REGULATIONS 2017

CURRICULUM AND SYLLABI (I & II Semester)

B.TECH.
ELECTRICAL AND ELECTRONICS ENGINEERING
UNIVERSITY VISION AND MISSION

VISION

B.S. Abdur Rahman Institute of Science and Technology aspires to be a leader in Education, Training and Research in Engineering, Science, Technology and Management and to play a vital role in the socio-economic progress of the Country.

MISSION

• To blossom into an internationally renowned University
• To empower the youth through quality education and to provide professional leadership
• To achieve excellence in all its endeavors to face global challenges
• To provide excellent teaching and research ambience
• To network with global institutions of excellence, Business, Industry and Research Organizations
• To contribute to the knowledge base through scientific enquiry, Applied research and Innovation.
DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION AND MISSION

VISION

To achieve excellence in the programs offered by the Department of Electrical and Electronics Engineering through quality teaching, holistic learning and innovative research.

MISSION

- To offer Under Graduate, Post Graduate & Research programs of industrial and societal relevance.
- To provide knowledge and skill in the Design and realization of Electrical and Electronic circuits and systems.
- To impart necessary managerial and soft skills to face the industrial challenges.
- To pursue academic and collaborative research with industry and research institutions in India and abroad.
- To disseminate the outcome of research and projects through publications, seminars and workshops.
- To provide conducive ambience for higher education, teaching and research.
PROGRAMME EDUCATIONAL OBJECTIVES

- To provide fundamental knowledge of mathematics and science to understand the basic concepts of Electrical and Electronics Engineering.

- To impart theoretical and practical knowledge in the broad areas of Power Generation, transmission, Distribution and Utilization.

- To provide knowledge and skill in using Electrical and Electronic components circuits and systems.

- To develop skills for devising and evaluating solutions including design of components system and their analysis using appropriate tools.

- To enhance the spirit of enquiry through projects and internships to develop creativity, self confidence and team spirit.

- To inculcate self learning capability to enable the students to constantly update themselves with the technological developments.

- To impart necessary managerial and soft skills to face the challenges in core industries and software companies.

PROGRAMME OUTCOMES

On successful completion of the programme, the graduates will

- Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
• Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

• Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

• Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

• Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.

• Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

• Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

• Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

• Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

• Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
• Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

• Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

• Design, Simulate and Analyse the Electrical and Magnetic Systems in the areas of Electrical and Electronics Engineering and arrive at appropriate solutions.

• Competent to work professionally in an Industrial Environment.
1.0 PRELIMINARY DEFINITIONS & NOMENCLATURE

In these Regulations, unless the context otherwise requires:

i) "Programme" means B.Tech. Degree Programme.

ii) "Branch" means specialization or discipline of B.Tech. Degree Programme like Civil Engineering, Mechanical Engineering, etc.

iii) "Course" means a theory or practical subject that is normally studied in a semester, like Mathematics, Physics, Engineering Graphics, Computer Practice, etc.

iv) "University" means B.S. Abdur Rahman Crescent University.

v) "Dean (Academic Affairs)" means the Dean (Academic Affairs) of B.S. Abdur Rahman Crescent University.

vi) "Dean (Student Affairs)" means the Dean (Students Affairs) of B.S. Abdur Rahman Crescent University.

vii) "Controller of Examinations" means the Controller of Examination of B.S. Abdur Rahman Crescent University, who is responsible for conduction of examinations and declaration of results.

2.0 ADMISSION

2.1a) Candidates for admission to the first semester of the eight-semester B.Tech. degree programme shall be required to have passed the Higher Secondary Examination of the (10+2) curriculum (Academic stream) prescribed by the appropriate authority or any other examination of any university or authority accepted by the University as equivalent thereto.

2.1b) Candidates for admission to the third semester of the eight-semester B.Tech. programme under lateral entry scheme shall be required to have passed the Diploma examination in Engineering / Technology of the Department of Technical Education, Government of Tamil Nadu or any other examination of any other authority accepted by the University as equivalent thereto.

2.2 Notwithstanding the qualifying examination the candidate might have passed, the
candidate shall also write an entrance examination prescribed by the University for admission. The entrance examination shall test the proficiency of the candidate in Mathematics, Physics and Chemistry on the standards prescribed for Ten plus Two academic stream.

2.3 The eligibility criteria such as marks, number of attempts and physical fitness shall be as prescribed by the University from time to time.

3.0 BRANCHES OF STUDY

3.1 Regulations are applicable to the following B.Tech. degree programmes in various branches of Engineering and Technology, each distributed over eight semesters with two semesters per academic year.

B.TECH. DEGREE PROGRAMMES:

1. Aeronautical Engineering
2. Automobile Engineering
3. Civil Engineering
4. Computer Science and Engineering
5. Electrical and Electronics Engineering
6. Electronics and Communication Engineering
7. Electronics and Instrumentation Engineering
8. Information Technology
9. Manufacturing Engineering
10. Mechanical Engineering
11. Polymer Engineering
12. Biotechnology
13. Cancer Biotechnology
14. Food Biotechnology

4.0 STRUCTURE OF THE PROGRAMME

4.1 Every Programme will have a curriculum with syllabi consisting of theory and practical courses such as,

i) Basic Sciences (BS)
ii) Humanities & Social Sciences (HS)
iii) Management Sciences (MS)
iv) Engineering Sciences Fundamentals (ESF)
v) Engineering Core Courses (EC)
vi) Professional Electives (PE)
vii) General Electives (GE)
viii) Workshop practice, laboratory work, industrial training, seminar presentation, project work, etc.

4.2 Each course is normally assigned certain number of credits:
- one credit per lecture period per week
- one credit per tutorial period per week
- one credit for two to three periods and two credits for four periods of laboratory or practical sessions
- one credit for two periods of seminar / project work per week
- one credit for two weeks of industrial training.

4.3 Each semester curriculum shall normally have a blend of lecture courses, laboratory courses and laboratory integrated theory courses of total not exceeding 26 credits.

4.4 For the award of the degree, a student has to earn a minimum total credits specified in the curriculum of the relevant branch of study. The minimum credits to be earned will be between 174 and 180, depending on the program.

4.5 The medium of instruction, examinations and project report shall be in English, except for courses in languages other than English.

5.0 DURATION OF THE PROGRAMME

5.1 A student is ordinarily expected to complete the B.Tech. programme in eight semesters (six semesters in the case of lateral entry scheme), but in any case not more than 14 continuous semesters reckoned from the date of first admission (12 semesters in the case of lateral entry student).

5.2 Each semester shall consist of a minimum of 90 working days.

5.3 Semester end examination will normally follow within a week after the last working day of the semester.

6.0 CLASS ADVISOR AND FACULTY ADVISOR

6.1 CLASS ADVISOR
A faculty member will be nominated by the HOD as Class Advisor for the class
throughout the period of study except first year. The Class Advisor shall be responsible for maintaining the academic, curricular and co-curricular records of students of the class throughout their period of study. However, for the first and second semester, the class advisors (First year class advisors) will be nominated by the first year coordinator.

6.2 FACULTY ADVISOR
To help the students in planning their courses of study and for general counseling, the Head of the Department of the students will attach a maximum of 20 students to a faculty member of the department who shall function as faculty advisor for the students throughout their period of study. Such faculty advisor shall guide the students in taking up the elective courses for registration and enrolment in every semester and also offer advice to the students on academic and related personal matters.

7.0 COURSE COMMITTEE
7.1 Each common theory course offered to more than one group of students shall have a “Course Committee” comprising all the teachers teaching the common course with one of them nominated as course coordinator. The nomination of the course coordinator shall be made by the Head of the Department / Dean (Academic Affairs) depending upon whether all the teachers teaching the common course belong to a single department or to several departments. The Course Committee shall meet as often as possible and ensure uniform evaluation of the tests and arrive at a common scheme of evaluation for the tests. Wherever it is feasible, the Course Committee may also prepare a common question paper for the test(s).

8.0 CLASS COMMITTEE
A class committee comprising faculty members handling the classes, student representatives and a senior faculty member not handling the courses as chairman will be constituted branch-wise and semester-wise.

8.1 The composition of class committees for first and second semester will be as follows:
   i) The first year coordinator shall be the chairman of the class committee
ii) Faculty members of all individual courses of first / second semester

iii) Six student representatives (male and female) of each class nominated by the first year coordinator

iv) The class advisor and faculty advisors of the class.

8.2 The composition of the class committee for each branch from 3rd to 8th semester will be as follows:

i) One senior faculty member preferably not handling courses for the concerned semester, appointed as chairman by the Head of the Department

ii) Faculty members of all courses of the semester

iii) Six student representatives (male and female) of each class nominated by the Head of the Department in consultation with the relevant faculty advisors

iv) All faculty advisors and the class advisors.

v) Head of the Department

8.3 The class committee shall meet at least four times during the semester. The first meeting will be held within two weeks from the date of commencement of classes, in which the nature of continuous assessment for various courses and the weightages for each component of assessment will be decided for the first and second assessment. The second meeting will be held within a week after the date of first assessment report, to review the students' performance and for follow up action. The third meeting will be held within a week after the second assessment report, to review the students' performance and for follow up action.

8.4 During these three meetings the student members representing the entire class, shall meaningfully interact and express opinions and suggestions to improve the effectiveness of the teaching-learning process.

8.5 The fourth meeting of the class committee, excluding the student members, shall meet within 5 days from the last day of the semester end examination to analyze the performance of the students in all the components of assessments and decide their grades in each course. The grades for a common course shall be decided by the concerned course committee and shall be presented to the class committee(s) by the concerned course coordinator.

9.0 REGISTRATION AND ENROLMENT
9.1 Except for the first semester, every student shall register for the ensuing semester during a specified week before the semester end examination of the ongoing semester. Every student shall submit a completed registration form indicating the list of courses intended to be enrolled during the ensuing semester. Late registration with the approval of the Dean (Academic Affairs) along with a late fee will be permitted up to the last working day of the current semester.

9.2 From the second year onwards, all students shall pay the prescribed fees for the year on a specific day at the beginning of the semester confirming the registered courses. Late enrolment along with a late fee will be permitted up to two weeks from the date of commencement of classes. If a student does not enroll, his/her name will be removed from rolls.

9.3 The students of first semester shall register and enroll at the time of admission by paying the prescribed fees.

9.4 A student should have registered for all preceding semesters before registering for a particular semester.

10.0 COURSE CHANGE / WITHDRAWAL

10.1 CHANGE OF A COURSE
A student can change an enrolled course within 10 working days from the commencement of the course, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department of the student.

10.2 WITHDRAWAL FROM A COURSE
A student can withdraw from an enrolled course at any time before the first assessment for genuine reasons, with the approval of the Dean (Academic Affairs), on the recommendation of the Head of the Department of the student.

11.0 TEMPORARY BREAK OF STUDY FROM PROGRAMME
A student may be permitted by the Dean (Academic Affairs) to avail temporary break of study from the programme up to a maximum of two semesters for reasons of ill health or other valid grounds. A student can avail the break of study before the start of first assessment of the ongoing semester. However the total duration for completion of the programme shall not exceed the prescribed maximum number of semesters (vide clause 5.1). If any student is debarred for
want of attendance or suspended due to any act of indiscipline, it will not be considered as break of study. A student who has availed break of study has to rejoin in the same semester only.

12.0 CREDIT LIMIT FOR ENROLMENT & MOVEMENT TO HIGHER SEMESTER

12.1 A student can enroll for a maximum of 32 credits during a semester including Redo /Pre do Courses

12.2 The minimum earned credit required to move to the higher semester shall be
   • Not less than 20 credits, to move to the 3rd semester
   • Not less than 40 credits, (20 for lateral entry) to move to the 5th semester
   • Not less than 60 credits, (40 for lateral entry) to move to the 7th semester

13.0 ASSESSMENT PROCEDURE AND PERCENTAGE WEIGHTAGE OF MARKS

13.1 Every theory course shall have a total of three assessments during a semester as given below:

<table>
<thead>
<tr>
<th>Assessment No.</th>
<th>Course Coverage in Weeks</th>
<th>Duration</th>
<th>Weightage of Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assessment 1</td>
<td>1 to 6</td>
<td>1.5 hours</td>
<td>25%</td>
</tr>
<tr>
<td>Assessment 2</td>
<td>7 to 12</td>
<td>1.5 hours</td>
<td>25%</td>
</tr>
<tr>
<td>Semester End Exam</td>
<td>Full course</td>
<td>3 hours</td>
<td>50%</td>
</tr>
</tbody>
</table>

13.2 Appearing for semester end theory examination for each course is mandatory and a student should secure a minimum of 40% marks in each course in semester end examination for the successful completion of the course.

13.3 Every practical course will have 60% weightage for continuous assessments and 40% for semester end examination. However a student should have secured a minimum of 50% marks in the semester end practical examination.

13.4 For laboratory integrated theory courses, the theory and practical components shall be assessed separately for 100 marks each and consolidated by assigning a weightage of 75% for theory component and 25% for practical component. Grading shall be done for this consolidated mark. Assessment of theory component shall have a total of three assessments with two continuous
assessments carrying 25% weightage each and semester end examination carrying 50% weightage. The student shall secure a separate minimum of 40% in the semester end theory examination. The evaluation of practical component shall be through continuous assessment.

13.5 The components of continuous assessment for theory/practical/laboratory integrated theory courses shall be finalized in the first class committee meeting.

13.6 In the case of Industrial training, the student shall submit a report, which will be evaluated along with an oral examination by a committee of faculty members, constituted by the Head of the Department. A progress report from the industry will also be taken into account for evaluation. The weightage for report shall be 60% and 40% for Viva Voce examination.

13.7 In the case of project work, a committee of faculty members constituted by the Head of the Department will carry out three periodic reviews. Based on the project report submitted by the student(s), an oral examination (viva-voce) will be conducted as the semester end examination, for which one external examiner, approved by the Controller of Examinations, will be included. The weightage for periodic review will be 50%. Of the remaining 50%, 20% will be for the project report and 30% for the Viva Voce examination.

13.8 Assessment of seminars and comprehension will be carried out by a committee of faculty members constituted by the Head of the Department.

13.9 For the first attempt of the arrear theory examination, the internal assessment marks scored for a course during first appearance will be used for grading along with the marks scored in the arrear examination. From the subsequent appearance onwards, full weightage shall be assigned to the marks scored in the semester end examination and the internal assessment marks secured during the course of study shall be ignored.

In case of laboratory integrated theory courses, after one regular and one arrear appearance, the internal mark of theory component is invalid and full weightage shall be assigned to the marks scored in the semester end examination for theory component. There shall be no arrear or improvement examination for lab component.
14.0 SUBSTITUTE EXAMINATIONS
14.1 A student who has missed, for genuine reasons, a maximum of one of the two continuous assessments of a course may be permitted to write a substitute examination paying the prescribed substitute examination fees. However, permission to take up a substitute examination will be given under exceptional circumstances, such as accidents, admission to a hospital due to illness, etc. by a committee constituted by the Dean of School for that purpose. However there is no Substitute Examination for Semester End examination.

14.2 A student who misses any continuous assessment test in a course shall apply for substitute exam in the prescribed form to the Head of the Department / Dean of School within a week from the date of missed assessment test. However the Substitute Examination will be conducted after the last working day of the semester and before Semester End Examination.

15.0 ATTENDANCE REQUIREMENT AND SEMESTER / COURSE REPEITION
15.1 A student shall earn 100% attendance in the contact periods of every course, subject to a maximum relaxation of 25% (for genuine reasons such as medical grounds or representing the University in approved events etc.) to become eligible to appear for the semester-end examination in that course, failing which the student shall be awarded “I” grade in that course. The cases in which the student is awarded “I” grade, shall register and repeat the course when it is offered next.

15.2 The faculty member of each course shall cumulate the attendance details for the semester and furnish the names of the students who have not earned the required attendance in that course to the Class Advisor. The Class Advisor will consolidate and furnish the list of students who have earned less than 75% attendance, in various courses, to the Dean (Academic Affairs) through the Head of the Department/ Dean of School. Thereupon, the Dean (Academic Affairs) shall announce the names of such students prevented from writing the semester end examination in each course.

15.3 A student who has obtained ‘I’ grade in all the courses in a semester is not permitted to move to next higher semester. Such student shall repeat all the courses of the semester in the subsequent academic year.
15.4 A student should register to re-do a core course wherein “I” or “W” grade is awarded. If the student is awarded, “I” or “W” grade in an elective course either the same elective course may be repeated or a new elective course may be taken with the approval of Head of the Department / Dean of School.

15.5 A student who is awarded “U” grade in a course will have the option to either write the semester end arrear examination at the end of the subsequent semesters, or to redo the course in the evening when the course is offered by the department. Marks scored in the continuous assessment during the redo classes shall be considered for grading along with the marks scored in the semester-end (redo) examination. If any student obtained “U” grade in the redo course, the marks scored in the continuous assessment test (redo) for that course will be considered as internal mark for further appearance of arrear examination.

15.6 If a student with “U” grade, who prefers to redo any particular course, fails to earn the minimum 75% attendance while doing that course, then he / she will not be permitted to write the semester end examination and his / her earlier “U” grade and continuous assessment marks shall continue.

16.0 REDO COURSES

16.1 A student can register for a maximum of two redo courses per semester in the evening after regular college hours, if such courses are offered by the concerned department. Students may also opt to redo the courses offered during regular semesters.

16.2 The Head of the Department with the approval of Dean Academic Affairs may arrange for the conduct of a few courses during the evening, depending on the availability of faculty members and subject to a specified minimum number of students registering for each of such courses.

16.3 The number of contact hours and the assessment procedure for any redo course will be the same as those during regular semesters except that there is no provision for any substitute examination and withdrawal from an evening redo course.

17.0 PASSING AND DECLARATION OF RESULTS AND GRADE SHEET

17.1 All assessments of a course will be made on absolute marks basis. However, the
Class Committee without the student members shall meet within 5 days after the semester-end examination and analyze the performance of students in all assessments of a course and award letter grades. The letter grades and the corresponding grade points are as follows:

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Grade Points</th>
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<tbody>
<tr>
<td>S</td>
<td>10</td>
</tr>
<tr>
<td>A</td>
<td>9</td>
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<tr>
<td>B</td>
<td>8</td>
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<td>C</td>
<td>7</td>
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<td>D</td>
<td>6</td>
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<td>E</td>
<td>5</td>
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<tr>
<td>U</td>
<td>0</td>
</tr>
<tr>
<td>W</td>
<td>0</td>
</tr>
<tr>
<td>I</td>
<td>0</td>
</tr>
<tr>
<td>AB</td>
<td>0</td>
</tr>
</tbody>
</table>

“W" denotes withdrawal from the course.
“I” denotes inadequate attendance and hence prevention from semester-end examination.
“U” denotes unsuccessful performance in the course.
“AB” denotes absence for the semester-end examination.

17.2 A student who earns a minimum of five grade points ('E' grade) in a course is declared to have successfully completed the course. Such a course cannot be repeated by the student for improvement of grade.

17.3 The results, after awarding of grades, shall be signed by the Chairman of the Class Committee and Head of the Department/Dean of Schools and it shall be declared by the Controller of Examinations.

17.4 Within one week from the date of declaration of result, a student can apply for revaluation of his / her semester-end theory examination answer scripts of one or
more courses, on payment of prescribed fee, through proper application to Controller of Examination. Subsequently the Head of the Department/Dean of School offered the course shall constitute a revaluation committee consisting of Chairman of the Class Committee as Convener, the faculty member of the course and a senior member of faculty knowledgeable in that course. The committee shall meet within a week to revalue the answer scripts and submit its report to the Controller of Examinations for consideration and decision.

17.5 After results are declared, grade sheets shall be issued to each student, which will contain the following details. The list of courses enrolled during the semester including redo courses, if any, and the grade scored, the Grade Point Average (GPA) for the semester and 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 of courses registered and the grade points 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.

If \( C_i \) is the number of credits assigned for the \( i^{th} \) course and \( GP_i \) is the Grade Point in the \( i^{th} \) course

\[
GPA = \frac{\sum_{i=1}^{n} (C_i)(GP_i)}{\sum_{i=1}^{n} C_i}
\]

Where \( n \) = number of courses

The Cumulative Grade Point Average CGPA shall be calculated in a similar manner, considering all the courses enrolled from first semester.

“\( I \)” and “\( W \)” grades will be excluded for calculating GPA.

“\( U \)”, “\( I \)”, “\( AB \)” and “\( W \)” grades will be excluded for calculating CGPA.

The formula for the conversion of CGPA to equivalent percentage of marks shall be as follows:

Percentage Equivalent of Marks = CGPA X 10

17.6 After successful completion of the programme, the Degree will be awarded with the following classifications based on CGPA.

<table>
<thead>
<tr>
<th>Classification</th>
<th>CGPA</th>
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<tbody>
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</table>
First Class with Distinction | 8.50 and above and passing all the courses in first appearance and completing the programme within the Prescribed period of 8 semester for normal entry and 6 semesters for lateral entry
---|---
First Class | 6.50 and above and completing the programme within a maximum of 10 semester for normal entry and 8 semesters for lateral entry
Second Class | Others

However, to be eligible for First Class with Distinction, a student should not have obtained ‘U’ or ‘I’ grade in any course during his/her study and should have completed the U.G. programme within a minimum period (except break of study). To be eligible for First Class, a student should have passed the examination in all the courses within the specified minimum number of semesters reckoned from his/her commencement of study. For this purpose, the authorized break of study will not be counted. The students who do not satisfy the above two conditions will be classified as second class. For the purpose of classification, the CGPA will be rounded to two decimal places. For the purpose of comparison of performance of students and ranking, CGPA will be considered up to three decimal places.

18.0 ELECTIVE CHOICE:

18.1 Apart from the various elective courses listed in the curriculum for each branch of specialization, the student can choose a maximum of two electives from any other specialization under any department, during the entire period of study, with the approval of the Head of the parent department and the Head of the other department offering the course.

18.2 ONLINE / SELF STUDY COURSES

Students are permitted to undergo department approved online/ self study courses not exceeding a total of six credits with the recommendation of the Head of the Department / Dean of School and with the prior approval of Dean Academic Affairs during his/ her period of study. In case of credits earned
through online mode ratified by the respective Board of Studies, the credits may be transferred following the due approval procedures. The students shall undergo self study courses on their own with the mentoring of a member of the faculty. The online/ self study courses can be considered in lieu of elective courses.

19.0 SUPPLEMENTARY EXAMINATION
Final Year students can apply for supplementary examination for a maximum of two courses thus providing an opportunity to complete their degree programme. Likewise students with less credits can also apply for supplementary examination for a maximum of two courses to enable them to earn minimum credits to move to higher semester. The students can apply for supplementary examination within three weeks of the declaration of results.

20.0 PERSONALITY AND CHARACTER DEVELOPMENT
20.1 All students shall enroll, on admission, in any of the personality and character development programmes, NCC / NSS / NSO / YRC / Rotaract and undergo practical training.

• National Cadet Corps (NCC) will have to undergo specified number of parades.
• National Service Scheme (NSS) will have social service activities in and around Chennai.
• National Sports Organization (NSO) will have sports, games, drills and physical exercises.
• Youth Red Cross (YRC) will have social service activities in and around Chennai.
• Rotaract will have social service activities in and around Chennai.

21.0 DISCIPLINE
21.1 Every student is required to observe disciplined and decorous behavior both inside and outside the campus and not to indulge in any activity which will tend to affect the prestige of the University.

21.2 Any act of indiscipline of a student, reported to the Dean (Student Affairs), through the HOD / Dean will be referred to a Discipline and Welfare Committee nominated
by the Vice-Chancellor, for taking appropriate action.

22.0 ELIGIBILITY FOR THE AWARD OF DEGREE

22.1 A student shall be declared to be eligible for the award of B.Tech. degree provided the student has:
   i) successfully completed all the required courses specified in the programme curriculum and earned the number of credits prescribed for the specialization, within a maximum period of 14 semester (12 semesters for lateral entry) from the date of admission, including break of study
   ii) no dues to the Institution, Library, Hostels
   iii) no disciplinary action pending against him/her.

22.2 The award of the degree must have been approved by the University.

23.0 POWER TO MODIFY

Notwithstanding all that has been stated above, the Academic Council has the right to modify the above regulations from time to time.
# B.S. ABDUR RAHMAN CRESCENT UNIVERSITY

Vandalur, Chennai – 600048

## B.TECH. ELECTRICAL AND ELECTRONICS ENGINEERING

CURRICULUM & SYLLABUS, REGULATIONS 2017

### SEMESTER I

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Course Group</th>
<th>Course Code</th>
<th>Course Title</th>
<th>L</th>
<th>T</th>
<th>P</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>BS</td>
<td>MAC 1181</td>
<td>Differential Calculus and Geometry</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>4</td>
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<tr>
<td>2.</td>
<td>HS</td>
<td>ENC 1181/</td>
<td>English / Arabic / Mandarin / German / Japanese</td>
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8. CHCX08 Organic Chemistry of Biomolecules 2 0 2 3
9. CHCX09 Polymer Science and Technology 2 0 2 3

**Maths Elective Courses**  
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OBJECTIVES:
The aims of this course are to

- introduce eigen values and eigenvectors of matrix algebra.
- make the student knowledgeable in the area of Three Dimensional Analytical Geometry.
- demonstrate the application of Differential Calculus.
- familiarize the student with the functions of several variables.
- develop the use of ODE solvable techniques necessary for engineering applications.
- motivate the students with some basic engineering application problems in ODE.

MODULE I MATRICES 8+2

MODULE II THREE DIMENSIONAL ANALYTICAL GEOMETRY 7+3
Direction cosines and ratios – angle between two lines – equations of a plane – equations of a straight line, coplanar lines - shortest distance between skew lines - sphere – tangent plane – plane section of a sphere – orthogonal spheres.

MODULE III DIFFERENTIAL GEOMETRY 7+3
Curvature – Cartesian and polar coordinates – centre and radius of curvature – circle of curvature – involutes and evolutes – envelopes.

MODULE IV DIFFERENTIAL CALCULUS OF SEVERAL VARIABLES 8+2

MODULE V ORDINARY DIFFERENTIAL EQUATIONS 8+2
Linear equations of second order with constant and variable coefficients – Simultaneous first order linear equations with constant coefficients – homogeneous equations of Euler’s type – method of undetermined coefficients, method of variation of parameters.
MODULE VI  APPLICATIONS OF ORDINARY DIFFERENTIAL EQUATIONS

Solution of Ordinary Differential Equation Related to Electric Circuits – Bending of Beams- Motion of a Particle in a resisting medium – Simple harmonic motion.

L – 45; T – 15; Total Hours –60

TEXT BOOKS:

REFERENCES:
7. James Stewart “.Calculus” (7th edition),Brooks/Cole cengage learning,UK

OUTCOMES:
After completing the course, student will be able to

- understand the matrix techniques and compute eigenvalues and eigenvectors of a given matrix.
- do the problems based on three dimensional analytic geometry.
- apply differential calculus in engineering problems.
- differentiate more than one variable and their applications.
- solve the differential equations with constant coefficient and variable coefficient.
- form and solve differential equations.
ENC 1181 ENGLISH

OBJECTIVES:

- To train students to use appropriate vocabulary in academic and technical contexts.
- To facilitate students to speak effectively while exchanging ideas and making presentations.
- To develop students’ listening skill for comprehending and analyzing information.
- To develop their reading skill through sub skills like skimming, scanning and critical reading of a text.
- To sharpen their academic writing skills.
- To expose them to the correct usage of language and help them to apply that knowledge appropriately.

MODULE I

8

L: Listening for general information
S: Self Introduction, Introducing one another.
R: Predicting the content
W: Paragraph Writing
Language Focus: Affixes, Simple Present tense, Connective & Prepositions.

MODULE II

8

L: Listening for specific information (from dialogues)
S: Exchanging opinion.
R: Skimming technical Passages
W: Argumentative Writing (using the concept of Flipped Learning), Letter to the Editor.
Language Focus: Idioms, use of Modals, Simple Past tense & use of “Wh” and question tags.

MODULE III

7

L: Learning the ways of describing images and presenting specific information (focusing on note making)
S: Making Presentations using visuals.
R: Scanning short texts for gist of information
W: Letter of Invitation, Expository Writing
Language Focus: Homophones, Homographs, Simple Future & Collocations.

MODULE IV

7

L: Understanding prepared presentation techniques through videos
S: Short Presentations.
R: Reading for coherence and cohesion
W: Letter seeking permission for Industrial Visit
Language Focus: S-V agreement, Euphemism

**MODULE V**

L: Understanding Non-Verbal Communications while listening to narration of incidents.
S: Narrating an experience
R: Inferential Reading
Language Focus: Interchange of Active & passive voice, Impersonal Passive voice.

**MODULE VI**

L: Learning Story telling techniques (stories & visuals) through audio files
S: Discussion in groups
R: Reading for critical appreciation
W: Developing an idea, Slogan writing, Interpreting a Bar Chart.
Language Focus: If clause and phrasal verbs.

**REFERENCES:**


**OUTCOMES:**

After completion of the course, students will have the ability to

- Demonstrate their range of vocabulary in academic and technical contexts
- Exchange ideas and make presentations
- Comprehend and respond appropriately to listening tasks.
- Read a text efficiently and process information.
- Create and draft different kinds of academic documents
- Communicate effectively using grammatically correct expressions.
OBJECTIVES:
- To read and write in Arabic language.
- To learn vocabulary of different fields
- To develop situational communication skills.

MODULE I PREPARATORY ARABIC
Introducing Arabic Alphabets.
Listening and Reading.
Audio & Video aided listening, Tajweed listening,
Writing Arabic Alphabets (connected & unconnected).
Introducing words.
Reading simple sentences.
Learning names of the things in and around the class room.
Exercises.

MODULE II FUNCTIONAL ARABIC
Listening Arabic texts, stories and action verbs
Communicating Simple sentences.
Jumla’ Ismiyya and Jumla’ Fi’liyya
Situational Conversation:
Greetings, Introduction.
Classroom, College, Picnic.
Dining and Kitchen.
Reading skills.
Exercises

MODULE III FUNCTIONAL ARABIC
Implication of effective listening.
Audio aids.
Writing Simple sentences.
Communicating ordinal and cardinal numbers.
Situational communication:
Playground, library.
Forms of plural – Sample sentences.
Introduction to tenses.
Exercises.

MODULE IV FUNCTIONAL ARABIC
Communication:
Family, travel
Market, Prayer hall
Writing skills:
Note making.
Sequencing of sentences.
Developing answers from the questions.
Exercises.

MODULE V  TECHNICAL ARABIC  8
Importance of technical communication.
Reading and writing skills.
Audio & Video aided listening.
Introduction to Arabic terms related to administration.
Situation communication:
Air travel, Office administration, passport, visa.
Exercises

MODULE VI  TECHNICAL ARABIC  7
Situation communication:
Contractual work, machineries and equipments..
Computer, internet browsing.
Banking,
Exercises.

TOTAL HOURS : 45

TEXT BOOKS:
1. Arabic for professionals and employees, Kilakarai Bukhari Aalim Arabic College, Chennai, India, 2013.

REFERENCES:
1. Arabic Reader for Non Arabs (Ummul Qura University, Makkah), Kilakarai Bukhari Aalim Arabic College, 2005.

OUTCOMES:
On successful completion of the course, the student will be able to:
• Write correct sentences in Arabic.
• Communicate in Arabic at primary level in working situations in the fields of engineering and administration.
OBJECTIVES:

- To improve the proficiency of students in Mandarin language.
- To develop their knowledge of vocabulary.
- To train them in using appropriate grammatical forms during communications.
- To empower them for successful communication in social and academic contexts.
- To make them appreciate the language usage in real life situations.

MODULE I 8

- General Introduction to Chinese
- Pinyin and Tones
- Introduction to the Writing System: basic strokes and stroke order
- Numbers 1-100, song
- Days of the Week
- Months of the Year

MODULE II 8

- Chinese names and related culture
- Chinese family structures and values
- Greetings
- Introducing Yourself
- Family members
- Occupations

MODULE III 7

- Languages and Nationalities
- Daily Routine
- Chinese breakfast
- Negative Sentences and Interrogative Sentences
- Asking for Personal Information
- The Verb shi and Basic Sentence Structures

MODULE IV 7

- Answering an Affirmative-negative Question
- Food and drinks
- Transportation
- Likes and dislikes
- Adverbs bu, jiu and dou
- Verb-absent Sentences

MODULE V 8

- Jisui and duoda Questions
- S+V+O Construction
- Routines and Daily Activities
- Haishi Questions
- Modal Verbs
- Hobbies and Habits

MODULE VI 7

- Making Suggestions with haoma
- Colors
- Clothing
- Body parts
- Talking about Likes and Dislikes
- Measurement Words in Chinese

TOTAL HOURS: 45

TEXT BOOKS:


OUTCOMES:

On completion of the course, students will be able to
• Exhibit proficiency in Chinese Language.
• Use vocabulary in appropriate contexts.
• Use appropriate grammatical forms effectively.
• Use the language in social and academic contexts.
• Appreciate the use of language forms.
OBJECTIVES:
- To improve the proficiency of students in German language.
- To create awareness of using vocabulary among students.
- To expose them to correct grammatical forms of the language.
- To empower them for successful communication in social and academic contexts.

MODULE I 8
Introduction to German alphabets, phonetics and pronunciation- Introducing themselves and others using simple sentences and answer to some basic personal questions:-: Introduction to different types of articles and verbs, Nouns

MODULE II 8
Understanding and responding to everyday queries like instruction, questions, - number & gender, pronouns, present and simple past tense.

MODULE III 7
Short telephone messages, requests etc., if spoken slowly and clearly-- Detailed overview of articles, adjectives with/without articles, Prepositions

MODULE IV 7
Ask and giving directions using simple prepositions- Ability to fill basic information on forms while registering for courses / classes.

MODULE V 8
Ability to extract and understand relevant information in a public announcement, broadcast, newspaper, radio etc-- dative & accusative

MODULE VI 7
Ability to describe about people, work, immediate environment, education and other topics related to personal needs in a concise manner-- Understanding of matters that are familiar and are encountered regularly like instances at school, work, at public places, places of leisure etc.

TOTAL HOURS :45

TEXT BOOKS:
2. Practice book: Tangram aktuell 1 – Lektion 1–4 (Kursbuch +
REFERENCES:


OUTCOMES:

On completion of the course, students will be able to

- Show their proficiency in German Language.
- Use appropriate vocabulary in real life contexts.
- Use appropriate grammatical forms while communicating with people.
- Effectively use the language in social and academic contexts.
OBJECTIVES:

- To train students to use appropriate vocabulary in academic and technical contexts.
- To facilitate students to speak effectively while exchanging ideas and making presentations.
- To develop their reading skill through sub skills like skimming, scanning and critical reading of a text.
- To sharpen their academic writing skills.
- To expose them to the correct usage of language and help them to apply that knowledge appropriately.

MODULE I

Introduction of the Japanese writing system, i.e. Hiragana, Katakana and Kanji, word-building, writing foreign names and loan words in Katakana.

MODULE II

Oral practice of pronunciation and intonation of Japanese sounds, Japanese greetings, self introduction, identifying things, time of the day, calendar; counting using Japanese numerical classifiers; describing things;

MODULE III

Making comparisons; talking of daily activities, kinship terms used for address and reference, seasons, giving and receiving, shopping; making requests, talking of one’s likes and dislikes.

MODULE IV

Extensive practice of basic patterns at the lower intermediate level through drills and exercises.

MODULE V


MODULE VI

Diverse texts based on Japanese culture, customs, history, food habits, and science etc, for the development of communicative competence of students; skimming, scanning of texts with emphasis on advanced sentence patterns, grammatical structures and idiomatic phrases, reading and writing of approximately

TOTAL HOURS : 46
REFERENCES:

1. Nihongo I, Kokusaigakuyukai, and other supplementary material
2. Exersice book 1of Nihongo 1, and other supplementary material
3. Nippon, the Land and its People & Encyclopedia of Contemporary Japanese
5. Chukyu Nihongo, Tokyo Gaikokugo Daigaku; Nihongo II, Kokusaigakuyukai, and other supplementary material.

OUTCOMES:

After completion of the course, students will have the ability to

- Demonstrate their range of vocabulary in academic and technical contexts
- Exchange ideas and make presentations
- Comprehend and respond appropriately to listening tasks.
- Read a text efficiently and process information.
- Create and draft different kinds of academic documents
- Communicate effectively using grammatically correct expressions.
OBJECTIVES:
To make students conversant with the
- basic concepts of crystal physics and its structures
- production and applications of ultrasonic waves
- study of thermal conductivities of good and bad conductors
- phenomenon of wave optics and its applications
- principle of fibre optic communication and its applications to sensors
- wave mechanics principle and its applications in electron microscopy
- green energy physics and its environmental impacts to society

MODULE I  CRYSTAL PHYSICS
Crystalline and amorphous solids – Unit Cell – Seven Crystal Systems – Bravais Lattice – Miller Indices – Interplanar Spacing – Characteristics of Unit Cell - Calculation of Number of atoms per unit cell, Atomic Radius, Coordination Number and Packing Factor for SC, BCC, FCC and HCP and Diamond structures – Defects in crystals: Point defects – Edge and screw dislocations and their significance – Surface Defects.

MODULE II  ULTRASONICS AND THERMAL PHYSICS

MODULE III  APPLIED OPTICS
Interference – Air Wedge – Michelson’s Interferometer – Determination of wavelength of light and thickness of thin transparent sheet.

MODULE IV  FIBRE OPTICS
Optical fibre – Principle and propagation of light in optical fibre – Numerical aperture and acceptance angle – Types of optical fibres – Attenuation – Absorption, Scattering losses, Bending losses and Dispersion in Optical fibres –
Fiber Connectors and Couplers - Applications – Fibre optic communication system (block diagram only)- Fibre optic sensors - displacement and pressure sensors (qualitative) - Medical endoscope.

**MODULE V  QUANTUM MECHANICS**

Black body radiation – Planck’s theory of radiation – Deduction of Wien’s displacement law and Rayleigh – Jean’s law from Planck’s theory –Dual nature of matter – de Broglie’s wavelength- Physical significance of wave function – Schrodinger wave equation – Time independent and time dependent wave equation – Particle in one dimensional box – Harmonic oscillator(qualitative).

**MODULE VI  RENEWABLE ENERGY SOURCES**


**PRACTICALS**

1. Determination of Velocity of Ultrasonic waves in a given liquid using Ultrasonic Interferometer.
2. Determination of wavelength of ultrasonic waves using Kundt’s tube method.
3. Determination of thickness of a thin wire using Air Wedge method.
4. Determination of wavelength of light using spectrometer diffraction grating.
5. Determination of angle of divergence of a laser beam using He-Ne laser.
9. Determination of thermal conductivity of a good conductor by Forbe’s method.
10. Determination of thermal conductivity of a bad conductor by Lee’s disc method.
11. Determination of solar cell characteristics.

*L – 45; P – 30; TOTAL HOURS – 75*

**REFERENCES :**


OUTCOMES:
At the end of the course, students will be able to
• understand the different types of crystal structures
• apply the concept of ultrasonic principle in engineering and medical field
• calculate thermal conductivities of good and bad conductors
• differentiate the various laser systems and its applications in engineering and medical field
• apply the principle of fibre optics for communication and sensor applications
• formulate wave mechanics principle for applications in electron microscopy
• Correlate the different renewable energy sources for societal needs.
• To complement the knowledge acquired in the theory class.
• To correlate the experimental results for application.
OBJECTIVES:
The students should be conversant with
- the basic problems like hardness, alkalinity, dissolved oxygen associated with
- the water used for domestic and industrial purpose and treatment process involved.
- the synthesis, properties and applications of nanomaterials.
- the importance of renewable energy sources like solar, wind, biogas, biomass, geothermal, ocean and their limitations.
- the basic analytical techniques like UV-Visible, FT-IR, NMR, AAS, AES, Circular Dichroism and XRD etc.
- photochemistry concepts related to physical processes and chemical reactions induced by photon absorption and their applications.
- basic principles of electrochemistry, cell construction and evaluation and to understand general methodologies for construction & design of electrochemical cell.

MODULE I  WATER TECHNOLOGY  9

MODULE II  NANO CHEMISTRY  6
Introduction – distinction between molecules, bulk materials and nanoparticles – classification based on dimension with examples – synthesis (top-down and bottom-up approach) : sol-gel, thermolysis (hydrothermal and solvothermal), electrodeposition, chemical vapour deposition, laser ablation – properties and applications (electronic, magnetic and catalytic) – risk factors and future perspectives.

MODULE III  ENERGY SOURCES  8
Energy: past, today, and future – a brief history of energy consumption – present energy scenario of conventional and renewable energy sources – renewable energy : needs of renewable energy, advantages and limitations of renewable energy – solar energy: basics, solar energy in the past , photovoltaic, advantages and disadvantages – bioenergy: conversion, bio degradation, biogas
generation, biomass gasifier, factors affecting biogas generation, advantages and disadvantages – geothermal energy: geothermal resources (hot dry rock and magma resources, natural and artificial), advantages and disadvantages – wind energy: wind resources, wind turbines, advantages and disadvantages – ocean energy: wave energy, wave energy conversion devices, ocean thermal energy, advantages and disadvantages.

**MODULE IV PHOTOCHEMISTRY**


**MODULE V ANALYTICAL TECHNIQUES**

Spectroscopy: electromagnetic radiation and spectrum – types of transitions – types of spectra (atomic and molecular with their chemical usefulness) – Beer-Lamberts law (problems) – principles, instrumentation and applications of: Colourimetry – UV-Vis spectrophotometer – atomic absorption spectroscopy – atomic emission spectroscopy – principles and applications of: IR, NMR, mass and X-ray diffraction analysis.

**MODULE VI ELECTROCHEMISTRY**

Electrochemistry - types of electrodes (principle and working): gas (SHE), metal/metal ion electrode, metal-metal insoluble salt (calomel electrode), ion-selective (glass electrode and fluoride ion selective electrode) – Electrolytic and galvanic cells, construction of cell, EMF measurement and applications (problems), standard cell (Weston-cadmium), reversible and irreversible cell, concentration cell. Determination of fluoride ion using fluoride ion selective electrode – Chemically modified electrodes (CMEs): concept, approaches and applications.

**PRACTICALS**

1. Estimation of hardness in given water sample.
2. Estimation of the alkalinity of the given water sample.
3. Estimation of strong acid by conductometry.
4. Estimation of Fe$^{2+}$ present in the given sample by potentiometry.
5. Verification of Beer-Lamberts law and estimation of Cu$^{2+}$ present in unknown sample.
6. Estimation of sodium and potassium present in the given sample by flame photometry.
7. Determination of molecular weight and degree of polymerisation of a polymer by viscosity method.
REFERENCES:


OUTCOMES:

The students will be able to

- solve problems related to hardness, alkalinity, dissolved oxygen associated with the water and describe the treatment processes.
- classify nanomaterials and apply the nanochemistry approach to synthesize the nanomaterials.
- explain the principle and enumerate the advantages and disadvantages of various renewable energy sources.
- state the principle and illustrate the instrumentation of various analytical techniques.
- apply the concepts of photochemistry to elaborate various photo-physical and photochemical reactions.
- construct a electrochemical cell and describe the various types of electrodes and determine the fluoride content.
OBJECTIVES:

• To introduce the students of all engineering programs, the basic concepts of engineering drawing, which is the basic communication medium for all engineers.

• To provide practical exposure on important aspects like drawing analytic curves, orthographic projections, section of solids, development of surfaces, isometric projection, perspective projection and free hand drawing.

• To introduce computerized drafting.

MODULE I  BASICS AND ENGINEERING CURVES  10

Drawing instruments, dimensioning, BIS conventions, types of lines, simple geometric constructions.

Conic sections: ellipse, parabola, hyperbola.

Special curves: cycloid, epicycloid, hypocycloid and involutes.

MODULE II  ORTHOGRAPHIC PROJECTION  8


MODULE III  PROJECTION OF STRAIGHT LINES AND PLANES  10

Projection of straight lines in first quadrant – true length and true inclinations – Rotating line and trapezoidal methods – traces of straight line.

Projection of plane lamina in first quadrant and its traces

MODULE IV  PROJECTION OF SOLIDS 10

Projection of solids in first quadrant: Axis inclined to one reference plane only - prism, pyramid, cone, cylinder – change of position and auxiliary projection methods.

MODULE V  SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 12

Section of solids: prism, pyramid, cone, cylinder, and sphere – sectional view – true shape of section Solids in simple position and cutting plane inclined to one reference plane only.

Development of surface of truncated solids: prism, pyramid, cone cylinder – frustum of cone, pyramid and simple sheet metal parts.
Module VI: pictorial projections

Isometric projection: Isometric scale – isometric axes - iso sheet - Isometric projection and view of prism, pyramid, cylinder, cone, frustums, truncated solids and simple products

Perspective projection: station point – vanishing point – Perspective projection and views of prism, pyramid, cylinder and frustums by Visual ray method.

L – 30; P – 30; TOTAL HOURS – 60

Text books:

References:

Outcomes:
- Students should be able to read the specifications and standards of technical drawing and able to draw conic sections and special curves.
- Students should be able to understand the insight of orthographic projection and to draw the various views of orthographic projection of a point and various components.
- Students should be able to draw the orthographic views of straight lines and plane figures.
- Students should be able to draw the orthographic views of simple solids.
- Students should be able to draw the sections of solids and development of solid surfaces.
- Students should be able to draw the isometric and perspective projection of simple solids and components.
OBJECTIVES:

- To understand the role of design in Engineering
- To understand the basic design concepts
- To understand the role of innovation in design

MODULE I DESIGN AS A CENTRAL ACTIVITY IN ENGINEERING

Product design – products and processes – product design methodology
Design of systems; Software design

MODULE II NEED ANALYSIS AND CONCEPT DEVELOPMENT

Voice of customers – product specification - need analysis Benchmarking
Product architecture – concept generation and evaluation;

MODULE III CASE STUDIES IN ENGINEERING DESIGN

Product design – process design; system design; software design
Ergonomics – usability

MODULE IV INNOVATION AND DESIGN

Role of innovation in Engineering – incremental changes and systemic changes;
scientific approach to driving innovation – case studies.

TOTAL HOURS – 30

REFERENCES:


OUTCOMES:
The students will be able to

- Apply the basic knowledge of design in engineering products / process / service.
- Analyse the problems and give innovative solutions.
- Correlate the basic knowledge of design in the real world problems.
- Apply innovative approaches to engineering design.
OBJECTIVES:

- To provide a practical exposure to basic engineering practices like carpentry, fitting, plumbing, welding and making of simple electrical and electronic circuits
- To have an understanding on the use of various tools, instruments and methods
- To enable the students to appreciate the practical difficulties and safety issues

CIVIL ENGINEERING PRACTICE

1. Study of plumbing in general household and industrial systems
2. Making a small window frame with Lap and Mortise & Tenon Joints
3. Introduction to power tools

MECHANICAL ENGINEERING PRACTICE

1. Fabrication of a small Table frame with Butt, Lap and Fillet Joints
2. Machining of a simple component like a table weight using lathe
3. Mold preparation for simple component

ELECTRICAL ENGINEERING PRACTICE

1. Comparison of incandescent, Fluorescent, CFL and LED lamps.
2. Study of Protection Circuits (small relay, fuse, MCB, HRC, MCCB, ECCB).
3. Familiarization of households Electrical Gadgets (Iron Box, Wet Grinder).
4. Understanding of Domestic and Industrial wiring.
5. Earthing and its significance.
6. Troubleshooting in Electrical Circuits.
7. Study of inverter fed UPS/Emergency lamp

ELECTRONICS ENGINEERING PRACTICE

1. Identifications symbolic representation of active and passive electronic components
2. Soldering and tracing of electronic circuits and checking its continuity
3. Assembling of A.C. to D.C, D.C to A.C. Circuits in bread Board and Mini project

TOTAL HOURS – 30

OUTCOMES:
Upon the completion of the course, students should be able to

- Appreciate the practical skills needed even in making of simple objects, assemblies and circuits
- Attend minor defects especially in items used in day to day life
• Aware of the safety aspects involved in using tools and instruments
OBJECTIVES:

- To identify the hardware and software components of the computer.
- To know the basic concept of operating system and get knowledge about different operating systems.
- To learn various database concepts and operations.
- To develop efficient algorithms for solving a problem.
- To implement the algorithms in C language.
- To use arrays in solving problems.

MODULE I  COMPUTER FUNDAMENTALS  7

Introduction - . Number System - Planning the computer program - Computer Software - Basic operating system concepts - Database Operations

MODULE II  PROGRAMMING IN C  8

Introduction to C Programming Language – Operators - Control statements - Iterative statements - Arrays.

LIST OF EXPERIMENTS:

1. Computer organization – Hardware in a typical computer Identification – Booting - error messages and what it means
2. Types of Operating systems – Windows and Linux
3. Structure of a basic program – Hello world program – Debugging it
4. Data types: Type conversions
5. Input / Output: Formatted functions – Unformatted functions – Library functions
6. Properties of operators – Priority of operators – Arithmetic relational logical and bitwise operators
8. Arrays – Operation with arrays
9. Sorting and searching.

L – 15; P – 30; TOTAL HOURS – 45

REFERENCES:


OUTCOMES:

Students who complete this course will be able to

- Recognize Modular design, logic flow, data abstraction
- Analyze the working of the programming constructs, functions, and I/O.
- Write down programs for sorting and searching algorithms
- Write down programs developing cycle for different applications
- Debug the programs and solve some practical problems in programming
- Develop programs using arrays.
OBJECTIVES:
The aims of this course are to

- train the students in solving problems using multiple integration.
- provide knowledge in using special functions to find out the area and volume of a region.
- acquire knowledge in tangent and normal vectors.
- gain knowledge in finding the areas of a curve and surface using vector integration.
- learn about the analytic functions and their properties along with bilinear transformation.
- know complex integration using Cauchy’s theorems.

MODULE I   MULTIPLE INTEGRATION AND ITS APPLICATIONS  8+2
Multiple integrals– Cartesian and Polar coordinates – change of order of integration – Multiple integral to compute area and volume.

MODULE II  TRANSFORMATION OF COORDINATES AND SPECIAL FUNCTIONS  7+3
Change of variables between Cartesian, polar, cylindrical and spherical coordinates - Beta and Gamma functions – Properties and applications.

MODULE III  VECTOR DIFFERENTIATION  7+3
Operations on vectors – Scalar Product, Vector Product, Projection of Vectors - Angle between two vectors - Gradient, divergence and curl

MODULE IV  VECTOR INTEGRATION  8+2
Line, surface and volume integrals – Green’s Theorem, Gauss Divergence Theorem and Stokes Theorem (statement only) – verification and evaluation of integrals.

MODULE V  ANALYTIC FUNCTION  8+2
Analytic function - Necessary and Sufficient condition (statement only) – Cauchy-Riemann equations in polar coordinates - properties of analytic function – determination of analytic function – conformal mapping (w = z+a, az and 1/z) and bilinear transformation.
MODULE VI  COMPLEX INTEGRATION  7+3

Statement and application of Cauchy’s integral theorem – Cauchy’s integral formula – Taylor’s series and Laurent’s series expansion – singularities - classification – residues - Cauchy’s residue theorem – contour integration – Unit circle and semi circular contours (excluding poles on the real axis).

L – 45; T – 15; TOTAL HOURS – 60

TEXT BOOKS:


REFERENCES:


OUTCOMES:

After completing the course, student will be able to

- compute the area and volume using multiple integrals.
- apply special functions to solve integration problems.
- apply differentiation in scalar and vector fields.
- find area and volume of a region using vector integration.
- verify analyticity, conformity and bilinearity of complex functions.
- evaluate complex integrals.
OBJECTIVES:

- To impart knowledge about the basic laws of statics and dynamics and their applications in problem solving
- To acquaint both with scalar and vector approaches for representing forces and moments acting on particles and rigid bodies and their equilibrium
- To give on exposure on inertial properties of surfaces and solids
- To provide an understanding on the concept of work energy principle, friction, kinematics of motion and their relationship

MODULE I VECTOR APPROACH TO MECHANICS


MODULE II EQUILIBRIUM OF PARTICLE

Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Principle of transmissibility - Single equivalent force

MODULE III EQUILIBRIUM OF RIGID BODY

Free body diagram - Types of supports and their reactions - requirements of stable equilibrium - Moments and Couples - Moment of a force about a point and about an axis - Vectorial representation of moments and couples - Scalar components of a moment - Varignon’s theorem - Equilibrium of Rigid bodies in two dimensions - Examples

MODULE IV PROPERTIES OF SURFACES

Determination of Areas - First moment of area and the Centroid of sections - Rectangle, circle, triangle from integration - T section, I section, Angle section, Hollow section by using standard formula - second and product moments of plane area - Physical relevance - Rectangle, triangle, circle from integration - T section, I section, Angle section, Hollow section by using standard formula - Parallel axis theorem and perpendicular axis theorem - Polar moment of inertia-
MODULE V  FRICITION  08
Introduction to friction- types of friction- Laws of Coloumb friction- Frictional force
– simple contact friction – Rolling resistance –ladder friction

MODULE VI  LAWS OF MOTION  10
Impulse and Momentum – Impact of elastic bodies.

L – 45; T – 15; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
On completion of this course students should be able

- Analyse and resolve forces, moments and solve problems using various principles and laws of Mechanics
- Apply the concept of equilibrium to particles and solve problems
- Apply the concept of equilibrium to rigid bodies and solve problems
- Analyse and determine the properties of surfaces
- Analyse and evaluate the fractional forces between the bodies
- Apply the laws of motion in solving dynamics problems
OBJECTIVES:
The student will be conversant with the
- various natural resources, availability, utilisation and its current scenario
- different ecosystems, energy transfer, values, threats and conservation of biodiversity
- levels of different pollutants and its impact and the causes and effects of natural disasters
- impacts of human population, impact assessment, human rights and environmental acts and sustainable development

MODULE I  NATURAL RESOURCES  8
Land resources: land degradation, soil erosion and desertification - Forest resources: use and over-exploitation, deforestation - Water resources: use and over-utilisation of surface and ground water, conflicts over water (inter-state and international), dams (benefits and problems), water conservation (rainwater harvesting and watershed management) - Mineral resources: use and exploitation, environmental effects of extracting and using mineral resources, mining - Food resources: world food problems, changes in land use by agriculture and overgrazing, modern agriculture and its effects, fertilizer and pesticide problems, water logging and salinity - Energy resources: increasing energy needs, renewable and non-renewable, use of alternate energy sources.

MODULE II  ECOSYSTEM AND BIODIVERSITY  8
Ecosystem- energy flow in the ecosystem - food chains, food webs and ecological pyramids - characteristics, structure and function of (a) Terrestrial ecosystems (forest, grassland, desert) and (b) Aquatic fresh water ecosystems (pond, lake, river) (c) Aquatic salt water ecosystems (ocean, estuary) - ecological succession.

MODULE III  ENVIRONMENTAL POLLUTION AND NATURAL DISASTER  8
Definition, cause, effects and control measures of (a) air pollution (b) water pollution...
pollution (c) soil pollution (d) marine pollution (e) noise pollution (f) thermal pollution (g) nuclear hazards - ill-effects of fireworks and upkeep of clean environment - solid waste management: types (urban, industrial, biomedical and electronic wastes), collection, processing and disposal (incineration, composting and land-fill) - natural disaster and management: flood, cyclone, drought, landslide, avalanche, volcanic eruptions, earthquake and tsunami.

**MODULE IV HUMAN POPULATION, HEALTH AND SOCIAL ISSUES**

Population and population growth, population variation among nations, population explosion, family welfare programme.
Human health: air-borne, water borne diseases, infectious diseases, risks due to chemicals in food and environment.

**Case studies related to current situation**

**TOTAL HOURS – 30**

**TEXT BOOKS:**

**REFERENCES:**
OUTCOMES:

The student will be able to

- predict the scenario of various natural resources and suggest remedies to curb the exploitation of these resources.
- identify food chain and web and its role in various ecosystems, assess the impacts on biodiversity and provide solutions to conserve it.
- analyse the impacts of pollutants in the environment and propose suitable method to alleviate the pollutants and the natural disasters.
- assess on the impact of human population and the health related issues and the ethics to be followed for sustainable life.
OBJECTIVES:

- To provide knowledge about the benefits of Object Oriented Programming over Procedure oriented programming.
- To learn various File operations
- To expose fundamental concepts of object-oriented programming in classes, invoking methods and functions.
- To prepare students to get full use of code reusability using object oriented programming.
- To implement the basic concepts of object oriented programming using C++
- To focus on solving problems based on analyzing, designing and implementing programs in C and C++.

MODULE I PROGRAMMING IN C


MODULE II PROGRAMMING IN C++

Programming in C++ - Overview of OOP in C – Inheritance - Polymorphism - Type Casting – Exceptions.

LIST OF EXPERIMENTS:

1. Functions
2. One dimensional arrays, Pointers
3. Recursion
4. Multi dimensional arrays, Linked lists.
5. Operating on Files.
6. Simple C++ program with Control statements.
7. Getting input from user console.
8. Classes, Object and Constructors.
10. Inheritance

L – 15; P – 30; TOTAL HOURS – 45

REFERENCES:

2. Brian W. Kernighan and Dennis M. Ritchie, “The C Programming


OUTCOMES:

Students who complete this course will be able to

- Develop efficient algorithms for solving problems
- Handle files in C
- Use simple data structures like arrays and linked lists in solving problems.
- Write simple programs using concepts of object oriented programming.
- Implement algorithms in C++ Language.
- Demonstrate the Object Oriented Programming concepts applied in networking, web development and Database applications.
OBJECTIVES:

• To learn circuit laws, theorems and circuit solution methods
• To be able to analyze DC and AC circuits
• To be able to analyze magnetic circuits and magnetically coupled electric circuits

MODULE I  DC CIRCUITS  8

Circuit elements: R, L and C - sources: Independent (ideal and practical), and dependent voltage and current sources - ohm’s and Kirchhoff’s laws - power and energy - solution of DC circuits - use of source transformations - network reduction by Y-∆ transformations.

MODULE II   AC FUNDAMENTALS  7

Sinusoidal voltages and currents: Average and RMS Values, peak and form factors - concept of phasor and its use in representing sinusoidal voltages and currents - impedance and admittance - Real, reactive and apparent power – Power factor and its practical importance -Analysis of simple series and parallel circuits.

MODULE III  AC NETWORK ANALYSIS  7

Solution of series-parallel AC circuits - Resonance: RLC series and parallel resonance, resonant frequency, half-power frequencies, Q-factor – Design of Resonant circuits - Node voltage and mesh current method of analysis - concept of super nodes and super meshes.

MODULE IV  NETWORK THEOREMS  8

Network Theorems: Superposition theorem, Millman’s Theorem, Thevenin’s Theorem, Norton’s Theorem and Maximum power transfer theorem - Application to DC and AC networks

MODULE V  MAGNETIC CIRCUITS  8

Magnetic circuits: Definition of magnetic quantities i.e., permeability, flux, flux density, field intensity and their units and relationships - magnetic curves of ferromagnetic materials - magnetic circuit concept and analogies - magnetic circuit computations - Hysteresis and eddy current losses.

MODULE VI  COUPLED AND THREE PHASE CIRCUITS  7

Magnetically coupled circuits: self and mutual inductances, Dot rule for coupled circuits.
circuits, coupled circuits analysis and applications - Three phase circuits: generation of 3 - phase voltages - star and delta connection - relation between phase and line quantities - balanced and unbalanced 3 - phase loads - power measurement by 2 - wattmeter method - Application of two wattmeter method of power measurement.

L – 45; T – 15; TOTAL HOURS – 60

REFERENCES:


OUTCOMES:

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

- Calculate currents, voltages and powers in typical DC electric circuits.
- Analyze circuits with ideal, independent, and controlled voltage and current sources.
- Apply node-voltage analysis and mesh-current analysis techniques to analyze circuit behavior.
- Reduce circuits into equivalent circuits by applying network theorems.
- Perform steady state analysis on AC circuits and to design resonant circuits
- Implement the concept of magnetic circuits and coupled circuits in magnetic circuits
- Perform the calculations on three phase circuits and implement in practical circuits.
OBJECTIVES:
- To impart hands on experience in verification of Electric Circuit laws and Theorems
- To verify Electric Circuit laws and theorems using MatLab / PSpice
- To implement power measurement methods for three phase circuits.

LIST OF EXPERIMENTS:
1. Verification of Kirchhoff’s Voltage and Current Laws
2. Verification of Thevinin’s and Norton’s Theorem
3. Verification of Superposition and Maximum Power Transfer Theorem
4. Study of Oscilloscope and measurement of sinusoidal voltage, frequency and power factor
5. Study of the effect of Q on frequency response of series and parallel resonant circuits
6. Measurement of real power, reactive power, power factor and impedance of RL, RC and RLC circuits using 3 voltmeters and 3 ammeters
7. Power measurement in a three phase circuit using two wattmeter method
8. Verification of Kirchhoff’s Voltage and Current Laws using MatLab / PSpice
9. To obtain Thevenin’s and Norton’s equivalent circuits using PSpice / MatLab
10. To verify Maximum power Transfer theorem and Superposition theorem using PSpice / MatLab
11. Simulation of three phase power measurement by two wattmeter method using MatLab

TOTAL HOURS – 30

REFERENCES:
OUTCOMES:

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

- Conduct basic laboratory experiments involving electrical circuits using laboratory test equipments such as power supplies, signal generators, oscilloscopes, multimeters etc.
- Implement and verify network theorems
- Implement three phase power measurement method using two wattmeter method
- Relate physical observations and measurements involving electrical circuits to theoretical principles.
- To simulate various electric circuits using PSpice and MaTLab simulation.
- For electric circuits the performance evaluations can be done using simulation tools.
Physics Elective Courses
(to be offered in II Semester)

PHCX 01 FUNDAMENTALS OF ENGINEERING MATERIALS

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OBJECTIVES:

- To help students to acquire the properties and applications of conducting and semiconducting materials.
- To familiarize students with basic ideas about the properties of dielectric and magnetic materials and their applications.
- To familiarize students with basic knowledge of nanomaterials and its electrical, electronic, mechanical and magnetic properties.
- To enable the students to correlate theoretical principles with practical applications.

MODULE I CONDUCTING AND SEMICONDUCTING MATERIALS

Conductors: properties, Fermi distribution function, Fermi energy in metals-density of states- conducting polymers-properties-applications, semiconductors: intrinsic and extrinsic semiconductors-carrier concentration, conductivity and energy band gap, semiconducting polymers- properties- applications.

MODULE II DIELECTRIC MATERIALS

Polarization- dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – Internal field - Clausius Mosotti relation - dielectric loss – dielectric breakdown – applications of dielectric materials (capacitors and transformers) – Pyroelectricity, Piezoelectricity, ferroelectricity and applications in Ferroelectric Random Access Memory (FeRAM) - multiferroic materials and its applications.

MODULE III MAGNETIC MATERIALS


MODULE IV NANOMATERIALS

Properties of nanomaterials – size effect on thermal, electrical, electronic,

PRACTICALS
1. Determination of energy band gap of a semiconductor.
2. Determination of resistivity of metals by four point probe method.
3. Determination of dielectric constant of dielectric material.
5. Determination of paramagnetic susceptibility of given liquid.
7. Analysis of size effect on the absorption spectrum of nanomaterials.

REFERENCES:
5. Charles P. Poole and Frank J. Owens, "Introduction to nanotechnology", Wiley (India), 2009.

OUTCOMES:
On completion of this course, the student will be able to
- apply the concepts of conducting and semiconducting materials for solid state devices.
- comprehend the significance of properties of dielectric magnetic materials and derive these properties from synthesized materials.
- differentiate between the properties of the nanomaterials compared to bulk materials.
- complement the knowledge acquired in the theory class and correlate the results for applications.
OBJECTIVES:

- To familiarize students with basic concepts of heat.
- To help students acquire the fundamentals of heat conduction and radiation.
- To enable students acquaint with the basics of thermodynamic concepts.
- To make students understand the fundamentals of heat based experiments.

MODULE I   CONCEPTS OF HEAT

Definition of temperature, thermal and thermodynamic equilibrium - relationship between temperature and kinetic energy - definition of solid, liquid, gas - Introduction to phase transitions, critical and triple points- definition of heat capacity, mechanical equivalent of heat - Joule's calorimeter- latent heat- microscopic model of ideal gas - equation of state, internal energy, equipartition theorem- equation of state for non-ideal gases.

MODULE II   CONDUCTION AND RADIATION


MODULE III   FUNDAMENTALS OF THERMODYNAMICS


PRACTICALS

1. Determination of mechanical equivalent of heat by Joule’s calorimeter.
2. Relation between temperature of a body and time by plotting a cooling curve- Newton’s law of cooling.
3. Determination of specific heat capacity of liquid by cooling.
4. Determination of thermal conductivity of a good conductor-Forbe’s method
5. Determination of thermal conductivity of a bad conductor-Lee’s disc method

L – 30; P – 30; TOTAL HOURS – 60
REFERENCES:

OUTCOMES:
On completion of this course, the student will be able to
• understand the concepts of heat and its properties.
• comprehend the ideas governing the conduction and radiation processes.
• apply the knowledge of laws of thermodynamics in thermodynamic systems.
• perform heat based experiments and determine its various properties.
OBJECTIVES:

- To acquire basic knowledge about the nanomaterials and applications.
- To learn about the synthesis and imaging techniques of nanomaterials.
- To gain the basic concepts of fabrication techniques.
- To enable the students to correlate theoretical principles with practical applications.

MODULE I  NANOMATERIALS AND APPLICATIONS


MODULE II  SYNTHESIS AND IMAGING TECHNIQUES


Optical microscopy – Phase contrast and interference microscopy – confocal microscopy - high resolution Scanning electron microscope (HRSEM) - high resolution Transmission electron microscope (HRTEM) - Atomic force microscope - Scanning Tunnelling microscope (STM).

MODULE III  NANOFABRICATION

Photolithography - electron beam lithography - X-ray and Ion beam lithography - nanoimprint lithography - soft lithography - nanoelectromechanical systems (NEMS) - nanoindentation principles.

PRACTICALS

2. Synthesis of nanomaterials by hydrothermal method.
4. Synthesis of nanomaterials by chemical bath deposition method.
5. Synthesis of nanomaterials by co-precipitation method.
7. Synthesis of nano thin films by pulsed laser deposition (PLD) method.
8. Analysis of size effect on the absorption spectrum of nanomaterials.
9. SEM characterization of nanomaterials.
10. AFM characterization of nano thin films.
11. Phase confirmation by XRD.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
At the end of the course, the students will be able to
• understand the importance and basic concepts of the nanomaterials.
• comprehend the imaging techniques for nanomaterials.
• illustrate the various nanofabrication techniques.
• complement the knowledge acquired in the theory class and correlate the results for applications.
OBJECTIVES:

- To recognize the fundamentals of laser and its characteristics.
- To comprehend and compare the different laser systems.
- To apply lasers in metrology and material processing.
- To understand the working of laser instrumentation.
- To correlate the experimental results for applications.

MODULE I  LASER THEORY  8


MODULE II  DIFFERENT LASER SYSTEMS  8


MODULE III  METROLOGICAL AND MATERIAL PROCESSING APPLICATIONS  8

CW and Pulsed laser beam characteristics and its measurements - Beam focusing effects - spot size - Power and Energy density Measurements - Distance measurement - Interferometric techniques - LIDARS - different experimental arrangements - Pollution monitoring by remote sensing - Laser gyroscope - Laser welding, drilling, machining and cutting - Laser surface treatment - Laser vapour deposition – Biophotonic applications.

MODULE IV  LASER INSTRUMENTATION  7

Laser for measurement of length, current and voltage – Laser Doppler Velocimetry - Holography and speckle in displacement and deformation measurements - Laser for communication with fiber optics as channel.

PRACTICALS

1. Tuning of Dye Laser using DFDL Arrangement
2. Determination of Brewster Angle using He-Ne laser
3. Study of transversely Pumped Dye Lasers
4. Study of longitudinally Pumped Dye Lasers
5. Determination of power and wavelength using Distributed Feedback Dye
7. Bandgap determination of a semiconductor diode.

**L – 30; P – 30; TOTAL HOURS – 60**

**REFERENCES:**

**OUTCOMES:**
At the end of the course, the students will be able
- To complement the knowledge acquired in the theory class.
- To work with dye lasers for tunability of laser wavelength.
- To measure the loss of information involved in fibre optic communication.
- To correlate the results for application.
OBJECTIVES:

- To gain basic knowledge in conducting and semiconducting materials and their properties.
- To provide basic understanding of properties and applications of dielectric materials.
- To impart knowledge on magnetic and optical materials and their properties & applications.
- To enable the students to correlate theoretical principles with practical applications.

MODULE I CONDUCTING AND SEMICONDUCTING MATERIALS

Quantum free electron theory of metals and its importance - Energy distribution of electrons in metals - Fermi distribution function - Density of energy states and carrier concentration in metals - Fermi energy – Classification of solids into conductors, semiconductors and insulators on the basis of Band theory – Introduction to Elemental and Compound semiconductors - Carrier concentration derivation for Intrinsic semiconductors - Density of electrons in conduction band & Density of holes in valence band- intrinsic carrier concentration - Fermi energy & Variation of Fermi energy level with temperature - Mobility and electrical conductivity - Band gap determination.

MODULE II DIELECTRIC MATERIALS


MODULE III MAGNETIC MATERIALS


MODULE IV OPTICAL MATERIALS

Optical properties of semiconductors - Direct and Indirect bandgap semiconductors – Traps, recombination centre, color center and exciton –

PRACTICALS
1. Resistivity measurement of a semiconductor using four point probe method.
2. Determination of band gap of a semiconductor diode.
3. Determination of Hall coefficient of a given semiconductor material.
4. Determination of dielectric constant of a given non-polar liquid.
5. Determination of magnetic susceptibility of a given paramagnetic liquid using Quincke’s method.
6. Determination of energy loss of a given transformer core using hysteresis method.
7. To study the I-V characteristics of a photodiode.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
On the completion of this course, the students will be able to
- Gain knowledge about fundamentals of conducting and semiconducting materials.
- Understand concepts and applications of Dielectric and Magnetic materials.
- Familiarize Optical materials and their applications in Engineering and Medical fields.
- Complement the knowledge acquired in the theory class and correlate the results for applications.
OBJECTIVES:
- To study the process and applications of ultrasonic inspection method.
- To understand the basic concepts of radiographic inspection method.
- To acquire the knowledge about the various surface Non-Destructive Testing (NDT) techniques.
- To enable the students to correlate theoretical principles with practical applications.

MODULE I  ULTRASONIC INSPECTION METHOD  10

MODULE II  RADIOGRAPHIC INSPECTION METHOD  10

MODULE III  SURFACE NDT TECHNIQUES  10
Liquid Penetrant Testing – Principles, Characteristics and types of liquid penetrants – developers - advantages and disadvantages of various methods - Inspection Procedure and Interpretation of results. Applications of Liquid Penetrant testing.
Magnetic Particle Testing - Principle-magnetizing technique - procedure – equipment - Interpretation and evaluation of test indications - applications and limitations - demagnetization.

PRACTICALS
1. Inspection of welds using solvent removable visible dye penetrant.
2. Inspection of welds using solvent removable fluorescent dye penetrant.
3. Inspection on non magnetic materials by eddy current method.
4. Inspection on magnetic materials by eddy current method.
5. Inspection of welds by Eddy current Testing.
6. Inspection of welds by Magnetic Particle Testing - Dry method.
7. Inspection of welds by Magnetic Particle Testing - Wet method.
8. Ultrasonic flaw detector - Inspection of defects.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:

Upon completion of this course, the students will be able to
- illustrate the ultrasonic inspection methods of NDT.
- understand the basic concept of radiographic inspection method.
- test the surfaces by the various surface NDT techniques.
- complement the knowledge acquired in the theory class and correlate the results for applications.
OBJECTIVES:
- To understand principles and properties of elasticity.
- To understand the basic concepts and application of viscosity.
- To analysis acoustic of building.
- To know about photoelasticity and its applications.

MODULE I  ELASTICITY  8

MODULE II  VISCOSITY  8

MODULE III  ACOUSTICS OF BUILDING  7
Basic requirement for the acoustically good halls - Reverberation and time of reverberation – Sabine’s formula for reverberation time - Absorption coefficient and its measurement -Transmission of sound and transmission loss - Factors affecting the architectural acoustics and their remedy-sound absorbing materials - vibration and noise control systems for buildings.

MODULE IV  PHOTOELASTICITY  7
Polarization - double refraction - Theory of Plane, Circularly and Elliptically polarized light - Quarter wave plate and half wave plate - photo elasticity - Theory of photo-elasticity - Stress optic relations - model materials - analysis techniques - Photo elastic bench - Three dimensional photo elasticity - Digital photo elasticity - Photo elastic coatings.

PRACTICALS
1. Determination of viscosity of liquid by Poiseuille’s method.
2. Determination of viscosity of liquid by Stoke’s method.
4. Verification of Hooke’s law by spring method.
5. Determination of Young’s modulus of the cantilever beam.
6. Determination of rigidity modulus by static torsion method.
7. Visit to acoustically good auditorium and identifying the sound absorbing materials in the auditorium.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
Upon completion of this course, the students will be able to
• understand the basic concepts of the elasticity of materials.
• comprehend the concepts of viscosity of liquid and measurement.
• demonstrate the acoustical aspects of building and its importance in construction.
• apply the fundamental concept of photo elasticity for the stress analysis of the object.
OBJECTIVES:
- To impart knowledge about the principles and properties of elasticity.
- To learn the laws governing the dynamic of rigid bodies.
- To acquire the knowledge of the various techniques of Non-Destructive Testing (NDT) of materials.
- To understand the principle and basic concept of low temperature applications.

MODULE I  ELASTICITY

Stress and strain - Hooke’s Law of elasticity - Elastic moduli - Stress-Strain Diagram - Poisson’s Ratio - Relation between elastic constants - Work done in stretching and twisting a wire - Twisting couple on a cylinder - Expression for bending moment-Cantilever - Expression for depression - Uniform Bending and Non-uniform bending of beams (theory & experiment) - I form Girders (qualitative treatment) and applications.

MODULE II  DYNAMICS OF RIGID BODIES


MODULE III  NDT TECHNIQUES


MODULE IV  LOW TEMPERATURE PHYSICS


PRACTICALS
1. Verification of Hooke’s law by spring method.
2. Determination of Young’s modulus of the beam by bending method.
3. Inspection of welds using solvent removable visible dye penetrant.
4. Inspection of welds using solvent removable fluorescence dye penetrant.
5. Inspection of welds by Magnetic Particle Testing.
7. Determination of moment of inertia of the disc by static torsion method.
8. Demonstration of working of flywheel.

**REFERENCES:**


**OUTCOMES:**

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

- understand the basic concept of elasticity of materials.
- comprehend the basic concepts of motion of rigid bodies and its applications.
- demonstrate the various NDT techniques and its importance.
- know the low temperature systems and its applications.
OBJECTIVES:
- To understand the Physics of Semiconductor devices.
- To make the students learn the fundamentals of Photoluminous - semiconductor, Optoelectronic devices, Optical modulators/detectors.
- To make them understand the technology behind latest Display devices like LCD, Plasma and LED Panels.
- To enable the students to correlate theoretical principles with practical applications.

MODULE I PHYSICS OF SEMICONDUCTORS
Elemental and compound semiconductors – Drift and diffusion current - Intrinsic semiconductors – Carrier concentration (derivation) – Fermi energy – Variation of Fermi energy level with temperature – Mobility and electrical conductivity – Band gap determination – Extrinsic semiconductors – Carrier concentration in \( n \)-type and \( p \)-type semiconductor (derivation) – Variation of Fermi level with temperature and impurity concentration – Variation of Electrical conductivity with temperature – Hall effect – Experiment and applications of Hall effect.

MODULE II OPTOELECTRONIC DEVICES

MODULE III OPTICAL MODULATORS

MODULE IV OPTICAL DETECTORS
Photo detectors - photodiodes - phototransistors - noise characteristics - PIN diode – Avalanche Photodiode (APD) characteristics - APD design of detector arrays – Charged Couple Device - Solar cells - Materials and design considerations, Thin film solar cells, amorphous silicon solar cells.

PRACTICALS
1. Resistivity measurement of a semiconductor using four point probe method.
2. Determination of band gap of a semiconductor diode.
3. Determination of Hall coefficient of a given semiconductor material.
4. Determination of the wavelength of a given laser source using diffraction grating.
5. Determination of Planck’s constant using LED.
6. To study the I-V characteristics of photodiode and phototransistor.
7. To study the characteristics of a solar cell.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
On completion of this course, the student will be able to
- understand the principles of Physics behind semiconductor devices.
- choose the correct semiconductors for electronic devices and display.
- differentiate the working principle of LED and Diode Laser.
- apply the knowledge of modulation of light for different types of optical modulators.
- select suitable photodetectors for different types of applications.
- complement the knowledge acquired in the theory class and correlate the results for applications.
Chemistry Elective Courses
(to be offered II Semester)

CHCX01    ANALYTICAL INSTRUMENTATION    L    T    P    C

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OBJECTIVES:
To make the student conversant with

- principles, instrumentation and applications of different
electroanalytical techniques
- different chromatographic techniques
- principles, instrumentation and applications of various types of
  absorption and emission spectroscopy
- different thermal analytical methods and their applications

MODULE I    ELECTROANALYTICAL TECHNIQUES    7

Principle and applications: conductometric titrations – potentiometric titrations,
ion-selective electrodes and pH-metry – coulometry – voltammetry –
polarography, amperometric titrations.

MODULE II    CHROMATOGRAPHY    8

Basic concepts of chromatography – paper chromatography – column
chromatography – thin layer chromatography – gas chromatography – high
performance liquid chromatography – gel permeation chromatography.

MODULE III    SPECTROSCOPY    8

Absorption spectroscopy (principle, instrumentation and applications):
Colorimetric analysis – UV-Visible spectroscopy – FTIR spectroscopy – Emission
Spectroscopy (principle, instrumentation and applications): fluorescence,
phosphorescence and chemiluminescence – Atomic absorption spectroscopy –
flame emission spectroscopy.

MODULE IV    THERMAL ANALYSIS    7

Principle, instrumentation and applications: Thermogravimetric analysis –
Differential thermal analysis – Differential scanning calorimetry

PRACTICALS

1. Conductometric titrations: acid-base and precipitation titrations
2. Potentiometric titrations
3. Determination of pH of the unknown solution
4. Estimation of alkali metals using flame emission spectroscopy
5. Estimation of metal ions of coloured solutions using colorimetric analysis
6. Separation of compounds using gas chromatography
7. Separation of compounds using high performance liquid chromatography
8. Analysis of the given sample and interpretation of the data using IR, UV-Visible spectroscopy
9. Demonstration of TGA/DTA and DSC and interpretation of data.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:

The student will be able to
- state the principle and applications of various electro-analytical techniques
- identify the right separation method for a given sample using different chromatographic techniques
- explain the principle, instrumentation & applications of various spectroscopic methods and also to interpret the data
- elaborate the principle, instrumentation and applications of various thermal analytical techniques and interpret the data.
OBJECTIVES:
The students should be conversant with the
- Basic concepts, principles and factors affecting corrosion
- Types and mechanism of corrosion
- Control measures of corrosion by material selection, proper design and by applying organic coatings
- Control of corrosion by applying inorganic coating

MODULE I  BASIC CONCEPTS OF CORROSION  8

MODULE II  FORMS OF CORROSION  7

MODULE III  CORROSION CONTROL AND ORGANIC COATINGS  8

MODULE IV  INORGANIC COATINGS  7
coatings (chemical conversion coatings) : phosphate, chromate, oxide coatings and anodizing – comparison of anodic and cathodic protection.

PRACTICALS

1. Determination and comparison of rate of corrosion of metals in the presence of acid, base and neutral medium by weight loss method.
2. Determination of rate of corrosion of iron in the presence of various acids by weight loss method.
3. Determination of rate of corrosion of iron in the presence and absence of anodic Inhibitor by weight loss method.
4. Determination of rate of corrosion of iron in the presence and absence of cathodic Inhibitor by weight loss method.
5. Electroplating of base metal with copper.
6. Electrolessplating of base metal with copper
7. Chemical conversion coatings such as chromate and phosphate coatings.
8. Demonstration on the study of rate of corrosion by using cyclic voltametry.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:


OUTCOMES:

Students will be able to

- explain the mechanism, compare and enumerate the factors affecting corrosion
- describe and identify the place and types for a given situation.
- choose and elaborate the suitable organic coating method for a given real time situation.
- apply a suitable metallic coating for a given situation
OBJECTIVES:
The students should be conversant with
- preparation, properties and applications of plastics used in electrical and electronic applications
- properties and uses of electrical engineering materials
- classification and description of different types of batteries.
- classification and types of fuel cells

MODULE I POLYMERS FOR ELECTRICAL AND ELECTRONIC APPLICATIONS
Preparation, properties and applications: polyethylene, polypropylene, EPDM, Nylon-6,6, PVC, PTFE, polycarbonates, ABS, phenol formaldehyde, urea formaldehyde, epoxy resins – polymer blends and alloys.

MODULE II ELECTRICAL ENGINEERING MATERIALS

MODULE III BATTERIES

MODULE IV FUEL CELLS
Difference between batteries and fuel cells - chemistry of fuel cells - types of fuel cell (based on temperature and electrolyte) – principle, characteristic features, advantages, disadvantages and applications of polymer electrolyte membrane or proton exchange membrane fuel cell (PEMFC), direct methanol fuel cell (DMFC), alkaline fuel cell (AFC), phosphoric acid fuel cell (PAFC), molten carbonate fuel cell (MCFC) and solid oxide fuel cells (SOFC).

PRACTICALS
1. Free radical polymerization of styrene.
2. Free radical polymerization of PMMA.
4. Preparation of urea-formaldehyde.
5. Synthesis of epoxy resin.
6. Demonstration of mechanical properties of insulating materials using UTM
7. Demonstration of electrical properties of insulating materials
8. Construction of batteries using natural resources
9. Measurement of EMF for different batteries.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
The student will be able to
- summarise the preparation, properties and applications of plastics used in electrical and electronic applications
- enumerate the properties and uses of electrical engineering materials
- illustrate various types of batteries with the aid of a diagram
- classify the fuel cells and elaborate the different types of fuel cells.
OBJECTIVES:
The students should be conversant with
- properties and uses of different types of refractories and abrasives
- adhesives, cements and lime, setting of cements and their chemical behaviors.
- types, properties and uses of lubricants.
- various types of composite materials.

MODULE I  REFRACTORIES AND ABRASIVES

Introduction refractory:
- classification - based on chemical nature - characteristic and selection of good refractory - general manufacture of refractory - preparation properties and uses of: silica refractory - magnesite refractory - zirconia refractory, properties of refractories: refractoriness - refractoriness under load - thermal spalling - porosity and dimensional stability,
- Cermets - super refractory.


MODULE II  ADHESIVES AND BINDING MATERIALS


MODULE III  LUBRICANTS


MODULE IV  COMPOSITE MATERIALS

Introduction – advantageous characteristics of composites, applications of composites, main constituent of composites, types and applications of

PRACTICALS

1. Preparation of refractory bricks
2. Preparation of abrasive papers/cloth
3. Preparation of simple adhesives
4. Estimation of alkalinity in cements
5. Determination of cloud point and pour point
6. Determination of flash point and fire point
7. Preparation of fibre-reinforced composite

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

3. Engineering Chemistry, Wiley India Editorial Team, Willey India Publisher, New Delhi, 2011.

OUTCOMES:

The student will be able to

- classify and describe the manufacture the refractories and enumerate the properties and uses of abrasive materials.
- elaborate the manufacture, properties and uses of various adhesives and binding materials.
- classify lubricants and describe the properties and uses of them
- enumerate the properties and uses of various composite materials.
OBJECTIVES:
To make the students conversant with the
- three types of fuels available and the different processes involved in it.
- analysis of fuel characteristics and manufacture of fuels
- calculations involved in calorific values and minimum air requirement for complete combustion.
- classification, functions, mechanism and properties of lubricants.

MODULE I  SOLID FUELS

MODULE II  LIQUID AND GASEOUS FUELS

MODULE III  COMBUSTION
Calorific value: Gross and net caloric value – Bomb Calorimeter, Gas calorimeter - Definition of combustion – calculation of minimum requirement of air (problems) – theoretical calculation of calorific values (Dulong’s formula), Gross and net calorific values (problems) – Analysis of flue gas: Orsat’s gas analysis method, explosive range, Ignition temperature. Introduction to air pollution from IC (Internal combustion) engines, photochemical smog, primary and secondary pollutants.

MODULE IV  LUBRICANTS
Friction and wear – lubricants: definition, functions and mechanism of lubrication (thick film and thin film) – classification: liquid lubricants: animal and vegetable origin, mineral oil, blended oils, lubricating emulsions and silicones – properties of lubricating oils: viscosity and viscosity index; Flash and fire-point, Cloud and pour point, oiliness, emulsification number,

PRACTICALS

1. Testing of fuels - proximate analysis (moisture, volatile matter, ash content and fixed carbon present in coal, coke, charcoal etc)
2. Ash content and carbon residue test
3. Biodiesel synthesis by trans-esterification method (from coconut, groundnut, mustard oil, palm oil)
4. Determination of calorific value of a solid fuel using Bomb calorimeter (coal, charcoal, coke etc)
5. Determination of calorific value of a liquid fuel using Bomb calorimeter (petrol, diesel, biodiesel etc)
6. Determination of cloud point and pour point of a lubricant
7. Determination of flash and fire point of diesel.
8. Aniline Point of diesel
9. Viscosity Index of lubricants and Fuels by Viscometer
10. Flue gas analysis by Orsat’s gas analysis method – Demonstration
11. Working of internal combustion engine - Demonstration

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

2. Engineering Chemistry, Wiley India Editorial Team, Willey India Publisher, New Delhi, 2011.

OUTCOMES:

The students will be able to

- compare and contrast the solid, liquid and gaseous fuels and also describe the processes involved in liquid and gaseous fuels.
- analyse the fuel properties such as moisture, volatile matter, ash content, calorific value etc.
- calculate minimum air required for complete combustion and calorific values of fuels.
- categorize different lubricants into three types, explain the preparation and determine their properties.
OBJECTIVES:
The students will be conversant with the
- various thermodynamic terms and relate the laws of thermodynamics in chemical processes
- molecularity and order of reaction and derive the rate constant for different order of reactions
- basics of adsorption of different materials and propose mechanisms and surface area measurement
- conditions for equilibrium and learn different components at equilibrium

MODULE I  BASIC THERMODYNAMICS  8
Introduction - Thermodynamic terms - Thermodynamic equilibrium and processes - 1st law of thermodynamics: internal energy, enthalpy, heat capacity, isothermal and adiabatic expansion, Joule-Thomson effect - Zeroth law of thermodynamics: absolute temperature - 2nd law of thermodynamics: spontaneous and cyclic process, Entropy in isothermal, isobaric and isochoric processes, work and free energy function, Maxwell's relation - 3rd law of thermodynamics

MODULE II  CHEMICAL KINETICS  8
Rate of chemical reaction - order and molecularity of a reaction - Rate constant - kinetics of opposing, parallel and consecutive and chain reactions - isotope effects - effect of temperature on reaction rate - collision theory - absolute reaction rate theory - kinetics in enzyme catalysis

MODULE III  SURFACE SCIENCE AND CATALYSIS  8
Adsorption - adsorption isotherms - uni and bimolecular adsorption reactions - parahydrogen conversion - factors affecting adsorption – Langmuir adsorption isotherm - Hinshelwood mechanism and Eley-Rideal mechanism with example - adsorption of gases on solids and surface area measurement by BET method - Terms in catalysis - homogeneous and heterogeneous and enzyme catalysis with example

MODULE IV  PHASE RULE  6
Terms involved - Conditions for equilibrium - application of phase rule to water, lead-silver system, freezing mixtures, thermal analysis: cooling curves.

PRACTICALS
1. Determination of the heat capacity of benzoic acid, internal energy of
combustion of camphor using Bomb calorimeter. Calculation of enthalpy of combustion and formation for camphor.
2. Determination of adsorption isotherm of (i) acetic acid on charcoal (ii) oxalic acid on charcoal.
4. Phase rule experiments with organic compounds: (i) naphthalene and p-dichloro benzene (ii) naphthalene and diphenyl (iii) m-dinitrobenzenzene and p-nitro toluene.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
The student will be able to
- calculate entropy, enthalpy and free energy change for different chemical processes
- calculate the rate constant for any chemical and biochemical processes
- differentiate the adsorption processes and calculate the surface area and predict the suitability of catalysts for different chemical processes
- predict the equilibrium conditions for water, alloys, freezing mixtures and draw the thermal curves for phase transition
OBJECTIVES:
To make students conversant with the
- basic principles of green chemistry and green technology.
- wastes that causes hazards to human health
- chemicals that harms our environment
- need for green processes in various industries

MODULE I  GREEN CHEMISTRY PROTOCOL  7

MODULE II  WASTE & WASTE MINIMISATION  8

MODULE III  GREEN SYNTHESIS  7
Introduction - Solvent free reactions - green reagents, green solvents in synthesis - microwave and ultrasound assisted reactions – supercritical fluid extraction – green oxidation and photochemical reactions – catalyst and biocatalysts.

MODULE IV  GREEN INDUSTRIAL PROCESSES  8

PRACTICALS
1. Synthesis of an ionic liquids (Ex: imidazolium) and testing the solubility of organic chemicals.
2. Green bromination of stilbene (using pyridine hydrobromide).
4. Microwave assisted chemical reaction. (synthesis of aspirin, pinacol-
pinacolone reaction, etc).
5. Comparison of conventional reaction with microwave assisted reactions (atom economy, solvent, etc) [Ex: aldehyde and ketones with hydrazines to give hydrazones].
6. Diels-Alder reaction in eucalyptus oil (green process).

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
The students will be able to
- outline the principles and implications of green chemistry.
- comprehend the potential risks of waste generated and analyse the threats to human and environment.
- integrate information into design of molecules to avoid/eliminate toxic solvents & reagents or reduce toxic products.
- identify various alternate greener technologies for various industries.
OBJECTIVES:
To make students conversant with the
- basic concepts in organic chemistry
- types and structure of carbohydrates and lipids
- formation of different structures of proteins from amino acid
- structure of nucleic acids

MODULE I  BASIC CONCEPTS IN ORGANIC CHEMISTRY  8
Classification and IUPAC nomenclature of organic compounds – stereochemistry – optical, stereo and geometrical isomerism – types of reagents: electrophiles and nucleophiles – types of reactions: addition, substitution, elimination and rearrangement reactions.

MODULE II  CARBOHYDRATES, LIPIDS AND VITAMINS  7

MODULE III  AMINO ACIDS, PEPTIDES AND PROTEINS  7

MODULE IV  NUCLEIC ACIDS  8

PRACTICALS
1. Qualitative tests to identify carbohydrates.
2. Quantitative estimation of carbohydrates.
3. Separation of sugars – TLC and/or paper chromatography.
5. Separation of amino acids – TLC and/or paper chromatography.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:

The students will be able to
- classify organic compounds and explain the mechanism of various organic reactions.
- draw the structures and enumerate the functions of carbohydrate, lipids and vitamins.
- correlate the relationship among amino acids, peptides and proteins.
- recognize the role of nucleic acid in the formation of RNA & DNA and differentiate DNA & RNA using their structure and function.
OBJECTIVES:
To make the student conversant with the
• basic concepts of polymers, classification, types of polymerization and molecular weight & its distribution
• preparation, properties and applications of thermoplastics and introduction to biodegradable polymers
• properties and applications of thermosets, elastomers and FRP
• different types of moulding techniques

MODULE I  BASIC CONCEPTS OF POLYMERS  8

MODULE II  THERMOPLASTICS AND BIODEGRADABLE POLYMERS  8
Preparation, properties and applications: LDPE, HDPE, polypropylene, PVC, PTFE, PET, polyamides (Nylon-6 and Nylon 6,6) and polycarbonates – polymer blends and alloys – basics of biodegradable polymers.

MODULE III  THERMOSET RESINS, ELASTOMERS AND FRP  7

MODULE IV  MOULDING TECHNIQUES  7

PRACTICALS
1. Determination of molecular weight and degree of polymerization using Oswald's viscometer.
2. Free radical polymerization of styrene.
3. Free radical polymerization of PMMA.
4. Preparation of phenol-formaldehyde.
5. Preparation of urea-formaldehyde.
7. Synthesis of unsaturated polyester.
8. Preparation of FRP laminates.

L – 30; P – 30; TOTAL HOURS – 60

REFERENCES:

OUTCOMES:
The student will be able to
- classify various polymers, name the polymers and types of polymerization reactions, calculate molecular weight of polymers,
- summarise preparation, properties and applications of thermoplastics and give examples of biodegradable polymers
- elaborate the properties and applications of thermosets, elastomers and FRP
- select the appropriate moulding technique for a given polymer, based on the application