic Writing Skills**

Sentence Structures - Use of phrases and clauses in sentences - Importance of proper punctuation - Creating coherence- Organizing principles of paragraphs in documents - Techniques for writing precisely

**Unit 1I - Vocabulary Building**

The concept of Word Formation - Root words from foreign languages and their use in English - Acquaintance, with prefixes and suffixes from foreign languages in English to form derivatives. - Synonyms, antonyms, and standard abbreviations.

**Unit III - Grammar and Usage**

Subject-verb agreement - Noun-pronoun agreement - Misplaced modifiers – Articles – Prepositions – Redundancies - Clichés

**Unit IV - Listening and Reading Skills**

Note taking- viewing model interviews – listening to informal conversations – improving listening / reading comprehension – reading model prose / poems – reading exercise

**Unit** V - **Writing Practices** Comprehension - Précis Writing - Essay Writing Listening Comprehension - Common Everyday Situations: Conversations and Dialogues - Communication at Workplace – Interviews - Formal Presentations

**Note:** Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

## SUGGESTED READINGS


1. Sangeeta Sharma , Meenakshi Raman,(2015), Technical Communication: Principles And Practice, 2nd Edition, OUP, New Delhi.
2. Sanjay Kumar and PushpLata, (2011),Communication Skills ,Oxford University Press.
3. Liz Hamp - Lyons and Ben Heasly, (2006),Study Writing, Cambridge University Press.
4. F.T. Wood., (2007), Remedial English Grammar, Macmillan.
5. Michael Swan, (1995),Practical English Usage, OUP.

**Semester-II**

**18BECE204** **Programming for Problem solving (Theory & Lab.)** **7H-5C**

**Instruction Hours/week: L:3 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- Identify and understand the working of key components of a computer program.
- Identify and understand the various kinds of keywords and different data types of C programming
- Understand, analyze and implement software development tools like algorithm,
- pseudo codes and programming structure
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in "C" language

**Course Outcomes**

The course will enable the students

1. To formulate simple algorithms for arithmetic and logical problems
2. To translate the algorithms to programs (in C language)
3. To test and execute the programs and correct syntax and logical errors
4. To implement conditional branching, iteration and recursion
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach
6. To use arrays, pointers and structures to formulate algorithms and programs
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems
8. To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

**Unit I – Introduction to Programming, Arithmetic expressions and precedence**

Introduction to Programming-Flowchart / pseudocode, compilation, Variables including data types, Arithmetic expressions and precedence.

**Unit II – Conditional Branching and Loops**

Conditional Branching – Loops Writing and evaluation of conditionals and consequent branching, Iteration and loops.

**Unit III – Arrays and Basic Algorithms**

Arrays1-D,2-D,Characterarraysand Strings **Basic Algorithms**: Searching, Basic Sorting Algorithms, Finding roots of equations, idea of time complexity.

**Unit IV – Function and Recursion**

Functions (including using built in libraries), Recursion with example programs such as Quick sort, Ackerman function etc.

**Unit V - Structure, Pointers and File Handling**

Pointers, Structures including self-referential structures e.g., linked list, notional introduction, File handling in C.

**SUGGESTED READINGS**


1. E. Balagurusamy,(2017) Computing Fundamentals and C Programming, 5th Edition, TMH Education
2. E. Balaguruswamy (2017), Programming in ANSI C, 7th Edition, Tata McGraw-Hill,
3. Byron Gottfried (2017), Schaum's Outline of Programming with C, 3rd Edition, McGraw-Hill
4. Brian W. Kernighan and Dennis M. Ritchie,(2015) The C Programming Language, 2nd Edition, Prentice Hall of India

**(ii) Laboratory**

**Course Objectives**

- To provide an awareness to Computing and C Programming
- To know the correct and efficient ways of solving problems
- To learn to develop algorithm for simple problem solving

**Course outcomes**

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use the mind defining self- referential structures.
8. To be able to create, read and write to and from simple text files.

**List of Experiments**

**Tutorial 1:** Problem solving using computers:
**Lab 1:** Familiarization with programming environment
**Tutorial 2:** Variable types and type conversions:
**Lab 2:** Simple computational problems using arithmetic expressions
**Tutorial 3:** Branching and logical expressions:
**Lab 3:** Problems involving if-then-else structures
**Tutorial 4:** Loops, while and for loops:
**Lab 4:** Iterative problems e.g., sum of series
**Tutorial 5:**1DArrays: searching, sorting:
**Lab 5:**1DArray manipulation
**Tutorial 6:**2D arrays and Strings, memory structure:
**Lab 6:** Matrix problems, String operations
**Tutorial 7:** Functions, call by value:
**Lab 7:** Simple functions
**Tutorial 8 & 9**: Numerical methods (Root finding, numerical differentiation, numerical integration):
**Lab 8and 9:**Numerical methods problems
**Tutorial 10:** Recursion, structure of recursive calls:
**Lab 10:** Recursive functions
**Tutorial 11:** Pointers, structures and dynamic memory allocation
**Lab 11:** Pointers and structures
**Tutorial 12:** File handling:
**Lab 12:** File operations

**Semester-II**

**18BECE205 Workshop / Manufacturing Practices Laboratory 5H-3C**

**Instruction Hours/week: L:1 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- to prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

**Course Outcomes**

1. Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.
2. Students will be able to fabricate components with their own hands.
3. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
4. By assembling different components, they will be able to produce small devices of their interest.

**iii) Lectures & videos: (10 PERIODS)**

**Detailed contents**

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods **(3 lectures)**
2. CNC machining, Additive manufacturing **(1 lecture)**
3. Fitting operations & power tools **(1 lecture)**
4. Electrical &Electronics **(1 lecture)**
5. Carpentry **(1 lecture)**
6. Plastic moulding, glass cutting **(1 lecture)**
7. Metal casting **(1 lecture)**
8. Welding (arc welding & gas welding), brazing **(1 lecture)**

**iv) Workshop Practice: (60 PERIODS)**

1 Machine shop **(10 Periods)**
2 Fitting shop **(8 Periods)**
3 Carpentry **(6 Periods)**
4 Electrical & Electronics**(8 Periods)**
5 Welding shop **( 8 hours (Arc welding 4 Periods + gas welding 4 Periods)**
6 Casting **(8 Periods)**
7 Smithy **(6 Periods)**
8 Plastic moulding & Glass Cutting **(3 Periods)**
9 Plumbing Exercises **(3 Periods)**

**SUGGESTED READINGS**


1. Jeyachandran, K. and Balasubramanian, S,(2007), A Premier on Engineering Practices Laboratory, Anuradha Publications, Kumbakonam.
2. Jeyapoovan, T., Saravanapandian, M, (2006), Engineering Practices Lab Manual, Vikas Puplishing House Pvt. Ltd, Chennai.
3. Bawa, H.S, Workshop Practice, (2007), Tata McGraw – Hill Publishing Company Limited, New Delhi.
4. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K, (2008&2010), Elements of Workshop Technology", Vol. I and Vol. II, Media promoters and publishers private limited.
5. Gowri P. Hariharan and A. Suresh Babu, (2008), Manufacturing Technology – I, Pearson Education.
6. Kalpakjian S. And Steven S. Schmid, (2002), Manufacturing Engineering and Technology, Pearson Education India Edition.
7. Roy A. Lindberg, (1998), Processes and Materials of Manufacture, Prentice Hall India.
8. Rao P.N., (2017),Manufacturing Technology, Vol. I and Vol. II, Tata McGrawHill House.

**Semester-I**

**18BEEE101** **Mathematics –I** **4H-4C**

**(Calculus and Differential Equations)**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- The objective of this course is to familiarize the prospective engineers with techniques in Calculus, Multivariable calculus and Differential equations. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines.

**Course Outcomes**

The students will learn:

1. To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from various applications, they will have a basic understanding of Beta and Gamma functions.
2. The tool of power series and Fourier series for learning advanced Engineering Mathematics.
3. To deal with functions of several variables that is essential in most branches of engineering.
4. To find an appropriate method for a given integral and use Green, Gauss and Stokes theorems to simplify calculations of integrals and prove simple results.
5. To understand the ideas of differential equations and facility in solving simple standard examples.

**UNIT I - Calculus**

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

**UNIT II - Multivariable Calculus: Differentiation**

Limit, continuity and partial derivatives, directional derivatives, total derivative, Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

**UNIT III - Multivariable Calculus: Integration**

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Applications: areas and volumes, Center of mass and Gravity (constant and variable densities). Theorems of Green, Gauss and Stokes,Simple applications involving cubes and rectangular parallelepipeds.

**UNIT IV- Differential Equations**

Introduction to Ordinary differential equations: Linear ordinary differential equations of second and higher order with constant coefficients. Introduction to Partial differential equations: Linear Partial differential equations of second and higher order with constant coefficients.

**UNIT V - Sequences and Series**

Convergence of sequence and series, tests for convergence, power series, Taylor's series. Series for exponential, trigonometric and logarithmic functions; Fourier series: Half range sine and cosine series, Parseval's theorem

**SUGGESTED READINGS**


1. Hemamalini. P.T, (2014), Engineering Mathematics, McGraw Hill Education (India) Private Limited, New Delhi.
2. B.S. Grewal, (2010), Higher Engineering Mathematics, 36th Edition, Khanna Publishers.
3. Veerarajan T, (2008), Engineering Mathematics for first year,Tata McGraw-Hill, New Delhi.
4. Ramana B.V, (2010), Higher Engineering Mathematics, 11th Reprint, Tata McGraw Hill New Delhi.
5. N.P. Bali and Manish Goyal, (2010), A text book of Engineering Mathematics, Laxmi Publications.
6. W. E. Boyce and R. C. DiPrima(2009), Elementary Differential Equations and Boundary Value Problems, 9th EditionWiley India.
7. S. L. Ross(1984)**,** Differential Equations, 3rd Ed.,Wiley India.
8. E. A. Coddington(1995), An Introduction to Ordinary Differential Equations, Prentice Hall India.
9. G.B. Thomas and R.L. Finney, (2002), Calculus and Analytic geometry, 9th Edition,Pearson.
10. E. L. Ince,(1958)**,**Ordinary Differential Equations**,** Dover Publications.
11. G.F. Simmons and S.G. Krantz,(2007), Differential Equations, Tata McGraw Hill.
12. Erwin kreyszig, (2006), Advanced Engineering Mathematics, 9th Edition,John Wiley & Sons.

**Semester-I**

**18BEEE102** **Waves, Optics And Introduction To Quantum Mechanics (Theory & Lab.)** **7H-5C**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objective:**

The goal is to develop an awareness and understanding of wave motion; skills in the use of optical devices and also to understand the idea of wave function.

**Course Outcomes**

1. The students will study about the waves on strings and other transverse waves.
2. The students will have the knowledge on the optical applications
3. The students will understand the uncertainty relations as well as solve Schrodinger equation for simple potentials

**Unit 1 - Waves**

Mechanical and electrical simple harmonic oscillators, damped harmonic oscillator, impedance, steady state motion of damped Harmonic oscillator

**Non-dispersive transverse and longitudinal waves:**

Transverse wave on a string, the wave equation on a string, Harmonic waves, reflection and transmission of waves at a boundary, impedance matching, standing waves and their Eigen frequencies, longitudinal waves and the wave equation for them, acoustics waves.

**Unit 2 - Wave Optics**

Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, Farunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power

**Unit 3 - Lasers**

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, $CO_2$), solid-state lasers (Neodymium), Properties of laser beams: mono-chromaticity, coherence, directionality and brightness-application of lasers in science, engineering and medicine.

**Unit 4 - Introduction to Quantum Mechanics**

Introduction to quantum theory – Black body radiation - dual nature of matter and radiation – de Broglie wavelength, uncertainty principle –Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- physical significance of wave function, scanning electron microscope.

**Unit 5 - Introduction to Solids and Semiconductors**

Free electron theory of metals, Fermi level, density of energy states, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands. Types of electronic materials: metals, semiconductors, and insulators- Intrinsic and extrinsic semiconductors (no need derivation).

**SUGGESTED READINGS**


1. H. J. Pain(2006), The physics of vibrations and waves**,** Wiley.
2. A.Ghatak(2012) , Optics, McGraw Hill Education.
3. M.N. Avadhanulu and PG Kshirsagar,(2011), A Text book of Engineering Physics, S.Chand and company, Ltd., New Delhi.
4. Ganesan.S and Baskar.T,(2015), Engineering Physics I, GEMS Publisher, Coimbatore-641001.
5. I.G. Main,(1993)**,** Vibrations and waves in physics**,** Cambridge University Press
6. Gaur, R.K. and Gupta,(2011), S.C, Engineering Physics, Dhanpat Rai Publications,New Delhi.
7. E. Hecht,(2008), Optics, Pearson Education.
8. D. J. Griffiths,(2014)**,** Quantum mechanics**,** Pearson Education.
9. D. A. Neamen,(1997), Semiconductor Physics and Devices, Times Mirror High Education Group.
10. B.G. Streetman,(1995), Solid State Electronic Devices, Prentice Hall of India.

**(ii) Laboratory**

**Course Objective**

- To learn the basic concepts in physics relevant to different branches of Engineering and Technology.
- To study the concept of semiconductor and conductivity.
- To learn the properties of materials.

**Course Outcome**

2. Familiarize the properties of material and basic concepts in physics.

**LIST OF EXPERIMENTS – PHYSICS**

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young's modulus
3. Uniform bending – Determination of young's modulus
4. Lee's disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. Optical fibre -Determination of Numerical Aperture and acceptance angle
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Determination of Band gap of a semiconductor.
11. Spectrometer- Determination of wavelength using grating.
12. Viscosity of liquids-Determination of co-efficient of viscosity of a liquid by Poiseuille's flow

**Semester-I**

**18BEEE103** **English** **4H-3C**

**Instruction Hours/week: L:2 T:0 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.

**Course Outcomes**

Students undergoing this course will be able to

1 Use English language for communication: verbal & non –verbal.
2 Enrich comprehension and acquisition of speaking & writing ability.
3 Gain confidence in using English language in real life situations.
4 Improve word power: lexical, grammatical and communication competence.

**Unit I - Basic Writing Skills**

Sentence Structures - Use of phrases and clauses in sentences - Importance of proper punctuation - Creating coherence- Organizing principles of paragraphs in documents - Techniques for writing precisely

**Unit 1I - Vocabulary Building**

The concept of Word Formation - Root words from foreign languages and their use in English - Acquaintance, with prefixes and suffixes from foreign languages in English to form derivatives. - Synonyms, antonyms, and standard abbreviations.

**Unit III - Grammar and Usage**

Subject-verb agreement - Noun-pronoun agreement - Misplaced modifiers – Articles – Prepositions – Redundancies - Clichés

**Unit IV - Listening and Reading Skills**

Note taking- viewing model interviews – listening to informal conversations – improving listening / reading comprehension – reading model prose / poems – reading exercise

**Unit** V.- **Writing Practices**

Comprehension - Précis Writing - Essay Writing Listening Comprehension - Common Everyday Situations: Conversations and Dialogues - Communication at Workplace – Interviews - Formal Presentations

**Note:** Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

**SUGGESTED READINGS**


1. Sangeeta Sharma , (2015),Meenakshi Raman, Technical Communication: Principles And Practice, 2nd Edition, OUP, New Delhi.
2. Sanjay Kumar and PushpLata, (2011), Communication Skills ,Oxford University Press.
3. Liz Hamp - Lyons and Ben Heasly, (2006), Study Writing, Cambridge University Press.
4. F.T. Wood., (2007),Remedial English Grammar, Macmillan.
5. Michael Swan, (1995), Practical English Usage, OUP.

**Semester-I**

**18BEEE104** **Programming For Problem Solving (With C) (Theory & Lab.)** **7H-5**

**Instruction Hours/week: L:3 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- Identify and understand the working of key components of a computer program.
- Identify and understand the various kinds of keywords and different data types of C programming
- Understand, analyze and implement software development tools like algorithm,
- pseudo codes and programming structure
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in "C" language

**CourseOutcomes:**

The course will enable thestudents.

1. To formulate simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs(inClanguage).
3. To test and execute the programs and correct syntax and logical errors.
4. To implement conditional branching, iteration and recursion.
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
6. To use arrays, pointers and structurestoformulatealgorithmsand programs.
7. To apply programming to solve matrix addition and multiplication problems and searchingandsortingproblems.
8. To apply programming to solve simple numerical method problems, namely rootfinding of function,differentiation of function and simple integration.

**Unit I - Introductionto Programming**

IntroductiontotheideaofalgorithmIntroductiontoProgrammingFlowchart/pseudocode, thecompilation process,objectcodeandexecutables,Variablesincludingdatatypes, Mappingofvariablestomemorylocations, Syntaxandlogicalerror

**Unit II - Arithmetic expressions, precedence, ConditionalBranching, Loops and Arrays**

Writingand evaluationofconditionalsand consequentbranching,Iterationandloops.
**Arrays:**Arrays1-D,2-D,Characterarraysand Strings.

**Unit III - BasicAlgorithms**

Searching:LinearandBinary,BasicSortingAlgorithms,Findingrootsofequations.

**Unit IV - FunctionandRecursion**

Functionsincludingusing built inlibraries,Parameter passing,Callbyvalue, Passing Arraystofunctions,Callbyreference.Introduction toRecursion;Basecondition,example programssuchasFactorial, Fibonacciseries,Quick sort,Ackermanfunction.

**Unit V - StructuresandPointers**

Structures,typedef, Arrayofstructures;notionalintroductionto pointersincludingself-referentialstructures.Filehandling in C

**SUGGESTED READINGS**


1. E. Balagurusamy, (2017), Computing Fundamentals and C Programming, TMH Education, 5th Edition.
2. E. Balaguruswamy, (2017), ProgramminginANSIC, TataMcGraw-Hill, 7th Edition.
3. ByronGottfried, (2017), Schaum'sOutlineofProgrammingwithC, McGraw-Hill, 3rd Edition.
4. BrianW.KernighanandDennisM.Ritchie,(2015),TheCProgrammingLanguage,Prentice HallofIndia, 2nd Edition.

**(ii) Laboratory**

**Course Objectives**

- To provide an awareness to Computing and C Programming
- To know the correct and efficient ways of solving problems
- To learn to develop algorithm for simple problem solving

**LaboratoryOutcomes:**

1. Toformulatethealgorithmsforsimpleproblems
2. Totranslate givenalgorithmstoaworkingand correct program
3. Tobeabletocorrectsyntaxerrorsas reportedbythecompilers
4. Tobeabletoidentifyand correctlogicalerrorsencounteredatruntime
5. Tobeabletowriteiterativeas wellasrecursiveprograms
6. Tobeabletorepresentdatainarrays,stringsandstructuresandmanipulatethem throughaprogram
7. Tobeabletodeclarepointersofdifferenttypesandusethemindefiningself-referentialstructures.
8. Tobeabletocreate,readandwritetoandfromsimple text files.

**List of Experiments**

**Tutorial 1:**Problem solvingusingcomputers:

**Lab1:** Familiarization withprogramming environment

**Tutorial 2:** Variabletypesand typeconversions:

**Lab 2:** Simplecomputationalproblemsusing arithmeticexpressions

**Tutorial 3:** Branching andlogicalexpressions:

**Lab 3:** Problems involvingif-then-else structures

**Tutorial 4:** Loops, whileandforloops:

**Lab4:** Iterativeproblemse.g.,sumofseries

**Tutorial 5:**1DArrays:searching, sorting:

**Lab 5:**1DArraymanipulation

**Tutorial 6:**2D arraysandStrings, memorystructure:

**Lab 6:** Matrix problems, Stringoperations

**Tutorial 7:** Functions, callby value:

**Lab7:** Simplefunctions

**Tutorial 8 &9:** Numerical methods (Root finding, numerical differentiation, numerical integration)

**Lab 8 and 9:** Numericalmethodsproblems

**Tutorial 10:** Recursion,structureofrecursivecalls:

**Lab10:** Recursivefunctions

**Tutorial 11:** Pointersexplained

**Lab11:** Implementingand accessingarrayofstructures

**Tutorial 12:** Filehandling:

**Lab12:** Fileoperations

**Semester-II**

**18BEEE201** **Mathematics – II** **4H-4C**

**(Linear Algebra, Transform Calculus and Numerical Method)**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- The objective of this course is to familiarize the prospective engineers with techniques in Linear Algebra, Transform calculus and Numerical methods.
- The syllabus is designed to develop the use of Matrix algebra techniques which is needed by Engineers for practical applications.
- It aims to equip the students in numerical methods to solve engineering problems, Fundamentals of numerical methods/algorithms to solve systems of different mathematical equations will be introduced.
- To learn Basic concepts of Laplace transforms.

**Course Outcomes**

The students will learn:

1. To solve the problems in engineering using Matrix algebra Techniques.
2. To solve the Linear, Nonlinear Ordinary differential equations and Partial differential equations.
3. To solve problems using Laplace Transforms.

**UNIT I - Matrices**

Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors; Diagonalization of matrices; Cayley-Hamilton Theorem, Orthogonal transformation. Simple Problems using Scilab.

**UNIT II - Numerical Methods**

Solution of polynomial and transcendental equations – Bisection method, Newton-Raphson method and Regula-Falsi method. Finite differences, Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae. Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

**UNIT III - Numerical Methods**

Ordinary differential equations: Taylor's series, Euler and modified Euler's methods. Runge Kutta method of fourth order for solving first and second order equations. Milne's And Adam's predicator-corrector methods.

**UNIT IV -Numerical Methods**

Partial differential equations: Finite difference solution two Dimensional Laplace equation and Poisson equation, Implicit and explicit methods for one Dimensional heat equation(Bender-Schmidt and Crank-Nicholson methods), Finite difference Explicit method for wave equation.

**UNIT V - Transform Calculus**

Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of Integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method.

**SUGGESTED READINGS**


1. Hemamalini. P.T, (2014), Engineering Mathematics, McGraw Hill Education (India) Private Limited, New Delhi.
2. B.S. Grewal, (2010), Higher Engineering Mathematics, 36th Edition, Khanna Publishers
3. D. Poole, (2005), Linear Algebra: A Modern Introduction, 2nd Edition,Brooks/Cole.
4. N.P. Bali and Manish Goyal, (2008), A text book of Engineering Mathematics, Laxmi Publications.
5. V. Krishnamurthy, V. P. Mainra and J. L. Arora,(2005), An introduction to Linear Algebra, Affiliated East-West press.

**Semester-II**

**18BEEE202** **Chemistry –I (Theory & Lab.)** **7H-6C**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60**

Total**:100**

**End Semester Exam:**3 Hours

**(i) Concepts in chemistry for engineering**

**Course Objective**

- To understand the terminologies of atomic and molecular structure
- To study the basics of Periodic properties, Intermolecular forces
- To study about spectroscopic technique
- To understand the thermodynamic functions
- To comprehend the basic organic chemistry and to synthesis simple drug.

**Course Outcomes:**

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. Rationalise bulk properties and processes using thermodynamic considerations.
5. List major chemical reactions that are used in the synthesis of molecules.

**UNIT I - Atomic and molecular structure**

Schrodinger equation. Particle in a box solutions and their applications. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules. Pi-molecular orbitals of butadiene and benzene and aromaticity.Introduction to Crystal field theory.

**UNIT II - Periodic properties, Intermolecular forces and potential energy surfaces**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers. Ionic, dipolar and van Der Waals interactions.Equations of state of real gases and critical phenomena. Potential energy surfaces of $H_2F$ and HCN and trajectories on these surfaces.

**UNIT III - Spectroscopic techniques and applications**

Spectroscopy (Principles and Instrumentation only).Electronic spectroscopy.Vibrational and rotational spectroscopy.Applications.Surface characterization techniques. Diffraction and scattering.Fluorescence and its applications in medicine.

**UNIT IV - Use of free energy in chemical equilibria**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications.Acid base, oxidation reduction and solubility equilibria.Use of free energy considerations in metallurgy through Ellingham diagrams.

**UNIT V - Organic reactions and synthesis of a drug molecule**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.Synthesis of a commonly used drug molecule.

**SUGGESTED READINGS**


1. B. H. Mahan, (2010), University chemistry, Pearson Education.
2. M. J. Sienko and R. A. Plane, Chemistry: Principles and Applications.
3. C. N. Banwell, (1994) Fundamentals of Molecular Spectroscopy, McGraw-Hill.
4. B. L. Tembe, Kamaluddin and M. S. Krishnan, Engineering Chemistry (NPTEL Web-book)
5. P. W. Atkins, (2009) Physical Chemistry, Oxford University Press.
6. K. P. C. Volhardt and N. E. Schore,(2014), 5th Edition, Organic Chemistry: Structure and Function, W.H. Freeman.
7. P C Jain & Monica Jain, (2015), Engineering Chemistry, Dhanpat Rai Publishing Company.

**(ii) Chemistry Laboratory**

**Course Objectives**

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

**Course Outcomes**

1 The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:
2 Estimate rate constants of reactions from concentration of reactants/products as a function of time
3 Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
4 Synthesize a small drug molecule and analyse a salt

Choice of 10 experiments from the following:

1. Determination of surface tension and viscosity
2. Determination of Sodium Carbonate and Sodium Hydrogen Carbonate in a mixure using volumetric titration
3. Determination of Ca / Mg using complexometric titration
4. Thin layer chromatography
5. Determination of chloride content of water
6. Determination of the rate constant of a reaction
7. Conductometry - Determination of cell constant and conductance of solutions
8. pH Metry – Determination of Acid / Base
9. Potentiometry - determination of redox potentials and emfs
10. Saponification/acid value of an oil
11. Determination of the partition coefficient of a substance between two immiscible liquids
12. Adsorption of acetic acid by charcoal
13. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

**Semester-II**

**18BEEE203** **Basic Electrical Engineering (Theory & Lab.)** **7H-5C**

**Instruction Hours/week: L:3 T:1 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.
- To understand the working of Power Converters and components of low-voltage electrical installations.

**Course Outcomes**

1. To understand and analyse basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low-voltage electrical installations.

**UNIT I - DC Circuits**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation.Superposition, Thevenin and Norton Theorems.Time-domain analysis of first-order RL and RC circuits.

**UNIT II - AC Circuits**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT III - Electrical Machines**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

**UNIT IV - Transformers And Power Converters**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.Auto-transformer and three-phase transformer connections. Overviews of DC-DC buck and boost converters, duty ratio control. Introduction to Single-phase and three-phase voltage source inverters.

**UNIT V - Electrical Installations**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, RCCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

**SUGGESTED READINGS**


1. V. D. Toro, (1989), Electrical Engineering Fundamentals, Prentice Hall India.
2. D. P. Kothari and I. J. Nagrath, (2010) Basic Electrical Engineering, Tata McGraw Hill.
3. D. C. Kulshreshtha, (2009), Basic Electrical Engineering, McGraw Hill.
4. L. S. Bobrow, (2011), Fundamentals of Electrical Engineering, Oxford University Press.
5. E. Hughes, (2010), Electrical and Electronics Technology, Pearson.

**(ii) Laboratory**

**Course Objective**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.

**Course Outcomes (Cos)**

At the end of this course, students will demonstrate the ability

1. To understand and analyze basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.

**List of Experiments**

1. Experimental verification of electrical circuit problems using Ohms law and Kirchoff's law.
2. Measurement of electrical quantities – voltage, current, power & power factor in R load.
3. Speed control of DC shunt motor
4. Draw the equivalent circuit of single phase Transformer by conducting OC &SC Test.
5. Measurement of energy using single phase energy meter.

**SUGGESTED READING**


1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

**Semester-II**

**18BEEE204** **Workshop / Manufacturing Practices Laboratory** **5H-3C**

**Instruction Hours/week: L:1 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- to prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

**Course Outcomes**

1. Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.
2. Students will be able to fabricate components with their own hands.
3. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
4. By assembling different components, they will be able to produce small devices of their interest.

**i) Lectures & videos: (10 PERIODS)**

**Detailed contents**

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods **(3 lectures)**
2. CNC machining, Additive manufacturing **(1 lecture)**
3. Fitting operations & power tools **(1 lecture)**
4. Electrical &Electronics **(1 lecture)**
5. Carpentry **(1 lecture)**
6. Plastic moulding, glass cutting **(1 lecture)**
7. Metal casting **(1 lecture)**
8. Welding (arc welding & gas welding), brazing **(1 lecture)**

**ii) Workshop Practice: (60 PERIODS)**

1. Machine shop **(10 Periods)**
2. Fitting shop **(8 Periods)**
3. Carpentry **(6 Periods)**
4. Electrical & Electronics**(8 Periods)**
5. Welding shop **( 8 hours (Arc welding 4 Periods + gas welding 4 Periods)**
6. Casting **(8 Periods)**
7. Smithy **(6 Periods)**
8. Plastic moulding & Glass Cutting **(3 Periods)**
9. Plumbing Exercises **(3 Periods)**

**SUGGESTED READINGS**


1. Jeyachandran, K. and Balasubramanian, S, (2007), A Premier on Engineering Practices Laboratory, Anuradha Publications, Kumbakonam.
2. Jeyapoovan, T., Saravanapandian, M, (2006), Engineering Practices Lab Manual, Vikas Puplishing House Pvt. Ltd, Chennai.
3. Bawa, H.S, Workshop Practice, (2007), Tata McGraw – Hill Publishing Company Limited, New Delhi.
4. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K, (2008&2010), Elements of Workshop Technology", Vol. I and Vol. II, Media promoters and publishers private limited.
5. Gowri P. Hariharan and A. Suresh Babu, (2008), Manufacturing Technology – I, Pearson Education.
6. Kalpakjian S. And Steven S. Schmid, (2002), Manufacturing Engineering and Technology, Pearson Education India Edition.
7. Roy A. Lindberg,( 1998), Processes and Materials of Manufacture, Prentice Hall India.
8. Rao P.N., (2017),Manufacturing Technology, Vol. I and Vol. II, Tata McGrawHill House.

**Semester-II**

**18BEEE205** **Engineering Graphics And Design** **5H-3C**

**Instruction Hours/week: L:1 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- to prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

**CourseOutcomes:**

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design and engineering graphics standards
3. Exposure to solid modeling ,computer-aided geometric design , creating working drawings and engineering communication

**UNIT I - INTRODUCTION**

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Conic sections including the Ellipse, Parabola and Hyperbola (eccentricity method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales

**UNIT II - ORTHOGRAPHIC PROJECTIONS**

Principles of Orthographic Projections- Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

**UNIT III - PROJECTION OF POINTS, LINES AND PLANE SURFACES**

Projections of Points and lines located in the first quadrant inclined to both planes - Determination of true lengths and true inclinations; Projection of polygonal surface and circular lamina inclined to both reference planes

**UNIT IV - PROJECTION OF SOLIDS**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

## UNIT V - ISOMETRIC PROJECTIONS & COMPUTER GRAPHICS

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple solids, truncated prisms, pyramids, cylinders and cones; Conversion of Isometric Views to Orthographic Views and Vice-versa

Overview of Computer Graphics, listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software, Introduction to 3D modeling packages

## SUGGESTED READINGS


1. Venugopal K and Prabhu Raja V, (2010),Engineering Graphics, New Age International Publishers.
2. C M Agrawal and Basant Agrawal, (2012), Engineering Graphics, Tata McGraw Hill, New Delhi.
3. James D. Bethune, (2015), Engineering Graphics with AutoCAD Pearson Education.
4. Narayana, K.L. & P Kannaiah, (2008), text book on Engineering Drawing, Scitech Publishers.
5. Bureau of Indian Standards, (2003)., Engineering Drawing Practices for Schools and Colleges SP 46, BIS, New Delhi
6. Shah, M.B. & Rana B.C., (2008), Engineering Drawing and Computer Graphics, Pearson Education.
7. Bhatt N.D., Panchal V.M. & Ingle P.R, (2014), Engineering Drawing, Charotar Publishing House.

**Semester-I**

**18BEEC1031** **Mathematics –I** **4H-4C**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.

**Course Outcomes**

1 Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
2 Improved facility in algebraic manipulation.
3 Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
4 Understanding the ideas of differential equations and facility in solving simple standard examples.

**UNIT I - DIFFERENTIAL CALCULUS**

Representation of functions, New functions from old functions, Limit of a function, Limits at infinity, Continuity , Derivatives, Differentiation rules, Polar coordinate system , Differentiation in polar coordinates, Maxima and Minima of functions of one variable.

**UNIT II - FUNCTIONS OF SEVERAL VARIABLES**

Partial derivatives, Homogeneous functions and Euler's theorem, Total derivative, Differentiation of implicit functions, Change of variables, Jacobians, Partial differentiation of implicit functions, Taylor's series for functions of two variables, Errors and approximations, Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.

**UNIT III - INTEGRAL CALCULUS**

Definite and Indefinite integrals, Substitution rule, Techniques of Integration, Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions, Improper integrals.

**UNIT IV - MULTIPLE INTEGRALS**

Double integrals, Change of order of integration, Double integrals in polar coordinates, Area enclosed by plane curves, Triple integrals , Volume of solids, Change of variables in double and triple integrals.

**UNIT V - DIFFERENTIAL EQUATIONS**

Method of variation of parameters, Method of undetermined coefficients, Homogenous equation of Euler's and Legendre's type, System of simultaneous linear differential equations with constant coefficients.

**SUGGESTED READINGS**


1. Hemamalini. P.T, (2014&2017),Engineering Mathematics, McGraw Hill Education (India) Private, Limited, New Delhi.
2. James Stewart, (2008), Calculus with Early Transcendental Functions, Cengage Learning.
3. Narayanan S. and Manicavachagom Pillai T. K., (2007), Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd.
4. Erwin kreyszig, (2014), Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
5. B.S. Grewal, (2014) Higher Engineering Mathematics, 43rd Edition, Khanna Publisher.
6. Ramana B.V, (2010), Higher Engineering Mathematics, 11th Reprint,., Tata McGraw Hill New Delhi.
7. Jain R.K. and Iyengar S.R.K, (2007), Advanced Engineering Mathematics , 3rd Edition, Narosa Publications.
8. Bali N., Goyal M. and Watkins C, (2009), Advanced Engineering Mathematics, 7th Edition, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd).
9. Greenberg M.D., 5th Reprint, (2009). Advanced Engineering Mathematics, 2nd Edition,5th Reprint Pearson Education.
10. O'Neil, P.V, (2007), Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd..

**Semester-I**

**18BEEC102** **Semi-Conductor Physics (Theory & Lab.)** **4H-5C**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- To introduce students the physics of semiconductors and the inner working of semiconductor devices.
- Provide students the insight useful for understanding new semiconductor devices and technologies.

**Course Outcomes**

1. Students will be able to demonstrate a knowledge and broad understanding of Semiconductor Physics
2. The students will have the knowledge on the basic theory and operation of semiconductor devices used for integrated circuit applications.

**Unit 1 - Quantum Mechanics**

Introduction to quantum theory – Black body radiation - dual nature of matter and radiation – de Broglie wavelength, uncertainty principle –Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- physical significance of wave function, scanning electron microscope.

**Unit 2 - Electronic materials**

Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (to introduce origin of band gap), Energy bands in solids, Direct and indirect bandgaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass, Phonons.

**Unit 3 - Semiconductors**

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky).

**Unit 4 - Light-semiconductor interaction**

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; Transition rates (Fermi's golden rule), Optical loss and gain; Photovoltaic effect, Exciton, Drude model, LED,Solar cell, photo diode.

**Unit 5 - Engineered semiconductor materials**

Density of states in 2D, 1d and 0D (qualitatively). Practical examples of low-dimensional systems such as quantum wells, wires, and dots: design, fabrication, methods of fabrication (CVD,PVD) and characterization techniques.

**SUGGESTED READINGS**


1. Ganesan.S and Baskar.T(2015), Engineering Physics I, GEMS Publisher, Coimbatore-641001
2. J. Singh, (1995), Semiconductor Optoelectronics: Physics and Technology, McGraw-Hill Inc.
3. B. E. A. Saleh and M. C. Teich,(2007), Fundamentals of Photonics, John Wiley & Sons, Inc.,
4. S. M. Sze, (2008), Semiconductor Devices: Physics and Technology, Wiley.
5. Yariv and P. Yeh,(2007), Photonics: Optical Electronics in Modern Communications.
6. Oxford University Press, New York.
7. P. Bhattacharya,(1997), Semiconductor Optoelectronic Devices, Prentice Hall of India.

**(ii) Laboratory**

**Course Objective**

- To learn the basic concepts in physics relevant to different branches of Engineering and Technology.
- To study the concept of semiconductor and conductivity.
- To learn the properties of materials.

**Course Outcome**

1. Familiarize the properties of material and basic concepts in physics.

**LIST OF EXPERIMENTS – PHYSICS**

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young's modulus
3. Uniform bending – Determination of young's modulus
4. Lee's disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. Optical fibre -Determination of Numerical Aperture and acceptance angle
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Determination of Band gap of a semiconductor.
11. Spectrometer- Determination of wavelength using grating.
12. Viscosity of liquids-Determination of co-efficient of viscosity of a liquid by Poiseuille's flow

**Semester-I**

**18BEEC103** **English** **4H-3C**

**Instruction Hours/week: L:2T:0 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**5Hours

**Course Objectives**

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.

**Course Outcomes**

Students undergoing this course will be able to

1. Use English language for communication: verbal & non –verbal.
2. Enrich comprehension and acquisition of speaking & writing ability.
3. Gain confidence in using English language in real life situations.
4. Improve word power: lexical, grammatical and communication competence.

**Unit** I - **Basic Writing Skills**

Sentence Structures - Use of phrases and clauses in sentences - Importance of proper punctuation - Creating coherence- Organizing principles of paragraphs in documents - Techniques for writing precisely

**Unit: 1I - Vocabulary Building**

The concept of Word Formation - Root words from foreign languages and their use in English - Acquaintance, with prefixes and suffixes from foreign languages in English to form derivatives. - Synonyms, antonyms, and standard abbreviations.

**Unit: III - Grammar and Usage**

Subject-verb agreement - Noun-pronoun agreement - Misplaced modifiers – Articles – Prepositions – Redundancies – Clichés

**Unit: IV - Listening and Reading Skills**

Note taking- viewing model interviews – listening to informal conversations – improving listening / reading comprehension – reading model prose / poems – reading exercise

**Unit:** V.- **Writing Practices**

Comprehension - Précis Writing - Essay Writing Listening Comprehension - Common Everyday Situations: Conversations and Dialogues - Communication at Workplace – Interviews - Formal Presentations

**Note:** Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

**SUGGESTED READINGS**


1. Sangeeta Sharma , Meenakshi Raman, (2015),Technical Communication: Principles And Practice, 2nd Edition, OUP, New Delhi.
2. Sanjay Kumar and PushpLata, (2011), Communication Skills ,Oxford University Press.
3. Liz Hamp - Lyons and Ben Heasly, (2006), Study Writing, Cambridge University Press.
4. F.T. Wood., (2007), Remedial English Grammar, Macmillan.
5. Michael Swan, (1995), Practical English Usage, OUP.


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**Semester-I**

**18BEEC104** **Programming for problem solving (Theory & Lab.)** **7H-5C**

**Instruction Hours/week: L:3 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- Identify and understand the working of key components of a computer program.
- Identify and understand the various kinds of keywords and different data types of C programming
- Understand, analyze and implement software development tools like algorithm,
- pseudo codes and programming structure
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in "C" language

**Course Outcomes**

The course will enable the students

1. To formulate simple algorithms for arithmetic and logical problems
2. To translate the algorithms to programs (in C language)
3. To test and execute the programs and correct syntax and logical errors
4. To implement conditional branching, iteration and recursion
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach
6. To use arrays, pointers and structures to formulate algorithms and programs
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems
8. To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

**Unit I - IntroductiontoProgramming**

Introduction to components of a computer system disks, memory, processor, where a program is stored and executed, operating system, compilers - Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart / Pseudocode with examples. From algorithms to programs; source code, variables with data types variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

**Unit II – Arithmetic expressions, precedence, Conditional Branching and Loops**

**[Arithmetic expressions and precedence** – Conditional Branching- Loops-Writing and evaluation of conditionals and consequent branching-Iteration and loops.

**Unit III - Array and BasicAlgorithms**

Arrays-Arrays1-D, 2-D,Character arrays and Strings, Searching, Basic Sorting Algorithms-Bubble Insertion and Selection sorting, Finding roots of equations, notion of order of complexity through example programs (no formal definition required).

**Unit IV - Function and Recursion**

Functions including using built in libraries Parameter passing in functions, call by value, Passing arrays to functions:idea of call by reference, **Recursion:** Recursion,as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function. Quick sort or Merge sort.

**Unit V - Structure, Pointers and File Handling**

**[**Structures, Defining structures and Array of Structures,

**Pointers:** Idea of pointers,Defining pointers,Use of Pointers in self-referential structures, notion of linked list (no implementation), File handling.

**SUGGESTED READINGS**


1. E. Balagurusamy, (2017) Computing Fundamentals and C Programming, TMH Education, 5th Edition,
2. E. Balaguruswamy, (2017). ProgramminginANSIC, TataMcGraw-Hill, 7th Edition,
3. ByronGottfried, Schaum's (2017) OutlineofProgrammingwithC, McGraw-Hill, 3rd Edition,
4. BrianW.KernighanandDennisM.Ritchie, (2015).TheCProgrammingLanguage, Prentice HallofIndia, 2nd Edition,

**(ii) Laboratory**

**Course Objectives**

- To provide an awareness to Computing and C Programming
- To know the correct and efficient ways of solving problems
- To learn to develop algorithm for simple problem solving

**Course outcomes**

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use the mind defining self- referential structures.
8. To be able to create, read and write to and from simple text files.

**List of Experiments**

**Tutorial 1:** Problem solving using computers:
**Lab 1:** Familiarization with programming environment
**Tutorial 2:** Variable types and type conversions:
**Lab 2:** Simple computational problems using arithmetic expressions
**Tutorial 3:** Branching and logical expressions:
**Lab 3:** Problems involving if-then-else structures
**Tutorial 4:** Loops, while and for loops:
**Lab 4:** Iterative problems e.g., sum of series
**Tutorial 5:**1DArrays: searching, sorting:
**Lab 5:**1DArray manipulation
**Tutorial 6:**2D arrays and Strings, memory structure:
**Lab 6:** Matrix problems, String operations
**Tutorial 7:** Functions, call by value:
**Lab 7:** Simple functions
**Tutorial 8 & 9**: Numerical methods (Root finding, numerical differentiation, numerical integration):
**Lab 8and 9:**Numerical methods problems
**Tutorial 10:** Recursion, structure of recursive calls:
**Lab 10:** Recursive functions
**Tutorial 11:** Pointers, structures and dynamic memory allocation
**Lab 11:** Pointers and structures
**Tutorial 12:** File handling:
**Lab 12:** File operations

**Semester-I**

**18BEEC105** **Yoga** **1H-0C**

**Instruction Hours/week: L:1 T:0 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objective**

Yoga education helps to develop the self discipline, self control, awareness, concentration and higher level of consciousness.

**Course Outcomes**

To enable the student to have physical health and mental health.

**UNIT- I**

Introduction To Yoga- Meaning Of Yoga – Concept Of Yoga- Aim And Objectives Of Yoga – History Of Yoga - Systems Of Yoga.- Stages (Or) Limbs Of Yoga

**UNIT- II**

Asanas-Surya Namashkar- Thdasana- Veerabadhra Asana- Trikonasana- Utkatasana- Ardha Chakrasana- Ardha Kati Chakrasana- Thandasana- Gomugasana- Padmasana- Vajrasana- Paschimottasana- Matsyendrasana-Bavana Mukthasana- Supta Padhangusthasana-Sethubhandhasana- Navasana- Ardha Bavanamukthasana- Mathasyasana- Naukasana- Bujangasana- Salabasana- Makkarasana-Dhanurasana.

**UNIT- III**

Advance Asanas- Sirasasana- Garudasana- Natrajasana- Rajakoptasana- Chakrasana- Kukutasana- Virikshasana- Sarvagasana- Halasana-.Mayurasana .

**UNIT- IV**

Pranayama- Meaning- Types Of Pranayama- Bhastrika- Bhramari- Udgeeth- Kabalbhati- Bahya- Anulom Vilom- Pranay Pranayama- Benefits Of Pranayama. Neti - Jala Neti , Sutra Neti, Nouli- Three Types, Douthy-Three Types

**UNIT- V**

Mudras- Uses Of Mudras- Gyan- Shoonya- Apaan- Prana- Vayu- Prithvi- Linga- Apana- Adi Mudra- - Agni Mudra- Surya Mudra- Varuna- Hakini Mudra.

**SUGGESTED READINGS:**

1. Dr.K.Chandrasekaran(2009), Sound health through yoga,Prem Kalyan
2. B.K.S.Iyangar(2013) , Light on pranayama ,CrossRoad Centuary
3. Thirumular Thirumandhiram((2016)),SriRamakrishna Math

**Semester-II**

**18BEEC201** **MATHEMATICS – II** **4H-4C**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as fluid dynamics and flow of the electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

**Course Outcomes:**

The students will learn:

1 To Evaluate complex integrals using the Cauchy integral formula and the residue Theorem
2 To Appreciate how complex methods can be used to prove some important theoretical results.
3 To Evaluate line, surface and volume integrals in simple coordinate systems
4 To Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
5 To Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

**UNIT I - MATRICES**

Eigen values and Eigenvectors of a real matrix, Characteristic equation, Properties of eigenvalues and eigenvectors, Cayley-Hamilton theorem, Diagonalization of matrices , Reduction of a quadratic form to canonical form by orthogonal transformation, Nature of quadratic forms. Simple Problems using Scilab.

**UNIT II - VECTOR CALCULUS**

Gradient and directional derivative, Divergence and Curl, Irrotational and Solenoidal vector fields, Line integral over a plane curve, Surface integral, Area of a curved surface, Volume integral, Green's, Gauss divergence and Stoke's theorems, Verification and application in evaluating line, surface and volume integrals.

**UNIT III - ANALYTIC FUNCTION**

Analytic functions, Necessary and sufficient conditions for analyticity, Properties, Harmonic conjugates, Construction of analytic function, Conformal mapping, Mapping by Functions w =z+c, cz, 1/z, $z^2$ , Bilinear transformation.

**UNIT IV - COMPLEX INTEGRATION**

Line integral, Cauchy's integral theorem, Cauchy's integral formula, Taylor's and Laurent's series, Singularities, Residues, Residue theorem, Application of residue theorem for evaluation of real integrals, Use of circular contour and semicircular contour with no pole on real axis.

**UNIT V - LAPLACE TRANSFORMS**

Existence conditions, Transforms of elementary functions, Transform of unit step function and unit impulse function, Basic properties, Shifting theorems, Transforms of derivatives and integrals, Initial and final value theorems, Inverse transforms, Convolution theorem , Transform of periodic functions, Application to solution of linear ordinary differential equations with constant coefficients.

**SUGGESTED READINGS**


1. Hemamalini. P.T, (2014&2017) Engineering Mathematics, McGraw Hill Education (India) Private Limited, New Delhi.
2. Erwin kreyszig, (2014), Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
3. B.S. Grewal, (2014), Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
4. Ramana B.V, (2010),Higher Engineering Mathematics, Tata McGraw Hill.
5. Glyn James, (2007), Advanced Modern Engineering Mathematics, Pearson Education.
6. Jain R.K. and Iyengar S.R.K, (2007), Advanced Engineering Mathematics , 3rd Edition, Narosa Publications.
7. Bali N., Goyal M. and Watkins C, (2009), Advanced Engineering Mathematics, 7th Edition, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd).
8. O'Neil, P.V, (2007), Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd.

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| | | **Semester-II** |
| **18BEEC202** | **Chemistry – I (Theory & Lab.)** | **7H-6C** |

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Concepts in chemistry for engineering**

**Course Objective**

- To understand the terminologies of atomic and molecular structure
- To study the basics of Periodic properties, Intermolecular forces
- To study about spectroscopic technique
- To understand the thermodynamic functions
- To comprehend the basic organic chemistry and to synthesis simple drug.

**COURSE OUTCOMES:**

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. Rationalise bulk properties and processes using thermodynamic considerations.
5. List major chemical reactions that are used in the synthesis of molecules.

**UNIT I - Atomic and molecular structure**

Schrodinger equation. Particle in a box solutions and their applications. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules. Pi-molecular orbitals of butadiene and benzene and aromaticity.Introduction to Crystal field theory.

**UNIT II - Periodic properties, Intermolecular forces and potential energy surfaces**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers. Ionic, dipolar and van Der Waals interactions.Equations of state of real gases and critical phenomena. Potential energy surfaces of $H_2F$ and HCN and trajectories on these surfaces.

**UNIT III - Spectroscopic techniques and applications**

Spectroscopy (Principles and Instrumentation only).Electronic spectroscopy.Vibrational and rotational spectroscopy.Applications.Surface characterization techniques. Diffraction and scattering.Fluorescence and its applications in medicine.

**UNIT IV - Use of free energy in chemical equilibria**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications.Acid base, oxidation reduction and solubility equilibria.Use of free energy considerations in metallurgy through Ellingham diagrams.

**UNIT V - Organic reactions and synthesis of a drug molecule**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.Synthesis of a commonly used drug molecule.

**SUGGESTED READINGS**


1. B. H. Mahan, (2010).University chemistry, Pearson Education,
2. M. J. Sienko and R. A. Plane, Chemistry: Principles and Applications.
3. C. N. Banwell, (1994).Fundamentals of Molecular Spectroscopy, McGraw-Hill,
4. B. L. Tembe,.Kamaluddin and M. S. Krishnan(2009), Engineering Chemistry (NPTEL Web-book)
5. P. W. Atkins, Physical Chemistry, Oxford University Press,
6. K. P. C. Volhardt and N. E. Schore, (2014).5th Edition, Organic Chemistry: Structure and Function, W.H. Freeman,
7. P C Jain & Monica Jain, (2015), Engineering Chemistry, Dhanpat Rai Publishing Company,

**(ii) Chemistry Laboratory**

**Course Objectives**

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

**Course Outcomes**

1. The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:
2. Estimate rate constants of reactions from concentration of reactants/products as a function of time
3. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
4. Synthesize a small drug molecule and analyse a salt

Choice of 10 experiments from the following:

1. Determination of surface tension and viscosity
2. Determination of Sodium Carbonate and Sodium Hydrogen Carbonate in a mixure using volumetric titration
3. Determination of Ca / Mg using complexometric titration
4. Thin layer chromatography
5. Determination of chloride content of water
6. Determination of the rate constant of a reaction
7. Conductometry - Determination of cell constant and conductance of solutions
8. pH Metry – Determination of Acid / Base
9. Potentiometry - determination of redox potentials and emfs
10. Saponification/acid value of an oil
11. Determination of the partition coefficient of a substance between two immiscible liquids
12. Adsorption of acetic acid by charcoal
13. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

**Semester-II**

**18BEEC203** **Basic Electrical Engineering (Theory & Lab.)** **6H-5C**

**Instruction Hours/week: L:3 T:1 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.
- To understand the working of Power Converters and components of low-voltage electrical installations.

**Course Outcomes**

1. To understand and analyse basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low-voltage electrical installations.

**UNIT I - DC Circuits**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation.Superposition, Thevenin and Norton Theorems.Time-domain analysis of first-order RL and RC circuits.

**UNIT II - AC Circuits**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT III - Electrical Machines**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

**UNIT IV - Transformers And Power Converters**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.Auto-transformer and three-phase transformer connections. Overviews of DC-DC buck and boost converters, duty ratio control. Introduction to Single-phase and three-phase voltage source inverters.

**UNIT V - Electrical Installations**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, RCCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

**SUGGESTED READINGS**


1. D. P. Kothari and I. J. Nagrath, (2010), Basic Electrical Engineering, Tata McGraw Hill.
2. D. C. Kulshreshtha, (2009), Basic Electrical Engineering, McGraw Hill.
3. L. S. Bobrow, (2011),Fundamentals of Electrical Engineering, Oxford University Press.
4. E. Hughes, (2010), Electrical and Electronics Technology, Pearson.
5. V. D. Toro, (1989), Electrical Engineering Fundamentals, Prentice Hall India.

**(ii) Laboratory**

**Course Objective**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.

**Course Outcomes**

At the end of this course, students will demonstrate the ability

1. To understand and analyze basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.

**List of Experiments**

1. Experimental verification of electrical circuit problems using Ohms law and Kirchoff's law.
2. Measurement of electrical quantities – voltage, current, power & power factor in R load.
3. Speed control of DC shunt motor
4. Draw the equivalent circuit of single phase Transformer by conducting OC &SC Test.
5. Measurement of energy using single phase energy meter.

**SUGGESTED READING**


1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

**Semester-II**

**18BEEC204** **Environmental Sciences** **3H-3C**

**Instruction Hours/week: L:3 T:0 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To give a comprehensive insight into natural resources, ecosystem and biodiversity.
- To educate the ways and means of the environment
- To protect the environment from various types of pollution.
- To impart some fundamental knowledge on human welfare measures.

**Course Outcome**

1 Students will prepare themselves to go ecofriendly and help preserving the nature and environment.

**UNIT I - Introduction To Environmental Studies And Natural Resources**

Definition, Scope and Importance – Need for public awareness -Forestresources: Useandover-exploitation, deforestation- Water resources-Use and over-utilization of surface and ground water, floods, drought, conflicts over water- Land resources-Land as a resource, land degradation, man induced landslides, soil erosion and desertification –Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources- Food resources-World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture- Energy resources-Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources- role of an individual in conservation of natural resources.

**UNIT II - Ecosystem**

Chemistry and Environment- Environmental segments, Composition and Structure of atmosphere Concept of an ecosystem- Structure, components and function of an ecosystem Energy flow in the ecosystem – Food chain, Food web and Ecological pyramids, Structure and function of Terrestrial ecosystem (Forest, Desert and Grassland ecosystem) and Aquatic ecosystem (Fresh water and Marine ecosystem).

**UNIT III - Biodiversity**

Introduction to biodiversity, Definition- Geneticdiversity, Species diversity and Ecosystem diversity.Biogeographical classification of India, Importance of biodiversity-Value of biodiversity - Hot Spots of biodiversity-Threats to biodiversity - Endangered and Endemic Species of India – Conservation of biodiversity- In-Situ and Ex-Situ conservation of biodiversity.

**UNIT IV - Environmental Pollution**

Definition – causes, effects and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution and Thermal pollution. Solid waste management-causes, effects and control measures of urban and industrial wastes– Role of an individual in prevention of pollution–Disaster management-earthquake, tsunami, cyclone and landslides.

**UNIT V - Social Issues And Environment**

From Unsustainable to Sustainable development, Urban problems related to energy sources, Water conservation, Rain water harvesting and Watershed management, Resettlement and rehabilitation of people, its problems and concerns, Environmental ethics- Issues and possible solutions- Climate change- Green house effect and Global warming, Acid rain, Ozone layer depletion, Wasteland reclamation- Environment Protection Act- Human Rights- Value education, Role of Information Technology in Environment and Human health-Population growth, Variation of population among nations-Population explosion.

**SUGGESTED READINGS**


1. Dr. Ravikrishnan, A,(2012),Environmental Science, Sri Krishna Hi tech Publishing Company Private Ltd., Chennai
2. Anubha kaushik, C.P. Kaushik,(2010),Environmental Science and Engineering, New Age International (P) Ltd., New Delhi.
3. William P.Cunningham,(2008), Principles of Environmental Science, Tata Mc Graw -Hill Publishing Company, New Delhi.
4. Linda D. Williams, (2005), Environmental Science Demystified, Tata Mc Graw -Hill Publishing Company Ltd., New Delhi.
5. Bharucha Erach,(2005), Environmental Science Demystified Mapin Publishing (P) Ltd., Ahmedabad.
6. Tyler Miller G. Jr,(2004) Environmental Science, Thomson & Thomson Publishers, New Delhi
7. Trivedi, R.K. and Goel, P.K,(2003), Introduction to Air Pollution, Techno-Science Publications, Jaipur.

**Semester-II**

**18BEEC205** **Workshop / Manufacturing Practices Laboratory** **5H-3C**

**Instruction Hours/week: L:1 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- to prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

**Course Outcomes**

1. Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.
2. Students will be able to fabricate components with their own hands.
3. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
4. By assembling different components, they will be able to produce small devices of their interest.

**i) Lectures & videos: (10 PERIODS)**

**Detailed contents**

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods **(3 lectures)**
2. CNC machining, Additive manufacturing **(1 lecture)**
3. Fitting operations & power tools **(1 lecture)**
4. Electrical &Electronics **(1 lecture)**
5. Carpentry **(1 lecture)**
6. Plastic moulding, glass cutting **(1 lecture)**
7. Metal casting **(1 lecture)**
8. Welding (arc welding & gas welding), brazing **(1 lecture)**

**ii) Workshop Practice: (60 PERIODS)**

1. Machine shop **(10 Periods)**
2. Fitting shop **(8 Periods)**
3. Carpentry **(6 Periods)**
4. Electrical & Electronics**(8 Periods)**
5. Welding shop **( 8 hours (Arc welding 4 Periods + gas welding 4 Periods)**
6. Casting **(8 Periods)**
7. Smithy **(6 Periods)**
8. Plastic moulding & Glass Cutting **(3 Periods)**
9. Plumbing Exercises **(3 Periods)**

**SUGGESTED READINGS**


1. Jeyachandran, K. and Balasubramanian, S, (2007), A Premier on Engineering Practices Laboratory, Anuradha Publications, Kumbakonam.
2. Jeyapoovan, T., Saravanapandian, M, (2006) Engineering Practices Lab Manual, Vikas Puplishing House Pvt. Ltd, Chennai.
3. Bawa, H.S, (2007), Workshop Practice, Tata McGraw – Hill Publishing Company Limited, New Delhi.
4. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K, (200&2010), Elements of Workshop Technology", Vol. I and Vol. II, Media promoters and publishers private limited.
5. Gowri P. Hariharan and A. Suresh Babu, (2008), Manufacturing Technology – I, Pearson Education.
6. Kalpakjian S. And Steven S. Schmid, (2002), Manufacturing Engineering and Technology, Pearson Education India Edition.
7. Roy A. Lindberg, (1998), Processes and Materials of Manufacture, Prentice Hall India.
8. Rao P.N., (2017), Manufacturing Technology, Vol. I and Vol. II, Tata McGrawHill House.

**Semester-II**

**18BEEC206** **Engineering Graphics And Design** **5H-3C**

**Instruction Hours/week: L:1 T:0P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- to prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

**Course outcomes**

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design and engineering graphics standards
3. Exposure to solid modeling ,computer-aided geometric design , creating working drawings and engineering communication

**UNIT I - INTRODUCTION**

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Conic sections including the Ellipse, Parabola and Hyperbola (eccentricity method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales

**UNIT II - ORTHOGRAPHIC PROJECTIONS**

Principles of Orthographic Projections- Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

**UNIT III - PROJECTION OF POINTS, LINES AND PLANE SURFACES**

Projections of Points and lines located in the first quadrant inclined to both planes - Determination of true lengths and true inclinations; Projection of polygonal surface and circular lamina inclined to both reference planes

**UNIT IV - PROJECTION OF SOLIDS**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

## UNIT V - ISOMETRIC PROJECTIONS & COMPUTER GRAPHICS

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple solids, truncated prisms, pyramids, cylinders and cones; Conversion of Isometric Views to Orthographic Views and Vice-versa

Overview of Computer Graphics, listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software, Introduction to 3D modeling packages

## SUGGESTED READINGS


1. Venugopal K and Prabhu Raja V, (2010),Engineering Graphics, New Age International Publishers.
2. C M Agrawal and Basant Agrawal, (2012), Engineering Graphics, Tata McGraw Hill, New Delhi.
3. James D. Bethune, (2015),Engineering Graphics with AutoCAD, Pearson Education.
4. Narayana, K.L. & P Kannaiah, (2008), a Text book on Engineering Drawing, Scitech Publishers.
5. Bureau of Indian Standards, (2003),Engineering Drawing Practices for Schools and Colleges SP 46, BIS, New Delhi.
6. Shah, M.B. & Rana B.C., (2008), Engineering Drawing and Computer Graphics, Pearson Education.
7. Bhatt N.D., Panchal V.M. & Ingle P.R, (2014), Engineering Drawing, Charotar Publishing House.

**Semester-I**

**18BTFT101** **Mathematics – I** **4H-4C**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- The goal of this course is for students to gain proficiency in calculus computations. In calculus, we use three main tools for analyzing and describing the behavior of functions: limits, derivatives, and integrals.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.
- To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.
- To make the student acquire sound knowledge of techniques in solving ordinary differential equations that model engineering problems.

**Course Outcomes**

1 Understanding of the ideas of limits and continuity and an ability to calculate with them and apply them.
2 Improved facility in algebraic manipulation.
3 Fluency in integration using standard methods, including the ability to find an appropriate method for a given integral.
4 Understanding the ideas of differential equations and facility in solving simple standard examples.

**UNIT I - DIFFERENTIAL CALCULUS**

Representation of functions, New functions from old functions, Limit of a function, Limits at infinity, Continuity , Derivatives, Differentiation rules, Polar coordinate system , Differentiation in polar coordinates, Maxima and Minima of functions of one variable.

**UNIT II - FUNCTIONS OF SEVERAL VARIABLES**

Partial derivatives, Homogeneous functions and Euler's theorem, Total derivative, Differentiation of implicit functions, Change of variables, Jacobians, Partial differentiation of implicit functions, Taylor's series for functions of two variables, Errors and approximations, Maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.

**UNIT III - INTEGRAL CALCULUS**

Definite and Indefinite integrals, Substitution rule, Techniques of Integration, Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions, Improper integrals.

**UNIT IV - MULTIPLE INTEGRALS**

Double integrals, Change of order of integration, Double integrals in polar coordinates, Area enclosed by plane curves, Triple integrals , Volume of solids, Change of variables in double and triple integrals.

**UNIT V - DIFFERENTIAL EQUATIONS**

Method of variation of parameters, Method of undetermined coefficients, Homogenous equation of Euler's and Legendre's type, System of simultaneous linear differential equations with constant coefficients.

**SUGGESTED READINGS**


1. Hemamalini. P.T, (2014&2017)Engineering Mathematics, McGraw Hill Education (India) Private, Limited, New Delhi.
2. James Stewart, (2008), Calculus with Early Transcendental Functions, Cengage Learning.
3. Narayanan S. and Manicavachagom Pillai T. K., (2007) Calculus Volume I and II, S. Viswanathan Publishers Pvt. Ltd.
4. Erwin kreyszig, (2014), Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
5. B.S. Grewal, (2014), Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
6. Ramana B.V, (2010), Higher Engineering Mathematics, 11th Reprint,., Tata McGraw Hill New Delhi.
7. Jain R.K. and Iyengar S.R.K, (2007), Advanced Engineering Mathematics , 3rd Edition, Narosa Publications.
8. Bali N., Goyal M. and Watkins C, (2009), Advanced Engineering Mathematics, 7th Edition, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd).
9. Greenberg M.D., 5th Reprint, (2009). Advanced Engineering Mathematics, 2nd Edition,5th Reprint Pearson Education.
10. O'Neil, P.V, Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd


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**Semester-I**

**18BTFT102** **CHEMISTRY-I (Theory & Lab.)** **7H-6C**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Concepts in chemistry for engineering** 3 1 0 4

**Course Objective**

- To understand the terminologies of atomic and molecular structure
- To study the basics of Periodic properties, Intermolecular forces
- To study about spectroscopic technique
- To understand the thermodynamic functions
- To comprehend the basic organic chemistry and to synthesis simple drug.

**Course Outcomes:**

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. Rationalise bulk properties and processes using thermodynamic considerations.
5. List major chemical reactions that are used in the synthesis of molecules.

**UNIT I - Atomic and molecular structure**

Schrodinger equation. Particle in a box solutions and their applications. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules. Pi-molecular orbitals of butadiene and benzene and aromaticity.Introduction to Crystal field theory.

**UNIT II - Periodic properties, Intermolecular forces and potential energy surfaces**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers. Ionic, dipolar and van Der Waals interactions.Equations of state of real gases and critical phenomena. Potential energy surfaces of $H_2F$ and HCN and trajectories on these surfaces.

**UNIT III - Spectroscopic techniques and applications**

Spectroscopy (Principles and Instrumentation only).Electronic spectroscopy.Vibrational and rotational spectroscopy.Applications.Surface characterization techniques. Diffraction and scattering.Fluorescence and its applications in medicine.

**UNIT IV - Use of free energy in chemical equilibria**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications.Acid base, oxidation reduction and solubility equilibria.Use of free energy considerations in metallurgy through Ellingham diagrams.

**UNIT V - Organic reactions and synthesis of a drug molecule**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.Synthesis of a commonly used drug molecule.

**SUGGESTED READINGS**


1. B. H. Mahan, (2010), University chemistry, Pearson Education.
2. M. J. Sienko and R. A. Plane, Chemistry: Principles and Applications.
3. C. N. Banwell, (1994), Fundamentals of Molecular Spectroscopy, McGraw-Hill.
4. B. L. Tembe, Kamaluddin and M. S. Krishnan, Engineering Chemistry (NPTEL Web-book)
5. P. W. Atkins, (2009), Physical Chemistry, Oxford University Press.
6. K. P. C. Volhardt and N. E. Schore, (2014), 5th Edition, Organic Chemistry: Structure and Function, W.H. Freeman.
7. P C Jain & Monica Jain, (2015),Engineering Chemistry, Dhanpat Rai Publishing Company.

**(ii) Chemistry Laboratory**

**Course Objectives**

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

**Course Outcomes**

1 The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:
2 Estimate rate constants of reactions from concentration of reactants/products as a function of time
3 Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
4 Synthesize a small drug molecule and analyse a salt

Choice of 10 experiments from the following:

1. Determination of surface tension and viscosity
2. Determination of Sodium Carbonate and Sodium Hydrogen Carbonate in a mixure using volumetric titration
3. Determination of Ca / Mg using complexometric titration
4. Thin layer chromatography
5. Determination of chloride content of water
6. Determination of the rate constant of a reaction
7. Conductometry - Determination of cell constant and conductance of solutions
8. pH Metry – Determination of Acid / Base
9. Potentiometry - determination of redox potentials and emfs
10. Saponification/acid value of an oil
11. Determination of the partition coefficient of a substance between two immiscible liquids
12. Adsorption of acetic acid by charcoal
13. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

**Semester-I**

**18BTFT103** **Basic Electrical Engineering (Theory & Lab.)** **6H-5C**

**Instruction Hours/week: L:3 T:1 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.
- To understand the working of Power Converters and components of low-voltage electrical installations.

**Course Outcomes**

1. To understand and analyse basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low-voltage electrical installations.

**UNIT I - DC Circuits**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation.Superposition, Thevenin and Norton Theorems.Time-domain analysis of first-order RL and RC circuits.

**UNIT II - AC Circuits**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT III - Electrical Machines**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

**UNIT IV - Transformers And Power Converters**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.Auto-transformer and three-phase transformer connections. Overviews of DC-DC buck and boost converters, duty ratio control. Introduction to Single-phase and three-phase voltage source inverters.

**UNIT V - Electrical Installations**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, RCCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

**SUGGESTED READINGS**


1. D. P. Kothari and I. J. Nagrath, (2010), Basic Electrical Engineering, Tata McGraw Hill.
2. D. C. Kulshreshtha, (2009),Basic Electrical Engineering, McGraw Hill.
3. L. S. Bobrow, (2011),Fundamentals of Electrical Engineering, Oxford University Press.
4. E. Hughes, (2010), Electrical and Electronics Technology, Pearson.
5. V. D. Toro, (1989), Electrical Engineering Fundamentals, Prentice Hall India,.

**(ii) Laboratory**

**Course Objective**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.

**Course Outcomes (Cos)**

At the end of this course, students will demonstrate the ability

1. To understand and analyze basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.

**List of Experiments**

1. Experimental verification of electrical circuit problems using Ohms law and Kirchoff's law.
2. Measurement of electrical quantities – voltage, current, power & power factor in R load.
3. Speed control of DC shunt motor
4. Draw the equivalent circuit of single phase Transformer by conducting OC &SC Test.
5. Measurement of energy using single phase energy meter.

**SUGGESTED READING**


1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

**Semester-I**

**18BTFT104** **Engineering Graphics And Design** **5H-3C**

**Instruction Hours/week: L:1 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- to prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

**COURSEOUTCOMES:**

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design and engineering graphics standards
3. Exposure to solid modeling ,computer-aided geometric design , creating working drawings and engineering communication

**UNIT I - INTRODUCTION**

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension. Conic sections including the Ellipse, Parabola and Hyperbola (eccentricity method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales

**UNIT II - ORTHOGRAPHIC PROJECTIONS**

Principles of Orthographic Projections- Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

**UNIT III - PROJECTION OF POINTS, LINES AND PLANE SURFACES**

Projections of Points and lines located in the first quadrant inclined to both planes - Determination of true lengths and true inclinations; Projection of polygonal surface and circular lamina inclined to both reference planes

**UNIT IV - PROJECTION OF SOLIDS**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

## UNIT V - ISOMETRIC PROJECTIONS & COMPUTER GRAPHICS

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple solids, truncated prisms, pyramids, cylinders and cones; Conversion of Isometric Views to Orthographic Views and Vice-versa

Overview of Computer Graphics, listing the computer technologies that impact on graphical communication, demonstrating knowledge of the theory of CAD software, Introduction to 3D modeling packages

## SUGGESTED READINGS


1. Venugopal K and Prabhu Raja V, (2010), Engineering Graphics, New Age International Publishers..
2. C M Agrawal and Basant Agrawal, (2012), Engineering Graphics, Tata McGraw Hill, New Delhi..
3. James D. Bethune, (2015), Engineering Graphics with AutoCAD, Pearson Education.
4. Narayana, K.L. & P Kannaiah, (2008),text book on Engineering Drawing, Scitech Publishers.
5. Bureau of Indian Standards, (2003), Engineering Drawing Practices for Schools and Colleges SP 46, BIS, New Delhi.
6. Shah, M.B. & Rana B.C., (2008), Engineering Drawing and Computer Graphics, Pearson Education.
7. Bhatt N.D., Panchal V.M. & Ingle P.R, (2014), Engineering Drawing, Charotar Publishing House.

**Semester-II**

**18BTFT201** **Mathematics – II** **4H-4C**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To develop the use of matrix algebra techniques that is needed by engineers for practical applications.
- To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
- To develop an understanding of the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as fluid dynamics and flow of the electric current.
- To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated.

**Course Outcomes:**

The students will learn:

1 To Evaluate complex integrals using the Cauchy integral formula and the residue Theorem
2 To Appreciate how complex methods can be used to prove some important theoretical results.
3 To Evaluate line, surface and volume integrals in simple coordinate systems
4 To Calculate grad, div and curl in Cartesian and other simple coordinate systems, and establish identities connecting these quantities
5 To Use Gauss, Stokes and Greens theorems to simplify calculations of integrals and prove simple results.

**UNIT I - MATRICES**

Eigen values and Eigenvectors of a real matrix, Characteristic equation, Properties of eigenvalues and eigenvectors, Cayley-Hamilton theorem, Diagonalization of matrices , Reduction of a quadratic form to canonical form by orthogonal transformation, Nature of quadratic forms. Simple Problems using Scilab.

**UNIT II - VECTOR CALCULUS**

Gradient and directional derivative, Divergence and Curl, Irrotational and Solenoidal vector fields, Line integral over a plane curve, Surface integral, Area of a curved surface, Volume integral, Green's, Gauss divergence and Stoke's theorems, Verification and application in evaluating line, surface and volume integrals.

**UNIT III - ANALYTIC FUNCTION**

Analytic functions, Necessary and sufficient conditions for analyticity, Properties, Harmonic conjugates, Construction of analytic function, Conformal mapping, Mapping by Functions w =z+c, cz, 1/z, $z^2$ , Bilinear transformation.

## UNIT IV - COMPLEX INTEGRATION

Line integral, Cauchy's integral theorem, Cauchy's integral formula, Taylor's and Laurent's series, Singularities, Residues, Residue theorem, Application of residue theorem for evaluation of real integrals, Use of circular contour and semicircular contour with no pole on real axis.

## UNIT V - LAPLACE TRANSFORMS

Existence conditions, Transforms of elementary functions, Transform of unit step function and unit impulse function, Basic properties, Shifting theorems, Transforms of derivatives and integrals, Initial and final value theorems, Inverse transforms, Convolution theorem , Transform of periodic functions, Application to solution of linear ordinary differential equations with constant coefficients.

## SUGGESTED READINGS


1. Hemamalini. P.T, (2014&2017), Engineering Mathematics, McGraw Hill Education (India) Private Limited, New Delhi.
2. Erwin kreyszig, (2014), Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
3. B.S. Grewal, (2014), Higher Engineering Mathematics, 43rd Edition, Khanna Publishers.
4. Ramana B.V, (2010),Higher Engineering Mathematics, Tata McGraw Hill.
5. Glyn James, (2007), Advanced Modern Engineering Mathematics, Pearson Education.
6. Jain R.K. and Iyengar S.R.K, (2007), Advanced Engineering Mathematics , 3rd Edition, Narosa Publications.
7. Bali N., Goyal M. and Watkins C, (2009), Advanced Engineering Mathematics, 7th Edition, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd).
8. O'Neil, P.V, (2007),Advanced Engineering Mathematics, Cengage Learning India Pvt., Ltd.

**Semester-II**

**18BTFT202** **Engineering Physics (Theory & Lab.)** **7H-5C**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objective:**

- To introduce the basic physics concepts relevant to different branches of Engineering and Technology.

**Course Outcomes**

1. Familiarize in properties of matter.
2. Thorough knowledge in basic physics concepts relevant to different branches of Engineering and Technology.

**UNIT I - PROPERTIES OF MATTER**

Elasticity –Three types of modulus of elasticity – basic definitions, relation connecting the moduli (Derivation)-factors affecting elastic modulus and tensile strength–Poisson's ratio- Torsional pendulum- bending of beams - bending moment – uniform and non-uniform bending - I-shaped girders - stress due to bending in beams.

**UNIT II - ACOUSTICS AND ULTRASONICS**

Classification of sound - loudness and intensity - standard intensity and intensity level - decibel - reverberation - reverberation time - derivation of Sabine's formula - factors affecting acoustics of buildings : focussing, interference, echo, Echelon effect, resonance - noise and their remedies. Ultrasonics: production - magnetostriction and piezoelectric methods - industrial applications – Non-destructive testing- pulse echo system through transmission and reflection modes – scan displays.

**UNIT III - THERMAL PHYSICS**

Thermal expansion - thermal stress - expansion joints - bimetallic strips – thermal conductivity - conductions in solids - Forbe's and Lees' disc methods - Rectilinear flow of heat through a rod - flow of heat through a compound materials - radical flow of heat through a spherical shell – Laws of blackbody radiation: Kirchoffs law, Stephens law, Wiens law, Raleigh-Jean law- Thermodynamics – laws of thermodynamics- concept of entropy- change of entropy in reversible and irreversible processes – refrigeration.

**UNIT IV - APPLIED OPTICS**

Introduction – emission and absorption process- Einstein's coefficients derivation. Types of LASER - $CO_2$, Semiconductor LASER- Applications of LASER in industry and medicine.

Total internal reflection – modes of propagation of light in optical fibers – numerical aperture and acceptance angle –derivations, types of optical fibers (Material, refractive index and mode) – fiber optical communication system (block diagram).

**UNIT V - SOLID STATE PHYSICS**

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - Coordination number and packing factor for SC, BCC, FCC, HCP – crystal Imperfections: point defects, line defects, Surface defects.

**SUGGESTED READINGS**


1. Gaur R.K. and Gupta S.L, (2003), Engineering Physics, Dhanpat Rai Publications.
2. Palanisamy P.K, (2006), Engineering Physics, Scitech Publications (P) Ltd.
3. Arumugam M , (2000),Engineering Physics, Anuradha Publications.
4. Sankar B.N., Pillai.S.O**,** (2007), Engineering Physics**,** New Age International**.**
5. Rajendran.V, (2009), Engineering Physics, Tata McGraw-Hill.

**(ii) Laboratory**

**Course Objective**

- To learn the basic concepts in physics relevant to different branches of Engineering and Technology.
- To study the concept of semiconductor and conductivity.
- To learn the properties of materials.

**Course Outcome**

1. Familiarize the properties of material and basic concepts in physics.

**LIST OF EXPERIMENTS – PHYSICS**

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young's modulus
3. Uniform bending – Determination of young's modulus
4. Lee's disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. Optical fibre -Determination of Numerical Aperture and acceptance angle
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Determination of Band gap of a semiconductor.
11. Spectrometer- Determination of wavelength using grating.
12. Viscosity of liquids-Determination of co-efficient of viscosity of a liquid by Poiseuille's flow

**Semester-II**

**18BTFT203** **English** **4H-3C**

**Instruction Hours/week: L:2 T:0 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.

**Course Outcomes**

Students undergoing this course will be able to

1. Use English language for communication: verbal & non –verbal.
2. Enrich comprehension and acquisition of speaking & writing ability.
3. Gain confidence in using English language in real life situations.
4. Improve word power: lexical, grammatical and communication competence.

**Unit:** I - **Basic Writing Skills**

Sentence Structures - Use of phrases and clauses in sentences - Importance of proper punctuation - Creating coherence- Organizing principles of paragraphs in documents - Techniques for writing precisely

**Unit: 1I - Vocabulary Building**

The concept of Word Formation - Root words from foreign languages and their use in English - Acquaintance, with prefixes and suffixes from foreign languages in English to form derivatives. - Synonyms, antonyms, and standard abbreviations.

**Unit: III - Grammar and Usage**

Subject-verb agreement - Noun-pronoun agreement - Misplaced modifiers – Articles – Prepositions – Redundancies - Clichés

**Unit: IV - Listening and Reading Skills**

Note taking- viewing model interviews – listening to informal conversations – improving listening / reading comprehension – reading model prose / poems – reading exercise

**Unit:** V.- **Writing Practices**

Comprehension - Précis Writing - Essay Writing Listening Comprehension - Common Everyday Situations: Conversations and Dialogues - Communication at Workplace – Interviews - Formal Presentations

**Note:** Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

**SUGGESTED READINGS**


1. Sangeeta Sharma , Meenakshi Raman, (2015), Technical Communication: Principles And Practice, 2nd Edition, OUP, New Delhi.
2. Sanjay Kumar and PushpLata, (2011), Communication Skills ,Oxford University Press.
3. Liz Hamp - Lyons and Ben Heasly, (2006),Study Writing, Cambridge University Press,.
4. F.T. Wood., (2007), Remedial English Grammar, Macmillan.
5. Michael Swan, (1995), Practical English Usage, OUP.

**Semester-II**

**18BTFT204** **Programming For Problem Solving (Theory & Lab.)** **7H-5C**

**Instruction Hours/week: L:3 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- Identify and understand the working of key components of a computer program.
- Identify and understand the various kinds of keywords and different data types of C programming
- Understand, analyze and implement software development tools like algorithm,
- pseudo codes and programming structure
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in "C" language

**Course Outcomes**

The course will enable the students

1. To formulate simple algorithms for arithmetic and logical problems
2. To translate the algorithms to programs (in C language)
3. To test and execute the programs and correct syntax and logical errors
4. To implement conditional branching, iteration and recursion
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach
6. To use arrays, pointers and structures to formulate algorithms and programs
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems
8. To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

**Unit I – Introduction to Programming, Arithmetic expressions and precedence**

Introduction to Programming-Flowchart / pseudocode, compilation, Variables including data types, Arithmetic expressions and precedence.

**Unit II – Conditional Branching and Loops**

Conditional Branching – Loops Writing and evaluation of conditionals and consequent branching, Iteration and loops.

**Unit III – Arrays and Basic Algorithms**

Arrays1-D,2-D,Characterarraysand Strings **Basic Algorithms**: Searching, Basic Sorting Algorithms, Finding roots of equations, idea of time complexity.

**Unit IV – Function and Recursion**

Functions (including using built in libraries), Recursion with example programs such as Quick sort, Ackerman function etc.

**Unit V - Structure, Pointers and File Handling**

Pointers, Structures including self-referential structures e.g., linked list, notional introduction, File handling in C.

**SUGGESTED READINGS**


1. E. Balagurusamy,(2017) Computing Fundamentals and C Programming, 5th Edition, TMH Education
2. E. Balaguruswamy (2017), Programming in ANSI C, 7th Edition, Tata McGraw-Hill,
3. Byron Gottfried (2017), Schaum's Outline of Programming with C, 3rd Edition, McGraw-Hill
4. Brian W. Kernighan and Dennis M. Ritchie,(2015) The C Programming Language, 2nd Edition, Prentice Hall of India

**(ii) Laboratory**

**Course Objectives**

- To provide an awareness to Computing and C Programming
- To know the correct and efficient ways of solving problems
- To learn to develop algorithm for simple problem solving

**Course outcomes**

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use the mind defining self- referential structures.
8. To be able to create, read and write to and from simple text files.

**List of Experiments**

**Tutorial 1:** Problem solving using computers:
**Lab 1:** Familiarization with programming environment
**Tutorial 2:** Variable types and type conversions:
**Lab 2:** Simple computational problems using arithmetic expressions
**Tutorial 3:** Branching and logical expressions:
**Lab 3:** Problems involving if-then-else structures
**Tutorial 4:** Loops, while and for loops:
**Lab 4:** Iterative problems e.g., sum of series
**Tutorial 5:**1DArrays: searching, sorting:
**Lab 5:**1DArray manipulation
**Tutorial 6:**2D arrays and Strings, memory structure:
**Lab 6:** Matrix problems, String operations
**Tutorial 7:** Functions, call by value:
**Lab 7:** Simple functions
**Tutorial 8 & 9**: Numerical methods (Root finding, numerical differentiation, numerical integration):
**Lab 8and 9:**Numerical methods problems
**Tutorial 10:** Recursion, structure of recursive calls:
**Lab 10:** Recursive functions
**Tutorial 11:** Pointers, structures and dynamic memory allocation
**Lab 11:** Pointers and structures
**Tutorial 12:** File handling:
**Lab 12:** File operations

**Semester-II**

**18BTFT205** **Food Chemistry (Theory & Lab.)** **7H-6C**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- To understand the properties of biomolecules and its reactions involved.
- To study the functional role of food components and their interaction in food products in terms of colour, flavour, texture and nutrient composition
- To understand and use effectively, food composition tables and databases.
- To study and understand the physical and chemical properties of foods
- To get exposure with analysis of proteins and lipids

**Course Outcomes**

1. Better Understanding of molecules, its reactions and interactions of food components in food products
2. Effective use of food composition tables and databases.
3. Better understanding the physical and chemical properties of food.
4. Gained knowledge in analysis test of proteins and lipids.

**UNIT I - CARBOHYDRATES**

Simple Sugars: mono and disaccharides, Hygroscopcity & solubility, optical rotation,mutarotation; sensory properties-sweetness index, caramelization, Maillard reaction;Glucose syrup, high fructose corn syrup, Dextrose Equivalent, Degree of polymerisation;Sugar alcohols; Oligosaccharides: structure, nomenclature, occurrence, uses in foods.Polysaccharides: Starch-amylose and amylopectin- properties, thickening & gelatinization,modified starches, resistant starch, Dextrins and dextrans, Starch hydrolysates – Maltodextrins and dextrins; Pectins, gums & seaweeds-gel formation & viscosity. Fiber Cellulose & hemicellulose; Food sources, functional role and uses in foods.

**UNIT II - PROTEINS**

Review of protein structure & conformation; Chemical and Physical properties of Proteins.Reactions of proteins in foodsystems: Dissociation, optical activity, solubility, hydration, swelling, foam formation &stabilization, gel formation, emulsifying effect, thickening & binding, amino acids in Maillardreaction, denaturation; Food enzymes ; textsurized proteins; Food sources, functional role and uses in foods, Determination of proteins in food.

**UNIT III - LIPIDS**

Review of structure, composition & nomenclature of fats. Non-glyceride components in fats& oils; Properties of fats & oils: crystal formation, polymorphism, melting points, plasticity,isomerisation, unsaturation; Modification of fats: hydrogenation- cis and trans isomers,interesterification, acetylation, winterization; Hydrolytic rancidity & oxidative rancidity;radiolysis Shortening power of fats, tenderization, emulsification, frying - smoke point, autooxidation, polymerization; Fat replacements; Food sources, functional role and uses infoods.

**UNIT IV**

**A. WATER**

Structure of water molecule, Chemical and physical properties of water, Types of water: free, bound & entrapped water, water activity. Drinkingwater, mineral water, water hardness, water quality for food processing

**B. MINERALS & VITAMINS**

Mineral & vitamin content of foods- Food and Pharmaceutical grades; stability & degradationin foods.

**C. COLOUR, FLAVOUR & AROMA COMPONENTS**

Naturally occurring colours, acids, other flavour & aroma components present in herbs,spices, coffee, tea, cocoa, fruits, vegetables & fermented products; Synthetic Colours andNaturally similar /artificial flavours, Threshold values, off flavours & food taints.

**D. OTHER COMPONENTS**

Naturally occurring toxic substances (trypsin inhibitors, phytins, tannins, oxalates, goitrogen, toxic amino acids, glucosinolates, aflatoxins), protease inhibitors, bioactive components: phytates,polyphenols, saponins, phytoestrogens etc.

**UNIT V - FOOD GROUPS & COMPOSITION**

Food groups, proximate composition, methods of evaluation & labelling - food composition tables, food composition databases: USDA Database, UK Database.

**(ii) Laboratory**

**Course objectives**

- To study and understand the physical and chemical properties of foods
- To get exposure with analysis of proteins and lipids

**Course outcomes**

1. Better understanding the physical and chemical properties of food.
2. Gained knowledge in analysis test of proteins and lipids.

**LAB COMPONENTS**

1. Estimation of Viscosity of foods
2. Properties of solutions- sugar & salt
3. Preparation of emulsions
4. Foaming properties of proteins
5. Solubility, specific gravity and Refractive index of oils
6. Oxidative rancidity of fats
7. Effect of heat on proteins
8. Iso-electric precipitation of casein, Effect of rennin on milk proteins
9. Gelling properties of starch
10. Study of gluten formation
11. Enzymatic Browning in foods

**SUGGESTED READINGS:**


1. Belitz H.-D, Grosch W and Schieberle P.(2004), Food Chemistry, 3rd Revised Edition, Springer-Verlag
2. Meyer, Lillian Hoagland(1987), Food Chemistry, CBS Publishers
3. DeMan, John M.(1999), Principles of Food Chemistry - 3rd Edition, Springer
4. Chopra, H.K. and P.S. Panesar,(2010), Food Chemistry, Narosa
5. Vaclavik, V. A. and Christian E. W.,(2003), Essentials of Food Science - 2nd Edition, Kluwer Academic, Springer
6. Weaver, C.M, and J.R. Daniel,(2005), The Food Chemistry Laboratory – A Manual for Experimental Foods, Dietetics & Food Scientists - 2nd Edition, CRC Press

**Semester-I**

**18BEME101** **Mathematics -I** **4H-4C**

**(Calculus and Linear Algebra for Mechanical & Automobile Engineering)**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towardstackling more advanced level of mathematics and applications that they would find useful in their disciplines.

**Course Outcomes**

The students will learn:

1 To apply differential and integral calculus to notions of curvature and to improper integrals.

2 Apart from some other applications they will have a basic understanding ofBeta and Gamma functions.

3 The tool of power series and Fourier series for learning advanced EngineeringMathematics.

4 To deal with functions of several variables thatare essential in most branches ofengineering.

5 The essential tool of matrices and linear algebra in a comprehensive manner.

**UNIT I - Matrices**

Inverse and rank of a matrix, rank-nullity theorem; System of linear equations; Symmetric,skew-symmetric and orthogonal matrices; Determinants; Eigenvalues and eigenvectors;Diagonalization of matrices; Cayley-Hamilton Theorem, and Orthogonal transformation.

Simple problems using Scilab.

**UNIT II - Calculus**

Evolutes and involutes; Evaluation of definite and improper integrals; Beta and Gammafunctions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

**UNIT III - Calculus**

Taylor’s and Maclaurin theorems with remainders; indeterminate forms and L'Hospital's rule; Maxima and minima.

**UNIT IV - Multivariable Calculus (Differentiation)**

Limit, continuity and partial derivatives, directional derivatives, total derivative; Maxima, minima and saddle points; Method of Lagrange multipliers;Gradient, curl and divergence.

**UNIT V - Sequences and series**

Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem

**SUGGESTED READINGS**


1. Hemamalini. P.T**,** (2014), Engineering Mathematics**,** McGraw Hill Education (India) Private Limited, New Delhi.
2. G.B. Thomas and R.L. Finney**,** (2002),Calculus and Analytic geometry, 9th Edition,Pearson**,**.
3. Erwin kreyszig**,** (2006), Advanced Engineering Mathematics, 9th Edition,John Wiley & Sons.
4. Veerarajan T**,** (2008),Engineering Mathematics for first year,Tata McGraw-Hill, New Delhi,.
5. Ramana B.V**,** (2010), Higher Engineering Mathematics, 11th Reprint, Tata McGraw Hill New Delhi.
6. D. Poole**,** (2005),Linear Algebra: A Modern Introduction, 2nd Edition,Brooks/Cole.
7. N.P. Bali and Manish Goyal, (2008), A text book of Engineering Mathematics, Laxmi Publications.
8. B.S. Grewal, (2010), Higher Engineering Mathematics, 36th Edition, Khanna Publishers

**Semester-I**

**18BEME102** **Electromagnetism (Theory & Lab.)** **7H-5C**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objective**

- To introduce the basic physics concepts relevant to different branches of Engineering and Technology and also to acquire the knowledge of Electromagnetic field theory that allows the student to learn scientific, mathematical and engineering principles.

**Course Outcomes**

1 The student shall be able to formulate potential problems within electrostatics, magnetostatics and stationary current distributions in linear, isotropic media and also will acquire knowledge on properties of matter, quantum physics,basics of vacuum science, production and

**Unit 1 - Electrostatics in vacuum**

Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential and uniqueness of their solution and connection with steady state diffusion and thermal conduction; Practical examples like Farady's cage and coffee-ring effect.

**Electrostatics in a linear dielectric medium:**

Polarization-Field of a polarized object-Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement.

**Unit 2 - Magnetostatics**

Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem

**Magnetostatics in a linear magnetic medium:**

Magnetization- diamagnets, paramagnets, ferromagnets- Field of a magnetized object- bound currents; auxiliary magnetic field $\vec{H}$ ; Boundary conditions on $\vec{B}$ and $\vec{H}$ - magnetic susceptibility and permeability - Ferromagnetism.

**Unit 3 - Properties of Matter**

Elasticity –Three types of modulus of elasticity – basic definitions, relation connecting the moduli (Derivation)-factors affecting elastic modulus and tensile strength–Poisson's ratio- Torsional pendulum- bending of beams - bending moment – uniform and non-uniform bending - I-shaped girders - stress due to bending in beams.

**Unit 4 - Quantum Mechanics**

Introduction to quantum theory – Black body radiation - dual nature of matter and radiation – de Broglie wavelength, uncertainty principle –Schrödinger's wave equation – time dependent and time independent equations – particle in one dimensional box- physical significance of wave function, scanning electron microscope.

**Unit 5 - Vacuum science**

Introduction - Importance of vacuum in industries - Pumping speed and throughput - Types of pumps-Rotary vane type Vacuum pump(oil sealed), Diffusion Pump and Turbo Molecular Pump - Measurement of High Vacuum-McLeod Gauge-Pirani Gauge-Penning Gauge.

**SUGGESTED READINGS**


1. David Griffiths**,** (2017), Introductionto Electrodynamics**,** Cambridge publisher.
2. Ganesan.S and Baskar.T**,** (2015), Engineering Physics I**,** GEMS Publisher, Coimbatore-641 001.
3. Ganesan S. Iyandurai N , (2007),Applied Physics, KKS Publishers.
4. Gaur, R.K. and Gupta, S.C, (2012),Engineering Physics, Dhanpat Rai Publications.
5. Halliday and Resnick, (2007), Physics, Wiley ($5^{th}$ edition).
6. W. Saslow, (2002),Electricity, magnetism and light, Academic Press.

**(ii) Laboratory**

**Course Objective:**

- To learn the basic concepts in physics relevant to different branches of Engineering and Technology.
- To study the concept of semiconductor and conductivity.
- To learn the properties of materials.

**Course Outcome:**

2 Familiarize the properties of material and basic concepts in physics.

**LIST OF EXPERIMENTS – PHYSICS**

1. Torsional pendulum - Determination of rigidity modulus of wire and moment of inertia of disc
2. Non-uniform bending - Determination of young's modulus
3. Uniform bending – Determination of young's modulus
4. Lee's disc Determination of thermal conductivity of a bad conductor
5. Potentiometer-Determination of thermo e.m.f of a thermocouple
6. Laser- Determination of the wave length of the laser using grating
7. Air wedge - Determination of thickness of a thin sheet/wire
8. Optical fibre -Determination of Numerical Aperture and acceptance angle
9. Ultrasonic interferometer – determination of the velocity of sound and compressibility of liquids
10. Determination of Band gap of a semiconductor.
11. Spectrometer- Determination of wavelength using grating.
12. Viscosity of liquids-Determination of co-efficient of viscosity of a liquid by Poiseuille's flow

**Semester-I**

**18BEME103** **Basic Electrical Engineering (Theory & Lab.)** **6H-5C**

**Instruction Hours/week: L:3 T:1 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.
- To understand the working of Power Converters and components of low-voltage electrical installations.

**Course Outcomes**

1. To understand and analyse basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.
3. To introduce the components of low-voltage electrical installations.

**UNIT I - DC Circuits**

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation.Superposition, Thevenin and Norton Theorems.Time-domain analysis of first-order RL and RC circuits.

**UNIT II - AC Circuits**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT III - Electrical Machines**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

**UNIT IV - Transformers And Power Converters**

Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency.Auto-transformer and three-phase transformer connections. Overviews of DC-DC buck and boost converters, duty ratio control. Introduction to Single-phase and three-phase voltage source inverters.

**UNIT V - Electrical Installations**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, RCCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

**SUGGESTED READINGS**


1. D. P. Kothari and I. J. Nagrath, (2010),Basic Electrical Engineering, Tata McGraw Hill.
2. D. C. Kulshreshtha, (2009), Basic Electrical Engineering, McGraw Hill.
3. L. S. Bobrow, (2011),Fundamentals of Electrical Engineering, Oxford University Press.
4. E. Hughes, (2010), Electrical and Electronics Technology, Pearson.
5. V. D. Toro,( 1989), Electrical Engineering Fundamentals, Prentice Hall India.


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**(ii) Laboratory**

**Course Objective**

- To impart the basic knowledge about the Electric circuits.
- To understand the working of Electrical Machines and Transformers.

**Course Outcomes (Cos)**

At the end of this course, students will demonstrate the ability

1. To understand and analyze basic electric and magnetic circuits.
2. To study the working principles of electrical machines and power converters.

**List of Experiments**

1. Experimental verification of electrical circuit problems using Ohms law and Kirchoff's law.
2. Measurement of electrical quantities – voltage, current, power & power factor in R load.
3. Speed control of DC shunt motor
4. Draw the equivalent circuit of single phase Transformer by conducting OC &SC Test.
5. Measurement of energy using single phase energy meter.

**SUGGESTED READING**


1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
5. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989

**Semester-I**

**18BEME104** **Engineering Graphics – I** **5H-3C**

**Instruction Hours/week: L:1 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- To prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

**Course Outcomes**

1. The student will also learn:
2. Introduction to engineering design and its place in society
3. Exposure to the visual aspects of engineering design and engineering graphics standards
4. Exposure to engineering communication

**UNIT I - Introduction**

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Bureau of Indian Standards (BIS), Layout of drawing sheets, sizes of drawing sheets, different types of lines used in drawing practice geometric constructions, principles of dimensioning– linear, angular, aligned system, unidirectional system, parallel dimensioning, chain dimensioning, location dimension and size dimension.

**UNIT II - Scales and Plane Curves**

SCALES: Reducing Scale, Enlarging Scale, Plain Scale, Diagonal Scale and Vernier Scale. Conic sections including the Ellipse, Parabola and Hyperbola (eccentricity method only); Cycloid, Epicycloid, Hypocycloid and Involute.

**UNIT III - Free Hand Sketching**

Representation of Three Dimensional objects – General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – layout views – Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

**UNIT IV - Projection of Points, Lines and Plane Surfaces**

Projection of points and straight lines located in the first quadrant inclined to both planes– Determination of true lengths and true inclinations – Traces–Projection of polygonal surface and circular lamina inclined to both reference planes.

**UNIT V - Projection of Solids**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

**SUGGESTED READINGS**


1. Venugopal K and Prabhu Raja V, (2010), Engineering Graphics, New Age International Publishers.
2. C M Agrawal and Basant Agrawal, (2012),Engineering Graphics, Tata McGraw Hill, New Delhi.
3. James D. Bethune, (2015), Engineering Graphics with AutoCAD , Pearson Education.
4. Narayana, K.L. & P Kannaiah, (2008), Text book on Engineering Drawing, Scitech Publishers.
5. Bureau of Indian Standards, (2003), Engineering Drawing Practices for Schools and Colleges SP 46, (2003), BIS, New Delhi.
6. Shah, M.B. & Rana B.C., (2008), Engineering Drawing and Computer Graphics, Pearson Education,.
7. Bhatt N.D., Panchal V.M. & Ingle P.R, (2014), Engineering Drawing, Charotar Publishing House.

**Semester-II**

**18BEME201** **Mathematics-II** **4H-4C**

**(Calculus, Ordinary DifferentialEquations and Complex Variable for Mechanical and Automobile Engineering)**

**Instruction Hours/week: L:3 T:1 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

The objective of this course is to familiarize the prospective engineers with techniques in Multivariate integration, ordinary and partial differential equations and complex variables. It aims to equip the students to deal with advanced level of mathematics and applications thatwould be essential for their disciplines.

**Course Outcome**

The students will learn:

1 The mathematical tools needed in evaluating multiple integrals and their usage.

2 The effective mathematical tools for the solutions of differential equations that modelphysical processes.

3 The tools of differentiation and integration of functions of a complex variable that are used in various techniques dealing engineering Problems.

**UNIT I - Multivariable Calculus (Integration)**

Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Applications: areas and volumes, Center of mass and Gravity (constant and variable densities). Theorems of Green, Gauss and Stokes, Simple applications involving cubes and rectangular parallelepipeds.

**UNIT II - First order ordinary differential equations**

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree:equations solvable for p, equations solvable for y, equations solvable for x and Clairaut'stype.

**UNIT III - Ordinary differential equations of higher orders**

Second order linear differential equations with variable coefficients, method of variation ofparameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Besselfunctions of the first kind and their properties.

**UNIT IV - Analytic Functions**

Cauchy-Riemann equations, analytic functions, harmonic functions, findingharmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm)and their properties; Conformal mappings, Mobius transformations.

**UNIT V - Complex Integration**

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula(without proof), zeros of analytic functions, singularities, Taylor's series, Laurent's series, Residues, CauchyResidue theorem (without proof), Evaluation of definite integral involving sine and cosine.

**SUGGESTED READINGS:**


1. Hemamalini. P.T., (2014), Engineering Mathematics, McGraw Hill Education (India) Private Limited,, New Delhi.
2. G.B. Thomas and R.L. Finney, (2002), Calculus and Analytic geometry, 9th Edition, Pearson.
3. Erwin kreyszig, (2006), Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons.
4. W. E. Boyce and R. C. DiPrima, (2009), Elementary Differential Equations and Boundary , Value Problems9th Edn., Wiley India.
5. S. L. Ross,( 1984), Differential Equations, 3rd Ed., Wiley India.
6. E. A. Coddington, (1995), An Introduction to Ordinary Differential Equations, Prentice Hall, India.
7. E. L. Ince, (1958),Ordinary Differential Equations, Dover Publications.
8. J. W. Brown and R. V. Churchill,( 2004), Complex Variables and Applications, 7th Ed., Mc-Graw Hill.
9. N.P. Bali and Manish Goyal, (2008),A Text book of Engineering Mathematics, Laxmi Publications.
10. B.S. Grewal, (2010), Higher Engineering Mathematics, 36th Edition, Khanna Publishers.

**Semester-II**

**18BEME202** **Chemistry-I (Theory & Lab.)** **7H-6C**

**Instruction Hours/week: L:3 T:1 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Concepts in chemistry for engineering**

**Course Objective**

- To understand the terminologies of atomic and molecular structure
- To study the basics of Periodic properties, Intermolecular forces
- To study about spectroscopic technique
- To understand the thermodynamic functions
- To comprehend the basic organic chemistry and to synthesis simple drug.

**Course Outcomes**

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
4. Rationalise bulk properties and processes using thermodynamic considerations.
5. List major chemical reactions that are used in the synthesis of molecules.

**UNIT I - Atomic and molecular structure**

Schrodinger equation. Particle in a box solutions and their applications. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules. Pi-molecular orbitals of butadiene and benzene and aromaticity.Introduction to Crystal field theory.

**UNIT II - Periodic properties, Intermolecular forces and potential energy surfaces**

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers. Ionic, dipolar and van Der Waals interactions.Equations of state of real gases and critical phenomena. Potential energy surfaces of $H_2F$ and HCN and trajectories on these surfaces.

**UNIT III - Spectroscopic techniques and applications**

Spectroscopy (Principles and Instrumentation only).Electronic spectroscopy.Vibrational and rotational spectroscopy.Applications.Surface characterization techniques. Diffraction and scattering.Fluorescence and its applications in medicine.

**UNIT IV - Use of free energy in chemical equilibria**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications.Acid base, oxidation reduction and solubility equilibria.Use of free energy considerations in metallurgy through Ellingham diagrams.

**UNIT V - Organic reactions and synthesis of a drug molecule**

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.Synthesis of a commonly used drug molecule.

**SUGGESTED READINGS**


1. B. H. Mahan, (2010), University chemistry, Pearson Education.
2. M. J. Sienko and R. A. Plane, Chemistry: Principles and Applications.
3. C. N. Banwell, (1994), Fundamentals of Molecular Spectroscopy, McGraw-Hill.
4. B. L. Tembe, Kamaluddin and M. S. Krishnan, Engineering Chemistry (NPTEL Web-book)
5. P. W. Atkins, (2009), Physical Chemistry, Oxford University Press.
6. K. P. C. Volhardt and N. E. Schore, (2014), 5th Edition, Organic Chemistry: Structure and Function, W.H. Freeman.
7. P C Jain & Monica Jain, (2015), Engineering Chemistry, Dhanpat Rai Publishing Company.

**(ii) Chemistry Laboratory**

**Course Objectives**

- To provide students with practical knowledge of quantitative analysis of materials by classical and instrumental methods for developing experimental skills in building technical competence.

**Course Outcomes**

1 The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. The students will learn to:
2 Estimate rate constants of reactions from concentration of reactants/products as a function of time
3 Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc
4 Synthesize a small drug molecule and analyse a salt

Choice of 10 experiments from the following:

Determination of surface tension and viscosity

1. Determination of Sodium Carbonate and Sodium Hydrogen Carbonate in a mixure using volumetric titration
2. Determination of Ca / Mg using complexometric titration
3. Thin layer chromatography
4. Determination of chloride content of water
5. Determination of the rate constant of a reaction
6. Conductometry - Determination of cell constant and conductance of solutions
7. pH Metry – Determination of Acid / Base
8. Potentiometry - determination of redox potentials and emfs
9. Saponification/acid value of an oil
10. Determination of the partition coefficient of a substance between two immiscible liquids
11. Adsorption of acetic acid by charcoal
12. Use of the capillary viscosimeters to the demonstrate of the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

**Semester-II**

**18BEME203** **English** **4H-3C**

**Instruction Hours/week: L:2 T:0 P:2** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To enable students to attain fluency and accuracy to inculcate proficiency in professional communication to meet the growing demand in the field of Global communication.
- To help students acquire their ability to speak effectively in real life situations.
- To inculcate the habit of reading and to develop their effective reading skills.
- To ensure that students use dictionary to improve their active and passive vocabulary.
- To enable students to improve their lexical, grammatical and communicative competence.

**Course Outcomes**

Students undergoing this course will be able to

1. Use English language for communication: verbal & non –verbal.
2. Enrich comprehension and acquisition of speaking & writing ability.
3. Gain confidence in using English language in real life situations.
4. Improve word power: lexical, grammatical and communication competence.

**Unit:** I - **Basic Writing Skills**

Sentence Structures - Use of phrases and clauses in sentences - Importance of proper punctuation - Creating coherence- Organizing principles of paragraphs in documents - Techniques for writing precisely

**Unit: 1I - Vocabulary Building**

The concept of Word Formation - Root words from foreign languages and their use in English - Acquaintance, with prefixes and suffixes from foreign languages in English to form derivatives. - Synonyms, antonyms, and standard abbreviations.

**Unit: III - Grammar and Usage**

Subject-verb agreement - Noun-pronoun agreement - Misplaced modifiers – Articles – Prepositions – Redundancies - Clichés

**Unit: IV - Listening and Reading Skills**

Note taking- viewing model interviews – listening to informal conversations – improving listening / reading comprehension – reading model prose / poems – reading exercise

**Unit:** V. - **Writing Practices**

Comprehension - Précis Writing - Essay Writing Listening Comprehension - Common Everyday Situations: Conversations and Dialogues - Communication at Workplace – Interviews - Formal Presentations

**Note:** Students shall have hands on training in improving listening skill in the language laboratory @ 2 periods per each unit.

**SUGGESTED READINGS**


1. Sangeeta Sharma , Meenakshi Raman, (2015),Technical Communication: Principles And Practice, 2nd Edition, OUP, New Delhi.
2. Sanjay Kumar and PushpLata, (2011),Communication Skills ,Oxford University Press.
3. Liz Hamp - Lyons and Ben Heasly, (2006), Study Writing, Cambridge University Press.
4. F.T. Wood., (2007),Remedial English Grammar, Macmilla.
5. Michael Swan, (1995),Practical English Usage, OUP.

**Semester-II**

**18BEME204** **Programming for Problem solving (Theory & Lab.)** **7H-5C**

**Instruction Hours/week: L:3 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**(i) Theory**

**Course Objectives**

- Identify and understand the working of key components of a computer program.
- Identify and understand the various kinds of keywords and different data types of C programming
- Understand, analyze and implement software development tools like algorithm,
- pseudo codes and programming structure
- Study, analyze and understand logical structure of a computer program, and different construct to develop a program in "C" language

**Course Outcomes**

The course will enable the students

1. To formulate simple algorithms for arithmetic and logical problems
2. To translate the algorithms to programs (in C language)
3. To test and execute the programs and correct syntax and logical errors
4. To implement conditional branching, iteration and recursion
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach
6. To use arrays, pointers and structures to formulate algorithms and programs
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems
8. To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.

**Unit I – Introduction to Programming, Arithmetic expressions and precedence**

Introduction to Programming-Flowchart / pseudocode, compilation, Variables including data types, Arithmetic expressions and precedence.

**Unit II – Conditional Branching and Loops**

Conditional Branching – Loops Writing and evaluation of conditionals and consequent branching, Iteration and loops.

**Unit III – Arrays and Basic Algorithms**

Arrays1-D,2-D,Characterarraysand Strings **Basic Algorithms**: Searching, Basic Sorting Algorithms, Finding roots of equations, idea of time complexity.

**Unit IV – Function and Recursion**

Functions (including using built in libraries), Recursion with example programs such as Quick sort, Ackerman function etc.

**Unit V - Structure, Pointers and File Handling**

Pointers, Structures including self-referential structures e.g., linked list, notional introduction, File handling in C.

**SUGGESTED READINGS**


1. E. Balagurusamy,(2017) Computing Fundamentals and C Programming, 5th Edition, TMH Education
2. E. Balaguruswamy (2017), Programming in ANSI C, 7th Edition, Tata McGraw-Hill,
3. Byron Gottfried (2017), Schaum's Outline of Programming with C, 3rd Edition, McGraw-Hill
4. Brian W. Kernighan and Dennis M. Ritchie,(2015) The C Programming Language, 2nd Edition, Prentice Hall of India

**(ii) Laboratory**

**Course Objectives**

- To provide an awareness to Computing and C Programming
- To know the correct and efficient ways of solving problems
- To learn to develop algorithm for simple problem solving

**Course outcomes**

1. To formulate the algorithms for simple problems
2. To translate given algorithms to a working and correct program
3. To be able to correct syntax errors as reported by the compilers
4. To be able to identify and correct logical errors encountered at run time
5. To be able to write iterative as well as recursive programs
6. To be able to represent data in arrays, strings and structures and manipulate them through a program
7. To be able to declare pointers of different types and use the mind defining self- referential structures.
8. To be able to create, read and write to and from simple text files.

**List of Experiments**

**Tutorial 1:** Problem solving using computers:
**Lab 1:** Familiarization with programming environment
**Tutorial 2:** Variable types and type conversions:
**Lab 2:** Simple computational problems using arithmetic expressions
**Tutorial 3:** Branching and logical expressions:
**Lab 3:** Problems involving if-then-else structures
**Tutorial 4:** Loops, while and for loops:
**Lab 4:** Iterative problems e.g., sum of series
**Tutorial 5:**1DArrays: searching, sorting:
**Lab 5:**1DArray manipulation
**Tutorial 6:**2D arrays and Strings, memory structure:
**Lab 6:** Matrix problems, String operations
**Tutorial 7:** Functions, call by value:
**Lab 7:** Simple functions
**Tutorial 8 & 9**: Numerical methods (Root finding, numerical differentiation, numerical integration):
**Lab 8and 9:**Numerical methods problems
**Tutorial 10:** Recursion, structure of recursive calls:
**Lab 10:** Recursive functions
**Tutorial 11:** Pointers, structures and dynamic memory allocation
**Lab 11:** Pointers and structures
**Tutorial 12:** File handling:
**Lab 12:** File operations

**Semester-II**

**18BEME205** **Workshop / Manufacturing Practices Laboratory** **5H-3C**

**Instruction Hours/week: L:1 T:0 P:4** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- to prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

**Course Outcomes**

1. Upon completion of this course, the students will gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.
2. Students will be able to fabricate components with their own hands.
3. They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
4. By assembling different components, they will be able to produce small devices of their interest.

**i) Lectures & videos: (10 PERIODS)**

**Detailed contents**

1. Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods **(3 lectures)**
2. CNC machining, Additive manufacturing **(1 lecture)**
3. Fitting operations & power tools **(1 lecture)**
4. Electrical &Electronics **(1 lecture)**
5. Carpentry **(1 lecture)**
6. Plastic moulding, glass cutting **(1 lecture)**
7. Metal casting **(1 lecture)**
8. Welding (arc welding & gas welding), brazing **(1 lecture)**

**ii) Workshop Practice: (60 PERIODS)**

1 Machine shop **(10 Periods)**
2 Fitting shop **(8 Periods)**
3 Carpentry **(6 Periods)**
4 Electrical & Electronics**(8 Periods)**
5 Welding shop **( 8 hours (Arc welding 4 Periods + gas welding 4 Periods)**
6 Casting **(8 Periods)**
7 Smithy **(6 Periods)**
8 Plastic moulding & Glass Cutting **(3 Periods)**
9 Plumbing Exercises **(3 Periods)**

**SUGGESTED READINGS**


1. Jeyachandran, K. and Balasubramanian, S, (2007), A Premier on Engineering Practices Laboratory, Anuradha Publications, Kumbakonam.
2. Jeyapoovan, T., Saravanapandian, M, (2006), Engineering Practices Lab Manual, Vikas Puplishing House Pvt. Ltd, Chennai.
3. Bawa, H.S, (2007),Workshop Practice, Tata McGraw – Hill Publishing Company Limited, New Delhi.
4. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K, (2008&2010))Elements of Workshop Technology", Vol. I and Vol. II, Media promoters and publishers private limited.
5. Gowri P. Hariharan and A. Suresh Babu, (2008), Manufacturing Technology – I, Pearson Education.
6. Kalpakjian S. And Steven S. Schmid, (2002), Manufacturing Engineering and Technology, Pearson Education India Edition.
7. Roy A. Lindberg, (1998) ,Processes and Materials of Manufacture, Prentice Hall India.
8. Rao P.N., (2017), Manufacturing Technology, Vol. I and Vol. II, Tata McGrawHill House.

**Semester-II**

**18BEME206** **Engineerign Graphics II** **4H-2C**

**Instruction Hours/week: L:1 T:0 P:3** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- to prepare the students to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare the students to communicate effectively and to use the techniques, skills, and modern engineering tools necessary for engineering practice

**Course Outcomes**

1. Introduction to engineering design and its place in society
2. Exposure to the visual aspects of engineering design and engineering graphics standards
3. Exposure to solid modeling ,computer-aided geometric design , creating working drawings and engineering communication

**UNIT I - SECTION OF SOLIDS**

Sectioning of Prism, Cylinder, Pyramid, and Conein simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – Obtaining true shape of section.

**UNIT II - DEVELOPMENT OF SURFACES**

Development of lateral surfaces of simple and truncated solids – Prisms, pyramids, cylinders and cones – Development of lateral surfaces of solids with cylindrical cutouts, perpendicular to the axis.

**UNIT III - ISOMETRIC PROJECTIONS**

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple solids, truncated prisms, pyramids, cylinders and cones; Conversion of Isometric Views to Orthographic Views and Vice-versa

**UNIT IV - COMPUTER GRAPHICS – 2D**

Overview of Computer Graphics, listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars, Drawing Area, Dialog boxes and windows, Shortcut menus ,The Command Line (where applicable), Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids]; consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Annotations, layering & other

functions, Demonstration of a simple team design project, Introduction to Building Information Modeling

**UNIT V - COMPUTER GRAPHICS – 3D**

Introduction to3D modeling packages. Drafting practices - modeling of simple engineering components, sections and extraction of 2D drawings.

**SUGGESTED READINGS:**


1. Venugopal K and Prabhu Raja V, (2010),Engineering Graphics, New Age International Publishers.
2. C M Agrawal and Basant Agrawal, (2012),Engineering Graphics, Tata McGraw Hill, New Delhi.
3. James D. Bethune, (2015), Engineering Graphics with AutoCAD , Pearson Education.
4. Narayana, K.L. & P Kannaiah, (2008), A Text book on Engineering Drawing, Scitech Publishers.
5. Bureau of Indian Standards, (2003), Engineering Drawing Practices for Schools and Colleges SP 46, BIS, New Delhi.
6. Shah, M.B. & Rana B.C. , (2008),Engineering Drawing and Computer Graphics, Pearson Education.
7. Bhatt N.D., Panchal V.M. & Ingle P.R, (2014), Engineering Drawing, Charotar Publishing House.

**Semester-I**

**18BEME207** **Constitution of India** **1H-0C**

**Instruction Hours/week: L:1 T:0 P:0** **Marks:** Internal**:40** External**:60** Total**:100**

**End Semester Exam:**3 Hours

**Course Objectives**

- To know about Indian constitution.
- To know about central and state government functionalities in India.
- To know about Indian society.

**Course outcomes:**

**Upon completion of the course, students will be able to:**

1 Understand the functions of the Indian government.
2 Understand and abide the rules of the Indian constitution.
3 Understand and appreciate different culture among the people.

**UNIT I - INTRODUCTION**

Historical Background – Constituent Assembly of India – Philosophical foundations of the IndianConstitution – Preamble – Fundamental Rights – Directive Principles of State Policy – FundamentalDuties – Citizenship – Constitutional Remedies for citizens.

**UNIT II - STRUCTURE AND FUNCTION OF CENTRAL GOVERNMENT**

Union Government – Structures of the Union Government and Functions – President – Vice President– Prime Minister – Cabinet – Parliament – Supreme Court of India – Judicial Review.

**UNIT III - STRUCTURE AND FUNCTION OF STATE GOVERNMENT**

State Government – Structure and Functions – Governor – Chief Minister – Cabinet – StateLegislature – Judicial System in States – High Courts and other Subordinate Courts.

**UNIT IV - CONSTITUTION FUNCTIONS**

Indian Federal System – Center – State Relations – President‟s Rule – Constitutional Amendments – Constitutional Functionaries - Assessment of working of the Parliamentary System in India.

**UNIT V - INDIAN SOCIETY**

Society : Nature, Meaning and definition; Indian Social Structure; Caste, Religion, Language in India;Constitutional Remedies for citizens – Political Parties and Pressure Groups; Right of Women,Children and Scheduled Castes and Scheduled Tribes and other Weaker Sections.

**SUGGESTED READINGS**

1. Durga Das Basu, Introduction to the Constitution of India, Prentice Hall of India, New Delhi
2. R.C.Agarwal, (1997),Indian Political System ,S.Chand and Company, New Delhi.
3. Maciver and Page, Society: An Introduction Analysis, Mac Milan India Ltd, New Delhi
4. K.L.Sharma,( 1997), Social Stratification in India: Issues and Themes , Jawaharlal Nehru University, New Delhi.
5. Sharma, Brij Kishore, (2011),Introduction to the Constitution of India, Prentice Hall of India, New Delhi.
6. U.R.Gahai, (1998),Indian Political System, New Academic Publishing House, New Delhi.
**7.**R.N. Sharma, (1987),Indian Social Problems, Media Promoters and Publishers Pvt. Ltd, New Delhi.