

CHADALAWADA RAMANAMMA ENGINEERING COLLEGE (AUTONOMOUS)

(Approved by AICTE | NAAC Accreditation with 'A' Grade | Permanently Affiliated to JNTUA)
Chadalawada Nagar, Tirupati - 517506, Andhra Pradesh.



OUTCOME BASED EDUCATION WITH CHOICE BASED CREDIT SYSTEM

BACHELOR OF TECHNOLOGY ACADEMIC REGULATIONS UNDER AUTONOMOUS STATUS

DEPARTMENT OF MECHANICAL ENGINEERING

B.Tech Regular Four Year Degree Programme

(for the batches admitted from the academic year 2019- 2020)

&

B.Tech (Lateral Entry Scheme)

(for the batches admitted from the academic year 2020 - 2021)

**FAILURE TO READ AND UNDERSTAND THE REGULATIONS IS
NOT AN EXCUSE**

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“Take up one idea.

Make that one idea your life-think of it, dream of it, live on that idea. Let the brain muscles, nerves, every part of your body be full of that idea and just leave every other idea alone.

This is the way to success”

Swami Vivekananda

VISION AND MISSION OF THE INSTITUTE

VISION

To be a top notch institution, imparting quality education in technology and management to produce globally competent professionals and address socio-economic issues through research and innovation.

MISSION

- Continuously update curricula and teaching learning process to meet the needs of industry and promote entrepreneurship.
- Inculcate research, development and innovation culture among students and faculty.
- Capacity to work in diverse fields and cultures with ethical practices to address socio-economic issues.

PRELIMINARY DEFINITIONS AND NOMENCLATURES

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

Academic Autonomy: Means freedom to an institute in all aspects of conducting its academic programs, granted by UGC for Promoting Excellence.

Academic Year: It is the period necessary to complete an actual course of study within a year. It comprises two main semesters i.e., (one odd + one even) and one supplementary semester.

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

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

Backlog Course: A course is considered to be a backlog course if the student has obtained a failure grade (F) in that course.

Basic Sciences: The courses offered in the areas of Mathematics, Physics, Chemistry, Biology etc., are considered to be foundational in nature.

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

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

Branch: Means specialization in a program like B.Tech degree program in Mechanical Engineering, B.Tech degree program in Computer Science and Engineering etc.

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

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

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

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

Continuous Internal Examination: It is an examination conducted towards sessional assessment.

Course: A course is a subject offered by a department for learning in a particular semester.

Course Outcomes: The essential skills that need to be acquired by every student through a course.

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

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

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

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

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

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

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

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

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

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

Institute: Means CHADALAWADA RAMANAMMA ENGINEERING COLLEGE, Tirupati unless indicated otherwise by the context.

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

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

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

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

Program: Means, Bachelor of Technology (B.Tech) degree program / PG degree program: M.Tech/ MBA.

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

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

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

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

Regulations: The regulations, common to all B.Tech programs offered by Institute are designated as “CREC Regulations R-19” and are binding on all the stakeholders.

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

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

S/he: Means “she” and “he” both.

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

University: Means the Jawaharlal Nehru Technological University Anantapur, Anantapuramu.

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

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

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

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

PRINCIPAL



CHADALAWADA RAMANAMMA ENGINEERING COLLEGE

(Autonomous)

ACADEMIC REGULATIONS

B.Tech. Regular Four Year Degree Programme

(For the batches admitted from the academic year 2019-20)

&

B.Tech. (Lateral Entry Scheme)

(For the batches admitted from the academic year 2020 - 21)

For pursuing four year undergraduate Bachelor Degree programme of study in Engineering (B.Tech) offered by CHADALAWADA RAMANAMMA ENGINEERING COLLEGE under Autonomous status and herein after referred to as CREC.

1.0. CHOICE BASED CREDIT SYSTEM

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

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

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

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

The CBCS permits students to:

- Choose electives from a wide range of elective courses offered by the departments.

- Undergo additional courses of interest.
- Adopt an interdisciplinary approach in learning.
- Make the best use of expertise of the available faculty.

2.0 MEDIUM OF INSTRUCTION

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

3.0 TYPES OF COURSES

Courses in a programme may be of three kinds: **Foundation / Skill, Core and Elective.**

3.1 Foundation / Skill Course:

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

3.2 Core Course:

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

3.3 Elective Course:

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

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

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

There are FIVE professional elective groups, students can choose not more than two courses from each group. Overall, students can opt for FIVE professional elective courses which enhances their professional knowledge inline with latest industrial needs.

There are FOUR open elective groups, students can choose not more than two courses from each group consisting of four different subjects.

There are TWO humanities elective groups, students can choose not more than two courses from each group consisting of three different subjects.

4.0 SEMESTER STRUCTURE

Each academic year is divided into three semesters, TWO being MAIN SEMESTERS (one odd + one even) and ONE being a SUPPLEMENTARY SEMESTER. Main Semesters are for regular class work. Supplementary Semester is primarily for failed students i.e. registration for a course directly for the first time is generally not permitted in the supplementary semester. Students admitted on transfer from JNTU affiliated institutes, Universities and other institutes in the

subjects in which they are required to earn credits so as to be on par with regular students as prescribed by concerned 'Board of Studies'.

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

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

4.3 The supplementary semester shall be a fast track semester consisting of eight weeks and this period includes time for registration of courses, course work, examination preparation, conduct of examinations, assessment and declaration of final results.

4.4 All subjects may not be offered in the supplementary semester. The student has to pay a stipulated fee prescribed by the Institute to register for a course in the supplementary semester. The supplementary semester is provided to help the student in not losing an academic year. It is optional for a student to make use of supplementary semester. **Supplementary semester is a special semester and the student cannot demand it as a matter of right** and will be offered based on availability of faculty and other institute resources.

4.5 The institute may use **supplementary semester** to arrange add-on courses for regular students and / or for deputing them for practical training / FSI. A student can register for a maximum number of 12 credits during a supplementary semester.

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

Table 1: Academic Calendar

ZERO SEMESTER (3 weeks)	Physical Activities, Career Counseling, Orientating of respective branch, Proficiency Modules and Productivity Tools and Communicating Skills	3 weeks	3 weeks
FIRST SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation	1 week	
	Semester End Examinations		
Semester Break and Supplementary Exams			2 weeks
SECOND SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation	1 week	
	Semester End Examinations		
Summer Vacation, Supplementary Semester and Remedial Exams			8 weeks

5.0 REGISTRATION

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

5.2. IN ABSENTIA registration will not be permitted under any circumstance.

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

6.0 UNIQUE COURSE IDENTIFICATION CODE

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

Table 2: Group of Courses

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

7.0 CURRICULUM AND COURSE STRUCTURE

The curriculum shall comprise Foundation / Skill Courses, Core Courses, Elective Courses, Laboratory Courses, Mandatory Courses, Social Relevant Project, Internship and Project work. The list of elective courses may include subjects from allied disciplines also.

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

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

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

Table 3: Credit distribution

S. No	Course	Hours	Credits
1	Theory Course (Core/Foundation/Elective)	2/3/4	2/3/4
2	Laboratory Course	2	1
3	MOOC Courses	-	3
4	Audit Course	3	0
5	Social Relevant Project	15/ Sem	0.5
6	Industrial Training/Internship	-	2
7	Project – I	-	2
8	Project – II	-	7

7.2 Course Structure

Every program of study shall be designed to have 41 theory courses and 17-20 laboratory courses. Every course of the B.Tech program will be placed in one of the eight categories with minimum credits as listed in the Table 4. In addition, a student has to carry out four socially Relevant Project, project work.

Table 4: Category Wise Distribution of Credits

S. No	Category	AICTE CREDITS	Average No. of Credits
1	Humanities and Social Sciences (HS), including Management.	12	13
2	Basic Sciences (BS) including Mathematics, Physics and Chemistry.	25	24
3	Engineering Sciences (ES), including Workshop, Drawing, Basics of Electrical / Electronics / Mechanical / Computer Engineering.	24	21
4	Professional Subjects - Core (PC), relevant to the chosen specialization/branch.	48	62
5	Professional Subjects - Electives (PE), relevant to the chosen specialization/branch.	18	15
6	Open Subjects - Electives (OE), from other technical and/or emerging subject areas.	18	12
7	Project Work, Social Relevant Project and Internship	15	13
TOTAL		160	160

7.3 Semester-wise course break-up

For Four year Regular program:

Semester	No. of Theory Courses	No. of Lab Courses	Total Credits
I Semester	4 + Audit Course	3/4	18
II Semester	5 + Audit Course	5/4	21.5

III Semester	6 (3 Core + 3 Foundation) + Audit Course	2	21.5
IV Semester	6 (3 Core + 3 Foundation) +SRP	3/4	21.5
V Semester	6(4 Core + 1 Professional Elective + 1 Open Elective) + SRP	2/3	21.5
VI Semester	6 (3 Core + 1 Professional Elective + 1 Open Elective + 1 Humanities Elective) + SRP	2/3	21.5
VII Semester	6 (2 Core + 2 Professional Elective + 1 Open Elective + 1 Humanities Elective) + SRP + Project – I + Internship	0	21.5
VIII Semester	2 (1 Professional Elective + 1 Open Elective) + Project – II	0	13
Total	41 (15 Foundation + 15 Core + 5 Professional Electives + 4 Open Electives+ 2 Humanities Elective) + 4 SRP + Project I & II + 1 Internship	17-20	160

7.5 For Three year lateral entry program:

Semester	No. of Theory Courses	No. of Lab Courses	Total Credits
III Semester	6 (3 Core + 3 Foundation) + Audit Course	2	21.5
IV Semester	6 (3 Core + 3 Foundation) +SRP	3/4	21.5
V Semester	6(4 Core + 1 Professional Elective + 1 Open Elective) + SRP	2/3	21.5
VI Semester	6 (3 Core + 1 Professional Elective + 1 Open Elective + 1 Humanities Elective) + SRP	2/3	21.5
VII Semester	6 (2 Core + 2 Professional Elective + 1 Open Elective + 1 Humanities Elective) + SRP + Project – I + Internship	0	21.5

VIII Semester	2 (1 Professional Elective + 1 Open Elective) + Project – II	0	13
Total	32 (6 Foundation + 15 Core + 5 Professional Electives + 4 Open Electives+ 2 Humanities Elective) + 4 SRP + Project I & II + 1 Internship	9-12	120.5

8.0 EVALUATION METHODOLOGY

8.1 Theory Course:

Each theory course will be evaluated for a total of 100 marks, with 40 marks for Continuous Internal Assessment (CIA) and 60 marks for Semester End Examination (SEE). Out of 40 marks allotted for CIA during the semester, final marks for 30 shall be arrived by considering 80% weightage to the better internal exam and 20% to the other. The remaining 10 Marks will be considered through Alternative Assessment Tool (AAT) after second internal examination. The AAT converts the classroom into an effective learning centre. The AAT may include

1. Seminars – 2 Marks
2. Assignment – 4 Marks
3. Slip Test – 2 Marks
4. Library – 2 Marks

AAT helps the student for the improvement of self learning and presentation skills.

8.1.1 Semester End Examination (SEE):

The syllabus for each theory course consists of FIVE units and each unit carries equal weightage in terms of marks distribution. The semester end examination is conducted for 60 marks of 3 hours duration.

The Semester End Examination (SEE) consists of two parts i.e Part A and Part B. Part A consists of 12 short questions, student has to answer any ten questions, each question carries two marks. Part B consists of five questions with ‘either’ ‘or’ choice will be drawn from each unit. Each question carries 8 marks. There could be a maximum of two sub divisions in a question.

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

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

8.1.2 Continuous Internal Assessment (CIA):

For each theory course the CIA shall be conducted by the faculty/teacher handling the course as given in Table-5. CIA is conducted for a total of 30 marks, with 25 marks for Continuous Internal Examination (CIE) and 05 marks for Alternative Assessment

Tool (AAT).

Table-5: Assessment pattern for Theory Courses

COMPONENT	THEORY		TOTAL MARKS
Type of Assessment	CIE Exam (Sessional)	AAT	
Max. CIA Marks	25	05	30

8.1.2.1 Continuous Internal Examination (CIE):

Two CIE exams shall be conducted at the end of the 8th and 17th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration consisting of two parts. Part–A shall have five compulsory questions of one mark each. In part–B, four out of five questions have to be answered where, each question carries 5 marks. The final CIE for 25 marks with weightage of 80% to better mid marks and 20% for the other. The valuation and verification of answer scripts of CIE exams shall be completed within a week after the conduct of the Internal Examination.

8.1.2.2 Alternative Assessment Tool (AAT)

In order to encourage innovative methods while delivering a course, the faculty members have been encouraged to use the Alternative Assessment Tool (AAT). This AAT enables faculty to design own assessment patterns during the CIA. The AAT enhances the autonomy (freedom and flexibility) of individual faculty and enables them to create innovative pedagogical practices. If properly applied, the AAT converts the classroom into an effective learning centre. The AAT may include seminars, assignments, Slip tests and Library hour.

8.2 Laboratory Course:

- 8.2.1 Each laboratory will be evaluated for a total of 100 marks consisting of 30 marks for internal assessment and 70 marks for semester end lab examination. Out of 30 marks of internal assessment, continuous lab assessment will be done for 20 marks for the day to day performance and 10 marks for the final internal lab assessment. The semester end lab examination for 70 marks shall be conducted by two examiners. Internal Examiner nominated by the HOD and the External Examiner nominated by the Controller of Examinations from the panel of experts recommended by HOD. For supplementary lab examinations both the examiners will be nominated by HOD.
- 8.2.2 All the drawing related courses are evaluated in line with theory courses. The distribution shall be 30 marks for internal evaluation (15 marks for day-to-day work, and 15 marks for internal tests) and 40 marks for semester end lab examination.

8.3 MOOC Courses:

Meeting with the global requirements, to inculcate the habit of self learning and incompliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives.

- 8.3.1 The proposed MOOC courses would be additional choices in all the elective groups subject to the availability during the respective semesters and respective departments will declare the list of the courses at the beginning of the semester. Course content for the selected MOOC courses shall be drawn from respective MOOCs links or shall be supplied by the department. Course will be mentored by faculty members .
- 8.3.2 Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8/12 weeks duration.

8.3.3 Students interested in doing MOOC courses shall register the course title at their department office at the start of the semester against the courses that are announced by various agencies and academic institutions.

8.3.4 The students who opt MOOC course as conventional course and study in the college, the evaluation will be conducted just like all other courses.

8.4 Audit Courses (MC):

These courses are among the compulsory courses.

- a) Environmental Science, Constitution of India and Essence of Indian Traditional Knowledge are audit courses offered in I,II & III semesters respectively.
- b) By the end of VI semester, all the students should complete the audit courses.
- c) Audit course will carry no credit and a pass in each such course after attaining required CIE requirements during the programme shall be necessary requirement for the student to qualify for the award of Degree. Its result shall be declared with “Satisfactory” or “Not Satisfactory” performance.

8.5 Socially Relevant Projects :

The Social Relevant Project (SRP) shall be carried out in IV, V, VI & VII semesters. In a bid to support socially relevant projects, the college has approved the Scheme for Trans-Disciplinary Research for India`s Developing Economy (STRIDE). The scheme will provide support to research projects that are socially relevant, locally need-based, nationally important and globally significant. This will strengthen research culture and innovation in the college, help the students and the faculty to contribute towards India`s developing economy. Focus on humanities and human sciences will boost quality research on Indian languages and knowledge systems. It creates unity of intellectual frameworks beyond the disciplinary perspectives and solves problems by going beyond the boundaries of disciplines to involve various stakeholders.

The Social Relevant Project will be evaluated for 50 marks in total. Assessment will be done by the supervisor/guide based on the work and presentation/execution of the Project. Evaluation shall be done by a committee comprising the supervisor and Head of the department.

8.6 Project work

The project work will be divided into two parts as Project- I and Project- II in VII and VIII semesters respectively. Project- I shall be evaluated for 100 marks out of which 40 marks for internal evaluation and 60 marks for semester end evaluation. Project- II shall be evaluated for 200 marks out of which 80 marks for internal evaluation and 120 marks for semester end evaluation. The project work shall be somewhat innovative in nature, exploring the research bent of the mind of the student. A project batch shall comprise not more than four students.

In VII semester, the students have to identify the problem and have to collect the material relevant to the project by undergoing literature. By the end of semester he has to submit the report and has to give brief presentation to project review committee comprising the Head of the department, project supervisor and senior faculty member of the department. In VIII semester, the students have to analysis and design the prototype of the project. By the end of semester he has to submit the project report and has to give the final presentation to project review committee comprising the Head of the department, project supervisor and an external examiner nominated by the Controller of Examinations. A minimum of 50% of maximum marks shall be obtained to earn the corresponding credits.

9.0 ATTENDANCE REQUIREMENTS AND DETENTION POLICY

- 9.1 It is desirable for a candidate to put on 100% attendance in each course. In every course (theory/laboratory), student has to maintain a minimum of 75% attendance including the days of attendance in sports, games, NCC and NSS activities to be eligible for appearing in Semester End Examination of the course.
- 9.2 A candidate shall put in a minimum required attendance of 75 % in that semester. Otherwise, s/he shall be declared detained and has to repeat semester.
- 9.3 For cases of medical issues, deficiency of attendance in each course to the extent of 10% may be condoned by the College Academic Committee (CAC) on the recommendation of Head of the department if their attendance is between 75% and 65% in a semester, subjected to submission of medical certificates, medical case file and other needful documents to the concerned departments. The condonation is permitted maximum of two times during the entire course of study.
- 9.4 A prescribed fee shall be payable towards condonation of shortage of attendance.
- 9.5 A student shall not be promoted to the next semester unless he/she satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he/she shall not be eligible for readmission into the same class.
- 9.6 Any student against whom any disciplinary action by the institute is pending shall not be permitted to attend any SEE in that semester.

10.0 CONDUCT OF SEMESTER END EXAMINATIONS AND EVALUATION

- 10.1 Semester end examination shall be conducted by the Controller of Examinations (COE) by inviting Question Papers from the External Examiners.
- 10.2 Question papers may be moderated for the coverage of syllabus, pattern of questions by a Examination Committee chaired by COE and senior subject expert before the commencement of semester end examinations. Internal Examiner shall prepare a detailed scheme of valuation.
- 10.3 The answer papers of semester end examination should be evaluated by the first examiner immediately after the completion of exam and the award sheet should be submitted to COE in a sealed cover before the same papers are kept for second evaluation by external examiner.
- 10.4 In case of difference is more than 15% of marks, the answer paper shall be re-evaluated by a third examiner appointed by the Examination Committee and the marks awarded by third examiner is compared with first and second evaluation marks and higher marks of minimum difference pair will be considered as final marks.
- 10.5 The CoE processes the evolution of all the end-semester answer scripts on a prescribed date(s).
- 10.6 Examinations Committee shall consolidate the marks awarded by both the examiners.

11.0 SCHEME FOR THE AWARD OF GRADE

- 12.1 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each theory course, if s/he secures
 - i. Not less than 35% marks for each theory course in the semester end examination, and
 - ii. A minimum of 40% marks for each theory course considering both internal and semester end examination.
- 12.2 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each Lab / Socially Relevant Project / Project, if s/he secures
 - i. Not less than 40% marks for each Lab / Project course in the semester end

examination,

- ii. A minimum of 40% marks for each Lab / Project course considering both internal and semester end examination.
- 12.3 If a candidate fails to secure a pass in a particular course, it is mandatory that s/he shall register and reappear for the examination in that course, when examination is conducted in that course. It is mandatory that s/he should continue to register and reappear for the examination till s/he secures a pass.

12.0 LETTER GRADES AND GRADE POINTS

- 12.1 Performances of students in each course are expressed in terms of marks as well as in Letter Grades based on absolute grading system. The UGC recommends a 10-point grading system with the following letter grades as given in the Table-6.

Table-6: Grade Points Scale (Absolute Grading)

Range of Marks	Grade Point	Letter Grade
90 – 100	10	S (Superior)
80 – 89	9	A+ (Excellent)
70 – 79	8	A (Very Good)
60 – 69	7	B+ (Good)
50 – 59	6	B (Average)
40 – 49	5	C (Pass)
Below 40	0	F (Fail)
Absent	0	AB (Absent)

- 12.2 A student is deemed to have passed and acquired to correspondent credits in particular course if s/he obtains any one of the following grades: “S”, “A+”, “A”, “B+”, “B”, “C”.
- 12.3 A student obtaining Grade F shall be considered Failed and will be required to reappear in the examination.
- 13.4 For non credit courses, ‘Satisfactory’ or “Not Satisfactory” is indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.
- 12.5 “SA” denotes shortage of attendance (as per item 10) and hence prevention from writing Semester End Examination.
- 12.6 At the end of each semester, the institute issues grade sheet indicating the SGPA and CGPA of the student. However, grade sheet will not be issued to the student if s/he has any outstanding dues.

13.0 COMPUTATION OF SGPA AND CGPA

The UGC recommends to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA). The credit points earned by a student are used for calculating the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average

(CGPA), both of which are important performance indices of the student. SGPA is equal to the sum of all the total points earned by the student in a given semester divided by the number of credits registered by the student in that semester. CGPA gives the sum of all the total points earned in all the previous semesters and the current semester divided by the number of credits registered in all these semesters. Thus,

$$SGPA = \frac{\sum_{i=1}^n (C_i G_i)}{\sum_{i=1}^n C_i}$$

where, C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course and n represent the number of courses in which a student is registered in the concerned semester.

$$CGPA = \frac{\sum_{j=1}^m (C_j S_j)}{\sum_{j=1}^m C_j}$$

where, S_j is the SGPA of the j^{th} semester and C_j is the total number of credits upto the semester and m represent the number of semesters completed in which a student registered upto the semester.

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

14.0 ILLUSTRATION OF COMPUTATION OF SGPA AND CGPA

14.1 Illustration for SGPA

Course Name	Course Credits	Grade letter	Grade point	Credit Point (Credit x Grade)
Course 1	3	A	8	3 x 8 = 24
Course 2	4	B+	7	4 x 7 = 28
Course 3	3	B	6	3 x 6 = 18
Course 4	3	S	10	3 x 10 = 30
Course 5	3	C	5	3 x 5 = 15
Course 6	4	B	6	4 x 6 = 24
	20			139

Thus, $SGPA = 139 / 20 = 6.95$

14.2 Illustration for CGPA

Semester 1	Semester 2	Semester 3	Semester 4
Credit: 20 SGPA: 6.9	Credit: 22 SGPA: 7.8	Credit: 25 SGPA: 5.6	Credit: 26 SGPA: 6.0
Semester 5	Semester 6		
Credit: 26 SGPA: 6.3	Credit: 25 SGPA: 8.0		

$$\text{Thus, CGPA} = \frac{20 \times 6.9 + 22 \times 7.8 + 25 \times 5.6 + 26 \times 6.0 + 26 \times 6.3 + 25 \times 8.0}{144} = 6.73$$

15.0 REVALUATION

A student, who seeks the re-evaluation of the answer script, is directed to apply within 5 working days from the declaration of results in the prescribed format with prescribed fee to the Controller of Examinations through the Head of the department. The Controller of Examinations shall arrange for the revaluation and declare the results. Revaluation is not permitted to the courses other than theory courses.

16.0 PROMOTION POLICIES

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no. 10.

16.1 For students admitted into B.Tech (Regular) program

16.1.1 A student will not be promoted from II semester to III semester unless s/he fulfills the academic requirement of securing 40% of credits (16) from I and II semesters examinations, whether or not the candidate takes the examinations.

16.1.2 A student will not be promoted from IV semester to V semester unless s/he fulfills the academic requirement of securing 40% of credits (33) upto IV semester from all the examinations, whether or not the candidate takes the examinations.

16.1.3 A student will not be promoted from VI semester to VII semester unless s/he fulfills the academic requirement of securing 40% of credits (51) upto VI semester from all the examinations, whether or not the candidate takes the examinations.

16.1.4 A student shall register for all the 160 credits and earn all the 160 credits. Marks obtained in all the 160 credits shall be considered for the award of the Grade.

16.2 For students admitted into B.Tech (lateral entry students)

16.2.1 A student will not be promoted from IV semester to V semester unless s/he fulfills the academic requirement of securing 40% of credits (18) upto IV semester from all the examinations, whether or not the candidate takes the examinations.

16.2.2 A student will not be promoted from VI semester to VII semester unless s/he fulfills the academic requirement of securing 40% of credits (35) upto VI semester from all the examinations, whether or not the candidate takes the examinations.

16.2.3 A student shall register for all the 120.5 credits and earn all the 120.5 credits. Marks obtained in all the 120.5 credits shall be considered for the award of the Grade.

17.0 GRADUATION REQUIREMENTS

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

17.1 Student shall register and acquire minimum attendance in all courses and secure 160 credits for regular program and 120.5 credits for lateral entry program.

17.2 A student of a regular program, who fails to earn 160 credits within eight consecutive academic years from the year of his/her admission with less than or equal to 4.0 CGPA, shall forfeit his/her degree and his/her admission stands cancelled.

17.3 A student of a lateral entry program who fails to earn 120.5 credits within six consecutive academic years from the year of his/her admission with less than or equal to 4.0 CGPA, shall forfeit his/her degree and his/her admission stands cancelled.

18.0 BETTERMENT OF MARKS IN THE COURSES ALREADY PASSED

Students who clear all the courses in their first attempt and wish to improve their CGPA shall register and appear for betterment of marks for any theory courses within a period of subsequent two semesters. The improved marks shall be considered for classification / distinction but not for ranking. If there is no improvement in marks, there shall not be any change in the original marks already awarded.

19.0 AWARD OF DEGREE

19.1 Classification of degree will be as follows:

CGPA \geq 7.5	CGPA \geq 6.5 and < 7.5	CGPA \geq 5.0 and < 6.5	CGPA \geq 4.0 and < 5.0	CGPA < 4.0
First Class with Distinction	First Class	Second Class	Pass Class	Fail

19.2 In order to extend the benefit to the students with one/two backlogs after either VI semester or VIII semester, GRAFTING option is provided to the students enabling their placements and fulfilling graduation requirements. Following are the guidelines for the Grafting:

- a. Grafting will be done among the courses within the semester shall draw a maximum of 6 marks from the any one of the cleared courses in the semester and will be grafted to the failed course in the same semester.
- b. Students shall be given a choice of grafting only once in the 4 years program, either after VI semester (Option #1) or after VIII semester (Option #2).
- c. Option#1: Applicable to students who have maximum of TWO theory courses in V and / or VI semesters.
Option#2: Applicable to students who have maximum of TWO theory courses in VII and / or VIII semesters.
- d. Eligibility for grafting:
 - i. Prior to the conduct of the supplementary examination after the declaration of VI or VIII semester results.
 - ii. S/he must appear in all regular or supplementary examinations as per the provisions laid down in regulations for the courses s/he appeals for grafting.
 - iii. The marks obtained by her/him in latest attempt shall be taken into account for grafting

of marks in the failed course(s).

19.3 By the end of VI semester, all the students shall complete the audit courses offered to them with acceptable performance.

All the candidates who register for the semester end examination will be issued grade sheet by the institute. Apart from the semester wise grade sheet, the institute will issue the provisional certificate and consolidated grade sheet subject to the fulfillment of all the academic requirements.

20.0 TEMPORARY BREAK OF STUDY FROM THE PROGRAMME

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

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

20.3 The total period for completion of the program reckoned from the commencement of the semester to which the candidate was first admitted shall not exceed the maximum period specified in clause 17.0. The maximum period includes the break period.

21.0 TERMINATION FROM THE PROGRAM

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

- a. The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.
- b. A student shall not be permitted to study any semester more than three times during the entire Program of study.
- c. The student fails to satisfy the norms of discipline specified by the institute from time to time.

22.0 WITH-HOLDING OF RESULTS

If the candidate has not paid any dues to the institute / if any case of indiscipline / malpractice is pending against him, the results of the candidate will be withheld. The issue of the degree is liable to be withheld in such cases.

23.0 GRADUATION DAY

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

24.0 DISCIPLINE

Every student is required to observe discipline and decorum both inside and outside the institute and not to indulge in any activity which will tend to bring down the honor of the institute. If a student indulges in malpractice in any of the theory / practical examination,

continuous assessment examinations he/she shall be liable for punitive action as prescribed by the Institute from time to time.

25.0 GRIEVANCE REDRESSAL COMMITTEE

The institute shall form a Grievance Redressal Committee for each department with the two senior faculty and the HOD as the members. This Committee shall solve all grievances related to the courses under consideration.

26.0 TRANSITORY REGULATIONS

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

a) Four Year B.Tech Regular course:

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

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

b) Three Year B.Tech program under Lateral Entry Scheme:

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

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

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

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

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

d) Transfer candidates (from an autonomous college affiliated to JNTUA):

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

27.0 REVISION OF REGULATIONS AND CURRICULUM

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

**FAILURE TO READ AND UNDERSTAND
THE REGULATIONS IS NOT AN EXCUSE**

B.TECH - PROGRAM OUTCOMES (POS)

- PO-1:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems (**Engineering Knowledge**).
- PO-2:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences (**Problem Analysis**).
- PO-3:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations (**Design/Development of Solutions**).
- PO-4:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions (**Conduct Investigations of Complex Problems**).
- PO-5:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations (**Modern Tool Usage**).
- PO-6:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice (**The Engineer and Society**).
- PO-7:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development (**Environment and Sustainability**).
- PO-8:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice (**Ethics**).
- PO-9:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings (**Individual and Team Work**).
- PO-10:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions (**Communication**).
- PO-11:** Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
- PO-12:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change (**Life-long learning**).

FREQUENTLY ASKED QUESTIONS AND ANSWERS ABOUT AUTONOMY

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

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

2. Shall CREC award its own Degree?

No. Degree will be awarded by Jawaharlal Nehru Technological University, Anantapuramu with a mention of the name CREC on the Degree Certificate.

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

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

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

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

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

An autonomous college carries a prestigious image. Autonomy is actually earned out of our continued past efforts on academic performances, our capability of self- governance and the kind of quality education we offer.

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

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

7. Will the students of CREC as an Autonomous College qualify for University Medals and Prizes for academic excellence?

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

8. Can CREC have its own Convocation?

No. Since the University awards the Degree the Convocation will be that of the University, but there will be Graduation Day at CREC.

9. Can CREC give a provisional degree certificate?

Since the examinations are conducted by CREC and the results are also declared by CREC, the college sends a list of successful candidates with their final Grades and Grade Point Averages including CGPA to the University. Therefore with the prior permission of the University the college will be entitled to give the provisional certificate.

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

Certainly. The number of students qualifying for placement interviews is expected to improve, due to rigorous and repetitive classroom teaching and continuous assessment. Also the autonomous status is more responsive to the needs of the industry. As a result therefore, there will

be a lot of scope for industry oriented skill development built-in into the system. The graduates from an autonomous college will therefore represent better employability.

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

Presently, it is 70 % external and 30% internal. As the autonomy matures the internal assessment component shall be increased at the cost of external assessment.

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

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

13 Why Credit based Grade System?

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

14 What exactly is a Credit based Grade System?

The credit based grade system defines a much better statistical way of judging the academic performance. One Lecture Hour per week of Teaching Learning process is assigned One Credit. One hour of laboratory work is assigned half credit. Letter Grades like S,A+,A, B+,B,C,F etc. are assigned for a Range of Marks. (e.g. 90% and above is S, 80 to 89 % could be A+ etc.) in Absolute Grading System while grades are awarded by statistical analysis in relative grading system. We thus dispense with sharp numerical boundaries. Secondly, the grades are associated with defined Grade Points in the scale of 1 to 10. Weighted Average of Grade Points is also defined Grade Points are weighted by Credits and averaged over total credits in a Semester. This process is repeated for all Semesters and a CGPA defines the Final Academic Performance

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

These norms are usually defined by UGC or AICTE. Usually around 25 Credits per semester is the accepted norm.

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

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

$$SGPA = \frac{\sum_{i=1}^n (C_i G_i)}{\sum_{i=1}^n C_i}$$

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

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

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

$$CGPA = \frac{\sum_{j=1}^m (C_j S_j)}{\sum_{j=1}^m C_j}$$

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

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

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

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

into Grades?

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

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

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

21 How fast Syllabi can be and should be changed?

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

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

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

23 What are Statutory Academic Bodies?

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

24 Who takes Decisions on Academic matters?

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

25 What is the role of Examination committee?

The Examinations Committee is responsible for the smooth conduct of internal, End Semester and makeup Examinations. All matters involving the conduct of examinations spot valuations, tabulations preparation of Grade Cards etc, fall within the duties of the Examination Committee.

26 Is there any mechanism for Grievance Redressal?

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

27 How many attempts are permitted for obtaining a Degree?

All such matters are defined in Rules & Regulation

28 Who declares the result?

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

29 Who will keep the Student Academic Records, University or CREC?

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

30 What is our relationship with the JNT University?

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

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

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

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

Yes, presently our PG programmes also enjoying autonomous status.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

S.No	Nature of Malpractices/Improper conduct	Punishment
	<i>If the candidate:</i>	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Controller of Examinations.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is

		subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Controller of Examinations /Additional Controller of Examinations/any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the COE or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the COE or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the Institute premises or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s) has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical

	hall.	examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper conduct mentioned in clause 6 to 8.	Student of the colleges expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the College will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the University for further action to	

award suitable punishment.



CHADALAWADA RAMANAMMA ENGINEERING COLLEGE

(Autonomous)

(Approved by AICTE | NAAC Accreditation with 'A' Grade | Permanently Affiliated to JNTUA)

Chadalawada Nagar, Tirupati - 517506, Andhra Pradesh.

MECHANICAL ENGINEERING

COURSE STRUCTURE-R19

(w.e.f AY 2019-2020)

0 SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
19CA56001	Physical Activities -- Sports, Yoga and Meditation, Plantation	MC	Foundation	0	0	6	0	-	-	-
19CA56002	Career Counselling	MC	Foundation	2	0	2	0	-	-	-
19CA56003	Orientation to all branches -- career options, tools etc.	MC	Foundation	3	0	0	0	-	-	-
19CA04001	Orientation on admitted Branch -- corresponding labs, tools and platforms	EC	Foundation	1	0	4	0	-	-	-
19CA05001	Proficiency Modules & Productivity Tools	ES	Foundation	2	1	2	0	-	-	-
19CA56004	Assessment on basic aptitude and mathematical skills	MC	Foundation	1	0	4	0	-	-	-
19CA56005	Remedial Training in Foundation Courses	MC	Foundation	2	1	2	0	-	-	-
19CA56006	Human Values & Professional Ethics	MC	Foundation	3	0	0	0	-	-	-
19CA52001	Communication Skills -- focus on Listening, Speaking, Reading, Writing skills	BS	Foundation	2	1	2	0	-	-	-
Total				16	3	22	0			

I SEMESTER

Course Code	Course ME	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
19CA52101	Communicative English I	HS	Foundation	2	-	-	2	30	70	100
19CA54101	Mathematics I	BS	Foundation	2	1	-	3	30	70	100
19CA55101	Engineering Physics	BS	Foundation	3	-	-	3	30	70	100
19CA02101	Essential Electrical and Electronic Engineering	ES	Foundation	3	1	-	4	30	70	100
PRACTICAL										
19CA52102	Communicative English I Laboratory	HS	Foundation	-	-	3	1.5	30	70	100
19CA55102	Engineering Physics Laboratory	ES	Foundation	-	-	3	1.5	30	70	100
19CA02102	Essential Electrical and Electronic Engineering Laboratory	ES	Foundation	-	-	3	1.5	30	70	100
19CA03102	Basic Engineering Workshop	LC	Foundation	-	-	3	1.5	30	70	100
TOTAL				10	02	12	18	240	560	800

II SEMESTER

Course Code	Course ME	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P / D		CIA	SEE	Total
THEORY										
19CA54201	Mathematics II	BS	Foundation	2	1	-	3	30	70	100
19CA51101	Engineering Chemistry	BS	Foundation	3	-	-	3	30	70	100
19CA03201	Engineering Graphics and Design	ES	Foundation	1	-	3	2.5	30	70	100
19CA05101	Problem Solving and Programming	ES	Foundation	3	1	-	4	30	70	100
19CA03202	Material Science and Engineering	PC	Foundation	3	-	-	3	30	70	100
PRACTICAL										
19CA51102	Engineering Chemistry Laboratory	BS	Foundation	-	-	3	1.5	30	70	100
19CA05102	Problem Solving & Programming Laboratory	BS	Foundation	-	-	3	1.5	30	70	100
19CA03203	Material Science and Engineering Laboratory	PC	Foundation	-	-	3	1.5	30	70	100
19CA03204	Mechanical Engineering Workshop	LC	Foundation	-	-	3	1.5	30	70	100
TOTAL				12	02	15	21.5	270	630	900

COMMUNICATIVE ENGLISH I

I B. Tech - I Semester: Common for all branches								
Course code	Category	Hours/week			Credits	Maximum Marks		
19CA52101	Foundation	L	T	P	C	CIA	SEE	Total
		2	-	-	2	30	70	100
Contact Classes:32	Tutorial Classes: Nil		Practical Classes: Nil			Total Classes:32		
OBJECTIVES:								
<ul style="list-style-type: none"> • Facilitate effective listening skills for better comprehension of academic lectures and English spoken by native speakers • Focus on appropriate reading strategies for comprehension of various academic texts and authentic materials • Help improve speaking skills through participation in activities such as role plays, discussions and structured talks/oral presentations • Impart effective strategies for good writing and demonstrate the same in summarizing, writing well organized essays, record and report useful information • Provide knowledge of grammatical structures and vocabulary and encourage their appropriate use in speech and writing 								
UNIT-I						Classes:07		
<p>Listening: Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions.</p> <p>Speaking: Asking and answering general questions on familiar topics such as home, family, work, studies and interests; introducing oneself and others.</p> <p>Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.</p> <p>Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.</p> <p>Grammar and Vocabulary: Content words and function words; word forms: verbs, nouns, adjectives and adverbs; nouns: countables and uncountables; singular and plural; basic sentence structures; simple question form - wh-questions; word order in sentences.</p> <p style="text-align: center;">Learning Outcomes</p> <p>At the end of the module, the learners will be able to</p> <ul style="list-style-type: none"> • Understand social or transactional dialogues spoken by native speakers of English and identify the context, topic, and pieces of specific information • Ask and answer general questions on familiar topics and introduce oneself/others • Employ suitable strategies for skimming and scanning to get the general idea of a text and locate specific information • Recognize paragraph structure and be able to match beginnings/endings/headings with paragraphs • Form sentences using proper grammatical structures and correct word forms 								
UNIT-II						Classes:07		
<p>Listening: Answering a series of questions about main idea and supporting ideas after listening to audio texts.</p> <p>Speaking: Discussion in pairs/ small groups on specific topics followed by short structured talks.</p> <p>Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.</p> <p>Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of</p>								

writing - punctuation, capital letters.

Grammar and Vocabulary: Cohesive devices - linkers, sign posts and transition signals; use of articles and zero article; prepositions.

Learning Outcomes

At the end of the module, the learners will be able to

- comprehend short talks on general topics
- participate in informal discussions and speak clearly on a specific topic using suitable discourse markers
- understand the use of cohesive devices for better reading comprehension
- write well structured paragraphs on specific topics
- identify basic errors of grammar/ usage and make necessary corrections in short texts

UNIT-III

Classes:06

Listening: Listening for global comprehension and summarizing what is listened to.

Speaking: Discussing specific topics in pairs or small groups and reporting what is discussed

Reading: Reading a text in detail by making basic inferences -recognizing and interpreting specific context clues; strategies to use text clues for comprehension.

Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions.

Grammar and Vocabulary: Verbs - tenses; subject-verb agreement; direct and indirect speech, reporting verbs for academic purposes.

Learning Outcomes

At the end of the module, the learners will be able to

- comprehend short talks and summarize the content with clarity and precision
- participate in informal discussions and report what is discussed
- infer meanings of unfamiliar words using contextual clues
- write summaries based on global comprehension of reading/listening texts
- use correct tense forms, appropriate structures and a range of reporting verbs in speech and writing.

UNIT-IV

Classes:06

Listening: Making predictions while listening to conversations/ transactional dialogues without video; listening with video.

Speaking: Role plays for practice of conversational English in academic contexts (formal and informal) - asking for and giving information/directions.

Reading: Studying the use of graphic elements in texts to convey information, reveal 46 trends/patterns/relationships, communicate processes or display complicated data.

Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.

Grammar and Vocabulary:Quantifying expressions - adjectives and adverbs; comparing and contrasting; degrees of comparison; use of antonyms

Learning Outcomes

At the end of the module, the learners will be able to

- infer and predict about content of spoken discourse
- understand verbal and non-verbal features of communication and hold formal/informal conversations
- interpret graphic elements used in academic texts
- produce a coherent paragraph interpreting a figure/graph/chart/table
- use language appropriate for description and interpretation of graphical elements

UNIT-V

Classes:06

Listening: Identifying key terms, understanding concepts and answering a series of relevant questions that test comprehension.

Speaking: Formal oral presentations on topics from academic contexts - without the use of PPT slides.

Reading: Reading for comprehension.

Writing: Writing structured essays on specific topics using suitable claims and evidences
Grammar and Vocabulary: Editing short texts –identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject verb agreement)

Learning Outcomes

At the end of the module, the learners will be able to

- take notes while listening to a talk/lecture and make use of them to answer questions
- make formal oral presentations using effective strategies
- comprehend, discuss and respond to academic texts orally and in writing
- produce a well-organized essay with adequate support and detail
- edit short texts by correcting common errors.

Text Books:

Reference Books:

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Chase, Becky Tarver. Pathways: Listening, Speaking and Critical Thinking. Heinley ELT; 2nd Edition, 2018.
3. Skillful Level 2 Reading & Writing Student's Book Pack (B1) Macmillan Educational. □
4. Hewings, Martin. Cambridge Academic English (B2). CUP, 2012.

Web References:

1Grammar/Listening/Writing 1-language.com

<http://www.5minuteenglish.com/>

<https://www.englishpractice.com/>

Grammar/Vocabulary

English Language Learning Online

<http://www.bbc.co.uk/learningenglish/>

<http://www.better-english.com/>

<http://www.nonstopenglish.com/>

<https://www.vocabulary.com/>

BBC Vocabulary Games

Free Rice Vocabulary Game

Reading

<https://www.usingenglish.com/comprehension/>

<https://www.englishclub.com/reading/short-stories.htm>

<https://www.english-online.at/>

Listening

<https://learningenglish.voanews.com/z/3613>

<http://www.englishmedialab.com/listening.html>

Speaking

<https://www.talkenglish.com/>

BBC Learning English – Pronunciation tips

Merriam-Webster – Perfect pronunciation Exercises

All Skills

<https://www.englishclub.com/>

<http://www.world-english.org/>

<http://learnenglish.britishcouncil.org/>

Online Dictionaries

Cambridge dictionary online

MacMillan dictionary

Oxford learner's dictionaries

Outcomes:

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

1. Understand the context, topic, and pieces of specific information from social or transactional dialogues spoken by native speakers of English
2. Apply grammatical structures to formulate sentences and correct word forms

3. Analyze discourse markers to speak clearly on a specific topic in informal discussions
4. Evaluate reading/listening texts and to write summaries based on global comprehension of these texts.
5. Create a coherent paragraph interpreting a figure/graph/chart/table

MATHEMATICS-1(ALGEBRA AND CALCULUS)

I B. Tech - I Semester: Common for all branches								
Course code	category	Hours/week			credits	Maximum Marks		
19CA54101	Foundation	L	T	P	C	CIA	SEE	TOTAL
		2	1	-	3	30	70	100
Contact Classes:32	Tutorial Classes:16	Practical Classes:NIL			Total Classes:48			
OBJECTIVES:								
The course should enable the students to :								
<ul style="list-style-type: none"> ● This course will illuminate the students in the concepts of calculus and linear algebra. ● To equip the students with standard concepts and tools at an intermediate to advanced level mathematics to develop the confidence and ability among the students to handle various real world problems and their applications. 								
UNIT-I	Matrix Operations and Solving Systems of Linear Equations						Classes:10	
Rank of a matrix by echelon form, solving system of homogeneous and non-homogeneous equations linear equations. Eigen values and Eigen vectors and their properties, Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, diagonalisation of a matrix,								
UNIT-II	Quadratic forms and Mean Value Theorems						Classes:09	
Quadratic forms and nature of the quadratic forms, reduction of quadratic form to canonical forms by orthogonal transformation. Rolle's Theorem, Lagrange's mean value theorem, Cauchy's mean value theorem, Taylor's and Maclaurin theorems with remainders (without proof);								
UNIT-III	Multivariable calculus						Classes:09	
Partial derivatives, total derivatives, chain rule, change of variables, Jacobians, maxima and minima of functions of two variables, method of Lagrange multipliers								
UNIT-IV	Double Integrals						Classes:10	
Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves								
UNIT-V	Multiple Integrals and Special Functions						Classes:10	
Evaluation of triple integrals, change of variables between Cartesian, cylindrical and spherical polar co-ordinates, Beta and Gamma functions and their properties, relation between beta and gamma functions.								
Text Books:								
1.E.Kreyszig," Advanced engineering mathematics",John wiley & Son's publishers ,New edition.								
2.B.S.Grewal,"Higher engineering mathematics",Khanna publishers, New edition.								
Reference Books:								
1. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha Science International Ltd., 2002.								
2. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013.								
3. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 201.								
Web References:								
1. https://www.efunda.com/math/math_home/math.cfm .								
2. https://www.ocw.mit.edu/resources/#mathematics .								
E-Text Books:								

1. <https://www.e-booksdirectory.com/details.php?ebook=10166>.

2. <https://www.e-booksdirectory.com/details.php?ebook=7400re>

Outcomes:

1. The student will be able to analyze engineering problems using the concept of matrices and differential equations.

2. The students attain the abilities to use mathematical knowledge to analyze, formulate and solve problems in engineering applications.

ENGINEERING PHYSICS

I B. Tech - I Semester: Common for all branches								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
19CA55101	Foundation	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes:48	Tutorial Classes: 0			Practical Classes: Nil		Total Classes: 48		
OBJECTIVES:								
<ul style="list-style-type: none"> To impart knowledge in basic concepts of solids, acoustics and ultrasonics with their engineering applications To explain the significant concepts of dielectrics and magnetic materials in the field of engineering and their potential applications. To impart knowledge in basic concepts of LASERs and optical fibers along with its engineering applications. 								
UNIT – I	CRYSTAL PHYSICS					Classes: 10		
Introduction – Space lattice – Unit cell – Lattice parameters – Bravais lattice – Crystal systems – Packing fractions of SC, BCC and FCC – Directions and planes in crystals – Miller indices – Interplanar spacing in cubic crystals – Crystal structure analysis using X-ray diffraction – Bragg’s law – Powder method – Laue Method – Problems.								
UNIT – II	MECHANICAL PROPERTIES OF SOLIDS					Classes: 8		
Mechanical properties: Introduction – Stress and strain – Hook’s law – Different moduli of elasticity – Poisson’s ratio – stress – strain diagram – Elastic behavior of material – Factors affecting elasticity – Relation between different moduli of elasticity – Determination of elastic moduli.								
UNIT – III	ACOUSTICS AND ULTRASONICS					Classes:10		
<p><i>Acoustics:</i> Introduction – Reverberation – Reverberation time – Sabine’s formula – Derivation using growth and decay method – Absorption co-efficient and its determination – Factors affecting acoustics of buildings and their remedies.</p> <p><i>Ultrasonics:</i> Introduction – Properties and production of ultrasonics by piezoelectric method – Acoustic grating – Detection of ultrasonics - Non-destructive testing – Pulse echo system through transmission and reflection modes – A, B and C – scan displays – Medical applications.</p>								
UNIT – IV	DIELECTRIC AND MAGNETIC MATERIALS					Classes:10		
<p><i>Dielectrics:</i> Dielectric polarization - Dielectric polarizability- Susceptibility and Dielectric constant- Types of polarizations: Electronic and Ionic (quantitative), Orientation polarizations (qualitative) - Frequency dependence of polarization – Lorentz (internal) field - Clausius - Mosotti equation - Applications of Dielectrics - ferroelectricity.</p> <p><i>Magnetic materials:</i> Magnetic dipole moment – Magnetization - Magnetic susceptibility and permeability- Origin of permanent magnetic moment - Classification of magnetic materials – Hysteresis - soft and hard magnetic materials –Magnetic materials and their applications.</p>								
UNIT – V	LASER AND FIBER OPTICS					Classes:10		
<p><i>Lasers:</i> Characteristics – Absorption, spontaneous and stimulated emission of radiation – Einstein’s A and B coefficients –Population of Inversion – Ruby laser, He-Ne laser and semiconductor diode laser – Applications.</p> <p><i>Fiber Optics:</i> Optical fiber - Total internal reflection – Classification of optical fibers - Acceptance angle - Numerical aperture – attenuation and losses of fibers - Block diagram of fiber optic communication system – Applications of optical fibers – optical fibers as sensors.</p>								
Text Books:								
<ol style="list-style-type: none"> 1. “A Text book of Engineering Physics” – M. N. Avadhanulu, P. G. Kshirsagar & T.V.S Arun Murthy, S. Chand Publications, 11th Edition, 2019. 2. “Engineering Physics” – B. K. Pandey and S. Chaturvedi, Cengage Learning India, 2013. 								

References

1. "Engineering Physics" – K. Thyagarajan, McGraw Hill Publishing Company Ltd, 2016.
2. "Engineering Physics" – Shatendra Sharma, Jyotsna Sharma, Pearson Education, 2018.

OUTCOMES:

- **Explain** physics applied to solve engineering problems (L2).
- **Apply** the principles of acoustics in designing of building (L3).
- **Explains** the applications of ultrasonics in various engineering fields (L3 & L2).
- **Summarize** the various types of polarization of dielectrics, classification of magnetic materials and the applications of dielectric and magnetic materials.(L2 & L3)
- **Apply** electromagnetic wave propagation in optical fibres (L3).
- **Summarize** the various concepts of physics to the real engineering problems. (L3)

ESSENTIAL ELECTRICAL & ELECTRONICS ENGINEERING

I B. Tech - I Semester: Common to ME & CSE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
19CA02101	Foundation	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes:48	Tutorial Classes: 16			Practical Classes: Nil		Total Classes: 64		
OBJECTIVES:								
<ul style="list-style-type: none"> • To familiarize with the basic DC and AC networks. • To explain the concepts of electrical machines and their characteristics. • To identify the importance of transformers in transmission and distribution of electric power. • To impart knowledge about the characteristics of semi conductor devices. • To expose basic concepts and applications of Operational Amplifiers. 								
UNIT – I	BASIC LAWS AND THEOREMS					Classes: 14		
<p>Basic laws and Theorems: Ohms law, Kirchoff's Laws, series and parallel circuits, source transformations, delta-wye conversion. Mesh analysis, nodal analysis. Linearity and superposition theorem, Thevenin's and Norton's theorem with simple examples, maximum power transfer theorem with simple examples.</p>								
UNIT – II	DC MACHINES					Classes: 13		
<p>DC Machines: Constructional features induced EMF and torque expressions, different types of excitation, performance characteristics of different types of dc machines, Starters: 2-point, 3-point starters, losses and efficiency, efficiency by direct loading.</p>								
UNIT – III	TRANSFORMERS AND THREE PHASE INDUCTION MOTORS					Classes:13		
<p>Transformers: Constructional details, EMF equation, voltage regulation, losses and efficiency, open/short- circuit tests and determination of efficiency.</p> <p>Three Phase Induction Motors: Construction, working principle of three phase induction motor, Torque and Torque-Slip characteristics.</p>								
UNIT – IV	SEMICONDUCTOR DEVICES					Classes:12		
<p>Semiconductor Devices: p-n Junction diode - Basic operating principle, current-voltage characteristics, rectifier circuits (half-wave, full-wave, rectifier with filter capacitor), Zener diode as Voltage Regulator; Metal oxide semiconductor field effect transistor (MOSFET): Operation of NMOS and PMOS FETs, MOSFET as an amplifier and switch.</p>								
UNIT – V	OPERATIONAL AMPLIFIERS					Classes:12		
<p>Operational Amplifiers: The Ideal Op Amp, The Inverting Configuration, The closed loop gain, Effect of Finite open-loop gain, The Noninverting Configuration, The closed loop gain, Characteristics of Non Inverting Configuration, Effect of finite open loop gain, the voltage follower, Difference amplifiers, A Single Op-amp difference amplifier</p>								
Text Books:								
<ol style="list-style-type: none"> 1. D.P. Kothari, I.J. Nagrath, Basic Electrical and Electronics Engineering, 1st edition, McGraw Hill Education (India) Private Limited, 2017. 2. B.L. Theraja, Fundamentals of Electrical Engineering and Electronics, 1st edition, S. Chand Publishing, New Delhi, 2006. 3. Adel S. Sedra and Kenneth C. Smith, Microelectronic Circuits 6th edition, Oxford University Press, 2014 								
References								
<ol style="list-style-type: none"> 1. S.K. Bhattacharya, Basic Electrical and Electronics Engineering, Pearson Education, 2011. 2. Dharma Raj Cheruku, B T Krishna, Electronic Devices and Circuits, 2/e, Pearson Education, 2008. 								

3. R.K. Rajput, Basic Electrical and Electronics Engineering, University Science Press, New Delhi, 2012.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to

- analyze the behavior of an electrical circuit. (L4)
- measure the performance quantities such as losses, efficiency of DC machines and transformers. (L3)
- understand the importance and applications of p-n junction diode. (L2)
- evaluate the configurations and applications of Op-Amps. (L3)
- analyze the basic circuits. (L4)

COMMUNICATIVE ENGLISH I LAB

I B. Tech - I Semester: Common for all branches								
Course code	Category	Hours/week		Credits	Maximum Marks			
19A52101	Foundation	L	T	P	C	CIA	SEE	TOTAL
		-	-	3	1.5	30	70	100
Contact Classes: NIL	Tutorial Classes: Nil		Practical Classes:45			Total Classes:45		
OBJECTIVES: The course should enable the : <ul style="list-style-type: none"> students will be exposed to a variety of self instructional, learner friendly modes of language learning students will cultivate the habit of reading passages from the computer monitor. Thus providing them with the required facility to face computer based competitive exams like GRE, TOEFL, and GMAT etc. students will learn better pronunciation through stress, intonation and rhythm students will be trained to use language effectively to face interviews, group discussions, public speaking students will be initiated into greater use of the computer in resume preparation, report writing, format making etc. 								
UNIT-I						Classes:09		
<ol style="list-style-type: none"> 1. Phonetics for listening comprehension of various accents 2. Reading comprehension 3. Describing objects/places/persons <p>Learning Outcomes At the end of the module, the learners will be able to</p> <ul style="list-style-type: none"> understand different accents spoken by native speakers of English employ suitable strategies for skimming and scanning on monitor to get the general idea of a text and locate specific information learn different professional registers and specific vocabulary to describe different persons, places and objects 								
UNIT-II						Classes:09		
<ol style="list-style-type: none"> 1. JAM 2. Small talks on general topics 3. Debates <p>Learning Outcomes At the end of the module, the learners will be able to</p> <ul style="list-style-type: none"> produce a structured talk extemporarily comprehend and produce short talks on general topics participate in debates and speak clearly on a specific topic using suitable discourse markers 								
UNIT-III						Classes:09		
<ol style="list-style-type: none"> 1. Situational dialogues – Greeting and Introduction 2. Summarizing and Note making 3. Vocabulary Building <p>Learning Outcomes At the end of the module, the learners will be able to</p> <ul style="list-style-type: none"> Learn different ways of greeting and introducing oneself/others 								

- summarize the content with clarity and precision and take notes while listening to a talk/lecture and make use of them to answer questions
- replenish vocabulary with one word substitutes, homonyms, homophones, homographs to reduce errors in speech and writing

UNIT-IV

Classes:09

1. Asking for Information and Giving Directions
2. Information Transfer
3. Non-verbal Communication – Dumb Charade

Learning Outcomes

At the end of the module, the learners will be able to

- Learn different ways of asking information and giving directions
- Able to transfer information effectively
- understand non-verbal features of communication

UNIT-V

Classes:09

1. Oral Presentations
2. Précis Writing and Paraphrasing
3. Reading Comprehension and spotting errors

Learning Outcomes

At the end of the module, the learners will be able to

- make formal oral presentations using effective strategies
- learn different techniques of précis writing and paraphrasing strategies
- comprehend while reading different texts and edit short texts by correcting common errors

Minimum Requirements for ELCS Lab:

The English Language Lab shall have two parts:

1. Computer Assisted Language Learning (CALL) Lab: The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self study by learners.
2. The Communication Skills Lab with movable chairs and audio-visual aids with a P.A. system, Projector, a digital stereo-audio & video system and camcorder etc.

System Requirement (Hardware component):

Computer network with LAN with minimum 60 multimedia systems with the following specifications:

- i) P – IV Processor
 - a) Speed – 2.8 GHZ
 - b) RAM – 512 MB Minimum
 - c) Hard Disk – 80 GB
- ii) Headphones of High quality

Suggested Software:

1. Clarity Pronunciation Power – Part I (Sky Pronunciation)
2. Clarity Pronunciation Power – part II
3. K-Van Advanced Communication Skills

4. Walden InfoTech Software.

References:

1. A Textbook of English Phonetics for Indian Students 2nd Ed T. Balasubramanian. (Macmillian),2012.
2. A Course in Phonetics and Spoken English, Dhamija Sethi, Prentice-Hall of India Pvt .Ltd
3. Speaking English Effectively, 2nd Edition Krishna Mohan & NP Singh, 2011. (Mc Millan).
4. A Hand book for English Laboratories, E. Suresh Kumar, P. Sreehari, Foundation Books, 2011
5. Spring Board Succes, Sharada Kouhik, Bindu Bajwa, Orient Blackswan, Hyderabad, 2010.

COURSE OUTCOMES

Upon successful completion of the course, the student will be able to

- Remember and understand the different aspects of the English language proficiency with emphasis on LSRW skills
- Apply communication skills through various language learning activities
- Analyze the English speech sounds, stress, rhythm, intonation and syllable division for better listening and speaking comprehension.
- Evaluate and exhibit acceptable etiquette essential in social and professional settings
- Create awareness on mother tongue influence and neutralize it in order to improve fluency in spoken English.

ENGINEERING PHYSICS LAB

I B. Tech - I Semester: Common for all branches								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
19CA55102	Foundation	L	T	P	C	CIA	SEE	Total
		-	-	3	1.5	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil			Practical Classes: 45		Total Classes: 45		
OBJECTIVES:								
<ul style="list-style-type: none"> • To understand the role of optical fiber parameters in communication. • To understand the mechanical properties of materials. • Recognize the importance of laser by studying the laser characteristics and its applications. • Illustrates the magnetic and dielectric materials applications. • To apply the principles of optical fibers to calculate the properties of fibers. 								
Expt. 1	Determination of wavelength of laser using diffraction grating							
Expt. 2	Determination of the size of a particle using laser.							
Expt. 3	Determination of spring constant of a spring using coupled oscillator							
Expt. 4	Determination of Hall voltage and Hall co-efficient using Hall effect.							
Expt. 5	Determination of dielectric constant by charging and discharging method							
Expt. 6	Determination of magnetic field along the axis of a circular coil carrying current using Stewart and Gee's method.							
Expt. 7	Determination of rigidity modulus of a material of a wire using dynamic method (Torsional pendulum)							
Expt. 8	Determination of self inductance of the coil (L) using Anderson's bridge.							
Expt. 9	Study the variation of B versus H by magnetizing the magnetic material using B-H curve method.							
Expt. 10	Determination of numerical aperture and acceptance angle of given optical fiber.							
Expt. 11	Measurement of magnetic susceptibility by Gouy's method.							
Expt. 12	Determination of ultrasonic velocity in liquid (acoustic grating)							
Expt. 13	Determination of pressure variation using strain gauge sensor							
Expt. 14	Determination of temperature change using strain gauge sensor							
Expt. 15	Determination of pressure and temperature variations using optical fiber sensor							
References								
<ol style="list-style-type: none"> 1. A Text book of practical physics – S. Balasubramanian, M. N. Srinivasan, S. Chand Publishers, 2017. 2. http://vlab.amrita.edu/index/php - virtual labs, Amrita University. 								
COURSE OUT COMES								
<ul style="list-style-type: none"> • Operate various optical experiments like microscope and spectroscope (L2). • Determine wavelength of laser and particle size of laser (L2). • Estimate the susceptibility and related magnetic parameters of magnetic materials (L2). • Plot the intensity of the magnetic field of circular coil carrying current with distance (L3). • Evaluate the acceptance angle and numerical aperture of an optical fiber (L3). • Determine magnetic susceptibility of the material and its losses by B-H curve (L3). • Determine of pressure and temperature variations using the sensors (L3). • Apply the concepts of sensors for various applications (L3). 								

ESSENTIAL ELECTRICAL & ELECTRONICS ENGINEERING LAB

I B. Tech - I Semester: Common to ME & CSE								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
19CA02102	Foundation	L	T	P	C	CIA	SEE	Total
		-	-	3	1.5	30	70	100
Contact Classes: NIL	Tutorial Classes: NIL		Practical Classes: 48		Total Classes: 48			
OBJECTIVES:								
•								
List of Experiments								
<ol style="list-style-type: none">1. Verification of Kirchhoff's Laws KVL and KCL.2. Verification of DC Superposition Theorem.3. Verification of Thevenin's Theorem and Norton's Theorem.4. OCC and External characteristics of separately excited DC generators.5. Swinburne's test on a DC shunts motor.6. OC and SC Tests on single phase transformer.7. Brake Test on DC shunt motor.8. Current Voltage Characteristics of a p-n Junction Diode/LED.9. Diode Rectifier Circuits.10. Voltage Regulation with Zener Diodes.11. Design of a MOSTFET amplifier and MOSFET inverter/NOR gate12. Inverting and Non-inverting Amplifier Design with Op-amps.13. Simulation experiments using PSPICE<ol style="list-style-type: none">(a) Diode and Transistor Circuit Analysis.(b) MOSFET Amplifier design.(c) Inverting and Noninverting Amplifier Design with Op-amps								
References								
1.								
COURSE OUTCOMES								
Upon successful completion of the course, the student will be able to								
•								

BASIC ENGINEERING WORKSHOP

I B. Tech - I Semester: Common for all branches								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
19CA03102	Foundation	L	T	P	C	CIA	SEE	Total
		-	-	3	1.5	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 48			Total Classes: 48			
OBJECTIVES:								
1. Identify and use of tools, types of joints in carpentry, fitting, forming, welding and foundry operations.								
2. Understand electrical wiring and components.								
Any 10 of the following experiments.								
CARPENTRY								
Expt. 1	Preparation of dove tail joint as per given taper angle.							
Expt. 2	Preparation of lap joint as per given dimensions.							
Expt. 3	Preparation of Cross Lap joint as per given taper angle.							
FITTING								
Expt. 4	Make a square fit for given sizes.							
Expt. 5	Make a V Joint for given dimensions.							
Expt. 6	Make a half round fit for given dimensions.							
FORMING								
Expt. 7	Prepare the development of a surface and make a rectangular tray.							
Expt. 8	Prepare the development of a surface and make a round tin.							
WELDING								
Expt. 9	Preparation of V butt joint using Arc welding							
Expt. 10	Preparation of Lap joint using Arc welding							
Expt. 11	Preparation of T fillet joint using Arc welding							
ELECTRICAL WIRING								
Expt. 12	Two bulbs controlled by one switch in series							
Expt. 13	Two bulbs controlled by one switch in parallel							
Expt. 14	One bulb controlled by 2 Two way switches							
References:								
1. K. C. John, "Mechanical Workshop Practice", PHI, 2 nd Edition, 2010.								
2. H.S. Bawa, "Workshop Practice", Tata McGraw Hill Publishing Company Limited, 2 nd Edition 2009.								
3. S. K. Hajra Choudhury, A. K. Hajra Choudhury, "Elements of Workshop Technology", Media Promoters, 1 st Edition, 2009.								
4. Engineering Work shop practice for JNTU, V. Ramesh Babu, VRB Publishers Pvt. Ltd., 2009								
5. Work shop Manual / P.Kannaiah/ K.L.Narayana/ SciTech Publishers.								
COURSE OUTCOMES:								
After completion of this lab the student will be able to								
1. apply wood working skills in real world applications. (L3)								
2. build different parts with metal sheets in real world applications. (L3)								
3. apply fitting operations in various applications. (L3)								
4. apply different types of basic electric circuit connections. (L3)								
5. develop different weld joints. (L2)								

MATHEMATICS-II

(Differential Equations and Vector Calculus)

I B. Tech – II Semester: common for all branches								
Course code	category	Hours/week			credits	Maximum Marks		
19CA54201	Foundation	L	T	P	C	CIA	SEE	TOTAL
		2	1	-	3	30	70	100
Contact Classes:32	Tutorial Classes:16	Practical Classes: NIL			Total Classes:48			
OBJECTIVES:								
<p>The course should enable the students to :</p> <ul style="list-style-type: none"> • To enlighten the learners in the concept of differential equations and multivariable calculus. • To furnish the learners with basic concepts and techniques at plus two level to lead them into advanced level by handling various real world applications. 								
UNIT-I	LINEAR DIFFERENTIAL EQUATIONS OF HIGHER ORDER						Classes:10	
Definitions, complete solution, operator D, rules for finding complimentary function, inverse operator, rules for finding particular integral, method of variation of parameters.								
UNIT-II	EQUATIONS REDUCIBLE TO LINEAR DIFFERENTIAL EQUATIONS AND APPLICATIONS						Classes:10	
Cauchy's and Legendre's linear equations, simultaneous linear equations with constant coefficients, Applications: Mass spring system and L-C-R Circuit problems.								
UNIT-III	PARTIAL DIFFERENTIAL EQUATIONS – FIRST ORDER						Classes:10	
First order partial differential equations, solutions of first order linear and non-linear PDEs. Solutions to homogenous and non-homogenous higher order linear partial differential equations								
UNIT-IV	MULTIVARIABLE CALCULUS (VECTOR DIFFERENTIATION)						Classes:09	
Scalar and vector point functions, vector operator del, del applies to scalar point functions- Gradient, del applied to vector point functions- Divergence and Curl, vector identities.								
UNIT-V	MULTIVARIABLE CALCULUS (VECTOR INTEGRATION)						Classes:09	
Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof) and its applications.								
Text Books:								
1.E.Kreyszig," Advanced engineering mathematics", John wiley & Son's publishers ,New edition. 2.B.S.Grewal,"Higher engineering mathematics", Khanna publishers, New edition.								
Reference Books:								
1. Dennis G. Zill and Warren S. Wright, Advanced Engineering Mathematics, Jones and Bartlett, 2011. 2. Michael Greenberg, Advanced Engineering Mathematics, 2/e, Pearson, 2018 3. George B. Thomas, Maurice D. Weir and Joel Hass, Thomas Calculus, 13/e, Pearson Publishers, 2013. 4. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, 3/e, Alpha								

Science International Ltd., 2002.

5. Glyn James, Advanced Modern Engineering Mathematics, 4/e, Pearson publishers, 2011.

Web References:

1. https://www.efunda.com/math/math_home/math.cfm.

2. <https://www.ocw.mit.edu/resources/#mathematics>.

E-Text Books:

1. <https://www.e-booksdirectory.com/details.php?ebook=10166>.

2. <https://www.e-booksdirectory.com/details.php?ebook=7400re>

OUTCOMES:

- solve the differential equations related to various engineering fields (L6)
- Identify solution methods for partial differential equations that model physical processes (L3)
- interpret the physical meaning of different operators such as gradient, curl and divergence (L5)
- estimate the work done against a field, circulation and flux using vector calculus (L6)

ENGINEERING CHEMISTRY

I B. Tech – II Semester: common for all branches								
Course code	category	Hours/week			credits	Maximum Marks		
		L	T	P		C	CIA	SEE
19A51101	Foundation	3	-	-	3	30	70	100
Contact Classes: 48	Tutorial Classes: NIL	Practical Classes: NIL			Total Classes: 48			
Course Objectives: <ul style="list-style-type: none"> ● To familiarize engineering chemistry and its applications ● To train the students on the principles and applications of electrochemistry and polymers ● To identify the constituents of Portland cement ● Calculate the hardness of water 								
UNIT-I	WATER TECHNOLOGY						Classes: 08	
Introduction – Soft Water and hardness of water, Estimation of hardness of water by EDTA Method - Boiler troubles - scale and sludge, Industrial water treatment – specifications for drinking water, Bureau of Indian Standards (BIS) and World health organization (WHO) standards, zeolite and ion-exchange processes - desalination of brackish water, reverse osmosis (RO) and electro dialysis.								
UNIT-II	ELECTROCHEMISTRY AND APPLICATIONS:						Classes: 10	
Electrodes – concepts, electrochemical cell, Nernst equation, cell potential calculations. Primary cells – Leclanche cell, Li Battery Secondary cells – lead acid, and lithium ion batteries- working of the batteries including cell reactions. Fuel cells- Basic Principles and Working Principles of hydrogen-oxygen, methanol fuel cells Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry electrochemical corrosion, Pilling Bedworth ratios and uses, Factors affecting the corrosion, cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).								
UNIT-III	POLYMERS AND FUEL CHEMISTRY						Classes: 12	
Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth and coordination polymerization. Thermoplastics and Thermo-setting plastics:- Preparation, properties and applications of PVC and Bakelite Elastomers – Preparation, properties and applications of Buna S, Buna N, Thiokol Fuels – Types of fuels, calorific value, numerical problems based on calorific value; Analysis of coal, Liquid Fuels refining of petroleum, fuels for IC engines, knocking and anti-knock agents, Octane and Cetane values, cracking of oils; alternative fuels- propane, methanol and ethanol, bio fuels.								
UNIT-IV	ADVANCED ENGINEERING MATERIALS						Classes: 10	
Composites - Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications Refractories - Classification, Properties, Factors affecting the refractory materials and Applications Lubricants - Classification, Functions of lubricants, Mechanism, Properties of lubricating oils and Applications Building materials - Portland Cement, constituents, phases and reactivity of clinker, Setting and Hardening of cement.								
UNIT-V	SURFACE CHEMISTRY AND APPLICATIONS						Classes: 08	

Introduction to surface chemistry, colloids, micelle formation, synthesis of colloids (any two methods with examples), chemical and electrochemical methods (not more than two methods) of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, solid-gas interface, solid-liquid interface, adsorption isotherm, applications of colloids and nanomaterials – catalysis, medicine, sensors.

Text Books:

1. Jain and Jain, Engineering Chemistry, 16/e, Dhanpat Rai, 2013.
2. K N Jayaveera, G V Subba Reddy and C Rama Chandraiah, Engineering Chemistry 1/e Mc Graw Hill Education (India) Pvt Ltd, New Delhi 2016.

Reference Books:

1. J. D. Lee, Concise Inorganic Chemistry, 5/e, Oxford University Press, 2008.
2. Peter Atkins, Julio de Paula and James Keeler, Atkins' Physical Chemistry, 10/e, Oxford University Press, 2010.
3. Skoog and West, Principles of Instrumental Analysis, 6/e, Thomson, 2007.
4. Ben L. Feringa and Wesley R. Browne, Molecular Switches, 2/e, Wiley-VCH, 2011.

COURSE OUTCOMES:

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

- **compare** the materials of construction for battery and electrochemical sensors
- **explain** the preparation, properties, and applications of thermoplastics & thermosettings, elastomers & conducting polymers.
- **outline** the preparation of nanomaterials and metal oxides
- **identify** the application of colloids and nanomaterials in medicine, sensors and catalysis
- **list** the differences between temporary and permanent hardness of water

ENGINEERING GRAPHICS AND DESIGN

I B. Tech – II Semester: ME								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
19CA03201	Core	L	T	P	C	CIA	SEE	Total
		1	-	3	2.5	30	70	100
Contact Classes:16	Tutorial Classes: Nil	Practical Classes: 48			Total Classes: 64			
OBJECTIVES:								
<ul style="list-style-type: none"> • Bring awareness that Engineering Drawing is the Language of Engineers. • Trained in Engineering Graphics concepts using Auto CAD. • Teach the practices for accuracy and clarity in presenting the technical information. • Develop the engineering imagination essential for successful design. • Instruct the utility of drafting & modeling packages in orthographic and isometric drawings. • Train the usage of 2D and 3D modeling. 								
UNIT – I	INTRODUCTION TO AUTO CAD AND ENGINEERING GRAPHICS						Classes: 12	
<p>Basic drawing and editing commands: line, circle, rectangle, erase, view, undo, redo, snap, object editing, moving, copying, rotating, scaling, mirroring, layers, templates, polylines, trimming, extending, stretching, fillets, arrays, dimensions. Dimensioning principles and conventional representations.</p> <p>Orthographic Projections: Systems of projections, conventions and application to orthographic projections. Principles of Engineering Graphics and their significance-Conventions in drawing-lettering - BIS conventions.</p> <p>a) Conic sections including the rectangular hyperbola- general method only.</p> <p>b) Cycloid, epicycloid and hypocycloid.</p>								
UNIT – II	PROJECTION OF POINTS & LINES						Classes: 12	
<p>Projection of points: Positions, notation system and projections in any quadrant.</p> <p>Projection of Lines: Projection of lines parallel to one plane and perpendicular to the other, parallel to both planes, inclined to one plane or both planes.</p>								
UNIT – III	PROJECTIONS OF PLANES AND SOLIDS						Classes: 12	
<p>Projection of planes: Parallel to on plane and perpendicular to the other, perpendicular to both planes, inclined to one or both planes.</p> <p>Projection of solids: Projections of regular solids inclined to one or both planes by rotational or auxiliary views method.</p>								
UNIT – IV	SECTIONS AND DEVELOPMENTS OF SOLIDS						Classes: 13	
<p>Sections of solids: Sectional planes and sectional view of regular solids-Prism, cylinder, cone and pyramids.</p> <p>Development of Solids: Development of surfaces of regular solids-Prism, cylinder, cone and pyramids.</p>								
UNIT – V	ISOMETRIC PROJECTIONS						Classes: 15	
<p>Principles of isometric projection- Isometric scale; Isometric views: planes, simple solids. Conversion of orthographic to isometric view.</p>								
Text Books:								
<ol style="list-style-type: none"> 1. D.M Kulkarni, A.P. Rastogi and A.M. Sarkar, Engineering Graphics with Auto CAD, PHI learning Private Limited, New Delhi 2009. 2. K.L.Narayana & P.Kannaiah, Engineering Drawing, 3/e, Scitech Publishers, Chennai, 2012. 3. N.D.Bhatt, Engineering Drawing, 53/e, Charotar Publishers, 2016. 								
References								

1. Dhanajay A Jolhe, Engineering Drawing: with an introduction to Auto CAD, Tata McGraw-Hill, 2008
2. Shah and Rana, Engineering Drawing, 2/e, Pearson Education, 2009
3. Venugopal, Engineering Drawing and Graphics, 3/e, New Age Publishers, 2000
4. K.C.John, Engineering Graphics, 2/e, PHI, 2013
5. Basant Agarwal & C.M.Agarwal, Engineering Drawing, Tata McGraw-Hill, Copy Right, 2008.

Web References:

1. Youtube: [http://sewor,Carleton.cag,kardos/88403/drawings.html](http://sewor.carleton.ca/gkardos/88403/drawings.html) conic sections-online, red woods.edu

Outcomes

After completing the course, the student will be able to

- draw various curves applied in engineering. (L2)
- draw and analyse the projection of points and lines. (L3)
- show projections of planes and solids. (L2)
- analyse the sectional view of solids and draw the developments. (L3)
- draw isometric views using CAD packages. (L3)

E-Text Books:

1. <https://www.wiziq.com/tutorial/219645-ENGINEERING-DRAWING-BOOK>

Note:

- Evaluation is to be done based on performance in Lab classes, Mid and End Examination.
- External examinations to be conducted in computer mode.

PROBLEM SOLVING AND PROGRAMMING

I B. Tech – II Semester: common for all branches								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
19CA05101	Foundation	L	T	P	C	CIA	SEE	Total
		3	1	-	4	30	70	100
Contact Classes:48	Tutorial Classes:16	Practical Classes: Nil			Total Classes:64			
Objectives:								
<ul style="list-style-type: none"> • Understand problem solving techniques • Understand representation of a solution to a problem • Understand the syntax and semantics of C programming language • Understand the significance of Control structures • Learn the features of C language 								
UNIT - I	INTRODUCTION TO COMPUTERS AND C LANGUAGE						Classes:14	
<p>Introduction to Computers, Introduction to Programming, Algorithms, Flowcharts, Flow chart symbols, Input/Output, Assignment, operators, conditional if, repetition, function and sub charts. Example problems–Finding maximum of 3 numbers, Unit converters, Interest calculators, multiplication tables, GCD of 2 numbers. Example problems-Fibonacci generation, prime number generation. Minimum, Maximum and average of n numbers, Linear search, Binary Search. Introduction to C Language, C Language Elements, Variables, Data Types, Operators and Expressions, Constants, Declarations, Operators, Type Conversions, Precedence and Order of Evaluation.</p>								
UNIT - II	CONTROL STATEMENTS, LOOPS AND ARRAYS						Classes:12	
<p>Statements: Selection Statements, Iteration Statements, Jump statements: Break, Continue, goto, Arrays: Accessing Array Elements, Single & Multi Dimensional Arrays.</p>								
UNIT - III	STRINGS AND FUNCTIONS						Classes:12	
<p>Strings: Declaring, Initialization of a String, Reading and Writing Strings, String manipulation functions from the standard Library, String I/O Functions: gets(), puts(). Functions: Definition, Function Call- Call by Value, Storage Class Specifiers, Understanding the scope of Functions with its Types, the Return Statement, Recursion, Command Line Arguments.</p>								
UNIT - IV	POINTERS, STRUCTURES AND UNIONS						Classes:13	
<p>Pointers: Pointer Variables, Pointer Expressions, Pointers And Arrays, Pointers to Strings, Call by Reference, C's Dynamic Allocation Functions, Problems with Pointers. Structures and Unions: Accessing structure members, Array of structures, Passing Structures to Functions, Structure Pointers, Structures within Structures, Bit Fields, Enumerations, Typedef.</p>								
UNIT -V	FILE I/O						Classes:13	
<p>Streams and File, File System Basics: File pointer, opening a file using fopen(), closing a file, getc(), putc(), fclose(), feof(), fputs, fgets(), ferror(), fread(), fwrite(), fseek(), Formatted Console I/O: fprintf, fscanf, the Preprocessor Directives: #define and #include.</p>								
Text Books:								
<ol style="list-style-type: none"> 1. The Complete Reference C, Fourth Edition, Herbert Schildt, McGraw-Hill Education. 2. The C Programming Language” Second Edition, Brain W. Kernighan, Dennis M. Ritchie, Prentice Hall, India. 								
References:								
<ul style="list-style-type: none"> • Programming with C Second Edition, Byron Gottfried, Schaum's outline, McGraw-Hill 								

Education.

- Computer Fundamentals and C programming, B. L Juneja, A Seth, Cengage Learning India.
- Programming in C and Data Structures”, Hanly, Koffman, Kamthane, Ananda Rao, Pearson.
- A BOOK ON C, Kelly pohl, Pearson Education.
- Computer Fundamentals and C Programming, By Dr. P. Chenna Reddy, Pothi.com (Self Publishing).

Web References

- <https://www.tutorialspoint.com/cprogramming/>
- www.studytonight.com/c/
- fresh2refresh.com/c-programming/
- www.cprogramming.com/tutorial/c/

E-Text Books:

- bookboon.com/en/c-cpp-csharp-ebooks
- electronicsforu.com › Resources › Cool Stuff
- https://en.wikibooks.org/wiki/C_Programming
- www.e-booksdirectory.com › Computers & Internet

OUTCOMES

- Illustrate the flowchart and design and algorithm for a given problem and to develop IC programs using operators
- Develop conditional and iterative statements to write C programs
- Exercise user defined functions to solve real time problems
- Inscribe C programs that use Pointers to access arrays, strings and functions.
- Exercise user defined data types including structures and unions to solve problems
- Inscribe C programs using pointers and to allocate memory using dynamic memory management functions.
- Exercise files concept to show input and output of files

MATERIAL SCIENCE AND ENGINEERING

I B. Tech – II Semester: ME									
Course Code	Category	Hours / Week			Credits	Maximum Marks			
19CA03202	Foundation	L	T	P	C	CIA	SEE	Total	
		3	-	-	3	30	70	100	
Contact Classes:48	Tutorial Classes: -	Practical Classes: Nil			Total Classes: 48				
OBJECTIVES:									
The course should enable the students to:									
1. To develop strong fundamentals of modern engineering materials.									
2. To gain and understanding of the relationship between the structure, properties, processing, testing, heat treatment Process.									
3. To prepare students for careers in manufacturing engineering where materials can be applied in various applications.									
UNIT-I	STRUCTURE OF METALS AND CONSTITUTION OF ALLOYS							Classes: 10	
Bonds in Solids – Metallic bond - crystallization of metals, grain and grain boundaries, effect of grain boundaries on the properties of metal / alloys – determination of grain size. Necessity of alloying, types of solid solutions, Hume Rotherys rules, intermediate alloy phases, and electron compounds.									
UNIT-II	EQUILIBRIUM OF DIAGRAMS							Classes: 10	
Experimental methods of construction of equilibrium diagrams, Isomorphous alloy systems, equilibrium cooling and heating of alloys, Lever rule, coring miscibility gaps, eutectic systems, congruent melting intermediate phases, peritectic reaction. Transformations in the solid state – allotropy, eutectoid, peritectoid reactions, phase rule, relationship between equilibrium diagrams and properties of alloys. Study of important binary phase diagrams of Cu-Ni-, Al-Cu, and Fe-Fe ₃ C.									
UNIT-III	CAST IRONS AND STEELS							Classes: 10	
Structure and properties of White Cast iron, Malleable Cast iron, grey cast iron, Spheroidal graphite cast iron, Alloy cast irons. Classification of steels, structure and properties of plain carbon steels, Low alloy steels, Hadfield manganese steels, tool and die steels. NON-FERROUS METALS AND ALLOYS: Structure and properties of copper and its alloys, Aluminium and its alloys, Titanium and its alloys.									
UNIT-IV	HEAT TREATMENT OF ALLOYS							Classes: 09	
HEAT TREATMENT OF ALLOYS: Effect of alloying elements on Iron – Iron carbon system, Annealing, normalizing, Hardening, TTT diagrams, tempering, Hardenability, surface - hardening methods, Age hardening treatment, Cryogenic treatment of alloys. Heat treatment of plastics									
UNIT-V	COMPOSITE MATERIALS							Classes: 09	
CERAMIC MATERIALS: Crystalline ceramics, glasses, cermets. COMPOSITE MATERIALS: Classification of composites, various methods of component manufacture of composites, particle – reinforced materials, fiber reinforced materials, polymer composites, metal ceramic mixtures, metal – matrix composites and Carbon – Carbon composites.									
Text Books:									
1. Introduction to Physical Metallurgy, Sidney H. Avner, US, 2nd Edition, 2007 Tata McGraw-Hill,									
2. Essential of Materials Science and Engineering, Donald R.Askeland, USA, 3rd Edition, Cengage Publisher,2013.									
Reference Books:									

1. Material Science and Metallurgy, U.C. Jindal, pearson educations, 2011,
2. Elements of Materials Science and Engineering, Lawrance H. Van Vlack, pearson educations, 6th Edition, 2002.
3. Material Science and Metallurgy, kodgire V.D, 12th Edition, Everest Publishing House,2002.
4. Engineering Mechanics of Composite Materials- Isaac and M Daniel, Oxford University Press, 1994, 2nd Edition 2013.
5. Mechanics of Composite Materials, R. M. Jones, McGraw Hill Company, New York, 1975.
6. Science of Engineering Materials, Agarwal, TMH.
7. Materials Science and Engineering, William D. Callister, 8th Edition,2010.
8. Elements of Material science, V. Rahghavan, PHI, 5th Editon.
9. Engineering Materials and Their Applications – R. A Flinn and P K Trojan, Jaico Books.
10. Engineering materials and metallurgy, R.K.Rajput, S.Chand, 1st Editon,2008.

Web References:

1. www.asminternational.org
2. www.henry.wells.edu
3. www.ce.berkeley.edu
4. www.sjsu.edu

ENGINEERING CHEMISTRY LAB

I B. Tech – IISemester: Common for all branches								
Course code	category	Hours/week			credits	Maximum Marks		
19A51101	Foundation	L	T	P	C	CIA	SEE	Total
		-	-	3	1.5	30	70	100
Contact Classes:NIL	Tutorial Classes:NIL	Practical Classes: 48			Total Classes:48			
Course Objectives:								
<ul style="list-style-type: none"> • Verify the fundamental concepts with experiments 								
EXP.1	Determination of Hardness of a groundwater sample							
EXP.2	pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base							
EXP.3	Estimation of dissolved oxygen in water.							
EXP.4	Determination of Alkalinity of water sample							
EXP.5	Estimation of Ferrous ion by dichrometry.							
EXP.6	Estimation of Calcium in port land Cement							
EXP.7	Preparation of polymer							
EXP.8	Adsorption of acetic acid by charcoal							
EXP.9	Determination of percentage of Iron in Cement sample by colorimetry							
EXP.10	Determination of cell constant and conductance of solutions							
EXP.11	Potentiometry - determination of redox potentials and emfs							
EXP.12	Determination of Strength of an acid in Pb-Acid battery							
EXP.13	Determination of viscosity of lubricating oil by red wood Viscometer 1&2							
EXP.14	Determination of calorific value of gases by Junker's gas calorimeter							
References								
<ol style="list-style-type: none"> 1. Laboratory Manual on Engineering Chemistry ,by Dr.Sudha Rani , Dhanpat Rai publishing house 2009. 2. A Text book on experiments and calculations in engineering chemistry ,by SS Dara , S .Chand publications 2015. 								
COURSE OUTCOMES								
<ul style="list-style-type: none"> • determine the cell constant and conductance of solutions • prepare advanced polymer materials • determine the physical properties like surface tension, adsorption and viscosity • estimate the Iron and Calcium in cement • calculate the hardness of water 								

PROBLEM SOLVING AND PROGRAMMING

I B.Tech II- Semester : Common for All Branches								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
19CA05102	Foundation	L	T	P	C	CIA	SEE	Total
		–	–	3	1.5	30	70	100
Contact Classes: Nil		Tutorial Classes: Nil		Practical Classes: 48			Total Classes:48	
Objectives: <ul style="list-style-type: none"> Learn C Programming language. To make the student solve problems, implement algorithms using C language. To write diversified solutions using C language. 								
Design an algorithm and construct a flow chart using Raptor tool and then write programs for the following problems.								
LIST OF PROGRAMS								
Week -1	BASIC C PROGRAMS							
Write C program to <ol style="list-style-type: none"> Find the Sum of three numbers. Exchange (swap) of two numbers by using third variable. Exchange (swap) of two numbers without using third variable. Print the size of all data types. 								
Week - 2	BASIC C PROGRAMS							
<ol style="list-style-type: none"> a). Develop a calculator to convert time, distance, area, volume and temperature from one unit to another. b). Write a C program to find the Priority and associativity of operators using expressions. Take the expressions with different operators. c). Write a C program to swap two numbers using bitwise operators. 								
Week - 3	CONTROL STATEMENTS							
<ol style="list-style-type: none"> a) Write a C program to find whether the given number is odd or even. b) Write a C program to find the Maximum and minimum of N numbers. c) Write a C program to find the Maximum of three numbers. d) Write a C program to print 'hello world' without using semicolon. e) Write a C program to find whether the given number is odd or even using bitwise operator. f) Write a C program to find the maximum of two numbers using Conditional operator. g) Write a program which takes two integers and one arithmetic operator from the user, and performs the operation and then prints the result by using switch-case.(Operators : +, -, *, /, %) 								
Week -4	ITERATION STATEMENTS							
<ol style="list-style-type: none"> a) Write a C program to generate the required multiplication table. b) Write a C program to find the Factorial of a given number. c) Write a C program to check whether the given number is prime or not. d) Write a C program to find GCD 								
Week - 5	ITERATION STATEMENTS							
<ol style="list-style-type: none"> a) Write a C program to find the sum of the digits of a number. b) Write a C program to find whether the given integer is a Palindrome or not. c) Write a C program to generate Fibonacci numbers in the given range. 								

Week - 6	NESTED LOOPS
<p>a) Write a C program to print the following pattern.</p> <pre> 1 2 2 3 3 3 </pre> <p>b) print multiplication tables upto the given table.</p> <p>c) Write a C program to print Series of prime numbers in the given range.</p>	
Week - 7	NESTED LOOPS
<p>a) Write a C program to check given number is strong number or not.</p> <p>b) Write a C program to evaluate the sum of the following series up to 'n' terms $e^x = 1 + x + x^2/2! + x^3/3! + x^4/4! + \dots$</p>	
Week - 8	ARRAYS
<p>a).calculate the maximum, minimum and average of N numbers.</p> <p>b).Write a C program to find the sum of positive and negative numbers in a given set(Array) of numbers.</p> <p>c).Design a flowchart to perform Linear search on list of N unsorted numbers(Iterative and recursive)</p> <p>d)Write a C program to read two matrices and find</p> <ol style="list-style-type: none"> Sum. Product and display the result in the matrix form. 	
Week -9	ARRAYS
<p>a) Write a C program to read matrix and perform the following operations</p> <ol style="list-style-type: none"> Find the sum of Diagonal Elements of a matrix. Print Transpose of a matrix. Print sum of even and odd numbers in a given matrix. 	
Week - 10	STRINGS
<p>a) Write a C program to read two strings and perform the following operations without using built-in string Library functions.</p> <ol style="list-style-type: none"> String length determination. Compare Two Strings. Concatenate Two Strings. String reversing <p>b) Write a C program to accept a line of characters and print the number of Vowels, Consonants, blank spaces, digits and special characters.</p> <p>c) Write a C program to read a set of strings and sort them in alphabetical order.</p>	
Week -11	FUNCTIONS
<p>a) Write a C program to illustrate the following types of functions</p> <ol style="list-style-type: none"> Function with no arguments and no return values Function with arguments and no return value Function without arguments and with return value Function with arguments and with return value 	
Week - 12	POINTERS
<p>a) Write a C program to exchange two numbers using pointers.</p> <p>b) Write a program to print the elements of an array in reverse order using pointers.</p>	
Week - 13	FUNCTIONS
<p>a) Write a C program to express a four digit number in words. For example 1546 should be written as one thousand five hundred and forty six</p> <p>b) Write a C program using recursion for finding Factorial of a number</p>	

- c). calculate the greatest common divisor using iteration and recursion for two numbers as specified by the user
- d).Write a C program to illustrate the Dynamic Memory allocation function malloc()

Week -14	STRUCTURES
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- a) Declare a structure time that has three fields hr, min, secs. Create two structure variables start_time and end_time. Input there values from the user. Then if start_time is not equal to end_time then display HELLO CREC on the screen.
- b) Write a C program to read student roll no, name and marks in six subjects for n number of students and give class of each student by following the required conditions.
- c) Write a C program to demonstrate self referential structures.

Week -15	FILES
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- a) Write a program to create a file and write some text data on the file. Then display the contents of the file and also print number of characters, number of words, number of lines in the file.
- b) Write a C program to merge two files.

Week -16	FILES
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- a) Write a C program to create a text file and write data on it, then display every 5th character in that file.
- b) Write a program to read student records into a file. Record consists of rollno, name and marks of a student in six subjects and class. Class field is empty initially. Compute the class of a student. The calculation of the class is as per CREC rules. Write the first class, second class, third class and failed students lists separately to another file.

REFERENCE BOOKS

1. How to Solve it by Computer, R.G. Dromey, Pearson.
2. The C Programming Language, Brian W. Kernighan, Dennis M. Ritchie, Pearson.
3. Let us C, Yeswant Kanetkar, BPB publications
4. Pointers in C, Yeswant Kanetkar, BPB publications.
5. Programming in C and Data Structures, J.R.Hanly, Ashok N. Kamthane and A.Ananda Rao, Pearson Education.

WEB REFERENCES

- <https://www.programiz.com/>
- <https://www.programmingsimplified.com>
- <https://www.techcrashcourse.com>
- <https://www.sanfoundary.com/>

OUTCOMES:

- Illustrate flowchart and algorithm to the given problem
- Understand basic Structure of the C-PROGRAMMING, declaration and usage of variables
- Write C programs using operators
- Exercise conditional and iterative statements to Write C programs
- Write C programs using Pointers to access arrays, strings and functions.
- Write C programs using pointers and allocate memory using dynamic memory management functions.
- Exercise user defined data types

MATERIAL SCIENCE AND ENGINEERING LAB

I B. Tech - II Semester: ME								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
19CA03203	Foundation	L	T	P	C	CLA	SEE	Total
		-	-	3	1.5	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil			Practical Classes: 48		Total Classes: 48		
OBJECTIVES:								
<ul style="list-style-type: none"> ➤ learn the relationship between the structure, properties, processing, testing, heat treatment ➤ learn the applications of metallic , non metallic, ceramic and composite materials ➤ learn to identify and select suitable materials for various engineering applications. 								
Any 10 of the following experiments.								
Expt. 1	Mounting and preparation of Specimen.							
Expt. 2	Preparation and study of the Micro Structure of Ferrous metal							
Expt. 3	Preparation and study of the Microstructure of Non - Ferrous metals (Cu, Al..... etc)							
Expt. 4	Preparation and study of the Microstructure of Mild Steel, Low carbon Steels, High carbon steels							
Expt. 5	Study of the Micro Structures of Cast Irons.							
Expt. 6	Study of the Micro Structures of Non-Ferrous alloys.							
Expt. 7	Study of the Micro structures of Heat treated steels.							
Expt. 8	Hardeneability of steels by Jominy End Quench Test.							
Expt. 9	To find out the hardness of various treated and untreated steels.							
Expt. 10	Fracture testing of materials.							
Expt. 11	Fatigue testing of materials.							
Expt. 12	Creep Testing of materials.							
References:								
<ol style="list-style-type: none"> 1. Material Science and Metallurgy, U.C. Jindal, pearson educations, 2011. 2. Engineering materials and metallurgy, R.K.Rajput, S.Chand, 1st Editon,2008. 								
Course Outcomes:								
<ul style="list-style-type: none"> ● identify various microstructures of steels and cast irons. (L3) ● visualize grains and grain boundaries. (L3) ● evaluate hardness of treated and untreated steels. (L4) ● summarize the importance of hardening of steels. (L2) 								

MECHANICAL ENGINEERING WORKSHOP

I B. Tech - II Semester: ME								
Course Code	Category	Hours/Week			Credits	Maximum Marks		
19CA03204	Foundation	L	T	P	C	CLA	SEE	Total
		-	-	3	1.5	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil			Practical Classes: 48		Total Classes: 48		
OBJECTIVES:								
<ol style="list-style-type: none"> 1. Familiarize moulding and casting skills. 2. Train on different types welding joints. 3. Develop assemble or disassembly skills. 4. Make plastic components. 5. Familiarize with use power tools. 								
Foundry Practice: (2 Sessions)								
i.	Preparation of a green sand mould using single piece pattern							
ii.	Preparation of a green sand mould using split piece pattern with core and demonstration of casting							
Welding Practice: (2 Sessions)								
i.	Lap and Butt joints using spot welding.							
ii.	Lap and Butt joints using gas welding.							
Assembling/ Disassembling Practice: (3 Sessions)								
i.	Bicycle.							
ii.	Carburetor							
ii.	Two wheeler Engine.							
Manufacture of a Plastic Component: (2 Sessions)								
i.	Use of injection moulding machine.							
ii.	FRP composite using hand layup method.							
iii.	Joining of plastic components.							
Design and Manufacture of any one domestic utility products with any material (1 Session)								
Use of Power Tools (2 Sessions)								
Course Outcomes:								
After completion of this lab student will be able to								
<ul style="list-style-type: none"> ● make moulds for sand casting. (L3) ● develop different weld joints. (L3) ● assemble or disassemble of machine components. (L3) ● make plastic components. (L3) ● use power tools for different applications. (L3) ● find applications of hydraulic and pneumatic circuits. (L3) 								