KIT - Kalaignarkarunanidhi Institute of Technology

(An Autonomous Institution)

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

Accredited by NAAC with ‘A’ GRADE & NBA (CSE, ECE, EEE & MECH)

An ISO 9001 : 2015 Certified Institution

Coimbatore – 641 402.

REGULATIONS, CURRICULUM & SYLLABUS - 2019

(Applicable for students admitted from the Academic Year 2021-22 onwards)

I to VIII Semester

DEGREE OF BACHELOR OF ENGINEERING
IN
ELECTRONICS AND COMMUNICATION ENGINEERING

Vision and Mission of the Department

Vision

◎	To impart standard education, training and research in the field of Electronics and Communication Engineering and to produce globally proficient engineers.

Mission

◎	Provide quality and contemporary education in the domain of ECE to produce globally competitive engineers.
◎	Facilitates industry institution interaction in teaching & learning, consultancy and research activities to accomplish the technological needs of the society.
◎	Develop entrepreneurship qualities and good management practices by adhering to the professional ethical code.

Program Educational Objectives (PEO's)

PEO 1	Our Graduates will exhibit knowledge in Electronics and Communication Engineering and related fields for professional achievement in industry and academia or to become an entrepreneur.
PEO 2	Our Graduates will acquire the skills to identify and engage in query, develop new innovations and products in allied area of Electronics and Communication engineering system.
PEO 3	Our Graduates will develop technological requirement for the society through lifelong learning.

Programme Outcomes (PO's)

Students graduating from Electronics and communication Engineering should be able to

PO 1	**Engineering knowledge :** Apply the fundamental knowledge of mathematics, science and Engineering for the solution of complex Electronics and communication engineering problems.
PO 2	**Problem analysis :** Identify, formulate, research literature, and analyse complex electronics and communication engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design / Development of Solutions :** Design solutions for complex electronics engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems :** Using research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO 5	**Modern tool usage :** Create, select, and apply appropriate techniques, resources, and modern electronics and communication engineering tools including prediction and modeling to complex electronics and communication engineering activities with an understanding of the limitations.
PO 6	**The engineer and society :** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability :** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for the sustainable development.
PO 8	**Ethics :** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and team work :** Function effectively as an individual, and as a member or leader in diverse teams and in multidisciplinary settings.
PO 10	**Communication :** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO 11	**Project management and finance :** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO 12	**Life-long learning :** Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcome (PSO's)	
After the successful completion of the U.G. programme in Electronics and Communication Engineering, Graduates will be able to	
PSO 1	Analyze and Design Electronic Systems for Signal Processing and Communication Applications.
PSO 2	Identify and Apply Domain Specific Tools for Design, Analysis, Synthesis and Validation of VLSI and Communication Systems.

R. Gowri

BoS Chairman

UG Regulations

1. SHORT TITLE AND COMMENCEMENT

- These Regulations shall be called the “KIT-Kalaignarkaraunanidhi Institute of Technology, Coimbatore, Regulations for the Award of B.E./B.Tech., Degree”.
- They have been evolved, drafted and implemented after deliberations in and approvals from UGC, Anna University and Academic Council of the Institute, and are subject to change/modifications from time to time; (major modifications at a frequency of FOUR years in synchronization with the curriculum structure revision and minor changes as and when applicable).
- The latest/first version shall be applicable for the students enrolling for B.E/B.Tech degree programs at this Institute from Academic year 2019-2020 and onwards.

2. PREAMBLE

The regulations prescribed herein have been made by KIT, an autonomous institution, approved by AICTE,New Delhi and affiliated to the Anna University, Chennai, to facilitate the smooth and orderly conduct of its academic programmes and activities at the B.E/B.Tech., level. It is expected that the regulations will enable the students to take advantage of the various academic opportunities at the Institute and prepare themselves to face the challenges in their professional careers ahead. It may be noted that:

a. The provision made herein shall be applicable to all the B.E/ B.Tech. programmes offered at the institute, at present;

b. They shall also be applicable to all the new B.E /B.Tech. programmes which may be started at the Institute in the future;

c. Academic and non-academic requirements prescribed by the Academic Council have to be fulfilled by a student for eligibility towards award of B.E/B.Tech. Degree.

3. PRELIMINARY DEFINITIONS AND NOMENCLATURE

In these Regulations, unless the context otherwise requires :

Sl. No.	Name	Definition
1.	**Programme**	Refers to Degree Programme that is B.E./B.Tech. Degree Programme.
2.	**Discipline**	Refers to branch or specialization of B.E./B.Tech. Degree Programme, like Computer Science and Engineering, Mechanical Engineering etc.,
3.	**Course**	Refers to a theory or practical subject that is normally studied in a semester, like Mathematics, Physics, etc.,
4.	**Head of the Institution**	Refers to the Principal of the College.
5.	**Controller of Examinations (CoE)**	Refers to the authority of the college who is responsible for all activities of the Examinations.

6.	**Head of the Department (HoD)**	Refers to the Head of the Department concerned.
7.	**University**	Refers to Anna University, Chennai.
8.	**College (KIT)**	Refers to KIT-Kalaignarkarunanidhi Institute of Technology, Coimbatore.
9.	**Curriculum**	Refers to the various components/courses studied in each programme that provide appropriate outcomes (knowledge, skill and behavior/attitude) in the chosen branch of study.
10.	**T– P – TU – C**	Refers to Theory, Practical, Tutorial, and Credits respectively.
11.	**Humanities and Social Sciences (HS)**	Courses include English, Professional Ethics and Human Values, Communication skills etc.
12.	**Basic Sciences (BS)**	Courses include Mathematics, Physics, Chemistry, etc.,
13.	**Engineering Sciences (ES)**	Courses include Engineering Practices, Engineering Graphics, Basics of Electrical / Electronics / Mechanical / Civil / Computer Engineering etc.,
14.	**Professional Core (PC)**	Courses include the core courses relevant to the chosen specialization / branch.
15.	**Professional Elective (PE)**	Courses include the elective courses relevant to the chosen specialization / programme.
16.	**Open Elective**	Open Elective (OE) courses include the courses which a student can choose from the curriculum of other B.E. / B.Tech. programmes and courses offered by the Departments under the Faculty of Science and Humanities & Department of Management. These courses may be offered by internal/external experts.
17.	**Project Work (PW)**	Refers to the project done by a student or a group of students during final year.
18.	**Career Enhancement Courses (CEC)**	Includes Mini Project Work and/or Internship, Seminar, Professional Practices, Case Study, soft skills and Industrial / Practical Trainings etc.,

19.	**Academic Evaluation Committee (AEC)**	The committee includes Principal, CoE, HoD concerned (For details refer **Annexure V**)
20.	**Department Evaluation Committee (DEC)**	The committee included HoD (need basis), senior faculty member(s) of department from various levels, class advisor, Mentor of the students. (For details refer **Annexure V**)

4. ADMISSION

4.1 B.E. / B.Tech. Degree Programme (I Semester)

The Candidates should have passed the Higher Secondary Examinations of (10+2) Curriculum (Academic Stream) prescribed by the Government of Tamil Nadu with Mathematics, Physics and Chemistry as three of the four subjects of study under Part-III or any examination of any other University or authority accepted by the Syndicate of Anna University as equivalent thereto.

(OR)

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

4.2 Lateral Entry Admission

i. The candidates who possess the Diploma in Engineering / Technology awarded by the State Board of Technical Education, Tamilnadu or its equivalent are eligible to apply for Lateral entry admission to the third semester of B.E. / B.Tech. in the branch corresponding to the branch of study.

(OR)

ii. The candidates who possess the Degree in Science (B.Sc.,) (10+2+3 stream) with Mathematics as a subject at the B.Sc. Level are eligible to apply for Lateral entry admission to the third semester of B.E. / B.Tech. Such candidates may be two additional Engineering subject(s) in the **third and fourth semesters** as prescribed by the AEC, if necessary.

4.3 Re - admission

Students, who have discontinued for reasons other than disciplinary action, may be readmitted as per guidelines given by DoTE, Government of Tamilnadu and Anna University. Department Evaluation Committee (DEC) shall study and recommend on the exception and addition of courses to be registered for, by the student concerned during re-admission. The details shall be forward to Academic Evaluation Committee (AEC) for approval and the committee's decision shall be final.

5. PROGRAMMES OFFERED

B.E. / B.Tech. Programmes under the Faculty of Mechanical Engineering, Faculty of Electrical Engineering, Faculty of Information and Communication Engineering and Faculty of Technology. KIT offers 4 year (8 Semesters) B.E./B.Tech. Degree programme affiliated to Anna University, under Choice Based Credit System (CBCS) for students admitted from 2019 onwards in the following branches of Engineering and Technology as in Table 1.

Table 1. List of B.E. / B.Tech. programmes offered

B.E.	B.Tech
Aeronautical Engineering	Bio Technology
Agriculture Engineering	Artificial Intelligence and Data Science
Bio Medical Engineering	Computer Science and Business Systems
Computer Science and Engineering	
Electronics and Communication Engineering	
Electrical and Electronics Engineering	
Mechanical Engineering	

6. ACADEMIC STRUCTURE OF PROGRAMMES

6.1 Medium of Instruction

The medium of instruction for the entire undergraduate programme will be English.

6.2 Categorization of Courses

Every B.E. / B. Tech. Programme will have a curriculum with syllabi consisting of theory and practical courses that shall be categorized as follows:

The typical curriculum structure for UG degree programmes are based on AICTE and Anna University and is given in Table 2.

Table 2 : Curriculum Structure

Humanities and Social Sciences including Management Courses (HS)	Basic Sciences (BS)	Basic Engineering Sciences (ES)
Professional Core (PC)	Professional Elective (PE)	Open Elective (OE)
Project Work (PW)		
Career Enhancement Courses (CEC)		
Mandatory Course (MC)		

The course outcomes (CO's) are designed to align with the Programme Outcomes (PO's) and Programme Educational Objectives (PEO's) of the respective programmes.

In addition to the courses listed in the curriculum, the department can include elective courses offered by reputed Industry / Educational Institutions /Experts from time to time, approved by DEC/AEC and ratified by the Academic Council.

The credits earned through such courses shall be considered equivalent to Professional Elective (PE) credits or Open Elective (OE) credits as decided by the Department evaluation Committee (DEC) on a course to course basis.

Experts from the Industry / Institution may design such specialized elective courses based on the current technical skill requirements. The Department evaluation Committee (DEC) shall review and approve the course offered by the expert from the industry / Institution.

In addition to the courses that carry credits, all students are required to complete mandatory non-credit courses, if offered (eg.,Value education courses, and others).Credits will not be awarded but will be assessed and graded, and must be completed.

The following is the credit distribution of KIT based on the suggested AICTE distribution. (Table 3)

Table 3 : Credit Distribution

Category	Credit range
A - Foundation Courses	
Humanities and Social Sciences including Management Courses (HS)	6-9
Basic Sciences Courses (BS)	17-26
Basic Engineering Sciences (ES)	10-29
B - Professional Core Courses	
Professional Core Courses (PC)	62-87
C - Elective Courses	
Professional Electives (PE)	15-18
Open Electives (OE)	6-12
D - Project Work	
Project Work (PW)	11-13
E - Mandatory Courses Prescribed by AICTE/UGC	
Mandatory Courses (Induction Program, Environmental Sciences, Indian Constitution)	–
F - Career Enhancement Courses(CEC)	8
Total Credits	**165 - 174**

6.3 Number of courses per semester

Each semester curriculum shall normally have a blend of lecture courses not exceeding 8 and Laboratory courses and Career Enhancement Courses (CEC) not exceeding 7.However, the total number of courses per semester shall not exceed 15. The students can register for Professional Elective/Open Elective courses in any semester, starting from the third semester.

6.4 Credit Assigned

Each course offered is given a T-P-TU-C structure, depending on the number of lecture periods (T), number of periods for practical (P) and number of tutorial periods (TU) required per week for an efficient teaching – learning process. A student is expected to put-in his/her own efforts in proportion with periods spent in classroom, as defined in T-P-TU-C structure. On successful completion of the course a student is said to have earned a specified number of credits defined for each course. Each course is assigned certain number of credits based on the following table:

Table 4: Credit Assigned

Contact period per week	Credits
1 Lecture Period (**T** = Lectures given during class by the faculty)	1
1 Tutorial Periods (**TU** = Tutorial, also class based with more emphasis on problem solving)	1
2 Practical Period (**P**) (Laboratory Periods / CEC / Projects)	1

6.5 Career Enhancement Courses

6.5.1 Personality and Character Development

All students shall enroll, on admission, in any one of the personality and character development programmes (NCC / NSS / YRC) and undergo training and attends camp as prescribe by the respective officers/ coordinators. The training shall include classes on hygiene and health awareness and also training in first-aid.

National Cadet Corps (NCC) will have number of parades/camps specified by the NCC officer.

National Service Scheme (NSS) will have social service activities in and around the College / Institution.

Youth Red Cross (YRC) will have activities related to social services in and around College /Institutions. While the trainingactivities will normally be during weekends, the camp will normally be during vacation period.

6.5.2 Industrial Training / Internship

Students shall undergo industrial training/Internship if mandated in the curriculum for periods as specified in the curriculum during the summer/winter vacation, the training being taken on a continuous basis for the periods mentioned. The industry/organization is to be selected with the approval of the Department Evaluation Committee (DEC). Industrial training may also be referred to as “In-plant training”.

The Industrial Training / Internship shall carry 100 marks and shall be evaluated through CIA only. The credit will be awarded to the student after the submission of Internship / Training report to the HoD. The report will be evaluated by a team of (DEC) faculty members nominated by the HoD for awarding the Credit. Based on the recommendation by the team, the student will be awarded credits and the results will be sent to the Controller of Examinations. The awarded credit will taken for CGPA calculation. The final year project period at industry /research organization will not be considered as industrial Training / internship.

6.5.3 Industrial Visit

Every student is required to go for at least one Industrial Visit every year starting from the second year of the Programme subject to the approval of the Head of the Department and Principal. The Heads of Departments shall ensure that necessary arrangements are made in this regard.

6.5.4 Professional Certificate Courses

Students have to undergo one credit courses offered by experts from industry / research organizations and approved by academic council. Students can register such courses from his / her second year of study as and when these courses are conducted by the departments. A student is also permitted to register for these courses of other departments.

If a student does not successfully complete the registered industry supported one credit courses in a semester, the registration of that course will be considered as cancelled. Further, it will not be treated as arrear and if he/she wishes, he/she can re-register for the same course in the ensuing semesters and successfully complete it as and when it is offered subsequently.

6.5.5 Online Courses

Students may be permitted to register for online courses (which are provided with certificate after evaluation of the performance, SWAYAM / NPTEL), during third to sixth semester of his / her study. On successful completion of the course, he / she has to submit the copy of the certificates to the Head of the Department. The assemment will not be calculated for CGPA.

6.5.6 Soft Skills

Every Student is required to go for two soft skill courses during first year of study. The soft skill course includes the communication skill, interpersonal skill and career development courses. One credit will be awarded for each soft skills courses and it will be included for SGPA/CGPA calculations.

6.5.7 Career Ability Course

The career Ability courses will be designed by the respective department with approval from DEC/AEC based on the industry requirements. One credit will be awarded for each soft skills courses and it will be included for SGPA / CGPA calculations.

6.5.8 Evaluation of One Credit Courses

Students can register for one credit courses in any semester when it is offered. Experts from the industry / Institution (KIT) may design such specialized one-credit courses based on the current technical skill requirements. The Department Evaluation Committee (DEC) shall review and approve the syllabus, course plan, and pedagogy and assessment pattern for the course. One credit courses can also be offered by internal experts i.e faculty members from other departments (not belonging to the specific discipline of the programme) also can offer such courses to the students with the approval of DEC.

A one - credit course shall carry 100 marks and shall be evaluated through Continuous Internal Assessment (CIA) only. The QP pattern and scheme will be decided by the course faculty and will be approved by the DEC/AEC.

The Head of the Department may identify a faculty member as the coordinator for the course. A committee consisting of the Head of the Department, faculty handling the course (if available), coordinator and a senior Faculty member nominated by the Head of the Department shall monitor the evaluation process.

The grades shall be assigned to the students by the above committee based on their performance and included in the calculation of CGPA.

6.5.9 Industry Supported Project Work

The students satisfying the following conditions shall be permitted to carry out their final semester Project work for six months in industry/research organization.

The student should not have current arrears and shall have CGPA of 8.0 and above until 5th semester. The student shall undergo the eighth semester courses in the sixth and seventh semesters. The Head of Department, in consultation with the faculty handling the said courses shall forward the proposal recommended by the Principal to CoE after approval from AEC at least four weeks before the commencement of the sixth semester of the programme.

6.6 Course Numbering Scheme

Each course is denoted by a unique code consisting of 9 alphanumeric characters. The details of the numbering scheme are in Annexure I.

6.7 Credit Requirement for Programmes

The total number of credits that a student earns during the period of study is called the total credits. For the successful completion of the B.E/B.Tech programme, a regular student must earn 165-174 credits (varies with the programme) in minimum of eight semesters, while a lateral-entry student must earn 122-131 credits in a minimum of six semesters.

7 DURATION OF THE PROGRAMMES

7.1 The duration for the B.E./B.Tech. degree programmes shall extend over a period of 4 years (8 semesters) for the students admitted in the first semester but in any case not more than 7 years (14 semesters) and 3 years (6 semesters) for the students admitted in third semester (Lateral Entry Scheme) and not more than 6 years (12 semesters).

7.2 Each semester normally consists of 90 working days, including test and examination days. In any contingent situation, the number of working days per semester shall not be less than 65 days. The Principal is given the discretionary powers to decide the number of working days. In such contingencies, the Principal shall ensure that every faculty member teaches the full content of the specified syllabus for the course being taught.

7.2.1 Due to Pandemic / Abnormal situations the Scheme of Examinations and Evaluation will be followed as per the guidelines issued by the Government of Tamil Nadu and Anna University, Chennai.

7.3 The total period for completion of the programme reckoned from the commencement of the first semester to which the candidate was admitted shall not exceed the maximum period specified in clause 7.1 irrespective of the period of break of study in order that he/she may be eligible for the award of the degree.

7.4 For the purpose of regulations, the academic year will be divided into two semesters, the odd semester normally spanning from June to November and the even semester from December to May.

8. COURSE REGISTRATION

Each student, on admission shall be assigned to a mentor who shall advice and counsel the student about the details of the academic programme and choice of courses, considering the student's academic background and career objectives. Some courses require students to register through a course registration process via online.

8.1 Course Registration

Each student on admission shall register for all the courses prescribed in the curriculum in the students first semester of the study.

The registration process for the courses offered in the online registration mode in the forthcoming semester, will commence preferably 10 working days prior to the last working day of the current semester.

A department shall offer a course only if a minimum number of students register for that course. This minimum number may vary from course to course and shall be specified by the department from time to time.

After registering for a course, a student shall attend the classes, satisfy the attendance requirements, earn Continuous Internal Assessment Marks and appear for the End Semester Examination (ESE) or as specified in the curriculum.

8.2 Credits details for Course Registration

A student has to earn the total credits specified in the curriculum of the respective programme of study, in order to be eligible to obtain the degree. However, if the student wishes, then he/she is permitted to earn more than the total number of credits prescribed in the curriculum.

The number of credits, most students are expected to register for, in a semester, will be about 20-30 credits (excluding arrears). so that they complete the programme within the specified duration of the programme. The minimum credits a student can register for, in a regular semester shall be 12 and the maximum credit a student can register is 36(excluding arrears). Students shall register for project work in the 7th and 8th semester or 8th semester only.

8.3 Flexibility to Add / Drop courses

A student can add or drop the courses registered within the first 5 instructional days, from the commencement of a regular semester, subject to the availability of resources and the minimum / maximum number of credits required to be registered in a semester vide clause 8.2.

From semester 3 to 8, the student has the options for Adding/dropping an existing course. The total number of credits that a student can add/drop is limited to 6. Practical courses cannot be added / dropped.

8.4 Reappearance Registration

8.4.1 If a student fails in a theory or practical course, the student shall do reappearance registration for that course in the subsequent semester by retaining the Continuous Assessment Marks already earned.

8.4.2 If the theory course, in which the student has failed, is a Professional Elective or an Open Elective, the student may register for the same or any other Professional Elective or Open Elective course respectively in the subsequent semesters. Such changes can be done only with due approval by DEC.

8.4.3 The student who fails in Project work/ Seminar other than Practical courses shall register for the same in the subsequent semester and reappear for the End Semester Examination.

8.4.4 If a student is not eligible to appear for End Semester Examination of a course due to lack of attendance, the student has to register for that course again, when offered next, attend the classes and fulfill the attendance requirements. If the course, in which the student has lack of attendance, is an elective, the student may register for the same or any other elective in the subsequent semesters.

8.4.5 If a student has completed the 8 semesters and has obtained RA grade in one or more courses, he can register and appear for arrear examination directly whenever conducted next.

8.4.6 A student who has already appeared for a course in a semester and passed the examination is not entitled to reappear the same course for improvement of Grade/ Marks.

9. REQUIREMENTS FOR APPEARING FOR CIA, ESE

9.1 A student who has fulfilled the following conditions shall be deemed to be eligible to appear for the CIA-I, CIA-II, CIA-III and ESE. Ideally, every student is expected to attend all the classes and earn 100% attendance. Students who have earned not less than 75% attendance course wise taking into account the number of periods required for that course as specified in the curriculum. Table 5 illustrates the mandatory attendance requirement for CIA-I, CIA-II, CIA-III and ESE.

Table 5: Mandatory Attendance Requirement for CIA-I, CIA-II, CIA-III and ESE.

Test / Examination Type	Period of Calculation	Minimum % of attendance required
Continuous Internal Assessment Test I (CIA-I)	**First Semester** From the date of joining of course to three working days before the start of CIA -I	60%
	Second to Eighth semester From the date of commencement of the class to one week before the start of CIA-I	75%
Continuous Internal Assessment Test II (CIA-II)	From the date of joining (1stsemester) / date of commencement of class (2nd to 8th Semester) to one week before the start of CIA-II	75% (for students maintaining 80% or more attendance between CIA-I and CIA-II, but falls short of the 75% cumulative requirement, the requirement may be relaxed if recommended by the AEC)
Continuous Internal Assessment Test III (CIA-III)	From the date of joining (1st semester)/date of commencement of class (2nd to 8th Semester) to one week before the start of CIA - III	75% (for students maintaining 80% or more attendance between CIA-II and CIA-III, but falls short of the 75% cumulative requirement, the requirement may be relaxed if recommended by the AEC)

End Semester Examination (ESE)	From the date of joining (1st semester)/ date of commencement of class (2^{nd} to 8^{th} Semester) to the last day of instruction.	75%

9.1.1 Students having a CGPA of 8.50 and above and with no standing arrears will be exempted from the minimum attendance requirements (from 7th Sem. onwards).

9.1.2 A student shall normally be permitted to appear for End Semester Examination of the course if he / she has satisfied the attendance requirements (vide Clause -9.1). He /she is eligible to register for ESE in that semester by paying the prescribed fee.

9.1.3 A Candidate who has fulfilled the following conditions shall be deemed to have satisfied the requirements for completion of a semester. Ideally every student is expected to attend all classes of all the courses and secure 100% attendance. However, in order to give provision for certain unavoidable reasons such as Medical / participation in sports, the student is expected to attend atleast 75% of the classes. Therefore, he/she shall secure not less than 75%.

9.1.4 However, a candidate who secures overall attendance between 65% and 74% in the current semester due to medical reasons (prolonged hospitalization / accident / specific illness) / Participation in Sports events may be permitted to appear for the current semester examinations subject to the condition that the candidate shall submit the medical certificate / sports participation certificate attested by the Head of the Institution. The same shall be forwarded to the Controller of Examinations for record purposes.

9.1.5 Candidates who secure less than 65% overall attendance and candidates who do not satisfy the clause 9.1.3 and 9.1.4 shall not be permitted to write the semester examination at the end of the semester and not permitted to move to the next semester. They are required to repeat the incomplete semester in the next academic year, as per the norms prescribed.

9.1.6 The students who are consistently good in academics ONLY be considered for the grant of ODL under Co-curricular activities by the competent authorities. The following activities shall be considered for the sanction of ODL;

- Sports and Games: TIES, Inter Collegiate, Inter Zonal, Inter University, State Level, National Level and Open Tournaments.
- NCC: Camps and expeditions, NSS camps
- Cultural Programme at State, National and International Level
- Seminar/Symposia: Paper presentation/Quiz
- Leadership courses organized by other organizations & Alumni Association activities, Association activities, Placement activities.

- Training programs/Internship at industries and Higher learning Institutions
- Personal damage incurred during the extracurricular activities
- The ODL requisition letter shall be forwarded to the Principal through the HoD of the student by the staff-in-charge of the respective activities before completion of every activity.
- The ODL sanctioned letters shall be submitted to the Department Office. The faculty-in-charge of the department office will check the eligibility for the award of attendance at the end of semester and the same may be submitted to DEC for approval.

9.1.7 The student should register all the courses of current semester and all the arrear courses in the previous semesters. If any student fails to register and pay the examination fees within the due date, he/she shall not be permitted to attend the End Semester Examinations. However, he/she will be permitted to continue their studies in the next higher semester, provided that the student satisfies the requirements as stipulated in this clause of this regulation.

9.1.8 Those students who are not deemed to have completed the semester with references to the conditions specified above shall undergo the semester again in all the courses in the respective semester during next academic year. He/she shall seek re-admission as per the norms of the affiliating University/DOTE (Directorate of Technical Education).

The days of suspension for a student on disciplinary grounds will be considered as days of absence for calculating the percentage of attendance for each individual course.

10. PROVISION FOR WITHDRAWAL FROM EXAMINATION

A student may, for valid reasons (medically unfit / unexpected family situations/Sports person representing Tamilnadu / India with prior permission for participation from Principal / CoE / DEC), be granted permission to withdraw (after registering for the examinations) from appearing for any course or courses in the End Semester Examination of a particular semester. The student may withdraw by following the due process of the CoE's office before the commencement of examination. This facility can be availed only once during the entire duration of the degree programme.

Withdrawal from ESE will be valid only if the student is, otherwise, eligible to write the examination and the application for withdrawal is made to the CoE, prior to the examination in the course or courses concerned. The application for withdrawal should be recommended by the Head of the Department concerned and approved by the Head of the Institution.

11. TEMPORARY BREAK OF STUDY FROM A PROGRAMME

11.1 Break of study is normally not permitted. However, if a student intends to temporarily discontinue the programme in the middle of a semester / year for valid reasons (such as Internships, accident or hospitalization due to prolonged ill health) and wishes to re-join the programme in the next academic year, he / she shall apply in advance to the Principal through the Head of the

Department, stating the reasons. The application shall be submitted not later than the last date for registering for the semester examinations. Break of study is permitted only once during the entire period of the degree programme.

11.2 The student permitted to re-join the programme after the break shall be governed by the rules and regulations in force, at the time of re-joining.

11.3 The duration specified for passing all the courses for the purpose of classification of degree(vide clause 19) shall be increased by the period of such break of study permitted(vide clause 11)

11.4 If a student is detained for want of requisite attendance, academic progress and good conduct, the period spent in that semester shall not be considered as permitted Break of Study and Clause 11.3 is not applicable for such cases.

12. ASSESSMENT PROCEDURES FOR AWARDING MARKS

The total marks for each course generally (Theory, Practical, Project Work) will be 100, comprising of two components namely Continuous Internal Assessment (CIA) and End Semester Examination (ESE). However, there could be some open elective courses, human excellence courses, one credit industry courses, add-on courses and Mandatory courses that have only continuous assessment for 100 marks without an End Semester Examination. The Department Consultative Committee (DCC) has to approve such courses every semester. The scheme of assessment may also be decided by the faculty handling the course concerned with the approval from DCC and shall be made available to the students during the online course registration. Each course shall be evaluated for a maximum of 100 marks as illustrated in **Table - 6.**

Table - 6 : Course Evaluation

S. No.	Category of course	Continuous Internal Assessment	Semester End Examinations
1.	Theory Courses	40 Marks	60 Marks
2.	Laboratory Courses	60 Marks	40 Marks
3.	Project Work	40 Marks	60 Marks
4.	Career Enhancement Course (CEC) and Mandatory Course (MC)	100 Marks	–

The End Semester Examination (theory and practical) of 3 hours duration shall ordinarily be conducted between October and December during the odd semesters and between April and June during the even semesters.

The End Semester Examination for project work shall consist of evaluation of the final report submitted by the student or students of the project group (of not exceeding 4 students) by an external examiner and an internal examiner, followed by a viva-voce examination conducted separately for each student by a committee consisting of the external examiner, the supervisor of the project group and an internal examiner.

For the End Semester Examination in both theory and practical courses including project work the internal and external examiners shall be appointed by the Controller of Examinations.

13. MARKS DISTRIBUTION

13.1 Question paper pattern

a) Table 7.1 Continuous Internal Assessment

(CIA – I CIA – II and CIA - III)

2 Marks	12 Marks	Total marks
7	3 (Either or Type)	50

b) Table 7.2 End Semester Examinations

2 Marks	13 Marks	15 marks	Total Marks
10	5 (Either or Type)	1 (Either or Type)	100
For Mathematics paper only			
2 Marks	16 Marks		Total Marks
10	5 (Either or Type)		100
For Engineering Graphics only			
20 Marks			Total Marks
5			100

13.2 Theory Courses

Theory Courses including mandatory courses are to be assessed out of 100 marks, the maximum marks for CIA is fixed as 40 and the ESE carries 60 marks.

The ESE for theory courses including mandatory courses will be of 3 hours duration and shall normally be conducted for a maximum of 100 marks during the Odd and Even Semesters. Every student should appear for the ESE for all the courses excluding the courses for which only continuous assessment is recommended.

A minimum of two tests would be conducted in a day (in the case of tests and they would be of two hours duration each) students will have two hours of coaching session followed by the CIA. In case a student misses the assessment due to medical reasons (hospitalization / accident / specific illness) or due to participation in the College / University / State / National / International level academic and sports events with prior permission from the HOD, a Reassessment may be given at the end of the semester after getting approval from the HOD through the Course Coordinator concerned.

To arrive the Continuous Assessment Marks, the following guidelines should be followed

Table 8 : Theory Courses : Continuous Assessment Marks

CIA I (100 Marks)		CIA II (100 Marks)		CIA III (100 Marks)		Total Continuous Assessment Marks
Individual Assignment/ Case Study/ Seminar/ Mini project	Written Test	Individual Assignment/ Case Study/ Seminar/ Mini project	Written Test	Individual Assignment/ Case Study/ Seminar/ Mini project	Written Test	
40	60	40	60	40	60	300*

*The weighted average shall be converted into 40 marks for Internals

A minimum of three CIA will be conducted as a part of continuous assessment during the semester by the respective department. Each Continuous assessment is to be conducted for 100 marks and will have to be distributed in two parts viz., Individual Assignment/Case study/ Seminar/Mini project and Test with each having a weightage of 40% and 60% respectively. The tests shall be in written mode. The total Continuous assessment marks of 300 shall be converted into a maximum of 40 marks and rounded to the next integer.

13.3 CRITERIA FOR ASSESSMENT FOR LAB COURSES

For practical including virtual practical Courses, out of 100 marks, the maximum marks for CIA is fixed as 60 and the ESE carries 40 marks.

Every practical exercise / experiment shall be evaluated (as per the rubrics approved by the class committee) based on conduct of experiment / exercise and records. There shall be at least one model test. The criteria for arriving at the CIA marks of 60 is as follows :

Table 9: Practical Courses : Continuous Internal Assessment Marks

Continuous Assessment (100 Marks)*	
Evaluation of Laboratory experiment, results & Record	Test
75	25

*Continuous Assessment marks shall be converted into 60 marks

The ESE for practical courses shall be of 3 hours duration and normally be conducted for a maximum of 100 marks during the odd and Even Semesters.

13.4 PROJECT WORK

For final year Project Work out of 100 marks, the maximum marks for Continuous Assessment is 40 marks and that for the End Semester Examination (project report evaluation and viva-voce examination) is 60 marks. Project work may be assigned to a single student or to a group of students not exceeding 4 per group, under the supervision of faculty guide(s).

The Head of the Department shall constitute a review committee for each programme. There shall be a minimum of three faculty members in the review committee. There shall be three reviews (as per **Table - 10**) in total, during the semester by a review committee. The student shall make presentation on the progress made before the committee.

Interim project report shall be submitted before the project reviews with the approval of the guide. The Project Report, prepared according to the approved guidelines and duly signed by the guide and the Head of the Department, shall be submitted to the department as per the timeline announced by the department. The End Semester Examination for project work shall consist of evaluation of the final project report by an external examiner, followed by a viva-voce examination conducted separately for each student, by a committee consisting of the external examiner, and an internal examiner. The Controller of Examinations (CoE) shall appoint Internal and External Examiners for the End Semester Examination of the Project Work.

The Continuous Internal Assessment Marks (CIAM) and End Semester Examinations Marks (ESEM) for Project Work and the Viva-Voce Examination will be distributed as indicated in **Table - 10**.

Table - 10 : CIAM and ESEM break-up for project work

<table>
<tr><th>Sl.No.</th><th colspan="2">Review No.</th><th>Description</th><th>Marks</th><th>Total Marks</th></tr>
<tr><td rowspan="7">1.</td><td colspan="5">Continuous Internal Assessment Marks</td></tr>
<tr><td rowspan="2">a.</td><td rowspan="2">Review 1</td><td>Review Committee</td><td>5</td><td rowspan="2">10</td></tr>
<tr><td>Guide</td><td>5</td></tr>
<tr><td rowspan="2">b.</td><td rowspan="2">Review 2</td><td>Review Committee</td><td>7</td><td rowspan="2">15</td></tr>
<tr><td>Guide</td><td>8</td></tr>
<tr><td rowspan="2">c.</td><td rowspan="2">Review 3</td><td>Review Committee</td><td>7</td><td rowspan="2">15</td></tr>
<tr><td>Guide</td><td>8</td></tr>
<tr><td colspan="5">Total CIAM</td><td>40</td></tr>
<tr><td rowspan="4">2.</td><td colspan="5">End Semester Examinations Marks</td></tr>
<tr><td rowspan="2">a.</td><td rowspan="2">Evaluation of final report and viva-voce</td><td>Internal Examiner</td><td>10</td><td rowspan="2">50</td></tr>
<tr><td>External Examiner</td><td>40</td></tr>
<tr><td>b.</td><td>Outcome*</td><td>Publication of papers / prototype / patents etc.,</td><td>10</td><td>10</td></tr>
<tr><td colspan="5">Total ESEM</td><td>60</td></tr>
<tr><td colspan="5">Total Marks</td><td>100</td></tr>
</table>

Review committee consists of internal faculty members nominated by the Head of the Department. The guide of student being examined shall not be part of the committee.

* Outcome – in terms of paper publication, patents, product development and industry projects shall be awarded by both internal and external examiners, based on the document proofs submitted by the student concerned.

If a student fails to submit project report / does not appear for the ESE /fails in the End Semester Examination (ESE), he/she is deemed to have failed in the project work and shall have to re-register for the same when offered next.

14. PASSING REQUIREMENTS

14.1 A student is declared to have successfully passed a theory based course if he / she has secured:

- A minimum of 45% marks in the End Semester Examinations.
- A minimum of 50% marks on combining both Continuous Internal Assessment Marks (CIAM) and End Semester Examination Marks (ESEM).

14.2 A student is declared to have successfully passed a practical / project based course if he/she has secured :

- A minimum of 45% marks in the End Semester Examinations.
- A minimum of 50% marks on combining both Continuous Internal Assessment Marks (CIAM) and End Semester Examination Marks (ESEM).

14.3 For a student who does not meet the minimum passing requirements, the term “RA” against the course will be indicated in his/her grade sheet. He/she shall reappear in the subsequent examinations for the course as arrear or re-register for the course when offered .

14.4 For a student who is absent for end-semester theory / practical / project viva-voce, the term “RA” will be indicated against the corresponding course. He/she shall reappear for the End Semester Examination of that course as arrear in the subsequent semester or when offered next.

14.5 The letter grade “W” will be indicated for the courses for which the student has been granted authorized withdrawal (refer Clause 10).

14.6 For mandatory courses (non-credit), the student must satisfy the minimum attendance requirement & passing criteria as specified for the course as detailed in Section 16.2.

15. METHODS FOR REDRESSAL OF GRIEVANCES IN EVALUATION

Students who are not satisfied with the grades awarded in the End Semester Examination of Theory for regular and arrear exams can seek redressal as illustrated in Table 11.

Table - 11 : Grievance Redressal Mechanism

<table>
<tr><th rowspan="2">Sl. No.</th><th rowspan="2">Redressal Sought</th><th colspan="2">Methodology</th></tr>
<tr><th>Regular Exam</th><th>Arrear Exam</th></tr>
<tr><td>1.</td><td>Revaluation</td><td colspan="2">Apply for photo copy of answer book
Then apply for revaluation after course expert recommendation</td></tr>
<tr><td>2.</td><td>Challenge of Evaluation</td><td colspan="2">Apply for photo copy of answer book
Then apply for revaluation after course expert recommendation
Next apply for challenge of evaluation</td></tr>
<tr><td colspan="4">Note: All applications to be made to COE along with the payment of the prescribed fee.</td></tr>
</table>

Challenge of Evaluation – Flow Process

Table - 12 : Evaluation – Flow Process

Step 1	A student can make an appeal to the CoE for the review of answer scripts after paying the prescribed fee
Step 2	CoE will issue the photocopy of answer scripts to the student
Step 3	The faculty who had handled the subject will evaluate the script and HoD will recommend
Step 4	A committee consisting of 2 evaluators appointed by CoE will review and declare the result
Step 5	If the result is in favour of the student, the fee collected will be refunded to the student
Step 6	The final mark will be announced by CoE.

16. LETTER GRADE

16.1 Grading System

The award of letter grades will be decided based on relative grading principle. The relative grading is applicable to ONLY those students who have passed the examination as per the passing requirements enumerated above. For those students who have not passed the examination, Reappearance (U) shall be awarded as shown in the below Table. 13.a and 13.b

For those students who have passed the course, the relative grading shall be done. The marks of those students who have passed only shall be considered for relative grading. The evolved relative grading method normalizes the results data using the BOX-COX transformation method and computes the grade range for each course separately and awards the grade to each student. For a given course, if the students strength is greater than 30, the relative grading method shall be adopted. However, if the students strength is less than 30 then the absolute grading shall be followed with the grade range as specified below.

Table 13 a : Grades and Range of Marks

O	A+	A	B+	B	C	U
91-100	81-90	71-80	61-70	56-60	50-55	<50

The performance of a student shall be reported using letter grades, each carrying certain points as detailed below.

Table 13 b : Grades and Grade Points

Letter Grade	Grade Points	Result
O (Outstanding)	10	PASS
A+ (Excellent)	9	
A (Very Good)	8	
B+ (Good)	7	
B (Average)	6	
C (Satisfactory)	5	
U (Re-appearance)	0	RA (Re- appearance)
SA (Shortage of Attendance)	0	RC (Repeat Course)
WD (Withdrawal)	0	EA (Extended Appearance)
AB (Absent)	0	RA (Re- appearance)
WH (Withheld)	0	RA (Re-appearance)
Pass in Mandatory non-credit courses	0	P
Fail in Mandatory non-credit courses	0	F

A student is deemed to have passed and acquired the corresponding credits in a particular course if he/she obtains any one of the following grades: “O”, “A+”, “A”, “B+”, “B”, “C”. ‘SA’ denotes shortage of attendance and hence prevented from writing the ESE. ‘SA’ will figure both in the Grade Sheet as well as in the Result Sheet.

“U” denotes that the student has failed to pass in that course. “WD” denotes withdrawal from the exam for the particular course. WH denotes the result withheld for the particular course. The grades U,WD and WH will figure both in the Grade Sheet as well as in the Result Sheet. In both cases, the student has to appear for the ESE.

If the grade U/AB is given to the courses which are evaluated through CIA and ESE, is not required to satisfy the attendance requirements, but has to appear for the end semester examination and fulfill the passing requirements to earn a pass in the respective courses.

If the grade U/AB is given to the courses which are evaluated only through Continuous assessment, the student shall register for the course again in the subsequent semester, fulfill the passing requirements to earn pass in the course. However, attendance requirement need not be satisfied

16.2 Grading for Mandatory Courses

Mandatory Courses are courses that are required to be completed to fulfill the degree requirements (e.g. Human excellence, Environmental science, etc.). They are normally non – credit based. These courses will not be taken in to consideration for the SGPA / CGPA calculations. Each of these courses is assessed continuously and internally for a total mark of 100. The pass mark is 50%. Students, who fail to pass this course, are required to repeat the course, when offered next.

16.2.1 For Mandatory non-credit courses the student must satisfy the minimum attendance requirement & passing criteria as specified for the course. These courses do not carry credits but needs to be completed to fulfill the degree requirements.

16.2.2 For the Mandatory non-credit courses student completing the course will be awarded Pass grade (P) and those who fail to satisfy the attendance requirement or fail to satisfy the minimum passing requirement of 50% marks, will be awarded Fail (F) grade and the student must re-register for the course when it is offered next.

16.3 Formula for SGPA and CGPA calculations

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

- The College Name and Affiliating University.
- The list of courses registered during the semester and the grades scored.
- The Semester Grade Point Average (SGPA) for the semester.
- The Cumulative Grade Point Average (CGPA) of all courses enrolled from first semester onwards.

On completion of a semester, each student is assigned a Semester Grade Point Average which is computed as below for all courses registered for, by the student during that semester.

$$\text{Semester Grade Point Average} = \frac{\sum (C_i \times GP_i)}{\sum C_i}$$

where Ci is the credit for a course in that semester and GPi is the Grade Point earned by the student for that course. The SGPA is rounded off to two decimals.

The overall performance of a student at any stage of the Degree programme is evaluated by the Cumulative Grade Point Average (CGPA) up to that point of time.

$$\text{Cumulative Grade Point Average} = \frac{\sum (C_i \times GP_i)}{\sum C_i}$$

where Ci is the credit for each course in each of the completed semesters at that stage and GPi is the grade point earned by the student for that course. The CGPA is rounded off to two decimals.

16.4 FORMULA FOR CALCULATING PERCENTAGE

CGPA X 10 = % of Marks

17. ELIGIBILITY FOR THE AWARD OF DEGREE

A student shall be declared to be eligible for the award of the B.E. / B.Tech. Degree provided the student has

i. Successfully gained the required number of total credits as specified in the curriculum corresponding to the student's programme within the stipulated time.

ii. Successfully completed the course requirements, appeared for the End-Semester examinations and passed all the subjects prescribed in all the 8 semesters within a maximum period of 7 years and 6 years in the case of Lateral Entry reckoned from the commencement of the first (third in the case of Lateral Entry) semester to which the candidate was admitted.

iii. Successfully passed any additional courses prescribed by the Academic council

iv. Successfully completed the NCC / NSS / NSO / YRC requirements.

v. Successfully passed any additional courses prescribed by the Department & concerned whenever readmitted under regulations 2019 (R19) (vide Clause 4.3)

vi. No disciplinary action pending against the student.

vii. The award of Degree must have been approved by the Academic Council of KIT.

18. CLASSIFICATION OF B.E. / B.TECH DEGREE

The degree awarded to eligible students will be classified as given in **Table 14.**

Table - 14 : Classification of the B.E. / B.Tech. Degree

SI.No.	Class Awarded	Criteria
1.	First class with distinction	A student who satisfies the following conditions shall be declared to have passed the examination in First class with Distinction : ⊙ Should have passed the examination in all the courses of all the eight semesters (10 Semesters in case of Mechanical (Sandwich) and 6 semesters in the case of Lateral Entry) in the student's First Appearance within five years (Six years in the case of Mechanical (Sandwich) and Four years in the case of Lateral Entry). Withdrawal from examination will not be considered as an appearance. ⊙ Should have secured a CGPA of not less than 8.50. ⊙ One year authorized break of study (if availed of) is included in the five years (Six years in the case of Mechanical (Sandwich) and four years in the case of lateral entry) for award of First class with Distinction. ⊙ Should NOT have been prevented from writing end semester examination due to lack of attendance in any semester.

2.	First Class	A student who satisfies the following conditions shall be declared to have examination in First class : ⊙ Should have passed the examination in all the courses of all eight semesters (10 Semesters in case of Mechanical (Sandwich) and 6 semesters in the case of Lateral Entry) within five years. (Six years in case of Mechanical (Sandwich) and Four years in the case of Lateral Entry). ⊙ One year authorized break of study (if availed of) or prevention from writing the End Semester examination due to lack of attendance (if applicable) is included in the duration of five years (Six years in case of Mechanical (Sandwich) and four years in the case of lateral entry) for award of First class. ⊙ Should have secured a CGPA of not less than 6.50.
3.	Second Class	All other students who qualify for the award of the degree shall be declared to have passed the examination in Second Class.
Note : A student who is absent for the End Semester Examination in a course / project work Viva Voce after having registered for the same will be considered to have appeared for that examination (except approved withdrawal from End Semester Examinations as per Clause 9) for the purpose of classification.		

19. AWARD OF DEGREE

The Academic Council of the institution will approve the award of Degree to all eligible students. The degree will be issued by Anna University, Chennai and the consolidated Grade Sheet will be issued by the institution. The consolidated grade sheet will specify any specializations and distinctions that the student has earned during the course of the study.

20. FACULTY MENTOR

To help the students in palnning their courses of study and for general advice on the academic progarmme, the Head of the Department will attach a certain number of students (maximum 25) to a faculty member of the department. He/She shall function as Faculty Mentor for these students throughout their period of study. The faculty mentor shall,

- Advice the students in registering and reappearance registering of courses
- Monitor their attendance, academic progress and discipline of the students
- Counsel periodically or during the faculty mentor meeting scheduled in the class time table.
- Inform the students about the various facilities and activities available to enhance the student's curricular and co-curricular activities.
- If necessary, the faculty mentor may also discuss with or inform the parents about the progress of the students through Head of the Department or in Parent-Teacher meeting.

21. CLASS COMMITTEE

The objective of the Class Committee is to improve the teaching-learning process.

The functions of the class committee include:

- Resolving difficulties experienced by students in the classroom and in the laboratories.
- Clarifying the regulations of the degree programme and the details of rules therein.
- Discussing the progress of academic schedule and deviations if any.
- Evaluating the performance of the students of the class after each test and finding the ways and means of improvement.
- Every class in first year of study shall have a class committee consisting of faculty members who are teaching in that class, student representatives (cross section of students from boys and girls) and a chairperson who is a faculty not handling the course for the class.
- From III semester onwards, Class committee comprises of all the faculty members who are handling courses in that particular semester and two student representatives from each course. A chairperson who is a faculty not handling course for that particular semester, nominated by the Head of the Department shall coordinate the activities of this committee.
- The class committee shall be constituted by the Head of the Department/Chief Tutor on the first week of commencement of the semester.
- The class committee shall meet three times in a semester as specified in the academic calendar.
- The Principal may participate in any class committee of the institution.
- During these meetings, the representative of the class shall meaningfully interact and express the opinions and suggestions of the other students of the class to improve the effectiveness of the teaching-learning process.
- The Chairperson is required to prepare the minutes of the meeting, signed by the members and submit the same to Head of the Department within five working days of the meeting. Head of the Department will in turn consolidate and forward the same to the Principal, within 10 working days of the meeting.
- In each meeting, the action taken report of the previous meeting is to be presented by the Chairperson of the class committee.

22. COMMON COURSE COMMITTEE

- A theory course handled by more than one teacher shall have a “Common Course Committee” comprising of all teachers teaching that course and few students who have registered for that course. There shall be two student representatives from each batch of that course. One of the teachers shall be nominated as Course Coordinator by the HoD concerned and duly approved by the Principal.
- The first meeting of the Common Course Committee shall be held within fifteen days from the date of commencement of the semester. The nature and weightage of the continuous assessments shall be decided in the first meeting, within the framework of the Regulations. Two or three subsequent meetings in a semester may be held at suitable intervals. During

these meetings, the student members shall meaningfully interact and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to the whole batch.

- In addition, the “Common Course Committee” (without the student representatives) shall meet to ensure uniform evaluation of continuous assessments after arriving at a common scheme of evaluation for the assessments.
- Wherever feasible, the common course committee (without the student representatives) shall also prepare a common question paper for the continuous assessment tests. The question paper for the End Semester Examination is common and shall be set by the Course Coordinator in consultation with all the teachers or the external member as appointed by the Controller of Examinations.

23. DETAILS OF FACULTY PEDAGOGICAL AND STUDENT ASSESSMENT RECORD

Every teacher is required to maintain a Faculty Record Book/ course file consisting of the following details as shown below;

- Time-table, course syllabus, program outcomes, course outcomes.
- Details of attendance of each student marked in each theory/practical/project work class.
- CIA marks,Details of Assignment/ seminar given, course delivery details, corrective and preventive actions on test performance of students and any other additional details.

The record book should be submitted to the HOD periodically (at least three times in a semester) for checking the syllabus covered, the test marks and attendance. The HOD shall put his/her signature and date in the record book after due verification. At the end of the semester, the record book shall be verified by the Principal who will also ensure safe custody of the document for at least four years. The university or any inspection team appointed by the University / UGC / AICTE may verify the records of attendance and assessment of both current and previous semesters.

24. DISCIPLINE

Every student is required to maintain discipline and decorum both inside and outside the institution campus. They shall follow all the rules and regulations and should not indulge in any activity which can tarnish the reputation of the University or Institution. The Principal shall refer any act of indiscipline by students to the Discipline and Welfare Committee and other appropriate committees for action.

25. REVISION OF REGULATIONS AND CURRICULUM

The institution may from time to time revise, amend or change the Regulations,scheme of Examinations and syllabi, if found necessary. Academic Council assisted by Board of Studies and Standing Committee will make such revisions / changes.

Note : Any ambiguity in interpretation of this regulation is to be put up to the Standing Committee, whose decision will be final.

26. SPECIAL CASES

In the event of any clarification in the interpretation of the above rules and relations, they shall be referred to the Standing Committee. The standing committee will offer suitable interpretations/clarifications/ amendments required for special case on such references and get them ratified in the next meeting of the Academic Council. The decision of the Academic Council is final.

ANNEXURE - I

COURSE NUMBERING SCHEME

B	1	9	M	E	T	7	0	9
Programme	Regulation		Department Code		Course Type	Semester	Sequence Number	

Programme :

Bachelor Degree (B.E. / B.Tech) - B

Masters Degree (M.E. / M.Tech / MBA / MCA) - M

Regulation :

R – 19

Department Code

AD - Artificial Intelligence and Data Science

AE - Aeronautical Engineering

AG - Agricultural Engineering

BT - Bio Technology

BM - Bio Medical Engineering

CB - Computer Science and Business Systems

CS - Computer Science and Engineering

EC - Electronics and communication Engineering

EE - Electrical and Electronics Engineering

ME - Mechanical Engineering

CA - Computer Application

MB - Management Studies

CH - Chemistry

EN - English

PH - Physics

MA - Mathematics

MC - Mandatory Course

CE - Career Enhancement

Course Type

T - Theory

P - Practical / Project/ Internship

E - Elective

O - Open Elective

C - One Credit Courses

N - Online courses

S - Special Electives

Semester

1 - First Semester

2 - Second Semester

3 - Third Semester

4 - Fourth Semester

5 - Fifth Semester

6 - Sixth Semester

7 - Seventh Semester

8 - Eighth Semester

Sequence Number

00-99

ANNEXURE - II

POLICY ON MALPRACTICES

GENERAL

- It shall be the endeavour of all concerned to prevent, control and take remedial action to bring about the occurrences of malpractices to "Zero" in Examinations (both Internal and External), Assignments and in all Academic class works.
- Therefore, a comprehensive approach to the malady of malpractices has to be adopted to create a mindset of integrity and honesty, and at the same time take sufficiently stern action to make it clear that such attempts are fraught with comparably very high risk.
- In keeping with this stance, the following measures are to be taken by all concerned from class room level to the Examination Halls:

A. PREVENTION (This is the best method of tackling this malady)

a. Class room level:

All faculty members are to involve themselves in a psychological growth of students by personal example and self-respect and strive towards

- Developing a sense of honour in the minds of students so that they look down upon earning undeserved marks.
- Imbibing a sense of self-respect and internal dignity that prevents him/her from succumbing to the temptation of easy marks by cheating.
- Generating an awareness of the risks to their character and career if convicted, while also explaining the process and strict rules and regulations adopted by the educational system to prevent malpractices.
- Taking stern view of copied assignments and attempts at malpractices in internal examinations also merits equal seriousness as external examinations.
- Setting sufficiently strong deterrent rules in place and regulations like intimation to parents and warning to students in the presence of parents etc. even in case of efforts at malpractices in internal tests and/or repeated acts despite warnings in case of assignments also.

Examination Halls

Detailed instructions on Invigilation, question paper setting and evaluation and such other instructions will be issued for Invigilation, vigilance, which are to be brought to the notice of all students prior to the examinations.

B. PENAL ACTION FOR MALPRACTICES

All instances of malpractices will be forwarded to the Principal/ Chief Superintendents. The offences will be investigated by a Standing Enquiry Committee constituted by Principal, The committee is to summon and give the student an opportunity to present / plead his/her case. The Committee may also summon anybody else, if it so deems necessary for the conduct of enquiry, in the interest of proper investigation and dispensation of the case. The tenure of the committee would be a complete Academic year.

The Committee is to be guided by the following :

- The seriousness of the malpractice, in terms of deviousness, and culpability/ criminality of motive
- The seriousness in terms of effort and degree of deviousness and culpability / criminality of effort
- Any FIR / Police case that has been registered in the first instance by the Principal/ Chief Superintendent
- Any other special consideration either mitigating or to the contrary.

C. PENALTY FOR OFFENSES

The penalties awarded will depend on the seriousness of the Offence. A list of Offences and penalties are placed at **Annexure III.**

The Enquiry Report with findings and recommendations of the Committee are to be forwarded to the Controller who will undertake necessary follow up action. Based on the recommendations of the Controller of Examinations, the Principal is empowered to award penalties for offences classified as belonging to categories 1 to 7 of the offence table. The cases falling in categories from S.No. 8 onwards are to be put up to the Principal for consideration and award of suitable penalty.

ANNEXURE - III

Sl.No.	Nature of Malpractice	Maximum Punishment
1.	Appeal by the candidate in the answer script to show mercy by way of awarding more than deserving marks.	Fine of Rs. 1000/- per subject.
2.	The candidate writing his/her name in the answer script.	
3.	The candidate writing his/her registration number/college name in places other than specified in the answer script	
4.	Any special marking in the answer script by the candidate.	
5.	The candidate communicating with neighbouring candidate orally or non- verbally; the candidate causing suspicious movement of his/her body.	
6.	Irrelevant writing by the candidate in the answer script.	
7.	The candidate writing answer on his/her question paper or making use of his/her question paper for rough work	

<table>
<tr><td>8.</td><td>The candidate possessing cell phones/ programmable calculator(s) / any other electronic storage device(s) gadgets</td><td>Invalidating the examination of the particular subject written by the candidate</td></tr>
<tr><td>9.</td><td>The candidate possessing cell phones/ programmable calculator(s)/any other electronic storage device(s) gadgets</td><td>Invalidating the examination of the particular subject written by the candidate</td></tr>
<tr><td>10.</td><td>The candidate possessing any incriminating material(s) (whether used or not). For example:-Written or printed materials, bits of papers containing written information, writings on scale, calculator, handkerchief, dress, part of the body, Hall Ticket, etc.</td><td rowspan="8">Invalidating the examination of the subject concerned and all the theory and the practical subjects of the current semester registered by the candidate.
Further the candidate is not considered for revaluation of answer scripts of the arrears-subjects.
If the candidate has registered for arrears – subjects only, invalidating the examinations of all the arrears – subjects registered by the candidate.</td></tr>
<tr><td>11.</td><td>The candidate possessing cell phone(s)/ programmable calculator(s)/any other electronic storage device(s) gadgets and containing incriminating materials (whether used or not).</td></tr>
<tr><td>12.</td><td>The Candidate possessing the question paper of another candidate with additional writing on it.</td></tr>
<tr><td>13.</td><td>The candidate passing his/her question paper to another candidate with additional writing on it</td></tr>
<tr><td>14.</td><td>The candidate passing incriminating materials brought into the examination hall in any medium (hard/soft) to other candidate(s).</td></tr>
<tr><td>15.</td><td>The candidate copying from neighbouring candidate.</td></tr>
<tr><td>16.</td><td>The candidate taking out of the examination hall answer booklet(s), used or unused</td></tr>
<tr><td>17.</td><td>Appeal by the candidate in the answer script coupled with a promise of any form of consideration.</td></tr>
</table>

<table>
<tr>
<td>18.</td>
<td>Candidate destroying evidence relating to an alleged irregularity.</td>
<td>Invalidating the examinations of the subject concerned and all the theory and the practical subjects of the current semester registered by the candidate.
Further the candidate is not considered for revaluation of answer scripts of the arrears-subjects.
If the candidate has registered for arrears – subjects only, invalidating the examinations of all the arrears – subjects registered by the candidate.
Additional Punishment :
i. If the candidate has not completed the programme, he/she is debarred from continuing his/her studies for one year i.e., for two subsequent semesters. However the student is permitted to appear for the examination in all the arrears-subjects during the debarred period.
ii. If the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears - subjects for two subsequent semesters.</td>
</tr>
<tr>
<td>19.</td>
<td>Vulgar/offensive writings by the candidate in the answer script.</td>
<td rowspan="3">Invalidating the examinations of all the theory and practical subjects of the current semester and all the arrears –subjects registered by the candidate.</td>
</tr>
<tr>
<td>20.</td>
<td>The candidate possessing the answer script of another candidate</td>
</tr>
<tr>
<td>21.</td>
<td>The candidate passing his / her answer script to another candidate</td>
</tr>
<tr>
<td>22.</td>
<td>Involved in any one or more of the malpractices of serial no. 8 to 21 for the second or subsequent times.</td>
<td rowspan="2">Invalidating the examinations of all the theory and practical subjects of the current semester and all the arrears –subjects registered by the candidate.
Additional Punishment :
i. If the candidate has not completed the programme, he/she is debarred from continuing his/her studies for one year i.e., for two subsequent semesters. However the student is permitted to appear for the examination in all the arrears-subjects during the debarred period.</td>
</tr>
<tr>
<td>23.</td>
<td>The candidate substituting an answer book let prepared outside the examination hall for the one already distributed to the candidate</td>
</tr>
</table>

<table>
<tr><td></td><td></td><td>ii. If the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears - subjects for two subsequent semesters.</td></tr>
<tr><td>24.</td><td>The candidate indulge in any disruptive conduct including, but not limited to, shouting, assault of invigilator, officials or students using abusive and /or threatening language, destruction of property.</td><td rowspan="3">Invalidating the examinations of all the theory and practical subjects of the current semester and all the arrears –subjects registered by the candidate.
Additional Punishment :
i. If the candidate has not completed the programme, he/she is debarred from continuing his/her studies for two years i.e., for four subsequent semesters. However the student is permitted to appear for the examination in all the arrears-subjects during the debarred period.
ii. If the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears-subjects for four subsequent semesters.</td></tr>
<tr><td>25.</td><td>The candidate harass or engage others to harass on his/her behalf an invigilator, official, witnesses or any other person in relation to an irregularity by making telephone calls, visits, mails or by any other means.</td></tr>
<tr><td>26.</td><td>Candidate possessing any firearm/weapon inside the examination hall.</td></tr>
<tr><td>27.</td><td>Cases of Impersonation</td><td>i. Handing over the impersonator to the police with a complaint to take appropriate action against the person involved in the impersonation by the Chief Supt.
If a student of this University is found to impersonate a ‘bonafide student’, the impersonating student is debarred from continuing his/her studies and writing the examinations permanently. He/she is not eligible for any further admission to any programme of the University.
Debarring the ‘bonafide student’ for whom the impersonation was done from continuing his/her studies and writing the examinations permanently. He/she is not eligible for any further admission to any programme of the University.</td></tr>
</table>

ANNEXURE - IV

Process to Consider the Application for Revocation of Detainment

The process to consider the application for revocation of detainment on account of lack of attendance in 3 or more courses, due to genuine reasons (viz. sports participation, NCC, Medical Grounds etc.) is as follows :

The student submits an application for consideration via a request letter to the CoE,not later than 3 days from the last working day, along with the HoD's recommendation, Class Advisor's report and Mentor's recommendation. A committee consisting of the Principal, CoE, HoD (Respective Department) and HoD's-2 from departments other than the student's own. The committee shall meet within 4 working days,to consider the case. Stakeholders may be called to be present in the meeting as may be required, and Decision arrived at.The decision approved by Principal shall be final.

ANNEXURE - V

Academic Evaluation Committee (AEC)

The committee includes the Principal, CoE, HoD concerned. The committee meets to carry out business related to academic matters which require central decision making and approval viz. retest approval of missed CIA, addressing the feedback collected from the various departments class committee meetings.

Department Evaluation Committee (DEC)

The committee includes HoD (need basis), and a few faculty members of the department from various levels. The committee meets to carry out business related to academic matters that can be addressed within the department viz. course equivalence of common courses for readmitted students; approval of new courses to be offered by the department; consider and approve the credit equivalence of courses offered by industry, review the course offerings; consider the merit of applications involving lack of attendance in PE/OE courses to take up another PE or OE; approve CIAM only courses every semester; approve scheme of assessment for each course; Approval for and Mapping credits of certification courses; approval of list of nationally or internationally recognized professional certification courses with prometric testing.

Curriculum

Conceptual Frame work

(For Students admitted from the Academic Year 2019–20 and onwards)

Semester	Level of Course	Hrs. / Week	No of Courses	Range of Credits / Courses	Total Credits
PART – I					
A – Foundation Courses					
I to II	Humanities and Social Sciences **(HS)**	1- 3	5	1 - 3	11
I to IV	Basic Sciences **(BS)**	3 - 4	6	2 - 4	25
I to III	Engineering Sciences **(ES)**	3 - 6	8	2 - 4	19
B – Professional Core Courses					
II to VII	Professional Core **(PC)**	3 - 4	30	2 - 4	71
C – Elective Courses					
V to VIII	Professional Elective **(PE)**	3	6	3	18
V to VIII	Open Elective **(OE)**	3	4	3	12
D – Project Work					
V, VII & VIII	Project Work **(PW)**	4 - 16	3	2 - 8	12
E – Mandatory Courses Prescribed by AICTE / UGC (Not to be Included for CGPA)					
I, III & IV	Mandatory Course **(MC)**	3	4	NC	NC
Total Credit					**168**
PART II – Career Enhancement Courses (CEC)					
II	Soft Skills - I	2	1	1	1
III	Soft Skills - II	2	2	1	1
	Professional Certificate Course - I	2		1	1
IV	Career Ability Course - I	2	1	-	-
	NPTEL Online Certificate Courses	-	-	-	-
V	Career Ability Course - II	2	3	-	-
	Professional Certificate Course - II	2		1	1
	Summer Internship	-		1	1
VI	Career Ability Course - III	2	1	-	-
	NPTEL Online Certificate Courses	-	-	-	-
Total Credit					**05**
Total Credit to be Earned					**173**
PART III (Additional Credit Course - Not to be Included for CGPA)					
III	Problem Solving and Python Programming	20 - 30	1	-	**1**
IV	Non Destructive Testing (NDT)	20 - 30	1	-	**1**
V	Basics of Automation	40 - 60	1	-	**1**
VI	CNC Certification Programme	40 - 60	1	-	**1**
VII	Robotics and Embedded Systems	30 - 40	1	-	**1**

BoS Chairman

Scheme of Instructions and Examinations

(For Students admitted from the Academic Year 2019-20 and onwards)

Semester - I

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
Induction Programme											
B19ENT101	Functional English	**HS**	3	3	0	0	**3**	40	60	100	**3**
B19MAT101	Matrices and Differential calculus	**BS**	4	3	0	1	**3**	40	60	100	**4**
B19PHT101	Engineering Physics	**BS**	3	3	0	0	**3**	40	60	100	**3**
B19CST101	Problem Solving and Python Programming	**ES**	3	3	0	0	**3**	40	60	100	**3**
B19MET101	Engineering Graphics	**ES**	6	2	4	0	**3**	40	60	100	**4**
B19PHP101	Physics Laboratory	**BS**	4	0	4	0	**3**	60	40	100	**2**
B19CSP101	Problem Solving and Python Programming Laboratory	**ES**	4	0	4	0	**3**	60	40	100	**2**
B19MCP101	Life Skills	**MC**	2	0	2	0	**-**	100	-	100	**NC**
Total Contact Hours/Week			**29**	**14**	**14**	**1**	**Total Credits**				**21**

Semester - II

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ENT201	Professional English	**HS**	3	3	0	0	**3**	40	60	100	**3**
B19MAT201	Integral Calculus and Complex Analysis	**BS**	4	3	0	1	**3**	40	60	100	**4**
B19CHT101	Engineering Chemistry	**BS**	3	3	0	0	**3**	40	60	100	**3**
B19ECT201	Circuit Analysis	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19ECT202	Electron Devices	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19HST201	தமிழர்மரபு / Heritage of Tamils	**HS**	1	1	0	0	**3**	40	60	100	**1**
B19CHP101	Chemistry Laboratory	**BS**	4	0	4	0	**3**	60	40	100	**2**
B19ECP201	Circuits and Devices Laboratory	**PC**	4	0	4	0	**3**	60	40	100	**2**
B19MEP201	Basic Workshop Practice Laboratory	**ES**	4	0	4	0	**3**	60	40	100	**2**
B19CEP201	Soft Skills – I	**CEC**	2	0	2	0	-	100	-	100	**1**
Total Contact Hours/Week			**30**	**15**	**14**	**1**	**Total Credits**				**24**

BoS Chairman

Semester - III

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19MAT302	Linear Algebra Transforms and Partial Differential Equations	**BS**	4	3	0	1	**3**	40	60	100	**4**
B19CST305	Fundamentals of Data Structures in C	**ES**	3	3	0	0	**3**	40	60	100	**3**
B19ECT301	Electronic circuits - I	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19ECT302	Digital Electronics	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19ECT303	Signals and Systems	**PC**	4	3	0	1	**3**	40	60	100	**4**
B19MCT301	Environmental Sciences	**MC**	3	3	0	0	**-**	100	-	-	**NC**
B19HST301	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	**HS**	1	1	0	0	**3**	40	60	100	**1**
B19CSP303	Fundamentals of Data Structures in C Laboratory	**ES**	2	0	2	0	**3**	60	40	100	**1**
B19ECP301	Analog and Digital Circuits Laboratory	**PC**	4	0	4	0	**3**	60	40	100	**2**
B19CEP301	Soft Skills – II	**CEC**	2	0	2	0	-	100	-	100	**1**
B19CEP302	Professional Certificate Course - I	**CEC**	2	0	2	0	-	100	-	100	**1**
Total Contact Hours/Week			**30**	**18**	**10**	**2**	**Total Credits**				**23**

In-plant Training – Minimum ONE WEEK has to be completed (Review will be conducted in first week of SEM IV and its credit will be included in SEM IV mark statement)

Semester - IV

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19MAT404	Probability and Random Processes	**BS**	4	3	0	1	**3**	40	60	100	**4**
B19ECT401	Electronic Circuits – II	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19ECT402	Communication Theory	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19ECT403	Electromagnetic Fields	**PC**	4	3	0	1	**3**	40	60	100	**4**
B19ECT404	Linear Integrated Circuits	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19MCT302	Indian Constitution	**MC**	3	3	0	0	**-**	100	-	-	**NC**
B19ECP401	Circuits Design and Simulation Laboratory	**PC**	4	0	4	0	**3**	60	40	100	**2**
B19ECP402	Linear Integrated Circuits Laboratory	**PC**	4	0	4	0	**3**	60	40	100	**2**
B19CEP401	Career Ability Course – I	**CEC**	2	0	2	0	-	100	-	100	**NC**
B19CEP402	In-plant Training	**CEC**	-	-	-	-	-	-	-	-	**NC**
B19CEP403	Online Certificate Course	**CEC**	-	-	-	-	-	-	-	-	**NC**
Total Contact Hours/Week			**30**	**18**	**10**	**2**	**Total Credits**				**21**

Summer Internship – THREE WEEKS (Review will be conducted in first week of **SEM V** and its credit will be **included in SEM V mark statement), Online Certificate Course (like NPTEL,COURSERA, UDEMY, etc)** has to be completed within second year (NC)

R. Gowri

BoS Chairman

Semester - V											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ECT501	Digital Communication	PC	3	3	0	0	3	40	60	100	3
B19ECT502	Discrete-Time Signal Processing	PC	4	3	0	1	3	40	60	100	4
B19ECT503	Control Systems	PC	3	3	0	0	3	40	60	100	3
B19ECT504	Transmission Lines and Wave Guides	PC	3	3	0	0	3	40	60	100	3
	Professional Elective– I	PE	3	3	0	0	3	40	60	100	3
	Open Elective – I	OE	3	3	0	0	3	40	60	100	3
B19ECP501	Digital Signal Processing Laboratory	PC	4	0	4	0	3	60	40	100	2
B19ECP502	Communication Systems Laboratory	PC	4	0	4	0	3	60	40	100	2
B19CEP501	Career Ability Course – II	CEC	2	0	2	0	-	100	-	100	NC
B19CEP502	Professional Certificate Course – II	CEC	2	0	2	0	-	100	-	100	1
B19CEP503	Summer Internship	CEC	-	-	-	-	-	-	-	-	1
Total Contact Hours/Week			31	18	12	1	Total Credits				25

Semester - VI											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ECT601	Microprocessors and Microcontrollers	PC	3	3	0	0	3	40	60	100	3
B19ECT602	VLSI Design	PC	3	3	0	0	3	40	60	100	3
B19ECT603	Communication Networks	PC	3	3	0	0	3	40	60	100	3
	Professional Elective– II	PE	3	3	0	0	3	40	60	100	3
	Professional Elective– III	PE	3	3	0	0	3	40	60	100	3
	Open Elective – II	OE	3	3	0	0	3	40	60	100	3
B19ECP601	Communication Networks Laboratory	PC	2	0	2	0	3	60	40	100	1
B19ECP602	Microprocessors and Microcontrollers Laboratory	PC	4	0	4	0	3	60	40	100	2
B19ECP603	VLSI Design Laboratory	PC	2	0	2	0	3	60	40	100	1
B19ECP604	Mini Project	PW	4	0	4	0	3	40	60	100	2
B19CEP601	Career Ability Course – III	CEC	2	0	2	0	-	100	-	100	NC
B19CEP602	Online Certificate Course	CEC	-	-	-	-	-	-	-	-	NC
Total Contact Hours/Week			32	18	14	0	Total Credits				24
Online Certificate Course (like NPTEL,COURSERA, UDEMY, etc) has to be completed within Third year (NC)											

R. Gowri

BoS Chairman

Semester - VII												
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ECT701	Optical Communication	PC	3	3	0	0	3	40	60	100	3
B19ECT702	Embedded and Real Time Systems	PC	3	3	0	0	3	40	60	100	3
B19ECT703	Microwave Engineering	PC	3	3	0	0	3	40	60	100	3
	Professional Elective – IV	PE	3	3	0	0	3	40	60	100	3
	Open Elective–III	OE	3	3	0	0	3	40	60	100	3
B19ECP701	Embedded Systems Laboratory	PC	4	0	4	0	3	60	40	100	2
B19ECP702	Advanced Communication Laboratory	PC	4	0	4	0	3	60	40	100	2
B19ECP703	Project Work Phase – I	PW	4	0	4	0	3	40	60	100	2
Total Contact Hours/Week			27	15	12	0	Total Credits				21

Semester - VIII											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
	Professional Elective – V	PE	3	3	0	0	3	40	60	100	3
	Open Elective – IV	OE	3	3	0	0	3	40	60	100	3
B19ECP801	Project Work Phase – II	PW	16	0	16	0	3	40	60	100	8
Total Contact Hours/Week			22	6	16	0	Total Credits				14

HUMANITIES AND SOCIALSCIENCES (HS)											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ENT101	Functional English	HS	3	3	0	0	3	40	60	100	3
B19ENT201	Professional English	HS	3	3	0	0	3	40	60	100	3
B19HST201	தமிழர்மரபு / Heritage of Tamils	HS	1	1	0	0	3	40	60	100	1
B19HST301	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	HS	1	1	0	0	3	40	60	100	1

R. Gowri

BoS Chairman

BASIC SCIENCES (BS)

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19MAT101	Matrices and Differential Calculus	BS	4	3	0	1	3	40	60	100	4
B19PHT101	Engineering Physics	BS	3	3	0	0	3	40	60	100	3
B19PHP101	Physics Laboratory	BS	4	0	4	0	3	60	40	100	2
B19MAT201	Integral Calculus and Complex Analysis	BS	4	3	0	1	3	40	60	100	4
B19CHT101	Engineering Chemistry	BS	3	3	0	0	3	40	60	100	3
B19CHP101	Chemistry Laboratory	BS	4	0	4	0	3	60	40	100	2
B19MAT301	Linear Algebra Transforms and Partial Differential Equations	BS	4	3	0	1	3	40	60	100	4
B19MAT404	Probability and Random Processes	BS	4	3	0	1	3	40	60	100	4

ENGINEERING SCIENCES (ES)

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19CST101	Problem Solving and Python Programming	ES	3	3	0	0	3	40	60	100	3
B19MET101	Engineering Graphics	ES	6	2	4	0	3	40	60	100	4
B19CSP101	Problem Solving and Python Programming Laboratory	ES	4	0	4	0	3	60	40	100	2
B19MEP201	Basic Workshop Practice Laboratory	ES	4	0	4	0	3	60	40	100	2
B19CST305	Fundamentals of Data Structures in C	ES	3	3	0	0	3	40	60	100	3
B19CSP303	Fundamentals of Data Structures in C Laboratory	ES	2	0	2	0	3	60	40	100	1

R. Gowri

BoS Chairman

PROFESSIONAL CORE (PC)											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ECT201	Circuit Analysis	PC	3	3	0	0	3	40	60	100	3
B19ECT202	Electron Devices	PC	3	3	0	0	3	40	60	100	3
B19ECP201	Circuits and Devices Laboratory	PC	4	0	4	0	3	60	40	100	2
B19ECT301	Electronic circuits - I	PC	3	3	0	0	3	40	60	100	3
B19ECT302	Digital Electronics	PC	3	3	0	0	3	40	60	100	3
B19ECT303	Signals and Systems	PC	4	3	0	1	3	40	60	100	4
B19ECP301	Analog and Digital Circuits Laboratory	PC	4	0	4	0	3	60	40	100	2
B19ECT401	Electronic Circuits - II	PC	3	3	0	0	3	40	60	100	3
B19ECT402	Communication Theory	PC	3	3	0	0	3	40	60	100	3
B19ECT403	Electromagnetic Fields	PC	4	3	0	1	3	40	60	100	4
B19ECT404	Linear Integrated Circuits	PC	3	3	0	0	3	40	60	100	3
B19ECP401	Circuits Design and Simulation Laboratory	PC	4	0	4	0	3	60	40	100	2
B19ECP402	Linear Integrated Circuits Laboratory	PC	4	0	4	0	3	60	40	100	2
B19ECT501	Digital Communication	PC	3	3	0	0	3	40	60	100	3
B19ECT502	Discrete -Time Signal Processing	PC	4	3	0	1	3	40	60	100	4
B19ECT503	Control Systems Engineering	PC	3	3	0	0	3	40	60	100	3
B19ECT504	Transmission Lines and Wave Guides	PC	3	3	0	0	3	40	60	100	3
B19ECP501	Digital Signal Processing Laboratory	PC	4	0	2	0	3	60	40	100	2
B19ECP502	Communication Systems Laboratory	PC	4	0	2	0	3	60	40	100	2
B19ECT601	Microprocessors and Microcontrollers	PC	3	3	0	0	3	40	60	100	3
B19ECT602	VLSI Design	PC	3	3	0	0	3	40	60	100	3
B19ECT603	Communication Networks	PC	3	3	0	0	3	40	60	100	3
B19ECP601	Communication Networks Laboratory	PC	2	0	2	0	3	60	40	100	1
B19ECP602	Microprocessors and Microcontrollers Laboratory	PC	4	0	4	0	3	60	40	100	2
B19ECP603	VLSI Design Laboratory	PC	2	0	2	0	3	60	40	100	1
B19ECT701	Optical Communication	PC	3	3	0	0	3	40	60	100	3
B19ECT702	Embedded and Real Time Systems	PC	3	3	0	0	3	40	60	100	3
B19ECT703	Microwave Engineering	PC	3	3	0	0	3	40	60	100	3
B19ECP701	Embedded Systems Laboratory	PC	4	0	4	0	3	60	40	100	2
B19ECP702	Advanced Communication Laboratory	PC	4	0	4	0	3	60	40	100	2

R. Gowri

BoS Chairman

PROFESSIONAL ELECTIVES (PE)

SEMESTER – V

ELECTIVE – I

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19CSE507	Data Sciences	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE508	Fundamentals of Computer Architecture	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE509	Foundations of Operating Systems	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE605	Artificial intelligence	**PE**	3	3	0	0	**3**	40	60	100	**3**

SEMESTER – VI

ELECTIVE – II

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ECE601	Antennas and Wave Propagation	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19ECE602	Wireless Communication	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19ECE603	Wireless Networks	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19ECE604	Neural Networks	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE613	Introduction to Web Technology	**PE**	3	3	0	0	**3**	40	60	100	**3**

SEMESTER – VI

ELECTIVE – III

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ECE605	Cognitive Radio	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19ECE606	Foundation Skills in Integrated Product Development	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19ECE607	Satellite Communication	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19AGE607	Disaster Management	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE611	Machine Learning Techniques	**PE**	3	3	0	0	**3**	40	60	100	**3**

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SEMESTER – VII												
ELECTIVE – IV												
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ECE701	CMOS Analog IC Design	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19ECE702	Digital Image Processing	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19EEE804	Total Quality Management	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE704	Soft Computing	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19MCP701	Professional Readiness for Innovation, Employability and Entrepreneurship	**EEC**	6	0	6	0	**3**	100	–	100	**3**

SEMESTER – VIII											
ELECTIVE – V											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ECE801	Nano Technology and Applications	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19ECE802	Electronics Packaging and Testing	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19ECE803	Principles of Speech Processing	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19EEE701	Power Electronics Applications for Renewable Energy Systems	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19EEE703	Principles of Management and Professional Ethics	**PE**	3	3	0	0	**3**	40	60	100	**3**

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OPEN ELECTIVES (OE)

SEMESTER – V

ELECTIVE – I

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19AEO501	Basics of Flight Mechanics	**OE**	3	3	0	0	**3**	40	60	100	**3**
B19AGO501	Environment and Agriculture	**OE**	3	3	0	0	**3**	40	60	100	**3**
B19BMO501	Introduction to Medical Physics	**OE**	3	3	0	0	**3**	40	60	100	**3**
B19BTO501	Food Processing and Preservation	**OE**	3	3	0	0	**3**	40	60	100	**3**
B19CSO501	Fundamentals of Database Management System	**OE**	3	3	0	0	**3**	40	60	100	**3**
B19EEO501	Rotating Machines and Transformers	**OE**	3	3	0	0	**3**	40	60	100	**3**
B19MEO501	Robotics	**OE**	3	3	0	0	**3**	40	60	100	**3**

SEMESTER – VI

ELECTIVE – II

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19AEO601	Aircraft Electrical and Electronic Systems	**OE**	3	3	0	0	**3**	40	60	100	**3**
B19AGO601	Integrated Water Resources Management	**OE**	3	3	0	0	**3**	40	60	100	**3**
B19BMO601	Introduction to Biomedical Engineering	**OE**	3	3	0	0	**3**	40	60	100	**3**
B19BTO601	Basic Bioinformatics	**OE**	3	3	0	0	**3**	40	60	100	**3**
B19CSO601	E-Commerce Technology and Management	**OE**	3	3	0	0	**3**	40	60	100	**3**
B19EEO601	Fundamentals of Power Electronics	**OE**	3	3	0	0	**3**	40	60	100	**3**
B19MEO601	Entrepreneurship Development	**OE**	3	3	0	0	**3**	40	60	100	**3**

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SEMESTER – VII												
ELECTIVE – III												
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19AEO701	Unmanned Aircraft Systems Operation & MRO	OE	3	3	0	0	3	40	60	100	3
B19AGO701	Production Technology for Agricultural Machinery	OE	3	3	0	0	3	40	60	100	3
B19BMO701	Telemedicine	OE	3	3	0	0	3	40	60	100	3
B19BTO701	Fundamentals of Nano Technology	OE	3	3	0	0	3	40	60	100	3
B19CSO701	Fundamentals of Cloud Computing	OE	3	3	0	0	3	40	60	100	3
B19EEO701	Hybrid Electric Vehicle	OE	3	3	0	0	3	40	60	100	3
B19MEO701	3D Printing and Tooling	OE	3	3	0	0	3	40	60	100	3

SEMESTER – VIII											
ELECTIVE – IV											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19AEO801	Vehicle Aerodynamics	OE	3	3	0	0	3	40	60	100	3
B19AGO801	Agriculture finance, Banking and Cooperatives	OE	3	3	0	0	3	40	60	100	3
B19BMO801	Hospital Management	OE	3	3	0	0	3	40	60	100	3
B19BTO801	Biological Waste Management	OE	3	3	0	0	3	40	60	100	3
B19CSO801	Fundamentals of IoT	OE	3	3	0	0	3	40	60	100	3
B19EEO801	Energy Conservation and Management	OE	3	3	0	0	3	40	60	100	3
B19MEO801	Lean Six Sigma	OE	3	3	0	0	3	40	60	100	3

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PROJECT WORK (PW)

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19ECP503	Mini Project	**PW**	4	0	4	0	**3**	40	60	100	**2**
B19ECP703	Project Work Phase - I	**PW**	4	0	4	0	**3**	40	60	100	**2**
B19ECP801	Project Work Phase - II	**PW**	16	0	16	0	**3**	40	60	100	**8**

CAREER ENHANCEMENT COURSE (CEC)

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19CEP201	Soft Skills - I	**CEC**	2	0	2	0	**-**	100	-	100	**1**
B19CEP301	Soft Skills - II	**CEC**	2	0	2	0	**-**	100	-	100	**1**
B19CEP302	Professional Certificate Course - I	**CEC**	2	0	2	0	**-**	100	-	100	**1**
B19CEP401	Career Ability Course - I	**CEC**	2	0	2	0	**-**	100	-	100	**NC**
B19CEP402	In-plant Training	**CEC**	-	-	-	-	**-**	-	-	-	**NC**
B19CEP403	Online Certificate Course	**CEC**	-	-	-	-	**-**	-	-	-	**NC**
B19CEP501	Career Ability Course - II	**CEC**	2	0	2	0	**-**	100	-	100	**NC**
B19CEP502	Professional Certificate Course - II	**CEC**	2	0	2	0	**-**	100	-	100	**1**
B19CEP503	Summer Internship	**CEC**	-	-	-	-	**-**	-	-	-	**1**
B19CEP601	Career Ability Course - III	**CEC**	2	0	2	0	**-**	100	-	100	**NC**
B19CEP602	Online Certificate Course	**CEC**	-	-	-	-	**-**	-	-	-	**NC**

MANDATORY COURSE (MC)

Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19MCP101	Life Skills	**MC**	2	0	2	0	**-**	100	-	100	**NC**
B19MCT301	Environmental Sciences	**MC**	3	3	0	0	**-**	100	-	100	**NC**
B19MCT302	Indian Constitution	**MC**	3	3	0	0	**-**	100	-	100	**NC**

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Syllabus

Semester - I

B.E / B.Tech	B19ENT101 - FUNCTIONAL ENGLISH (Common to all Branches)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To develop the basic reading and writing skills of first year engineering and technology students.
2.	To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
3.	To help learners develop their speaking skills and speak fluently in real contexts.
4.	To help learners develop vocabulary of a general kind by developing their reading skills.
5.	To enhance their basic grammatical knowledge and Vocabulary skills.

UNIT - I	12
Reading	Short comprehension passages, practice in skimming-scanning
Writing	Instructions, developing hints.
Listening	Listening to peer group
Speaking	Self Introduction, introducing others
Language development	Parts of Speech, Wh-Questions, asking and answering-yes or no questions
Vocabulary development	Prefixes-suffixes, articles.

UNIT - II	12
Reading	Skimming and Scanning - Pre & post reading, comprehension questions, including dialogues and conversations
Writing	Paragraph writing, free writing, day to day events
Listening	Telephonic conversations, conceptual conversations
Speaking	Sharing information of a personal kind, greeting, taking leave
Language development	Regular & Irregular Verbs, tenses
Vocabulary development	Guessing meanings of words in context.

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UNIT - III	12
Reading	Short texts and longer passages, note making .
Writing	Understanding text structure, use of reference words and discourse markers, jumbled sentences.
Listening	Listening to longer texts and filling up the table, product description, narratives from different sources.
Speaking	Short presentation, asking about routine actions and expressing facts and opinions.
Language development	Idioms and Phrases, Degrees of comparison, sentence pattern and types of sentences.
Vocabulary development	Single word substitutes.

UNIT - IV	12
Reading	Intensive and Extensive reading, reading longer texts, reading different types of texts-magazines.
Writing	Letter writing, informal or personal letters, e-mails.
Listening	Listening to dialogues or conversations and completing exercises based on them.
Speaking	Speaking about oneself, speaking about one's friend, conceptual conversations.
Language development	Direct / indirect questions.
Vocabulary development	Synonyms-antonyms, phrasal verbs.

UNIT - V	12
Reading	Longer texts-close reading.
Writing	Writing short essays, developing an outline, identifying main and subordinate ideas, dialogue Writing.
Listening	Listening to talks, conversations.
Speaking	Participating in conversations, short group conversations.

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Language development	Spelling and Punctuations, modal verbs	
Vocabulary development	Collocations	
		Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Develop basic reading and effective reading skills.
CO2	Build their grammatical understanding.
CO3	Explain their opinions efficiently in writing in formal and informal contexts through letters.
CO4	Develop their vocabulary skills
CO5	Develop their knowledge through LSRW skills

Text Books	
1.	Board of Editors Using English, “A Course book for Undergraduate Engineers and Technologists”, Orient Black Swan Limited, Hyderabad: 2015
2.	Richards, C. Jack, “Interchange Students Book-2”,New Delhi, CUP, 2015.

Reference Books	
1.	Bailey, Stephen, “A practical guide for students”, New York Rutledge, 2011.
2.	Comfort, Jeremy,et al, “Speaking Effectively: Developing Speaking Skills for Business English”, Cambridge University Press, Cambridge, Reprint 2011.
3.	Dutt P. Kiranmai and Rajeevan Geeta, “Basic Communication Skills”, Foundation Books, 2013

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B.E / B.Tech	B19MAT101 - MATRICES AND DIFFERENTIAL CALCULUS (Common to all Branches)	T	P	TU	C
		3	0	1	4

Course Objectives	
1.	Matrix algebra is one of the powerful tools to handle practical problems arising in the field of engineering.
2.	The goal of this course is to achieve conceptual understanding and to retain the best traditions of differential calculus.
3.	This is a foundation course which mainly deals with topics such as single variable and multivariable differential calculus and plays an important role in the understanding of science, engineering, medical and business among other disciplines.
4.	To provide the basic tools of differential calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions.
5.	To make the student appreciate the purpose of using Laplace transforms to create a new domain in which it is easier to handle the problem that is being investigated.

UNIT - I	MATRICES	12

Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem –Quadratic form: Nature, Reduction to canonical form by orthogonal transformation.

UNIT - II	FUNCTIONS OF SEVERAL VARIABLES	12

Partial differentiation –Total derivative – Change of variables – Jacobians – Taylor‘s series expansion for functions of two variables – Maxima and minima of functions of two variables – Lagrange‘s method of undetermined multipliers.

UNIT - III	ORDINARY DIFFERENTIAL EQUATIONS	12

Higher order linear ordinary differential equations with constant coefficients - Higher order linear ordinary differential equations with variable coefficients Cauchy Euler‘s and Cauchy Legendre‘s type - Method of variation of parameters (ordinary differential equations with constant coefficients) - Simultaneous differential equations

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UNIT - IV	APPLICATIONS OF ORDINARY DIFFERENTIAL EQUATIONS	12
Solution of specified differential equations connected with electric circuits, Bending of beams and simple harmonic motion (Differential equations and associated conditions need to be given).		

UNIT - V	LAPLACE TRANSFORMS	12
Existence conditions - Properties (excluding proofs) - Transform of standard functions -Transforms of derivatives and integrals - Periodic function – Inverse Laplace transform -Applications to solution of linear second order ordinary differential equations with constant coefficients.		
		Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Make use of Eigen values and Eigen vectors to reduce the quadratic form into canonical form and to find the powers of a square matrix.
CO2	Determine solution for maxima and minima problems
CO3	To solve differential equations which existing in different engineering disciplines.
CO4	Develop the applications of differential equations in various engineering field.
CO5	Apply Laplace transform and inverse transform to solve differential equations with constant coefficients.

Text Books	
1.	Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2.	Bali N., Goyal M. and Watkins C., “Advanced Engineering Mathematics”, Firewall Media - An imprint of Lakshmi Publications Pvt., Ltd., New Delhi, 7th Edition, 2017.
3.	Kreyszig Erwin, “Advanced Engineering Mathematics”, John Wiley and Sons, 10th Edition, New Delhi, 2016.

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Reference Books	
1.	Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 5th Edition, 2018.
2.	Srimantha Pal and Bhunia, S.C, "Engineering Mathematics", Oxford University Press, 2015.
3.	Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.
4.	Veerarajan T., "Engineering Mathematics for Semester I and II", Tata McGraw Hill Publishing Company, New Delhi,2015.
5.	Gean Duffy., "Advanced Engineering Mathematics with MATLAB", A CRC Press Company, Boca Raton London , New York Washington, D.C, 2nd edition 2009.

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B.E / B.Tech	B19PHT101 - ENGINEERING PHYSICS (Common to all Branches)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To gain knowledge on the basics of properties of matter and its applications.
2.	To acquire knowledge on the concepts of Photonics and their applications in fiber optics.
3.	To have adequate knowledge on the concepts of Ultrasonics and their applications.
4.	To get knowledge on advanced physics concepts of quantum theory and its applications in SEM, TEM.
5.	To make the students enhance the fundamental knowledge in Crystal Physics and its applications relevant to various streams of Engineering and Technology.

UNIT - I	PROPERTIES OF MATTER	9

Elasticity - Modulus, types of modulus, Stress - strain diagram and its uses - factors affecting elastic modulus and tensile strength - Twisting couple, torsion pendulum; theory and experiment.
Bending of beams - Bending moment - cantilever; theory and experiment - uniform and non-uniform bending; theory and experiment - I-shaped girders.

UNIT - II	PHOTONICS AND FIBER OPTICS	9

Lasers; Population of energy levels, Einsteins A and B coefficients derivation - resonant cavity, optical amplification (qualitative) – Types; Nd-YAG Laser, Semiconductor lasers; homojunction and heterojunction, Industrial and Medical Applications.
Fibre Optics; Principle, Numerical Aperture and Acceptance Angle Types of optical fibres (material, refractive index, mode) – Applications; Fibre optic communication system-Block diagram, fibre optic sensors - pressure and displacement sensors – Endoscopy.

UNIT - III	ULTRASONICS	9

Classification of Sound, Production of ultrasonics - Magnetostriction generators, piezoelectric generators - acoustic grating – cavitation - ultrasonic cleaning. Applications; Non Destructive Testing, pulse echo system through transmission and reflection modes, A, B and C, scan displays - Engineering applications; SONAR - Medical applications; Sonograms.

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UNIT - IV	QUANTUM PHYSICS	9
Black body radiation; Planck"s theory (derivation) - wave particle duality - debroglie wavelength - electron diffraction - Davisson - Germer experiment concept of wave function and its physical significance. Wave equation; Schroedingers time independent and time dependent equations, particle in a one - dimensional rigid box - Applications; Scanning Electron Microscope (SEM) and Transmission Electron Microscope (TEM).		

UNIT - V	CRYSTAL PHYSICS	9
Crystal Structures; Single crystalline, polycrystalline and amorphous materials unit cell - crystal systems - Bravais lattices - Miller indices - inter-planar distances – coordination number and packing factor for SC, BCC, FCC and HCP structures Crystal imperfections; Point and Line defects. Growth of single crystals; Solution and melt growth techniques (Bridgeman & Czhochralski)		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the basics of properties of matter and its application.
CO2	Illustrate the basics of Laser, Fiber optics and their applications.
CO3	Infer the concepts of Ultrasonics and its applications.
CO4	Interpret the basic knowledge of Quantum theory that could be helpful in understanding the wave functions of a particle.
CO5	Classify and compare the different types of crystals, their structures and its preparation techniques.

Text Books	
1.	Bhattacharya, D.K. & Poonam, T, “Engineering Physics”, Oxford University Press, 2015.
2.	Gaur, R.K. & Gupta, S.L., “Engineering Physics”, Dhanpat Rai Publishers, 2012.
3.	Pandey, B.K. & Chaturvedi, S., “Engineering Physics”, Cengage Learning India, 2012.
4.	Rajendran V, “Engineering Physics”, Tata McGraw Hill, Publishing Company, New Delhi, 2011.

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Reference Books	
1.	Halliday, D., Resnick, R. & Walker, J. “Principles of Physics“, Wiley, 2015.
2.	Serway, R.A. & Jewett, J.W., “Physics for Scientists and Engineers”, Cengage Learning, 2010.
3.	Tipler, P.A. & Mosca, G.,“Physics for Scientists and Engineers with Modern Physics”, W.H. Freeman, 2007.
4.	Avadhanulu M.N, “Engineering Physics”, Volume 1, S. Chand & Company Ltd., New Delhi, 2010.

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B.E.	B19CST101- PROBLEM SOLVING AND PYTHON PROGRAMMING (Common to CSE, ECE, EEE & BME)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To know the basics of problem-solving techniques.
2.	To construct simple python programs.
3.	To develop python programs with conditional statements and loops.
4.	To use python data structures such as lists, tuples, and dictionaries.
5.	To define python functions and use them.

UNIT - I	INTRODUCTION	7

Introduction : Fundamentals of digital computers.
Problem Solving Techniques : Algorithm, Flow Chart, Pseudo code, Program Control Structures, Programming Paradigms.
Programming languages : Generations of Programming Languages, Language Translators and Features of a Good Programming Languages.

UNIT - II	PYTHON PROGRAMMING BASICS	11

Introduction to Python: Python Interpreter and its working, Syntax and Semantics, Data Types, Assignments and Expressions, operators, comments, Modules and functions.

UNIT - III	CONDITIONAL STATEMENTS AND STRING MANIPULATION	9

Conditional Statements : if, if-else, nested if.
Looping : For, while, nested loop.
Control Statements : break, continue and pass.
String Manipulation : Accessing strings, basic operations, string slices, function and methods.

UNIT - IV	LISTS & TUPLES	9

Lists: Introduction, Accessing list, Operations, Working with lists, Function and Methods. Tuple: Introduction, Accessing tuples, Operations, Working, Functions and Methods. Dictionaries: Introduction, Accessing values in dictionaries, working with dictionaries, Properties and Functions.

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UNIT - V	FUNCTIONS & MODULES	9
Functions : Defining a function, calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables. **Modules :** Importing module, Math module, Random module, file handling.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Outline the basics of algorithmic problem solving.
CO2	Make use of basic elements of Python programming to develop applications.
CO3	Experiment with the various control statements in Python.
CO4	Summarize the build-in data structures of Python.
CO5	Develop Python programs to implement function concepts and modules.

Text Books	
1.	Allen B. Downey, "Think Python : How to Think like a Computer Scientist", 2nd Edition, Updated for Python 3, Shroff/ O, Reilly Publishers, 2016. (http://greenteapress.com/wp/think-python/).
2.	Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python", Revised and updated for Python 3.2, Network Theory Ltd., 2011.

Reference Books	
1.	Reema Thereja, "Python Programming using Problem Solving Approach", 4th Impression, Oxford University Press, 2018.
2.	John V Guttag, "Introduction to Computation and Programming Using Python", Revised and expanded Edition, MIT Press, 2013.
3.	Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach", Pearson India Education Services Pvt. Ltd, 2016.
4.	Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd, 2015.
5.	Kenneth A. Lambert, "Fundamentals of Python : First Programs", CENGAGE Learning, 2012.

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B.E / B.Tech	B19MET101 – ENGINEERING GRAPHICS (Common to All)	T	P	TU	C
		2	4	0	4

Course Objectives	
1.	Understand the basic principles of engineering drawing and construction of curves used in engineering field.
2.	To explain about standard principles of orthographic projection of points, lines and planes .
3.	Enable the students to be familiar with various positions of simple solids and disseminate them into different orthographic views.
4.	Create intricate details of components through sections and develop its surfaces.
5.	To improve visualization skills in developing pictorial and perspective views.

CONCEPTS AND CONVENTIONS (NOT FOR EXAMINATION)	2
Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.	

UNIT - I	PLANE CURVES AND FREE HANDSKETCHING	14
Basic Geometrical constructions, Curves used in engineering practices - Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization concepts and Free Hand sketching: Visualization principles – Representation of Three-Dimensional objects – Layout of views - Free hand sketching of multiple views from pictorial views of objects.		

UNIT - II	PROJECTION OF POINTS, LINES AND PLANE SURFACE	14
Orthographic projection- principles-Principal planes-First angle projection-Projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes- Determination of true lengths and true inclinations by rotating line method and trapezoidal method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.		

UNIT - III	PROJECTION OF SOLIDS	14
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to both the principal planes by rotating object method and auxiliary plane method.		

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UNIT - IV	PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES	14
Sectioning of solids in simple vertical position when the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones.		

UNIT - V	ISOMETRIC AND PERSPECTIVE PROJECTIONS	14
Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions and miscellaneous problems. Perspective projection of simple solids-prisms, pyramids and cylinders by visual ray method.		

COMPUTER AIDED DRAFTING (DEMONSTRATION ONLY)	3
Introduction to drafting packages and demonstration of their use.	
Total Instructional hours : 75	

Course Outcomes : Students will be able to	
CO1	Develop the basic engineering curves and freehand sketching of basic geometrical constructions and multiple views of objects.
CO2	Construct the projections of points, straight lines and planes.
CO3	Construct the various positions of simple solids
CO4	Identify the intricate details of components through sections and develop its surfaces.
CO5	Develop visualization skills in Isometric and perspective views.

Text Books	
1.	N.D. Bhattand V.M. Panchal, “Engineering Drawing”, Charotar Publishing House, 53rd Edition, 2014.
2.	K. Venugopal and V.Prabhu Raja, “Engineering Graphics”, New Age International Publishers, 2017.

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Reference Books	
1.	K.R.Gopalakrishna., "Engineering Drawing" (Vol. I & II combined) Subhas Publications, Bangalore, 2018.
2.	K.V.Natarajan, "A text book of Engineering Graphics", 28^{th} Edition, Dhana Lakshmi Publishers, Chennai, 2015.
3.	N.S Parthasarathy and Vela Murali, "Engineering Drawing", Oxford University Press, 2015.

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B.E / B.Tech	B19PHP101 - PHYSICS LABORATORY (Common to all Branches)	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To introduce different experiments to test basic understanding of physics concepts applied in properties of matter, optics, thermal physics, and liquids

List of Experiments

Expt. No.	Description of the Experiments	
1.	Determination of rigidity modulus – Torsion pendulum	
2.	Determination of Young‘s modulus by non-uniform bending method	
3.	Determination of Young‘s modulus by uniform bending method	
4.	Determination of wavelength of mercury spectrum – spectrometer grating	
5.	Determination of Refractive index of a prism – spectrometer	
6.	Determination of thickness of a thin wire – Air wedge method	
7.	a.	Determination of wavelength, and particle size using Laser
	b.	Determination of acceptance angle in an optical fiber.
8.	Determination of thermal conductivity of a bad conductor – Lee‘s Disc method	
9.	Determination of band gap of a semiconductor	
10.	Determination of specific resistance of the wire using Carey Foster‘s Bridge	
11.	Experiment with Poiseuille‘s apparatus to determine the viscosity of liquids	
12.	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer	

Total Instructional hours : 60

Course Outcomes : After the successful completion of the course the student will be able to	
CO1	Classify the elastic properties of the materials by using uniform, non- uniform Bending method and torsional pendulum apparatus.

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CO2	Illustrate the Optical properties of light with the help of LASER, Spectrometer and to determine the thickness of the wire using air wedge.
CO3	Identify the thermal conductivity of bad conductor using Lee's Disc apparatus.
CO4	Utilize the band gap apparatus to find the band gap a semiconductor and determine the specific resistance of the wire using Carey Foster's Bridge.
CO5	Make use of Poiseuilles's apparatus to determine the viscosity of liquid and to determine the velocity of sound and compressibility of liquid by using Ultrasonic Interferometer.

LIST OF EQUIPMENT REQUIRED : REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Sl. No.	Description of Equipment	Quantity required
1.	Torsional Pendulum (with accessories)	6
2.	Non Uniform bending (with Travelling Microscope , Knife edge, Slotted weights and accessories)	6
3.	Uniform Pending (with Travelling Microscope , Knife edge, Slotted weights and accessories)	6
4.	Spectrometer (with Grating and accessories)	6
5.	Spectrometer (with Prism and accessories)	6
6.	Air Wedge Apparatus (with Travelling Microscope and accessories)	6
7.	Diode Laser (2mS power) or He-Ne Laser source(2mW) (Lycopodium Powder, Optical Fibre Kit & accessories)	6
8.	Lee's Disc Apparatus (with accessories)	6
9.	Band Gap Apparatus	6
10.	Carey Foster Bridge(with accessories)	6
11.	Viscosity (Poiseuille's flow) apparatus (with accessories)	6
12.	Ultrosonic Interferometer(with accessories)	6

Reference Books

1.	Prepared by Physics department.
2.	Senthil Kumar, G. ,"Physics Laboratory I & II", VRB publishers Pvt. Ltd., Chennai (2016).

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B.E.	B19CSP101 - PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY (Common to BME, CSE, ECE & EEE)	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To identify and execute the basic programs in Python.
2.	To create the Python programs by using built-in data types and their methods.
3.	To create the user-defined functions and modules in Python.
4.	To implement the file handling operations.
5.	To learn the list and dictionary concepts in Python.

List of Experiments

Expt. No.	Description of the Experiments	
1.	Compute the GCD of two numbers. Find the square root of a number (Newton_s method)	
2.	Basic Python programs for reading input from console.	
	a.	Calculate area of a circle by prompting the user to enter radius value.
	b.	Compute average of three numbers using simultaneous assignment.
3.	Programs using Decision statements.	
	a.	Find the maximum of a list of numbers
	b.	Exponentiation (power of a number)
4.	Programs using Looping and Loop Control statements.	
	a.	Print a list in reverse order (from last to first item) using while and for loops
	b.	Generate Fibonacci series for a given number.
5.	Programs for math operations and random number generation.	
	a.	Compute area of a triangle, given three sides using math module.
	b.	Generate 50 random numbers from a given range of values, using random module.

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6.	Basic programs using the following Python built-in data types and their methods - String, List, Tuple, Set and Dictionary.	
	a.	Count the number of characters in a given word.
	b.	Remove duplicate words from a given string.
	c.	Count the occurrences of the substring in a given string
7.	a.	Implement linear search and binary search using list.
	b.	Matrix operations using Nested List.
8.	Programs using user - defined functions with different types of function arguments.	
	a.	Check whether a given number is Prime or not using function.
	b.	Create a simple calculator that can add, subtract, multiply and divide using functions.
	c.	Implement pass by value and pass by reference.
9.	Python programs using Time and Calendar related functions.	
	a.	Print the current time using time module.
	b.	Display the calendar of given month of the year using calendar module.
10.	Write a Python program to find the most frequent words from a file.	
		Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Develop basic Python programs.
CO2	Construct Python programs using looping and control statements.
CO3	Experiment with user-defined functions and different types of function arguments.
CO4	Build python programs with modules.
CO5	Develop Python application using file operations.

LIST OF EQUIPMENT REQUIRED : REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Sl. No.	Description of Equipment	Quantity required
1.	Dell Optiplex 380 PCs Operating systems: Windows* 7 or later, macOS, and Linux. Python* versions: 2.7.X, 3.6.X.,3.8.X	30

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B.E / B.Tech	B19MCP101 - LIFE SKILLS (COMMON TO ALL BRANCHES)	T	P	TU	C
		0	2	0	0

Course Objectives	
1.	To make the students to enhance their attitude, confidence and communication.

UNIT - I	TRANSITION MANAGEMENT	6
Getting started-Getting involved- being responsible-adapting to the new environment.		
UNIT - II	**VISION AND GOAL**	**6**
Defining Vision and designing Goals in accordance-Seeing College life as a path towards Lifetime Goals.		
UNIT - III	**VALUES VIRTUES**	**6**
Not as preaching but a way of life to succeed in all aspects of life.		
UNIT - IV	**FOCUS**	**6**
Focus on basic quality in all activities .Tips to enhance memory and focus skills.		
UNIT - V	**LEARNING SKILLS AND PASSIONATE LEARNER**	**6**
Transforming information into knowledge and learning to read people like a book - hedding out inhibitions - Blossoming with talent and leadership abilities.		
		Total Instructional hours : 30

Course Outcomes : Students will be able to	
CO1	Develop the adapting skills to various environments.
CO2	Identify the Vision and Goal towards success.
CO3	Build Values and Virtues to succeed in life
CO4	Develop focus in all activities
CO5	Develop knowledge to understand various kinds of people

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Semester - II

B.E / B.Tech	B19ENT201 - PROFESSIONAL ENGLISH (Common to all Branches)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
2.	Foster their ability to write convincing job applications and effective reports.
3.	Develop their speaking skills to make technical presentations, participate in group discussions.
4.	Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.
5.	Develop and integrate the use of the four language skills i.e. Reading, Listening, Speaking, Writing.

UNIT - I	12
Listening	Listening to motivational speech
Speaking	Asking for and giving directions
Reading	Reading short technical texts from newspapers and magazines
Writing	Extended definitions, Gerunds & Infinitives, writing checklists, recommendation
Vocabularydevelopment	Technical vocabulary, abbreviations
Language development	Subject verb agreement

UNIT - II	12
Listening	Listening to TED talks
Speaking	Describing a process, narrating a story
Reading	Reading longer technical texts, summarizing
Writing	Interpreting charts, graphs
Vocabularydevelopment	Vocabulary used in formal letters/emails and reports
Language development	British and American spelling, numerical adjectives.

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UNIT - III	12
Listening	Listening to classroom lectures, commentaries and announcements
Speaking	Oral presentations
Reading	Longer texts both general and technical, practice in speed reading
Writing	Process writing, use of sequence words, analytical essays and issue based essays
Vocabularydevelopment	Sequence words, misspelled words.
Language development	Identifying different types of sentences.

UNIT - IV	12
Listening	Listening to documentaries, listening to resume preparation and making notes.
Speaking	Techniques of effective presentations
Reading	Reading for detailed comprehension
Writing	Email etiquette, job application- cover letter, résumé preparation, Vocabulary
Vocabularydevelopment	Finding suitable synonyms, paraphrasing
Language development	Clauses, if conditionals

UNIT - V	12
Listening	Listening to talks based on profession
Speaking	Participating in a group discussion
Reading	Reading and understanding technical articles
Writing	Writing reports, minutes of a meeting, writing feasibility, survey and industrial reports
Vocabularydevelopment	Verbal analogies
Language development	Reported speech, active and passive voice, impersonal passive
	Total Instructional hours : 60

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Course Outcomes : Students will be able to	
CO1	Develop their Vocabulary skills
CO2	Develop their grammatical proficiency
CO3	Develop strategies and skills to enhance their ability to read and comprehend
CO4	Interpret graphical representation by comparing and contrasting the information
CO5	Extend their knowledge through LSRW skills

Text Books	
1.	Board of editors, “Fluency in English A Course Book for Engineering and Technology”, Orient Blackswan, Hyderabad: 2016.
2.	Sudharshana.N.P and Saveetha. C, “English for Technical Communication”, Cambridge University Press: New Delhi, 2016.

Reference Books	
1.	Raman, Meenakshi and Sharma, Sangeetha, “Technical Communication Principles and Practice”, Oxford University Press: NewDelhi, 2014.
2.	Kumar, Suresh. E, “Engineering English”, Orient Blackswan: Hyderabad, 2015
3.	Booth-L. Diana, “Project Work”, Oxford University Press, Oxford, 2014.

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B.E / B.Tech	B19MAT201 - INTEGRAL CALCULUS AND COMPLEX ANALYSIS (Common to all Branches)	T	P	TU	C
		3	0	1	4

Course Objectives	
1.	To provide the basic tools of calculus mainly for the purpose of modeling the engineering problems mathematically and obtaining solutions.
2.	To make the student understand the mathematical tools needed in evaluating multiple integrals and their usage.
3.	To acquaint the student with the concepts of vector calculus needed for problems in all engineering disciplines.
4.	To use the various methods of complex analysis efficiently for solving the problems that occurs in various branches of engineering disciplines.
5.	To develop an understanding of the standard techniques of complex integration so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current.

UNIT - I	DEFINITE AND INDEFINITE INTEGRALS	12

Definite and Indefinite integrals - Substitution rule - Techniques of integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions.

UNIT - II	MULTIPLE INTEGRALS	12

Double integrals: Change of order of integration – Double integrals in polar coordinates - Area enclosed by plane curves – Triple integrals: Evaluation of triple integrals-Volume as triple integral (Simple problems).

UNIT - III	VECTOR CALCULUS	12

Gradient and directional derivative - Divergence and curl - Solenoidal and Irrotational vector fields - Green’s theorem in a plane, Gauss divergence theorem and Stoke’s theorem (excluding proofs) – Verification of theorem and applications (for cubes and rectangular parallellopipeds).

UNIT - IV	COMPLEX DIFFERENTIATION	12

Analytic functions - Cauchy-Riemann equations (excluding proof) – Properties of analytic function – Harmonic conjugate- Construction of analytic function by Milne Thomson method – Bilinear transformation.

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UNIT - V	COMPLEX INTEGRATION	12
Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series - Singularities – Residues – Cauchy's Residue theorem –Evaluation of real integrals – use of circular contour and semicircular contour (excluding poles on real axis).		
Total Instructional hours : 60		

Course Outcomes : Students will be able to	
CO1	Develop Fundamental Theorem of Calculus, techniques of Integration such as substitution, partial fractions and integration by parts
CO2	Make use of integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
CO3	Apply the line, surface and volume integrals for verification of Green's, Gauss and Stokes theorems.
CO4	Construct Analytic function and develop Conformal Mapping
CO5	Identify infinite series of a complex function within the contour and types of the singularities, finding of complex integrals.

Text Books	
1.	Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rd Edition, 2014.
2.	Kreyszig Erwin, “Advanced Engineering Mathematics”, John Wiley and Sons, 10th Edition, New Delhi, 2016.

Reference Books	
1.	Bali N., Goyal M. and Watkins C., “Advanced Engineering Mathematics”, Firewall Media-An imprint of Lakshmi Publications Pvt., Ltd., New Delhi, 7th Edition,2015.
2.	Jain R.K. and Iyengar S.R.K., “Advanced Engineering Mathematics”, Narosa Publications, New Delhi, 5th Edition, 2016.

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3.	O'Neil, P.V., "Advanced Engineering Mathematics", Cengage Learning India Pvt.Ltd, New Delhi, 7th Edition, 2017.
4.	Sastry, S.S, "Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd, 4th Edition, New Delhi, 2014.
5.	Wylie, R.C. and Barrett, L.C., "Advanced Engineering Mathematics", Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.
6.	Gean Duffy., "Advanced Engineering Mathematics with MATLAB", A CRC Press Company, Boca Raton London, New York Washington, D.C, 2nd Edition, 2009.

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B.E / B.Tech	B19CHT101 - ENGINEERING CHEMISTRY (Common to all Branches)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To make the students conversant with boiler feed water requirements, related problems and water treatment techniques.
2.	To make the students conversant with basics of polymer chemistry.
3.	To make the students conversant with basic of electrochemical reactions and corrosion.
4.	To make the student acquire sound knowledge of energy devices.
5.	To develop an understanding of the basic concepts of nano materials.

UNIT - I	WATER TECHNOLOGY	9

Hardness of water : Types, Expression of Hardness and their units, boiler troubles Scale and sludge, caustic embrittlement, boiler corrosion, priming and foaming.
Water quality standards : WHO, BIS and CPCB
Treatment of Boiler feed water : Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning).
External treatment : Ion exchange process, Zeolite process.
Desalination of brackish water : Reverse Osmosis Municipal water treatment, break point chlorination.

UNIT - II	POLYMERS AND COMPOSITES	9

Polymers : Definition, polymerization, types - addition and condensation polymerization - Tacticity biodegradable and conducting polymers
Plastics : Classification, preparation, properties and uses of PVC, Teflon, Nylon-6,6 and Epoxy resin.
Rubber : Vulcanization of rubber, Synthetic rubbers Butyl rubber, SBR.
Moulding : Ingredients compression and Injection.
Composites : Definition, types, polymer matrix composites FRP.

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UNIT - III	ELECTROCHEMISTRY AND CORROSION	9
Electrochemistry : Redox reaction, Electrode potential oxidation potential, reduction potential, Nernst equation (derivation) - Measurement and applications Electrochemical Series and its significance. **Corrosion :** causes- factors- types-chemical, electrochemical corrosion (galvanic, differential aeration), corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method.		

UNIT - IV	ENERGY DEVICES	9
Batteries : Types of batteries – Primary battery (dry cell), Secondary battery (lead acid battery, lithium - ion - battery), Fuel Cells - H_2 & O_2 fuel cell. **Super Capacitors :** Principle, Construction, working and applications. **Photo voltaic cell :** Solar cells Principle, construction, working and applications.		

UNIT - V	NANOCHEMISTRY	9
Basics distinction between molecules, nanoparticles and bulk materials - Surface area to volume ratio - Quantum confinement (0D,1D,2D,3D) Synthesis: Top down process (Ball milling) - Bottom up process (Chemical Vapour Deposition and Sol-Gel method) properties of nano materials - optical, electrical, thermal and mechanical - applications (nano products of today)		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Outline the principle and characterization of water for the treatment of potable and industrial purposes
CO2	Illustrate and Intrepret about the basics of Polymer Chemistry
CO3	Relate the principles of electrochemical reactions and corrosions
CO4	Outline the concepts of energy devices and its engineering applications
CO5	Outline the basics of nano chemistry and its applications

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Text Books	
1.	Dara, S S and Umare, S S, "A Textbook of Engineering Chemistry", Chand S & Company Ltd., New Delhi, 2015.
2.	Jain, P C and Monika Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company Pvt. Ltd., New Delhi, 2015
3.	Vairam, S Kalyani, P and Suba Ramesh, "Engineering Chemistry", Wiley India Pvt. Ltd., New Delhi, 2013.

Reference Books	
1.	Friedrich Emich, "Engineering Chemistry", Scientific International Pvt. Ltd., New Delhi, 2014.
2.	Prasanta Rath, "Engineering Chemistry", Cengage Learning India Pvt. Ltd., Delhi, 2015.
3.	Shikha Agarwal, "Engineering Chemistry - Fundamentals and Applications", Cambridge University Press, Delhi, 2015.
4.	Charles P. Poole and Frank J. Owens, "Introduction to nanotechnology", John Wiley Sons, New Jersey, 2003.

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B.E.	B19ECT201 - CIRCUIT ANALYSIS (Common to ECE & BME)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To introduce the basic concepts of DC and AC circuits behavior.
2.	To study the application of network theorems.
3.	To study the resonance concepts, Q factor and tuned circuits.
4.	To study the transient and steady state response of the circuits subjected to step and sinusoidal excitations.
5.	To introduce different h parameters and different networks.

UNIT - I	BASIC CIRCUITS ANALYSIS AND NETWORK TOPOLOGY	9
Ohm's Law – Kirchhoff 's laws – Mesh current and node voltage method of analysis for D.C and A.C. circuits - Network terminology - Graph of a network Incidence and reduced incidence matrices – Trees – Cutsets - Fundamental cutsets - Cutset matrix – Tie sets Link currents and Tie set schedules Twig voltages and Cutset schedules, Duality and dual networks.		

UNIT - II	NETWORK THEOREMS FOR DC AND AC CIRCUITS	9
Network theorems - Superposition theorem, Thevenin's theorem, Norton's theorem, Reciprocity theorem, Millman's theorem, and Maximum power transfer theorem ,application of Network theorems - Network reduction: voltage and current division, source transformation – star delta conversion.		

UNIT - III	RESONANCE AND COUPLED CIRCUITS	9
Resonance - Series resonance - Parallel resonance - Variation of impedance with frequency Variation in current through and voltage across L and C with frequency – Bandwidth - Q factor - Selectivity. Self - inductance - Mutual inductance - Dot rule Coefficient of coupling - Analysis of multi winding coupled circuits Series, Parallel connection of coupled inductors Single tuned and double tuned coupled circuits.		

UNIT - IV	TRANSIENT ANALYSIS	9
Natural response - Forced response - Transient response of RC, RL and RLC circuits to excitation by Step Signal, Impulse Signal and exponential sources Complete response of RC, RL and RLC Circuits to sinusoidal excitation.		

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UNIT - V	TWO PORT NETWORKS	9
Two port networks, Z parameters, Y parameters, Transmission (ABCD) parameters, Hybrid (H) Parameters, Interconnection of two port networks, Symmetrical properties of T and π networks.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Identify the laws of basic electrical circuits and network topology
CO2	Apply the circuit theorems in network reduction.
CO3	Explain the concept of resonance and coupled circuits.
CO4	Analyze the transient response of different circuits
CO5	Inspect the different parameters of two port networks.

Text Books	
1.	William H. Hayt, Jr. Jack E. Kemmerly and Steven M. Durbin, “Engineering Circuit Analysis”, McGraw Hill Science Engineering, Eighth Edition, 11th Reprint, 2016.
2.	Joseph Edminister and Mahmood Nahvi, “Electric Circuits, Schaum’s Outline Series”, Tata McGraw Hill Publishing Company, New Delhi, Fifth Edition Reprint, 2016.

Reference Books	
1.	Charles K. Alexander, Mathew N.O. Sadiku, “Fundamentals of Electric Circuits”, Fifth Edition, McGraw Hill, 9th Reprint, 2015.
2.	A.Bruce Carlson, “Engineering Concepts and Analysis of Linear Electric Circuits”, Cengage Learning, India Edition 2nd Indian Reprint, 2009.
3.	Allan H.Robbins, Wilhelm C.Miller, “Circuit Analysis Theory and Practice”, Cengage Learning, Fifth Edition, 1st Indian Reprint, 2013.

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B.E.	B19ECT202 - ELECTRON DEVICES	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To acquaint the students with the construction, theory and operation of the basic electronic devices such as PN junction diode.
2.	To acquaint the students with the construction, theory and operation of the basic electronic devices such as Bipolar Junction Transistors.
3.	To acquaint the students with the construction, theory and operation of the basic electronic devices such as Field effect Transistors.
4.	To acquaint the students with the construction, theory and operation of the basic electronic devices such as special semiconductor Devices.
5.	To acquaint the students with the construction, theory and operation of the basic electronic devices such as Power control devices, LED, LCD and other Opto-electronic devices.

UNIT - I	SEMICONDUCTOR DIODE	9
PN junction diode, Current equations, Energy Band diagram, Diffusion and drift current densities, forward and reverse bias characteristics, Transition and Diffusion Capacitances, Switching Characteristics, Breakdown in PN Junction Diodes.		

UNIT - II	BIPOLAR JUNCTION TRANSISTORS	9
NPN and PNP Operations, Early effect Current equations, Input and Output characteristics of CE, CB, CC configurations. Hybrid - π model, h parameter model, Ebers Moll Model and Gummel Poon model. Multi Emitter Transistor.		

UNIT - III	FIELD EFFECT TRANSISTORS	9
Drain and Transfer characteristics, Current equations, Pinch off voltage and significance of JFET. Characteristics, Threshold voltage, Channel length modulation of MOSFET. Characteristics of D-MOSFET and E-MOSFET. Comparison of MOSFET with JFET.		

UNIT - IV	SPECIAL SEMICONDUCTOR DEVICES	9
MESFET, FINFET, PINFET, CNTFET, DUAL GATE MOSFET, Schottky barrier diode, Zener diode, Varactor diode, Tunnel diode, Gallium Arsenide device, LASER diode and LDR.		

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UNIT - V	POWER DEVICES AND DISPLAY DEVICES	9
UJT, SCR, Diac, Triac, Power BJT, Power MOSFET, DMOS, VMOS, LED, LCD, Photo transistor, Opto Coupler, Solar cell and CCD.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the operation and V-I characteristic of PN diode.
CO2	Illustrate the models and equivalence circuits of Bipolar Junction Transistors.
CO3	Explain the characteristic of Field Effect Transistors.
CO4	Classify the Special Semiconductor Devices such as MESFET, FINFET, LASER diode and LDR.
CO5	Relate the basic power and display devices such as, UJT, SCR, Diac, Triac, LED, LCD and other Optoelectronic devices.

Text Books	
1.	Donald A Neaman, "Semiconductor Physics and Devices", Tata Mc GrawHill Inc., Fourth Edition, 2012.
2.	Salivahanan. S, Suresh Kumar. N and Vallavaraj. A, "Electronic Devices and circuits", Tata McGraw Hill Publishing Company, New Delhi, Third Edition, 2008.

Reference Books	
1.	Robert Boylestad and Louis Nashelsky, "Electron Devices and Circuit Theory", Pearson Prentice Hall, Tenth edition, 2008.
2.	R.S.Sedha, "A Text Book of Applied Electronics", S.Chand Publications, 2006.
3.	Yang, "Fundamentals of Semiconductor devices", McGraw Hill International Edition, 1978.

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B.E. / B.Tech.	B19HST201 - தமிழர் மரபு	T	P	TU	C
		1	0	0	1

அலகு - I	மொழி மற்றும் இலக்கியம்	3
இந்திய மொழிக் குடும்பங்கள் - திராவிட மொழிகள் - தமிழ் ஒரு செம்மொழி - தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்ற தன்மை - சங்க இலக்கியத்தில் பகிர்தல் அறம் - திருக்குறளில் மேலாண்மைக் கருத்துக்கள் - தமிழ்க் காப்பியங்கள், தமிழகத்தில் சமண பௌத்த சமயங்களின் தாக்கம் - பக்தி இலக்கியம், ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கிய வளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.		

அலகு - II	மரபு - பாறை ஓவியங்கள் முதல் நவீன ஓவியங்கள் வரை - சிற்பக்கலை	3
நடுகல் முதல் நவீன சிற்பங்கள் வரை - ஐம்பொன் சிலைகள் - பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள், பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளுவர் சிலை - இசைக் கருவிகள் - மிருதங்கள், பறை, வீணை, யாழ், நாதஸ்வரம் - தமிழர்களின் சமூக பொருளாதார வாழ்வில் கோவில்களின் பங்கு.		

அலகு - III	நாட்டுப்புறக் கலைகள் மற்றும் வீர விளையாட்டுகள்	3
தெருக்கூத்து, கரகாட்டம், வில்லுப்பாட்டு, கணியான் கூத்து, ஒயிலாட்டம், தோல்பாவைக் கூத்து, சிலம்பாட்டம், வளரி, புலியாட்டம், தமிழர்களின் விளையாட்டுகள்.		

அலகு - IV	தமிழர்களின் திணைக் கோட்பாடுகள்	3
தமிழகத்தின் தாவரங்களும், விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றிய அறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும், கல்வியும் - சங்ககால நகரங்களும் துறை முகங்களும் - சங்ககாலத்தில் ஏற்றுமதி மற்றும் இறக்குமதி - கடல் கடந்த நாடுகளில் சோழர்களின் வெற்றி		

அலகு - V	இந்திய தேசிய இயக்கம் மற்றும் இந்திய பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு	3
இந்திய விடுதலைப் போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டில் தாக்கம் - சுயமரியாதை இயக்கம் - இந்திய மருத்துவத்தில், சித்த மருத்துவத்தின் பங்கு - கல்வெட்டுகள், கையெழுத்துப் படிகள் - தமிழ்ப் புத்தகங்களின் அச்சு வரலாறு.		
		மொத்தம் - 15 காலங்கள்

BoS Chairman

Text - Cum - Reference Books	
1.	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு - தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2.	கணினித் தமிழ் - முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
3.	கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4.	பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5.	Social Life of Tamils (Dr. K.K. Pillay) A joint publication of TNTB & ESC and RMRL - (in print)
6.	Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by : International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr. S.V. Subatamanian, Dr. K.D. Thirunavukkarasu) (Published by : International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by : International Institute of Tamil Studies).
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by : Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the Histroyb of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by : The Author)
11.	Porunai Civilization (Jointly Published by : Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by : RMRL) - Reference Book.

BoS Chairman

B.E. / B.Tech.	B19HST201 - HERITAGE OF TAMILS (Common to all Branches)	T	P	TU	C
		1	0	0	1

UNIT - I	LANGUAGE AND LITERATURE	3

Language Families in India - Dravidian Languages – Tamil as aClassical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan

UNIT - II	HERITAGE - ROCK ART PAINTINGS TO MODERN ART - SCULPTURE	3

Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils

UNIT - III	FOLK AND MARTIAL ARTS	3

Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils

UNIT - IV	THINAI CONCEPT OF TAMILS	3

Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas

UNIT - V	CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE	3

Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books

Total Instructional hours : 15

BoS Chairman

Text - Cum - Reference Books	
1.	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு - தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2.	கணினித் தமிழ் - முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
3.	கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4.	பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5.	Social Life of Tamils (Dr. K.K. Pillay) A joint publication of TNTB & ESC and RMRL - (in print)
6.	Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by : International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr. S.V. Subatamanian, Dr. K.D. Thirunavukkarasu) (Published by : International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by : International Institute of Tamil Studies).
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by : Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the Histroy of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by : The Author)
11.	Porunai Civilization (Jointly Published by : Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by : RMRL) - Reference Book.

BoS Chairman

B.E / B.Tech	B19CHP101- CHEMISTRY LABORATORY (Common to all Branches)	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To make the students to acquire practical skills in the determination of water quality parameters and estimation of ions through volumetric and instrumental analysis.

List of Experiments

Expt. No.	Description of the Experiments (Any 8 experiments)
1.	Estimation of HCl using Na_2CO_3 as primary standard and determination of alkalinity in water sample.
2.	Determination of total, temporary & permanent hardness of water by EDTA method.
3.	Determination of DO content of water sample by Winkler‘s method.
4.	Determination of chloride content of water sample by Argentometric method.
5.	Estimation of copper in brass.
6.	Determination of strength of given hydrochloric acid using pH meter.
7.	Estimation of iron content of the given solution using potentiometer.
8.	Estimation of iron content of the water sample using spectrophotometer (1, 10- Phenanthroline / thiocyanate method).
9.	Estimation of sodium and potassium present in water using flame photometer.
10.	Conductmetric titration of strong acid vs strong base
11.	Estimation of iodine in common salt.
12.	Estimation of calcium in milk powder.
	Total Instructional hours : 60

R. Gowri

BoS Chairman

Course Outcomes : Students will be able to	
CO1	Relate the acquired knowledge in the quantitative estimation of alkalinity, hardness, DO and chloride ion present in the water samples.
CO2	Interpret the nature of water quality parameters to find the pollution level in water.
CO3	Estimate the amount of copper, iodine, calcium in alloys and food products.
CO4	Apply the spectroscopic techniques for the quantitative estimation of sodium, potassium and Ferrous ion.
CO5	Analyze the solutions by electrochemical parameters like conductivity, pH and EMF.

LIST OF EQUIPMENT REQUIRED : REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Sl. No.	Description of Equipment	Quantity required
1.	pH Meter	10
2.	Conductivity Meter	10
3.	Flame Photometer	2
4.	Potentiometer	10
5.	Spectrophotometer	2
6.	Electronic Balance	1

Text Books	
1.	Vogel's, "Textbook of Quantitative Chemical Analysis", 8th edition, 2014.

R. Gowri

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B.E.	B19ECP201 - CIRCUITS AND DEVICES LABORATORY (Common to ECE and BME)	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To gain, hand on experience in Thevenin & Norton theorem, KVL & KCL and Super Position Theorems
2.	To understand the working of RL, RC and RLC circuits
3.	To learn the characteristics of basic electronic devices such as PN junction Diode and Zener Diode
4.	To learn the characteristics of Clipper, Clamper and FWR
5.	To learn the input - output characteristics using BJT, FET and SCR

LIST OF EXPERIMENTS

Expt. No.	Description of the Experiments	
1.	a.	Verifications of Thevenin & Norton theorem
	b.	Verifications of KVL & KCL
2.	Verifications of Super Position Theorem	
3.	Verifications of maximum power transfer & reciprocity theorem	
4.	Determination of Resonance Frequency of Series & Parallel RLC Circuits	
5.	Transient analysis of RL and RC circuits	
6.	Characteristics of PN Junction Diode	
7.	Clipper and Clamper & FWR	
8.	Zener diode Characteristics & Regulator using Zener diode	
9.	Common Emitter input-output Characteristics	
10.	Common Base input-output Characteristics	
11.	FET Characteristics	
12.	SCR Characteristics	
		Total Instructional hours : 60

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BoS Chairman

Course Outcomes : Students will be able to	
CO1	Analyze the characteristics of basic electronic devices such as PN junction Diode and Zener Diode
CO2	Inspect the characteristics of transistor configurations and SCR
CO3	Evaluate KVL & KCL, Thevenin Theorem, Norton theorem, Super Position Theorems, Maximum power transfer theorem and Reciprocity theorem
CO4	Examine the characteristics of Clipper, Clamper and FWR
CO5	Determine Resonance Frequency of Series & Parallel RLC Circuits
CO6	Interpret RL and RC circuits

LIST OF EQUIPMENT REQUIRED : REQUIREMENTS FOR A BATCH OF 30 STUDENTS

Sl. No.	Description of Equipment	Quantity required
1.	BC107, BC148, 2N2646, BFW10	25
2.	IN4007, Zener diodes	25
3.	Resistors, Capacitors, Inductors	100
4.	Bread Boards	15
5.	CRO (30 MHz)	15
6.	Function Generators (3 MHz)	10
7.	Dual Regulated power Supplies (0 - 30V)	10

R. Gowri

BoS Chairman

B.E / B.Tech	B19MEP201 – BASIC WORKSHOP PRACTICE LABORATORY (GROUP - A & B) (Common to all Branches)	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To provide exposure to the students with hands-on experience on various basic engineering practices in Civil, Mechanical Engineering.
2.	To provide exposure to the students with hands on experience on various basic engineering practices in Electrical Engineering.
3.	To provide exposure to the students with hands on experience on various basic engineering practices in Electronics Engineering.

GROUP – A (CIVIL & MECHANICAL)

I Civil Engineering Practices	**12**

Plumbing Works

Making basic pipe connections involving the fittings like valves, taps, coupling, unions, reducers, elbows and other components used in household fittings.

Carpentry

Preparation of wooden joints by sawing, planning and cutting

1.	Planning & Polishing operation
2.	Half lap joint
3.	Cross lap joint

II Mechanical Engineering Practices	**18**

Welding Workshop

Study of welding tools and equipment's - Study of various welding methods - Instruction of BI standards and reading of welding drawings.

Exercise in arc welding for making

1.	Lap joint
2.	Butt joint
3.	Demonstration of gas welding and cutting.

Machine Shop

1.	Drilling and Tapping
2.	Lathe Exercise – Facing operation
3.	Lathe Exercise – Straight turning and Chamfering

Sheet metal

1.	Tray Funnel

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GROUP – B (ELECTRICAL & ELECTRONICS)		
Expt. No.	**Description of the Experiments**	
1.	Residential house wiring using switches, fuse, indicator, lamp and energy meter.	
2.	Fluorescent lamp and Stair case wiring.	
3.	Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.	
4.	Measurement of energy using single phase energy meter.	30
5.	Measurement of resistance to earth of an electrical equipment.	
6.	Study of Electronic components and equipment's – Resistor color coding	
7.	Measurement of AC signal parameter (peak-peak, rms period, frequency) using CRO.	
8.	Study of logic gates AND, OR, EX-OR and NOT.	
9.	Soldering & de-soldering practices.	
		Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Explain the pipe connections and identify the various components used in plumbing.
CO2	Examine simple wooden joints using wood working tools and simple components using lathe and drilling machine.
CO3	Analyse simple lap, butt and tee joints using arc welding equipment and simple parts using sheet metal.
CO4	Interpret Residential house wiring, Fluorescent lamp wiring and Stair case wiring.
CO5	Measure electrical quantities such as voltage, current, power & power factor in RLC Circuit, resistance to earth, AC signal parameter (peak-peak, RMS period, frequency) and ripple factor.
CO6	Determine logic gates (AND, OR, EOR and NOT), Electronic components and equipment's tools.

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GROUP – A (CIVIL & MECHANICAL)			
LIST OF EQUIPMENT REQUIRED : REQUIREMENTS FOR A BATCH OF 30 STUDENTS			
Sl. No.	**Description of Equipment**		**Quantity required**
1.	Assorted components for plumbing, Consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.		15
2.	Carpentry vice (fitted to work bench)		15
3.	Standard woodworking tools		15
4.	Models of industrial trusses, door joints, furniture joints		5
5.	**Power Tools :**		
	a.	Rotary Hammer	2
	b.	Demolition Hammer	2
	c.	Circular Saw	2
	d.	Planer	2
	e.	Hand Drilling Machine	2
	f.	Jigsaw	2
6.	Arc welding transformer with cables and holders		5
7.	Welding booth with exhaust facility		5
8.	Welding accessories like welding shield, chipping hammer, wire brush, etc.		5
9.	Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.		2
10.	Centre lathe		2
11.	Hearth furnace, anvil and smithy tools		2
12.	Moulding table, foundry tools		2
13.	**Power Tool :** Angle Grinder		2
14.	Study-purpose items: Centrifugal pump, Airconditioner		1

BoS Chairman

GROUP – B (ELECTRICAL & ELECTRONICS)		
REQUIREMENTS FOR A BATCH OF 30 STUDENTS		
Sl. No.	**Description of Equipment**	**Quantity required**
1.	Assorted Electrical Components for House Wiring	15 sets
2.	Electrical Measuring Instruments	10 sets
3.	Iron Box	1
4.	Fan and Regulator	1
5.	**Emergency Lamp**	1
6.	Megger	1
7.	Digital Live Wire Detector	2
8.	Soldering Guns	10
9.	Assorted Electronic Components for Making Circuits	50
10.	Multipurpose PCBs	10
11.	Multi Meters	10
12.	Telephone	2
13.	FM radio	2
14.	Regulated Power Supply	2
15.	CRO (30MHz)	2
16.	Bread board	10
17.	Digital IC types (IC 7432, IC 7408, IC 7400, IC 7404, IC 7402, IC 7486)	Each 10

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B.E. / B.Tech	B19CEP201 - SOFT SKILLS I	T	P	TU	C
		0	2	0	1

Course Objectives	
1.	To Develop the inter personal skills
2.	To Develop creativity skills
3.	To Enhance communication and problem solving skills
4.	To Improve emotional maturity and emotional health
5.	To Enhance the Employability and Career Skills of students

UNIT - I	SELF EVALUATION	6
Introducing to soft skills, familiarize yourself, Self-understanding, SWOT analysis, Goal Setting.		

UNIT - II	INNOVATIVE THINKING	6
Divergent thinking, Encourage curiosity, Write your story, Poster making		

UNIT - III	COMMUNICATION SKILLS	6
Just a Minute, workplace communication, Role Play, Extempore, Effectiveness of body language.		

UNIT - IV	EMOTIONAL INTELLIGENCE	6
Personal etiquette and relationship, Stress and Time Management.		

UNIT - V	PERSONALITY DEVELOPMENT	6
Leadership skills, Managerial skills, corporate etiquette, Team Building Language Development.		
		Total Instructional hours : 30

Course Outcomes : Students will be able to	
CO1	Develop the Interpersonal Skills
CO2	Show the creative skill in different aspects.
CO3	Explain their ideas through conversations.

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CO4	Develop adequate Soft Skills required for the workplace
CO5	Develop leadership qualities

Reference Books	
1.	Butterfield, Jeff, “Soft Skills for Everyone”, Cengage Learning, New Delhi, 2015.
2.	S. Hariharanetal, “Soft Skills”, MJP Publishers: Chennai, 2010.
3.	Peter, Francis, “Soft Skills and Professional Communication”, New Delhi: Tata McGraw Hill, 2012.

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Semester - III

B.E.	B19MAT302 - LINEAR ALGEBRA, TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS (Common to ECE & BME)	T	P	TU	C
		3	0	1	4

Course Objectives	
1.	To introduce the basic concepts of PDE for solving standard partial differential equations.
2.	To understand Fourier analysis in representation of Periodic signals.
3.	To develop Fourier series techniques in solving wave and heat flow problems.
4.	To develop the concept of Z transforms techniques for discrete time systems.
5.	To apply the concept of linear algebra in solving engineering problems.

UNIT - I	PARTIAL DIFFERENTIAL EQUATIONS	12
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions Solution of first order partial differential equations of the forms f(p,q) = 0, z = px + qy + f(p,q), - Lagrange's linear equation Linear homogeneous partial differential equations of second and higher order with constant coefficients.		

UNIT - II	FOURIER ANALYSIS	12
Dirichlet's conditions – General Fourier series– Odd and even functions – Half range Fourier series – Parseval's identity – Fourier transform pair – Fourier sine and cosine transforms – Properties(excluding proof) – Transforms of simple functions – Convolution theorem(without proof) – Parseval's identity.		

UNIT - III	BOUNDARY VALUE PROBLEMS	12
Classification of second order linear PDE – Method of separation of variables – Solutions of one dimensional wave equation One dimensional equation of heat conduction – Steady state solution of two dimensional equation of heat conduction – Fourier series solutions in Cartesian coordinates.		

UNIT - IV	Z TRANSFORMS	12
Z-transforms Elementary properties – Inverse Z-transform (using partial fraction and residues) - Convolution theorem (without proof) Formation of difference equations – Solution of difference equations using Z transforms.		

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UNIT - V	VECTOR SPACES	12
Vector spaces – Subspaces – Linear transformation Eigen values and eigenvectors – Diagonalizability - Inner product & norms – Orthogonality Gram Schmidt orthogonalization process.		
		Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Solve various types of partial differential equations.
CO2	Solve engineering problems using fourier series.
CO3	Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.
CO4	Demonstrate accurate and efficient use of advanced algebraic techniques.
CO5	Demonstrate by solving non-trivial problems related to the concepts and by proving simple theorems about the statements.

Text Books	
1.	Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 44th Edition, 2020.
2.	William E. Schiesser, “Partial Differential Equation Analysis in Biomedical Engineering Case Studies with MATLAB”, Cambridge University Press, 2013.
3.	Friedberg, A.H., Insel, A.J. and Spence, L., “Linear Algebra”, Pearson Education Limited, 2014.

Reference Books	
1.	James, G., “Advanced Modern Engineering Mathematics”, Pearson Education, 2007.
2.	Erwin Kreyszig, “Advanced Engineering Mathematics”, 9th Edition, Wiley India, 2014.
3.	Veerarajan T., “Engineering Mathematics”, Tata McGraw Hill Publications, 2015.
4.	Gilbert Strang, “Introduction to Linear Algebra”, 5th Edition Wellesley - Cambridge Press, 2016.
5.	Lay, D.C., “Linear Algebra and its Applications”, 5th Edition, Pearson Education, 2015.
6.	Kolman, B. Hill, D.R., “Introductory Linear Algebra”, Pearson Education, New Delhi, First Reprint, 2009.

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B.E. - ECE	B19CST305 - FUNDAMENTALS OF DATA STRUCTURES IN C	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To learn the features of C.
2.	To learn the linear and non-linear data structures.
3.	To explore the applications of linear and non-linear data structures.
4.	To learn to represent data using graph data structure.
5.	To learn the basic sorting and searching algorithms.

UNIT - I	C PROGRAMMING BASICS	9

Algorithm Pseudo code-Algorithm efficiency-Structure of a C program – compilation and linking processes Decision Making and Branching – Looping statements. Arrays – Initialization – Declaration – One dimensional and Two-dimensional arrays. Strings - String operations – String Arrays.

UNIT - II	FUNCTIONS, POINTERS, STRUCTURES AND UNIONS	9

Functions - User defined functions, Standard library functions, Recursive functions, pointers - concepts, initialization of pointer variables, structures - declaration, definition and initialization of structures accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures -Union Programs using structures and Unions – Storage classes, Pre-processor directives.

UNIT - III	LINEAR DATA STRUCTURES	9

List ADT – array based implementation -Stacks and Queues - linked list implementation singly linked lists-circularly linked lists- doubly-linked lists -applications of lists Stack Operations – Applications-Polynomial Manipulation All operations(Insertion, Deletion, Merge, Traversal).

UNIT - IV	NON LINEAR DATA STRUCTURES	9

Tree ADT - tree traversals - Binary Tree ADT - expression trees - applications of trees binary search tree – Graph - Definition - Representation of Graph Types of graph – Graph traversals.

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UNIT - V	SEARCHING AND SORTING ALGORITHMS	9
Searching - Linear Search - Binary Search. Sorting - Bubble sort - Selection sort Insertion sort - Hashing - Hash Functions - Separate Chaining - Open Addressing Rehashing – Extendible Hashing.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Demonstrate looping and arrays using C
CO2	Illustrate linear and non-linear data structure operations using C
CO3	Infer the appropriate in linear / non-linear data structure for any given data set
CO4	Outline the concept of tree and graph data structures with examples
CO5	Develop searching and sorting algorithm for an application

Text Books	
1.	Pradip Dey and Manas Ghosh, “Programming in C”, Second Edition, Oxford University Press, 2011.
2.	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, University Press, 2008

Reference Books	
1.	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education, 2016.
2.	Richard F. Gilberg, and Behrouz A. Forouzan, “Data Structures - A Pseudo code Approach with C”, Thomson 2011.
3.	Aho, J.E. Hopcroft and J.D. Ullman, “Data Structures and Algorithms”, Pearson education, Asia, 2010.
4.	Reema Thareja, “Data Structures Using C”, Second Edition, Oxford University Press, 2011.

BoS Chairman

B.E.	B19ECT301 - ELECTRONIC CIRCUITS - I	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the methods of transistor biasing.
2.	To construct the h parameter models for BJT amplifiers.
3.	To design and analyse single stage and multistage amplifier circuits.
4.	To analyse the frequency response of small signal amplifiers.
5.	To design, analyse and troubleshoot the DC regulated power supplies.

UNIT - I	BIASING OF DISCRETE BJT, JFET AND MOSFET	9

BJT - Need for biasing - DC Load Line Various biasing methods of BJT – Thermal stability - Stability factors Bias compensation techniques using Diode, thermistor and sensistor. Various biasing methods of JFET and MOSFET.

UNIT - II	BJT AMPLIFIERS	9

Small Signal Hybrid π equivalent circuit of BJT – Early effect Analysis of CE, CC and CB amplifiers using Hybrid π equivalent circuits – Analysis of - Darlington Amplifier Bootstrap technique - Cascade, Cascode configurations Differential amplifier – Small signal analysis and CMRR.

UNIT - III	SINGLE STAGE FET AND MOSFET AMPLIFIERS	9

Small Signal Hybrid π equivalent circuit of FET and MOSFET Analysis of CS, CD and CG amplifiers using Hybrid π equivalent circuits - FET Differential amplifier BiCMOS circuits.

UNIT - IV	FREQUENCY RESPONSE OF AMPLIFIERS	9

Frequency response of transistor amplifiers with circuit capacitors – BJT frequency response – short circuit current gain cut off frequency – f_β and unity gain bandwidth – Miller effect - frequency response of FET High frequency analysis of CE and CS amplifier.

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UNIT - V	POWER SUPPLIES AND ELECTRONIC DEVICE TESTING	9
Linear mode power supply - Rectifiers - Filters - Half-Wave Rectifier Power Supply Full - Wave Rectifier Power Supply - Voltage regulators: Voltage regulation Linear series, shunt and switching Voltage Regulators - Over voltage protection BJT and MOSFET – Switched mode power supply (SMPS) Power Supply Performance and Testing – Troubleshooting and Fault Analysis, Design of DC Regulated Power Supply.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the biasing methods of Transistors
CO2	Develop small signal models of BJT amplifiers
CO3	Construct the small signal models of JFET and MOSFET amplifiers
CO4	Analyze the frequency response of BJT and FET amplifiers
CO5	Infer about the power supplies and testing of electronic devices

Text Books	
1.	Donald. A. Neamen, “Electronic Circuits Analysis and Design”, 3rd Edition, Mc Graw Hill Education (India) Private Ltd., 2010. (Unit I-IV)
2.	Robert L. Boylestad and Louis Nasheresky, “Electronic Devices and Circuit Theory”, 11th Edition, Pearson Education, 2013. (Unit V)

Reference Books	
1.	Millman J, Halkias.C.and Sathyabrada Jit, “Electronic Devices and Circuits”, 4th Edition, Mc Graw Hill Education (India) Private Ltd., 2015.
2.	Salivahanan and N. Suresh Kumar, “Electronic Devices and Circuits”, 4th Edition, Mc Graw Hill Education (India) Private Ltd., 2017.
3.	Floyd, “Electronic Devices”, Ninth Edition, Pearson Education, 2012.
4.	David A. Bell, “Electronic Devices & Circuits”, 5th Edition, Oxford University Press, 2008.
5.	Anwar A. Khan and Kanchan K. Dey, “A First Course on Electronics”, PHI, 2006.
6.	Rashid M, “Microelectronics Circuits”, Thomson Learning, 2007.

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B.E.	B19ECT302 - DIGITAL ELECTRONICS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To present the Digital fundamentals, Boolean algebra and its applications in digital systems.
2.	To familiarize with the design of various combinational digital circuits using logic gates.
3.	To introduce the analysis and design procedures for synchronous sequential circuits.
4.	To introduce the analysis and design procedures for asynchronous sequential circuits.
5.	To introduce the digital design of digital circuits using Verilog HDL.

UNIT - I	DIGITAL FUNDAMENTALS	9

Number Systems – Decimal, Binary, Octal, Hexadecimal, 1s and 2s complements, Codes – Binary, BCD, Excess 3, Gray, Alphanumeric codes, Boolean theorems, Logic gates, Universal gates, Sum of products and product of sums, Minterms and Maxterms, Karnaugh map Minimization and Quine - McCluskey method of minimization.

UNIT - II	COMBINATIONAL CIRCUIT DESIGN	9

Design of Half and Full Adders, Half and Full Subtractors, Binary Parallel Adder – Carry look ahead Adder, BCD Adder, Multiplexer, Demultiplexer, Magnitude Comparator, Decoder, Encoder, Priority Encoder, Parity generator.

UNIT - III	SYNCHRONOUS SEQUENTIAL CIRCUITS	9

Flip flops – SR, JK, T, D, Master/Slave FF – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design Moore/Mealy models, state minimization, state assignment, circuit implementation – Design of Counters- Ripple Counters, Ring Counters, Shift registers, Universal Shift Register.

UNIT - IV	ASYNCHRONOUS SEQUENTIAL CIRCUITS	9

Stable and Unstable states, output specifications, cycles and races, state reduction, race free assignments, ASM Charts, Hazards, Essential Hazards, Pulse mode sequential circuits, Design of Hazard free circuits.

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UNIT - V	DIGITAL DESIGN WITH VERILOG HDL	9
Introduction of Verilog HDL and VHDL – Types of Modelling : Behavioural, Dataflow and Gate level – Design of Combinational circuit using Verilog Design of Sequential circuit using Verilog.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Identify digital fundamentals and classify various logic gates and its families.
CO2	Build various combinational digital circuits using logic gates.
CO3	Analyze the procedure for synchronous sequential circuits.
CO4	Inspect the procedure for asynchronous sequential circuits.
CO5	Utilize Verilog HDL for designing digital circuits

Text Books	
1.	M. Morris Mano and Michael D. Ciletti, “Digital Design”, 5th Edition, Pearson, 2014.

Reference Books	
1.	Charles H.Roth., “Fundamentals of Logic Design”, 6th Edition, Thomson Learning, 2013.
2.	Thomas L. Floyd, “Digital Fundamentals”, 10th Edition, Pearson Education Inc, 2011.
3.	S.Salivahanan and S.Arivazhagan, “Digital Electronics”, Ist Edition, Vikas Publishing House pvt Ltd, 2012.
4.	Anil K.Maini, “Digital Electronics”, Wiley, 2014.
5.	A.Anand Kumar, “Fundamentals of Digital Circuits”, 4th Edition, PHI Learning Private Limited, 2016.
6.	Soumitra Kumar Mandal, “Digital Electronics”, McGraw Hill Education Private Limited, 2016.
7.	Samir Palnitkar, “Verilog HDL: A Guide to Digital Design and Synthesis”, 2nd Edition, Pearson education Inc, 2003.

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BoS Chairman

B.E.	B19ECT303 - SIGNALS AND SYSTEMS (Common to ECE & BME)	T	P	TU	C
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Course Objectives	
1.	To understand the basic properties and characterization of signal & systems using MATLAB.
2.	To analyse continuous time signals in the Fourier and Laplace domain.
3.	To apply LTI continuous time system in the Fourier and Laplace domain.
4.	To analyse discrete time signals in the Fourier and Z transform domain.
5.	To apply LTI discrete time system in the Fourier and Z transform domain.

UNIT - I	CLASSIFICATION OF SIGNALS AND SYSTEMS	15

Standard signals - Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids – Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals Classification of systems - CT systems and DT systems – Linear & Nonlinear, Time-variant & Time-invariant, Causal & Non-causal, Stable & Unstable.

UNIT - II	ANALYSIS OF CONTINUOUS TIME SIGNALS	15

Fourier series for periodic signals Fourier Transform – properties - Laplace Transforms and properties.

UNIT - III	LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS	12

Impulse response - convolution integrals - Differential Equation - Fourier and Laplace transforms in Analysis of CT systems Systems connected in series / parallel.

UNIT - IV	ANALYSIS OF DISCRETE TIME SIGNALS	9

Baseband signal Sampling – Fourier Transform of discrete time signals (DTFT) Properties of DTFT Z Transform & Properties.

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UNIT - V	LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS	9
Impulse response – Difference Equations - Convolution sum Discrete Fourier Transform and Z Transform Analysis of Recursive & Non-Recursive systems DT systems connected in series and parallel.		
Total Instructional hours : 60		

Course Outcomes : Students will be able to	
CO1	Classify the various types of continuous and discrete time signals and systems using MATLAB
CO2	Analyze Continuous time signals in the Fourier and Laplace domain
CO3	Apply LTI Continuous time systems in the Fourier and Laplace domain
CO4	Analyze discrete time signals in the Fourier and Z transform domain
CO5	Apply LTI discrete time systems in the Fourier and Z transform domain

Text Books	
1.	Allan V. Oppenheim, S.Wilsky and S.H.Nawab, “Signals and Systems”, Pearson, 2015. (Unit I - V)

Reference Books	
1.	B. P. Lathi, “Principles of Linear Systems and Signals”, Second Edition, Oxford, 2009.
2.	R.E.Zeimer, W.H.Tranter and R.D.Fannin, “Signals & Systems - Continuous and Discrete”, Pearson, 2007.
3.	John Alan Stuller, “An Introduction to Signals and Systems”, Thomson, 2007.

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B.E. / B.Tech.	B19MCT301 – ENVIRONMENTAL SCIENCES (Common to all Branches)	T	P	TU	C
		3	0	0	NC

Course Objectives	
1.	To study the nature and facts about environment.
2.	To find and implement scientific, technological, economic and political solutions to environmental problems.
3.	To study the interrelationship between living organism and environment.
4.	To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
5.	To study the dynamic processes and understand the features of the earth"s interior and surface.

UNIT - I	ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY	9

Definition, scope and importance of environment – need for public awareness concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – nergy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams,lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT - II	ENVIRONMENTAL POLLUTION	9

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

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UNIT - III	NATURAL RESOURCES	6
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams- benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.		

UNIT - IV	SOCIAL ISSUES AND THE ENVIRONMENT	6
From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non- governmental organization environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.		

UNIT - V	HUMAN POPULATION AND THE ENVIRONMENT	9
Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.		
		Total Instructional hours : 45

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Course Outcomes : Students will be able to	
CO1	Explain the basic concepts of environment, ecosystem and biodiversity.
CO2	Identify the different types of pollution and their control measures.
CO3	Outline various natural resources.
CO4	Summarize Development and improvement in the standard of living that has lead to serious environmental disasters.
CO5	Infer about the causes of population explosion and role of Information technology in environment.

Text Books	
1.	Benny Joseph, “Environmental Science and Engineering”, Tata McGraw-Hill, New Delhi, 2006.
2.	Gilbert M. Masters, “Introduction to Environmental Engineering and Science”, 2nd Edition, Pearson Education, 2004.

Reference Books	
1.	Dharmendra S. Sengar, “Environmental law”, prentice hall of India PVT LTD, New Delhi, 2007.
2.	Erach Bharucha, “Textbook of Environmental Studies”, Universities Press (I) PVT, LTD, Hydrabad, 2015.
3.	Rajagopalan, R, “Environmental Studies-From Crisis to Cure”, Oxford University Press, 2005.
4.	G.Tyler Miller and Scott E. Spoolman, “Environmental Science”, Cengage Learning India Pvt, Ltd, Delhi, 2014.

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B.E. / B.Tech.	B19HST301 - தமிழரும் தொழில்நுட்பமும்	T	P	TU	C
		1	0	0	1

அலகு - I	நெசவு மற்றும் பானைத் தொழில்நுட்பம்	3

சங்க காலத்தில் நெசவுத் தொழில் - பானைத் தொழில்நுட்பம் - கருப்பு சிவப்பு பாண்டங்கள் - பாண்டங்களில் கீறல் குறியீடுகள்.

அலகு - II	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்	3

சங்க காலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்க காலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு - சங்க காலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் - சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் - மாமல்லபுரச் சிற்பங்களும், கோவில்களும் - சோழர் காலத்துப் பெருங்கோவில்கள் மற்றும் பிற வழிபாட்டுத் தலங்கள் - நாயக்கர் காலக் கோவில்கள் - மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மதுரை மீனாட்சி அம்மன் ஆலயம் மற்றும் திருமலை நாயக்கர் மஹால் - செட்டிநாட்டு வீடுகள் - பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக் கட்டிடக்கலை

அலகு - III	உற்பத்தித் தொழில் நுட்பம்	3

கப்பல் கட்டும் கலை - உலோகவியல் - இரும்புத் தொழிற்சாலை - இரும்பை உருவாக்குதல், எ∴கு - வரலாற்றுச் சான்றுகளாக செம்பு மற்றும் தங்க நாணயங்கள் - நாணயங்கள் அச்சடித்தல் - மணி உருவாக்கும் தொழிற்சாலைகள் - கல்மணிகள், கண்ணாடி மணிகள் - சுடுமண் மணிகள் - சங்கு மணிகள் - எலும்புத் துண்டுகள் - தொல்லியல் சான்றுகள் - சிலப்பதிகாரத்தில் மணிகளின் வகைகள்

அலகு - IV	வேளாண்மை மற்றும் நீர்ப்பாசனத் தொழில் நுட்பம்	3

அணை, ஏரி, குளங்கள், மதகு - சோழர்காலக் குமிழித் தூம்பின் முக்கியத்துவம் - கால்நடை பராமரிப்பு - கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் - வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் - கடல்சார் அறிவு - மீன் வளம் - முத்து மற்றும் முத்துக் குளித்தல் - பெருங்கடல் குறித்த பண்டைய அறிவு - அறிவுசார் சமூகம்

அலகு - V	அறிவியல் தமிழ் மற்றும் கணித்தமிழ்	3

அறிவியல் தமிழின் வளர்ச்சி - கணித்தமிழ் வளர்ச்சி - தமிழ் நூல்களை மின் பதிப்பு செய்தல் - தமிழ் மென்பொருட்கள் உருவாக்கம் - தமிழ் இணையக் கல்விக் கழகம் - தமிழ் மின் நூலகம் - இணையத்தில் தமிழ் அகராதிகள் - சொற்குவைத் திட்டம்

மொத்தம் - 15 காலங்கள்

BoS Chairman

Text - Cum - Reference Books	
1.	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு - தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2.	கணினித் தமிழ் - முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
3.	கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4.	பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5.	Social Life of Tamils (Dr. K.K. Pillay) A joint publication of TNTB & ESC and RMRL
6.	Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by : International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr. S.V. Subatamanian, Dr. K.D. Thirunavukkarasu) (Published by : International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by : International Institute of Tamil Studies).
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by : Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the Histroy of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by : The Author)
11.	Porunai Civilization (Jointly Published by : Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by : RMRL) - Reference Book.

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B.E. / B.Tech.	B19HST301 - TAMILS AND TECHNOLOGY	T	P	TU	C
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UNIT - I	WEAVING AND CERAMIC TECHNOLOGY	3
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries		

UNIT - II	DESIGN AND CONSTRUCTION TECHNOLOGY	3
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period		

UNIT - III	MANUFACTURING TECHNOLOGY	3
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting,steel - Copper and goldCoins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram		

UNIT - IV	AGRICULTURE AND IRRIGATION TECHNOLOGY	3
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society		

UNIT - V	SCIENTIFIC TAMIL & TAMIL COMPUTING	3
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project		
		Total Instructional hours : 15

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Text - Cum - Reference Books	
1.	தமிழக வரலாறு - மக்களும் பண்பாடும் - கே.கே. பிள்ளை (வெளியீடு - தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள் கழகம்)
2.	கணினித் தமிழ் - முனைவர் இல.சுந்தரம் (விகடன் பிரசுரம்)
3.	கீழடி - வைகை நதிக்கரையில் சங்ககால நகர நாகரிகம் (தொல்லியல் துறை வெளியீடு)
4.	பொருநை - ஆற்றங்கரை நாகரிகம் (தொல்லியல் துறை வெளியீடு)
5.	Social Life of Tamils (Dr. K.K. Pillay) A joint publication of TNTB & ESC and RMRL - (in print)
6.	Social Life of the Tamils - The Classical Period (Dr. S. Singaravelu) (Published by : International Institute of Tamil Studies.
7.	Historical Heritage of the Tamils (Dr. S.V. Subatamanian, Dr. K.D. Thirunavukkarasu) (Published by : International Institute of Tamil Studies).
8.	The Contributions of the Tamils to Indian Culture (Dr. M. Valarmathi) (Published by : International Institute of Tamil Studies).
9.	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by : Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10.	Studies in the Histroyb of India with Special Reference to Tamil Nadu (Dr. K.K. Pillay) (Published by : The Author)
11.	Porunai Civilization (Jointly Published by : Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12.	Journey of Civilization Indus to Vaigai (R. Balakrishnan) (Published by : RMRL) - Reference Book.

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B.E.	B19CSP303 - FUNDAMENTALS OF DATA STRUCTURES IN C LABORATORY	L	T	P	C
		0	0	2	1

Course Objectives	
1.	To understand and implement basic data structures using C.
2.	To understand the principles of linear and nonlinear data structures.
3.	To understand and implement basic data structures using C.
4.	To build an applications using sorting.
5.	To build an application using searching.

List of Experiments

Expt. No.	Description of the Experiments	
1.	Basic C Programs – looping, data manipulations, arrays.	
2.	Programs using strings – string function implementation.	
3.	Programs using structures and pointers	
4.	Programs involving dynamic memory allocations	
5.	Write a C program to implement a Stack ADT using array.	
6.	Write a C program to implement the Queue ADT using array and write the routine to enqueuer and dequeuer operations	
7.	Linked list implementation of stacks and queues	
8.	Write a C program that uses functions to perform the following:	
	a.	Create a binary search tree of integers.
	b.	Traverse the above Binary search tree non recursively in inorder.
9.	Implementation of Linear search and binary search.	

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10.	Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order:	
	a.	Insertion sort
	b.	Merge sort
11.	Write C programs for implementing the following sorting methods to arrange a list of integers in ascending order:	
	a.	Quick sort
	b.	Bubble sort
12.		Implementation of hashing technique
		Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Build basic and advanced programs in C.
CO2	Develop functions and recursive functions in C.
CO3	Construct C programs to illustrate linear data structures.
CO4	Develop C programs to implement nonlinear data structures.
CO5	Make use of appropriate sorting algorithm for an application and implement it in a modularized way.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. No.	NAME OF THE EQUIPMENT	Qty.
1.	Dell Optiplex 380 PC **Operating systems :** Windows* 7 or later or Linux. TCC 4.0 or above	30

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B.E.	B19ECP301 - ANALOG AND DIGITAL CIRCUITS LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To study the Frequency response of CE and CS Amplifier.
2.	To learn the Transfer characteristics of differential amplifier.
3.	To perform experiment to obtain the response from multistage amplifiers.
4.	To perform SPICE simulation of amplifier circuits.
5.	To design and implement the combinational and sequential logic circuits with discrete components and Verilog HDL Simulation.

List of Experiments	
Expt. No.	**Description of the Experiments**
List of Analog Experiments	
1.	Design of Regulated Power supplies
2.	Construct the CE (BJT) and CS (FET) amplifiers by using discrete components and Spice Simulation for the analysis of Frequency Response.
3.	Differential Amplifiers - Transfer characteristics, CMRR Measurement
4.	Construct the Cascode and Cascade amplifiers by using discrete components and Spice Simulation
5.	Determination of bandwidth of single stage and multistage amplifiers
6.	Analysis of BJT with Fixed bias and Voltage divider bias using Spice
7.	Analysis of FET, MOSFET with fixed bias, self-bias and voltage divider bias using simulation software like Spice

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List of Digital Experiments		
8.	Design and implementation of code converters using logic gates	
	i.	BCD to excess-3 code and vice versa
	ii.	Binary to gray and vice-versa
9.	Design and implementation of 4 bit binary Adder/ Subtractor and BCD adder using IC 7483	
10.	Design and implementation of	
	i.	Multiplexer and De-multiplexer
	ii.	Encoder and Decoder
11.	Design and implementation of Synchronous and Asynchronous counter	
12.	Simulation of any two combinational and sequential circuits using Verilog HDL	
		Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Determine Rectifiers, Filters, and Regulated Power supplies.
CO2	Test BJT and FET Amplifiers.
CO3	Analyze the limitation in bandwidth of single stage, multi stage amplifiers and CMRR in differential amplifier.
CO4	Analyze amplifier circuits using PSpice Simulation.
CO5	Test the digital logic circuits using discrete components and Verilog HDL Simulation.

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LIST OF EQUIPMENT REQUIRED : REQUIREMENTS FOR A BATCH OF 30 STUDENTS		
Sl. No.	**Description of Equipment**	**Quantity**
1.	CRO (30MHz)	15
2.	Signal Generator /Function Generators (3 MHz)	15
3.	Dual Regulated Power Supplies (0 - 30V)	15
4.	Standalone desktop PCs with SPICE software	15
5.	Transistor/FET(BJT-NPN-PNP and NMOS/PMOS)	50
6.	Dual power supply/single mode power supply	15
7.	Resistors, Capacitors, Inductors	50
8.	Diodes, Zener diode	10
9.	IC Trainer Kit	15
10.	Bread Boards	15
11.	Computer with HDL software	15
12.	Seven segment display	15
13.	Multimeter	15
14.	ICs 7400/ 7402 / 7404 / 7486 / 7408 /7432 / 7483 / 74150 / 74151 / 74147 /7445 / 7476/7491/ 555 / 7494 / 7447 /74180 / 7485 / 7473 / 74138 / 7411 /7474	50

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B.E / B. Tech	B19CEP301- SOFT SKILLS - II (Common to all Branches)	T	P	TU	C
		0	2	0	1

Course Objectives	
1.	To enhance communication skills through LSRW skills.
2.	To enrich interpersonal skills through integrated activities.
3.	To develop social and professional etiquette.
4.	To identify and apply employability skills for professional success.

UNIT - I	COMMUNICATION SKILLS	6
Define Listening - Types of Listening - Listening and Filling Information - Basis of Phonetics - Strategies of Effective Reading - Reading & Responding to Business Communications - E-mail.		

UNIT - II	INTERPERSONAL SKILLS	6
Interpersonal Skills - Need & Components – Understanding Inter cultural Competence – Team Work - Problem Solving Skills – Workplace Conflict Management & Resolutions.		

UNIT - III	EMOTIONAL INTELLIGENCE	6
Key Elements of Emotional Intelligence - Self Awareness – Self Performance - Psychometric Analysis - Relationship Management - Critical Thinking & Reasoning.		

UNIT - IV	BUSINESS ETIQUETTE	6
Define Etiquette – Types & Importance of Workplace Etiquette – Basic Corporate Etiquette - Telephone Etiquette - Meeting & E-mail Etiquette - Customer Service Etiquette.		

UNIT - V	CORPORATE SKILLS	6
Work Ethics - Adaptability - Analytical Reasoning - Lateral Thinking - Stress & Time Management - Professionalism in Today's Workforce.		
Total Instructional hours : 30		

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Course Outcomes : At the end of the course the student will be able to	
CO1	Develop professional communication through LSRW skills.
CO2	Apply systematic approach in problem solving skills.
CO3	Utilize leadership skills with ability to work in a team.
CO4	Demonstrate employability skills.
CO5	Analyze & adapt workplace etiquette.

Reference Books	
1.	Meenakshi Raman, Shalini Upadhyay, "Soft Skills", Cengage Learning India Pvt. Ltd, Delhi, 2018.
2.	M.S. Rao, "Soft Skills Enhancing Employability", I. K. International Publishing House Pvt. Ltd, New Delhi, 2010.
3.	Sabina Pillai, Agna Fernandez, "Soft Skills and Employability Skills", Cambridge University Press, 2018.
4.	John Peter.A, "Self – Development and Professional Excellence", Cengage Learning India Pvt. Ltd, Delhi, 2019.

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Semester - IV

B.E.	B19MAT404 – PROBABILITY AND RANDOM PROCESSES	T	P	TU	C
		3	0	1	4

Course Objectives	
1.	To understand the fundamental concepts of probability and have the knowledge of Standard distributions.
2.	To provide basic knowledge in one and two dimensional random variables toapply in engineering domain.
3.	To apply the concept of random process in engineering disciplines.
4.	To introduce the concept of correlation and spectral densities.
5.	To analyze the response of random inputs to linear time invariant systems.

UNIT - I	PROBABILITY AND DISTRIBUTIONS	12
Probability – Axioms of probability – Conditional probability – Baye's theorem – Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.		

UNIT - II	TWO – DIMENSIONAL RANDOM VARIABLES	12
Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables – without proof).		

UNIT - III	RANDOM PROCESSES	12
Classification – Stationary process – Markov process - Markov chain Poisson process – Random telegraph process.		

UNIT - IV	CORRELATION AND SPECTRAL DENSITIES	12
Auto correlation functions – Cross correlation functions – Properties – Power spectral density – Cross spectral density – Properties.		

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UNIT - V	LINEAR SYSTEMS WITH RANDOM INPUTS	12
Linear time invariant system – System transfer function – Linear systems with random inputs – Auto correlation and cross correlation functions of input and output.		
		Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Interpret the fundamental knowledge of the concepts of probability and standard distributions.
CO2	Develop the basic concepts of one and two dimensional random variables and apply in engineering fields.
CO3	Identify the concept of random processes in engineering disciplines.
CO4	Apply the concept of correlation and spectral densities.
CO5	Show the response of random inputs to linear time invariant systems.

Text Books	
1.	Ibe. O.C., "Fundamentals of Applied Probability and Random Processes", Elsevier, 2nd edition 2014.
2.	Peebles.P.Z,"Probability, Random Variables and Random Signal Principles", Tata McGraw Hill, 4th Edition, New Delhi, 2017.

Reference Books	
1.	Miller.S.L. and Childers. D.G., "Probability and Random Processes with Applications to Signal Processing and Communications", Academic Press, 2018.
2.	Devore. J.L., "Probability and Statistics for Engineering and the Sciences, Cengage Learning", New Delhi, 8th Edition, 2014.
3.	Cooper. G.R., McGillem. C.D., "Probabilistic Methods of Signal and System Analysis", 3rd Indian Edition, Oxford University Press, New Delhi, 2012.

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B.E.	B19ECT401 – ELECTRONIC CIRCUITS - II	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To give a comprehensive exposure to all types of feedback amplifiers.
2.	To study about oscillator principles.
3.	To study about turned amplifier.
4.	To learn about various multivibrators.
5.	To understand various power amplifiers and DC convertors.

UNIT - I	FEEDBACK AMPLIFIERS AND STABILITY	9

Feedback Concepts – gain with feedback – effect of feedback on gain stability, distortion, bandwidth, input and output impedances; topologies of feedback amplifiers – analysis of series - series, shunt - shunt and shunt - series feedback amplifiers-stability problem - Gain and Phase - margins - Frequency compensation.

UNIT - II	OSCILLATORS	9

Barkhausen criterion for oscillation – phase shift, Wien bridge Hartley & Colpitt's oscillators – Clapp oscillator Ring oscillators and crystal oscillators – oscillator amplitude stabilization.

UNIT - III	TUNED AMPLIFIERS	9

Coil losses, unloaded and loaded Q of tank circuits, small signal tuned amplifiers – Analysis of capacitor coupled single tuned amplifier - double tuned amplifier effect of cascading single tuned and double tuned amplifiers on bandwidth – Stagger tuned amplifiers Stability of tuned amplifiers – Neutralization Hazeltine neutralization.

UNIT - IV	WAVE SHAPING AND MULTIVIBRATOR CIRCUITS	9

Pulse circuits – attenuators – RC integrator and differentiator circuits – diode clampers and clippers – Diode comparator - Collector coupled Astable multivibrator Bistable multivibrators - Collector coupled Monostable multivibrator - Schmitt Trigger - UJT Oscillator.

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UNIT - V	POWER AMPLIFIERS AND DC CONVERTERS	9
Power amplifiers- class A - Class B - Class AB - Class C - conversion efficiency Power MOSFET - Temperature Effect Class AB Power amplifier using MOSFET – DC/DC convertors – Buck, Boost, Buck Boost analysis and design.		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Analyze the stability of feedback amplifiers.
CO2	Develop various oscillator circuits.
CO3	Classify the various types of tuned amplifiers.
CO4	Construct multivibrator and wave shaping circuits.
CO5	Model power amplifiers and converters.

Text Books	
1.	Sedra and Smith,“Micro Electronic Circuits”, Sixth Edition, Oxford University Press, 2011. (UNIT I, III, IV, V)
2.	J Jacob Millman, “Microelectronics”, McGraw Hill, 2nd Edition, Reprinted, 2009. (UNIT I, II, IV, V)

Reference Books	
1.	Robert L. Boylestadand Louis Nasheresky, “Electronic Devices and Circuit Theory”, 10th Edition, Pearson Education / PHI, 2008.
2.	David A. Bell, “Electronic Devices and Circuits”, Fifth Edition, Oxford University Press, 2008.
3.	Millman J.and Taub H., “Pulse Digital and Switching Waveforms”, TMH, 2000.
4.	Millman and Halkias. C., “Integrated Electronics”, TMH, 2007.

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B.E.	B19ECT402 – COMMUNICATION THEORY	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To introduce the concepts of amplitude modulation process.
2.	To introduce the concepts of angle modulation process.
3.	To understand the properties of random process.
4.	To know the effect of noise on communication systems.
5.	To know the principles of sampling and quantization.

UNIT - I	AMPLITUDE MODULATION	9

Amplitude Modulation-DSBSC, DSBFC, SSB, VSB Modulation index, Spectra, Power relations and Bandwidth – AM Generation –Square law and Switching modulator, DSBSC Generation (with MATLAB) – Balanced and Ring Modulator, SSB Generation – Filter, Phase Shift and Third Methods, VSB Generation – Filter Method, Hilbert Transform, Comparison of different AM techniques, Superheterodyne Receiver.

UNIT - II	ANGLE MODULATION	9

Angle modulation – PM and FM – Narrow band, Wideband FM Spectral analysis of modulated signal – FM Modulators (with MATLAB) and FM Demodulators – Discriminator, PLL, Stereo FM.

UNIT - III	RANDOM PROCESS	9

Random variables, Central limit Theorem, Random Process, Stationary Processes, Mean, Correlation & Covariance functions, Power Spectral Density, Ergodic Processes, Gaussian Process, Transmission of a Random signal Through a LTI filter.

UNIT - IV	NOISE CHARACTERIZATION	9

Noise sources – Noise figure, noise temperature and noise bandwidth – Noise in cascaded systems. Representation of Narrow band noise – In-phase and quadrature, Envelope and Phase – Noise performance analysis in AM & FM systems – Threshold effect, Pre- emphasis and de-emphasis for FM.

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UNIT - V	SAMPLING & QUANTIZATION	9
Low pass sampling (with MATLAB) – Aliasing - Signal Reconstruction - Quantization Uniform & non-uniform quantization - quantization noise Logarithmic Companding – PAM (with MATLAB), PPM, PWM, PCM –TDM, FDM.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Develop Amplitude Modulation systems.
CO2	Construct Angle modulated communication systems.
CO3	Apply the concepts of Random Process to Communication systems.
CO4	Classify the noise performance of AM and FM systems.
CO5	Analyze the sampling and quantization techniques.

Text Books	
1.	J.G. Proakis, M. Salehi, "Fundamentals of Communication Systems", Pearson Education, 2014. (UNIT I - IV)
2.	Simon Haykin, "Communication Systems", 4th Edition, Wiley, 2014. (UNIT I - V).

Reference Books	
1.	B. P. Lathi, "Modern Digital and Analog Communication Systems", 3rd Edition, Oxford University Press, 2007.
2.	D. Roody, J. Coolen, "Electronic Communications", 4th Edition, PHI, 2006.
3.	A. Papoulis, "Probability, Random variables and Stochastic Processes", McGraw Hill, 3rd Edition, 1991.
4.	B. Sklar, "Digital Communications Fundamentals and Applications", 2nd Edition, Pearson Education, 2007.

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B.E.	B19ECT403 - ELECTROMAGNETIC FIELDS	T	P	TU	C
		3	0	1	4

Course Objectives	
1.	To understand the basic units, constants and Theorems of Electromagnetic Fields.
2.	To gain conceptual and basic mathematical understanding of electric field in free space and in materials.
3.	To gain conceptual and basic mathematical understanding of magnetic field in free space and in materials.
4.	To understand the coupling between electric and magnetic fields through Faraday's law, displacement current and Maxwell's equations.
5.	To understand wave propagation in lossless and in lossy media.

UNIT - I	INTRODUCTION	9

Electromagnetic model, Units and constants, Review of vector algebra, Rectangular, cylindrical and spherical coordinate systems (with MATLAB), Line, surface and volume integrals, Gradient of a scalar field, Divergence of a vector field, Divergence theorem (with MATLAB), Curl of a vector field, Stoke's theorem, Null identities, Helmholtz's theorem.

UNIT - II	STATIC ELECTRIC FIELD	9

Electric field, Coulomb's law, Gauss's law and applications, Electric potential, Conductors in static electric field, Dielectrics in static electric field, Electric flux density and dielectric constant, Boundary conditions, Capacitance, Parallel, cylindrical and spherical capacitors, Electrostatic energy, Poisson's and Laplace's equations, Uniqueness of electrostatic solutions.

UNIT - III	STATIC MAGNETIC FIELD	9

Lorentz force equation, Law of no magnetic monopoles, Ampere's law, Vector magnetic potential, Biot-Savart law and applications, Magnetic field intensity and idea of relative permeability, Magnetic circuits, Behaviour of magnetic materials, Boundary conditions, Inductance and inductors, Magnetic energy, Magnetic forces and torque.

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UNIT - IV	TIME-VARYING FIELDS AND MAXWELL's EQUATIONS	
Faraday's law, Displacement current and Maxwell-Ampere law, Maxwell's equations, Potential functions, Electromagnetic boundary conditions, Wave equations and solutions, Time-harmonic fields.		

UNIT - V	PLANE ELECTROMAGNETIC WAVES	9
Plane waves in lossless media, Plane waves in lossy media (low-loss dielectrics and good conductors), Group velocity, Electromagnetic power flow and Poynting vector, Normal incidence at a plane conducting boundary, Normal incidence at a plane dielectric boundary.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain basic laws and theorems applied in Electromagnetic waves and propagation analysis.
CO2	Analyze static and dynamic electric and magnetic field and associated laws.
CO3	Show the EM wave propagation in a medium and through boundaries.
CO4	Solve electromagnetic problems with Maxwell's equations.
CO5	Analyze about the plane waves in lossy and lossless media.

Text Books	
1.	D.K. Cheng, "Field and wave Electromagnetics", 2nd Edition, Pearson (India), 1989. (UNIT I, II, III, IV, V)
2.	W.H. Hayt and J.A. Buck, "Engineering Electromagnetics", 7th Edition, McGraw-Hill (India), 2006. (UNIT I - V)

Reference Books	
1.	D.J. Griffiths, "Introduction to Electrodynamics", 4th Edition, Pearson (India), 2013.
2.	B.M. Notaros, "Electromagnetics", Pearson: New Jersey, 2011.
3.	M.N.O. Sadiku and S.V. Kulkarni, "Principles of Electromagnetics", 6th Edition, Oxford (Asian Edition), 2015.

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B.E.	B19ECT404 - LINEAR INTEGRATED CIRCUITS (Common to ECE & BME)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To introduce the basic building blocks of linear integrated circuits.
2.	To learn the linear and non-linear applications of operational amplifiers.
3.	To introduce the theory and applications of analog multipliers and PLL.
4.	To learn the theory of ADC and DAC.
5.	To introduce the concepts of waveform generation and introduce some special function ICs.

UNIT - I	BASICS OF OPERATIONAL AMPLIFIERS	9
Current mirror and current sources, Current sources as active loads, Voltage sources, Voltage References, BJT Differential amplifier with active loads, Basic information about op-amps – Ideal Operational Amplifier - General operational amplifier stages and internal circuit diagrams of IC 741, DC and AC performance characteristics, slew rate, Open and closed loop configurations – JFET Operational Amplifiers – LF155 and TL082.		

UNIT - II	APPLICATIONS OF OPERATIONAL AMPLIFIERS	9
Sign Changer, Scale Changer, Phase Shift Circuits, Voltage Follower, V-to-I and I-to-V converters, adder, subtractor, Instrumentation amplifier, Integrator, Differentiator, Logarithmic amplifier, Antilogarithmic amplifier, Comparators, Schmitt trigger, Precision rectifier, peak detector, clipper and clamper, Low-pass, high-pass and band-pass Butterworth filters.		

UNIT - III	ANALOG MULTIPLIER AND PLL	9
Analog Multiplier using Emitter Coupled Transistor Pair Gilbert Multiplier cell – Variable trans - conductance technique, analog multiplier ICs and their applications, Operation of the basic PLL, Closed loop analysis, Voltage controlled oscillator, Monolithic PLL IC 565, application of PLL for AM detection, FM detection, FSK modulation and demodulation and Frequency synthesizing and clock synchronization.		

UNIT - IV	ANALOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS	9
Analog and Digital Data Conversions, D/A converter – specifications - weighted resistor type, R-2R Ladder type, Voltage Mode and Current - Mode R - 2R Ladder types - switches for D/A converters, high speed sample-and-hold circuits, A/D Converters – specifications - Flash type - Successive Approximation type - Single Slope type – Dual Slope type.		

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UNIT - V	WAVEFORM GENERATORS AND SPECIAL FUNCTION ICS	9
Sine-wave generators, Multivibrators and Triangular wave generator, Saw-tooth wave generator, ICL8038 function generator, Timer IC 555, IC Voltage regulators – Three terminal fixed and adjustable voltage regulators - IC 723 general purpose regulator - Audio Power amplifier, Video Amplifier, Opto-couplers and fibre optic IC.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the basics of operational amplifier.
CO2	Develop linear and nonlinear applications of operational amplifiers.
CO3	Examine applications with analog multiplier and PLL ICs.
CO4	Analyze analog to digital and digital to analog converters with Op-Amps.
CO5	Classify different types of Operational Amplifier based waveform generators and special function ICs.

Text Books	
1.	D. RoyChoudhry, Shail Jain, “Linear Integrated Circuits”, New Age International Pvt. Ltd., 2018, Fifth Edition. (Unit I – V)
2.	Sergio Franco, “Design with Operational Amplifiers and Analog Integrated Circuits”, 4^{th} Edition, Tata McGraw-Hill, 2016. (Unit I – V)

Reference Books	
1.	Ramakant A. Gayakwad, “OP-AMP and Linear ICs, 4^{th} Edition, Prentice Hall / Pearson Education, 2015.
2.	Robert F.Coughlin, Frederick F.Drisco, “Operational Amplifiers and Linear Integrated Circuits”, Sixth Edition, PHI, 2001.
3.	Gray and Meyer, “Analysis and Design of Analog Integrated Circuits”, Wiley International, 5^{th} Edition, 2009.
4.	S. Salivahanan & V.S. KanchanaBhaskaran,“Linear Integrated Circuits”, TMH, 2^{nd} Edition, 4^{th} Reprint, 2016.

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B.E./ B.Tech.	B19MCT302 - INDIAN CONSTITUTION (Common to all Branches)	T	P	TU	C
		3	0	0	NC

Course Objectives	
1.	To understand the constitutional organization of India.
2.	To understand the hierarchy of Union Government of India.
3.	To know the hierarchy and systems of state Governments.
4.	To know the power, role of local administration in Government sectors.
5.	To understand role, function of Election Commission of India.

UNIT - I	THE CONSTITUTION - INTRODUCTION

- The History of the Making of the Indian Constitution
- Preamble and the Basic Structure, and its interpretation
- Fundamental Rights and Duties and their interpretation

UNIT - II	UNION GOVERNMENT

- Structure of the Indian Union
- President – Role and Power
- Prime Minister and Council of Ministers

UNIT - III	STATE GOVERNMENT

- Governor – Role and Power
- Chief Minister and Council of Ministers
- State Secretariat

UNIT - IV	LOCAL ADMINISTRATION

- District Administration
- Municipal Corporation
- Zila Panchayat

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UNIT - V	ELECTION COMMISSION

- Role and Functioning
- Chief Election Commissioner
- State Election Commission

Total Instructional hours : 30

Course Outcomes : Students will be able to

CO1	Infer about organization of Indian constitution.
CO2	Explain the hierarchy organization of Indian government.
CO3	Explain various systems and application of State Governments.
CO4	Illustrate the power and functional systems of local administration.
CO5	Summarize the role and administration Indian Election Commission.

Text Books

1.	Rajeev Bhargava, “Ethics and Politics of the Indian Constitution”, Oxford University Press, New Delhi, 2008.
2.	Fadia, B.L., “The Constitution of India”, Sahitya Bhawan; New edition 2017.
3.	Basu, D.D., “Introduction to the Constitution of India”, Lexis Nexis; Twenty-Third 2018.

Suggested Software / Learning Websites

1.	https://www.constitution.org/cons/india/const.html
2.	http://www.legislative.gov.in/constitution-of-india
3.	https://www.sci.gov.in/constitution
4.	https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-ofindia/

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B.E.	B19ECP401 - CIRCUITS DESIGN AND SIMULATION LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To gain hands on experience in designing electronic circuits.
2.	To learn the simulation software used in circuit design.
3.	To learn the fundamental principles of amplifier circuits.
4.	To study feedback amplifiers and oscillators.
5.	To study the operation of various multivibrators.

List of Experiments

Expt. No.	Description of the Experiments
Design, Simulate and Analyse of Following Circuits	
1.	Series and Shunt feedback amplifiers (Frequency response, Input and output impedance)
2.	RC Phase shift oscillator
3.	Wien Bridge Oscillator
4.	Hartley and Colpitts Oscillators
5.	Tuned Amplifiers
6.	Integrator and Differentiator
7.	Astable and Monostable multivibrators
8.	Clipper and Clamper
9.	Schmitt Trigger
10.	Power Amplifier
	Total Instructional hours : 60

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Course Outcomes : Students will be able to	
CO1	Explain about the feedback amplifier & tuned amplifiers
CO2	Evaluate the power amplifiers
CO3	Inspect about various oscillators
CO4	Classify various electronic circuits
CO5	Analyze about the multivibrators

List of Equipment Required : Requirements for a Batch of 30 Students

Sl. No.	Description of the Equipment	Qty.
1.	CRO (Min 30MHz)	15
2.	Signal Generator /Function Generators (2 MHz)	15
3.	Dual Regulated Power Supplies(0 - 30V)	15
4.	Digital Multimeter	15
5.	Digital LCR Meter	2
6.	Standalone desktops PC	15
7.	Transistor/FET (BJT-NPN-PNP and NMOS/PMOS)	50
8.	Transistors, Resistors, Capacitors, Inductors, diodes, Zener Diodes, Bread Boards, Transformers	50
9.	SPICE Circuit Simulation Software (any public domain or commercial software)	15

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B.E.	B19ECP402 - LINEAR INTEGRATED CIRCUITS LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To understand the basics of linear integrated circuits and available ICs.
2.	To understand the characteristics of the operational amplifier.
3.	To apply operational amplifiers in linear and nonlinear applications.
4.	To acquire the basic knowledge of special function IC.
5.	To use simulation software for circuit design.

List of Experiments

Expt. No.	Description of the Experiments
Design, Simulate and Analyse of Following Circuits	
1.	Inverting, non - inverting and differential amplifier
2.	Integrator
3.	Differentiator
4.	Active low-pass filter
5.	Active high-pass filter
6.	Schmitt Trigger
7.	RC Phase shift oscillator
8.	Wien bridge oscillator
9.	Astable and Monostable multivibrators using NE555
10.	R-2R Ladder Type D- A Converter (3 – bit input) and any A-D Converter
	Total Instructional hours : 60

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Course Outcomes : Students will be able to	
CO1	Examine inverting, non-inverting amplifier and few applications of operational amplifier.
CO2	Analyze active filters.
CO3	Inspect the sine wave oscillators.
CO4	Interpret the working of multivibrators.
CO5	Evaluate the A/D and D/A converters.

List of Equipment Required : Requirements for a Batch of 30 Students

S.No.	Description of the Equipment	Qty.
1.	CRO /DSO (Min 30MHz)	15
2.	Signal Generator /Function Generators (2 MHz)	15
3.	Dual Regulated Power Supplies (0 - 30V)	15
4.	Digital Multimeter	15
5.	IC tester	2
6.	Standalone desktops PC	15
7.	Transistors, Resistors, Capacitors, diodes, Zener diodes, Bread Boards, Transformers, wires, Power transistors, Potentiometer, A/D and D/A convertors, LEDs	50

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Semester - V

B.E.	B19ECT501 - DIGITAL COMMUNICATION	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To study the limits set by Information Theory.
2.	To study the various waveform coding schemes.
3.	To learn the various baseband communication schemes.
4.	To understand the various digital modulation schemes.
5.	To know the fundamentals of channel coding.

UNIT - I	INFORMATION THEORY	9

Discrete Memory less source, – Information – Entropy - Mutual Information Discrete Memory less channels – Binary Symmetric Channel, Channel Capacity - Hartley Shannon law - Source coding theorem Shannon – Fano & Huffman codes.

UNIT - II	WAVEFORM CODING & REPRESENTATION	9

Prediction filtering and DPCM - Delta Modulation- ADPCM & ADM principles - Linear Predictive Coding Properties of Line codes- Power Spectral Density of Unipolar / Polar RZ & NRZ – Bipolar NRZ – Manchester.

UNIT - III	BASEBAND TRANSMISSION & RECEPTION	9

ISI – Nyquist criterion for distortion less transmission – Pulse shaping – Correlative coding Eye pattern – Receiving Filters Matched Filter, Correlation receiver, Adaptive Equalization.

UNIT - IV	DIGITAL MODULATION SCHEME	9

Geometric Representation of signals Generation, detection, PSD & BER of Coherent BPSK, BFSK & QPSK - QAM - Carrier Synchronization - Structure of Non-coherent Receivers Principle of DPSK.

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UNIT - V	ERROR CONTROL CODING	9
Channel coding theorem - Linear Block codes - Hamming codes - Cyclic codes Convolutional codes Viterbi Decoder.		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Identify the suitable channel for transmitting binary information and develop source coding techniques.
CO2	Compare various waveform coding techniques.
CO3	Analyze the base band communication schemes.
CO4	Analyze the various digital modulation schemes and their noise performance.
CO5	Examine various error control coding methods.

Text Books	
1.	S. Haykin, “Digital Communications”, John Wiley, 2015.
2.	J.G. Proakis, “Digital Communication”, Tata Mc Graw Hill Company, 5th Edition, 2008.

Reference Books	
1.	B. Sklar, “Digital Communication Fundamentals and Applications”, 2nd Edition, Pearson Education, 2009.
2.	B.P.Lathi, “Modern Digital and Analog Communication Systems”, 3rd Edition, Oxford University Press, 2007.
3.	H P Hsu, Schaum Outline Series, “Analog and Digital Communications”, TMH, 2006.

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B.E.	B19ECT502 – DISCRETE - TIME SIGNAL PROCESSING (Common to all ECE & BME)	L	P	TU	C
		3	0	1	4

Course Objectives	
1.	To make students learn discrete Fourier transforms, properties of DFT and its application to linear filtering.
2.	To understand the characteristics of digital IIR filters.
3.	To understand the characteristics of digital FIR filters.
4.	To understand the effects of finite precision representation on digital filters.
5.	To understand the internal blocks of DSP processors and Programming with DSP processors.

UNIT - I	DISCRETE FOURIER TRANSFORM	12

Review of discrete - time signals & systems - DFT and its properties, FFT algorithms & its applications, Overlap - add & overlap-save methods.

UNIT - II	DESIGN OF INFINITE IMPULSE RESPONSE FILTERS	12

Analog filters – Butterworth filters, Chebyshev Type I filters (upto 3rd order), Analog Transformation of prototype LPF to BPF / BSF / HPF. Transformation of analog filters into equivalent digital filters using Impulse invariant method and Bilinear Z transform method- Realization structures for IIR filters – direct, cascade, parallel forms.

UNIT - III	DESIGN OF FINITE IMPULSE RESPONSE FILTERS	12

Design of linear phase FIR filters windowing and Frequency sampling methods Realization structures for FIR filters –Transversal and Linear phase structures-Comparison of FIR & IIR.

UNIT - IV	FINITE WORD LENGTH EFFECTS	12

Fixed point and floating point number representation - ADC - quantization truncation and rounding - quantization noise - input / output quantization - coefficient quantization error product quantization error - overflow error - limit cycle oscillations due to product quantization and summation scaling to prevent overflow.

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UNIT - V	INTRODUCTION TO DIGITAL SIGNAL PROCESSORS	12
DSP functionalities Circular buffering – DSP architecture TMS320C5x and TMS320C3x – Fixed and Floating point architecture principles – Programming – Application examples.		
Total Instructional hours : 60		

Course Outcomes : Students will be able to	
CO1	Apply DFT for the analysis of digital signals and systems
CO2	Develop IIR filters
CO3	Construct FIR filters
CO4	Identify the effects of finite precision representation on digital filters
CO5	Summarize about the DSP processor

Text Books	
1.	A.V. Oppenheim, R.W. Schafer and J.R. Buck, "Discrete Time Signal Processing", Pearson, 8^{th} Indian Reprint, 2004.
2.	John G. Proakis and Manolakis, "Digital Signal Processing Principles Algorithms and Applications", Pearson, 4^{th} Edition, 2007.

Reference Books	
1.	I.C. Ifeachor and B.W. Jervis, "Digital Signal Processing A Practical Approach", Pearson, 2002.
2.	M.H.Hayes, "Digital Signal Processing", Schaum's outlines, Tata McGraw Hill, 2007.
3.	S.K. Mitra, "Digital Signal Processing A Computer Based approach", Tata McGraw- Hill, 1998.
4.	D.J. De Fatta, J.G.Lucas and W.S. Hodgkiss, "Digital Signal Processing A system Design Approach", John Wiley & sons, Singapore, 1988.
5.	Andreas Antoniou, "Digital Signal Processing", Tata McGraw Hill, 2006.

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B.E.	B19ECT503 – CONTROL SYSTEMS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the components and their representation of control systems.
2.	To learn the various methods for time response.
3.	To learn the various methods for frequency response.
4.	To understand the stability of systems.

UNIT - I	SYSTEMS COMPONENTS AND THEIR REPRESENTATION	9

Basic Elements of Control System – Open loop and Closed loop systems - Differential equation – Transfer function (with MATLAB), Modeling of Electric systems, Translational and rotational mechanical systems - Block diagram reduction Techniques - Signal flow graph- Multivariable control system.

UNIT - II	TIME RESPONSE ANALYSIS	9

Transient response - steady state response - First Order Systems - Impulse and Step Response analysis of second order systems - Steady state errors - Analytical design for PD, PI and PID control systems.

UNIT - III	FREQUENCY RESPONSE ANALYSIS	9

Closed loop frequency response - Performance specification in frequency domain - To learn the various approach for state variable methods. Frequency response of standard second order system - Bode Plot - Polar Plot - Nyquist plots - Design of compensators using Bode plots - Cascade lead compensation - Cascade lag compensation - Cascade lag - lead compensation.

UNIT - IV	STABILITY ANALYSIS	9

Concept of stability Routh Hurwitz Criterion, Root Locus Technique, Construction of Root Locus, Application of Root Locus Diagram - Nyquist Stability Criterion Relative Stability.

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UNIT - V	CONTROL SYSTEM ANALYSIS USING STATE VARIABLE METHODS	9
State space representation of Continuous Time systems – State equations – Transfer function from State Variable Representation (with MATLAB) – Solutions of the state equations Concepts of Controllability and Observability – State space representation for Discrete time systems. State variable analysis of digital control system – Digital control design using state feedback.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the transfer function of different physical systems.
CO2	Analyse the time domain specification and calculate the steady state error.
CO3	Illustrate the frequency response characteristics of open loop and closed loop systems.
CO4	Analyse the stability using Routh and root locus techniques.
CO5	Analyse the state space representation of continuous and discrete systems.

Text Books	
1.	M. Gopal, “Control System – Principles and Design”, Tata McGraw Hill, 4th Edition, 2012.

Reference Books	
1.	J. Nagrath and M.Gopal, “Control System – Principles and Design”, New Age International Publishers, 5th Edition, 2007.
2.	K. Ogata, “Modern Control Engineering”, PHI, 5th Edition, 2012.
3.	S.K. Bhattacharya, “Control System Engineering”, Pearson, 3rd Edition, 2013.
4.	Benjamin C. Kuo, “Automatic Control Systems”, Prentice Hall of India, 7th Edition, 1995.

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B.E.	B19ECT504 - TRANSMISSION LINES AND WAVE GUIDES	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To introduce the various types of transmission lines and to discuss the losses associated.
2.	To provide thorough understanding about impedance transformation and matching.
3.	To learn about the network components.
4.	To import knowledge on filter theories and waveguide theories.
5.	To analyze and minimize cross talk in unbounded conductive media.

UNIT - I	TRANSMISSION LINE THEORY & PARAMETERS	9

General theory of Transmission lines - the transmission line - general solution The infinite line - Wavelength, velocity of propagation - Waveform distortion - the distortion - less line Loading and different methods of loading - Line not terminated in Zo - Input and transfer impedance reflection factor, reflection loss, insertion loss, S-parameters and its properties.

UNIT - II	LINE AT RADIO FREQUENCY AND IMPEDANCE MATCHING	9

Transmission line equations at radio frequencies – Input impedance of the dissipation-less line Open and short circuited lines – Reflection Phenomena – Standing waves – $\lambda/8$, $\lambda/4$ & $\lambda/2$ lines – $\lambda/4$ Impedance transformers, Stub Matching – Single and Double Stub – Smith Chart and Applications.

UNIT - III	NETWORK COMPONENTS	9

Characteristic impedance of symmetrical networks filter fundamentals, Design of filters : Constant K - Low Pass, High Pass, Band Pass, Band Elimination, m- derived sections low pass, high pass, composite filters; Attenuators and Equalizers.

UNIT - IV	WAVEGUIDES AND RESONATORS	9

Waves between Parallel Planes – characteristic of TE , TM and TEM waves, Velocities of propagation, Solution of wave Equation in Rectangular guides ,TE and TM modes, Dominant Mode, Attenuation, Mode Excitation, Dielectric slab wave guides.

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UNIT - V	PLANAR TRANSMISSION LINES AND COUPLING	9
Introduction to strip line – Slot line – Coplanar waveguide Transmission line reflections – Lattice diagram – Time domain reflectometry – Coupled wave equation – Coupled line analysis – Modal Analysis – Crosstalk Minimization.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Classify the various types of transmission lines and to discuss the losses associated.
CO2	Analyze about impedance transformation and matching.
CO3	Develop different types of filters.
CO4	Identify the rectangular waveguide theories.
CO5	Illustrate the transmission lines and coupling.

Text Books	
1.	John D. Ryder, “Networks lines and fields”, Prentice Hall of India, 2005.
2.	Stephen H. Hall, Howard L. Heck, “Advanced Signal Integrity for High-Speed Digital Designs”, John Wiley & Sons, 2009.

Reference Books	
1.	E.C. Jordan and K.G. Balmain, “Electromagnetic Waves and Radiating Systems”, Prentice Hall of India, 2011.
2.	Bhag Singh Guru & Hüseyin R. Hiziroglu, “Electromagnetic Field Theory Fundamentals”, Second edition, Cambridge University press, 2005.
3.	R. K. Shevgaonkar, “Electromagnetic Waves”, Tata McGraw Hill Publications, 2006.
4.	G.S.N Raju, “Electromagnetic Field Theory and Transmission Lines”, Pearson Education India, First edition, 2005.

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Professional Elective - I

B.E.	B19CSE507 - DATA SCIENCES	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand Data Science concepts and basic stages of Data Science.
2.	To know the principles and functionalities of Big Data and Hadoop.
3.	To define data visualization and manipulate python for Data Modelling.
4.	To develop a Python programming to Data Munging.
5.	To understand the Data Science Statistical using R.

UNIT - I	INTRODUCTION TO DATA SCIENCE	9

Introduction to Data Science Data Scientist Roles and Responsibilities-Mathematical & Statistical Skills- Data Science life cycle and data acquisition, Data Modeling, Stages of Data Modeling, Working of Data Warehousing and Data Mining.

UNIT - II	BIG DATA TECHNOLOGY	9

Big Data Analytics and the Data Scientist Role, Stages in Big Data, 5 V‟s of Big Data, Big Data Analytical Tools, Solution to Big Data , Distributed File System, Hadoop, Hadoop Ecosystem, Case Study.

UNIT - III	PYTHON FOR DATA ANALYSIS	9

Python Data Science Introduction, Data Visualization, Environment Setup, Slicing, Strings: string slices, immutability, string functions and methods, string module, Lists: list operations, list slices, Tuples: tuple assignment, tuple as return value.

UNIT - IV	MODELING PROCESS IN DATA SCIENCE WITH PYTHON	9

Pandas: Pandas Operations, Data analysis with Pandas, Slicing, Merging, Data Munging, Numpy: Numpy vs List, Numpy operations, Special Functions, Python Matplotlib: Matplotllib, Types of plots, Working with graph, Multiple plots.

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UNIT - V	DATA SCIENCE WITH R	9
R Introduction, Data Inputting in R, Data Visualization, Functions and Programming, Basic Statistic, Data Science and Statistical Analytical System		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Develop the ability to build and assess data-based models
CO2	Demonstrate proficiency with statistical analysis of data
CO3	Examine statistical analyses with professional statistical software
CO4	Develop relevant programming abilities
CO5	Build a data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively

Text Books	
1.	Peter Bruce, “Practical Statistics for Data Scientists”, O'Reilly, 2017
2.	Wes McKinney, “Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Python”, O'Reilly Media, 2017.

Reference Books	
1.	Bill Franks, “Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics”, Wiley and SAS Business Series, 2012.
2.	David Loshin, “Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph”, 2013.
3.	Matt A Wood, “Python and Matplotlib Essentials for Scientists and Engineers”, Morgan & Claypool Publishers, 2015.
4.	Garrett Grolemund and Hadley Wickham R for “Data Science”, Import, Tidy, Transform, Visualize, and Model Data Paper back 2017.
5.	Emc, “Data Science and Big Data Analytics : Discovering, Analyzing, Visualizing and Presenting Data”, Wiley, 2015.

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B.E.	B19CSE508 - FUNDAMENTALS OF COMPUTER ARCHITECTURE	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To learn the basic structure and operations of a computer.
2.	To learn the arithmetic and logic unit and implementation of fixed-point and floating point, arithmetic unit.
3.	To learn the basics of pipelined execution.
4.	To understand parallelism and multi-core processors.
5.	To understand the memory hierarchies, cache memories and virtual memories.
6.	To learn the different ways of communication with I/O devices.

UNIT - I	INTRODUCTION	9

Functional Units – Basic Operational Concepts – Performance – Instructions: Language of the Computer – Operations, Operands – Instruction representation – Logical operations.

UNIT - II	BASIC OPERATIONS	9

Addition and Subtraction – Multiplication – Division – Floating Point Representation – Floating Point Operations – Sub word Parallelism.

UNIT - III	PROCESSOR AND CONTROL UNIT	9

A Basic MIPS implementation – Building a Data path – Control Implementation Scheme – Pipelining – Pipelined data path and control – Handling Data Hazards & Control Hazards – Exceptions.

UNIT - IV	PARALLELISIM	9

Parallel processing challenges – Flynn's classification – SISD, MIMD, SIMD, SPMD and Vector Architectures Hardware multithreading – Multi-core processors and other Shared Memory Multiprocessors.

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UNIT - V	MEMORY & I/O SYSTEMS	9
Memory Hierarchy memory technologies – cache memory – measuring and improving cache performance – virtual memory, TLB„s – Accessing I/O Devices – Interrupts – Direct Memory Access – Bus structure – Bus operation – Arbitration – Interface circuits.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the structure of computers, operations and instructions
CO2	Illustrate arithmetic and logic unit
CO3	Outline pipelined execution and design control unit
CO4	Show the parallel processing architectures
CO5	Summarize the various memory systems and I/O communication

Text Books	
1.	David A. Patterson and John L. Hennessy, "Computer Organization and Design: The Hardware/ Software Interface", Fifth Edition, Morgan Kaufmann / Elsevier, 2014.
2.	Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.

Reference Books	
1.	William Stallings, "Computer Organization and Architecture – Designing for Performance", Eighth Edition, Pearson Education, 2010.
2.	John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata McGraw Hill, 2012.
3.	John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

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B.E.	B19CSE509 - FOUNDATIONS OF OPERATING SYSTEMS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basic concepts and functions of operating systems.
2.	To analyze Scheduling algorithms.
3.	To understand the concept of Deadlocks.
4.	To analyze various memory management schemes and I/O management and File Systems.
5.	To be familiar with the basics of Linux system and Mobile OS like iOS and Android.

UNIT - I	INTRODUCTION	9

Overview - Types of systems - Computer system operations - System calls – System structure - Virtual machines. Process Management: Process concepts Process scheduling - Inter process communication - Multithreading models - Threading issues - Thread types CPU scheduling.

UNIT - II	PROCESS SYNCHRONIZATION	9

Critical section problem - synchronization hardware – Semaphores Classical problems of synchronization - Critical regions – Monitors – Deadlocks - Deadlock characterization Methods of handling deadlocks - Deadlock prevention – Avoidance Detection and recovery.

UNIT - III	STORAGE MANAGEMENT	9

Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture; Virtual Memory

UNIT - IV	FILE SYSTEMS AND I/O SYSTEMS	9

Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management; File-System Interface - File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection.

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UNIT - V	CASE STUDY	9
Linux System Design Principles, Kernel Modules, Memory Management, Input-Output Management, File System, Inter-process Communication; Mobile OS iOS and Android.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Show various scheduling algorithms.
CO2	Illustrate deadlock, prevention and avoidance algorithms.
CO3	Compare memory management schemes of OS.
CO4	Interpret the functionality of file systems.
CO5	Outline the working process of various operating systems.

Text Books	
1.	Silberschatz and Galvin, "Operating System Concepts", Ninth Edition, John Wiley and Sons, 2012.

Reference Books	
1.	Stevens W R and Rago S A, "Advanced Programming in the Unix Environment", Second Edition, Addison-Wesley, 2013.
2.	Gary Nutt, "Operating Systems", Third Edition, Pearson Education, 2009.
3.	Harvey M. Deitel, "Operating Systems", Third Edition, Pearson Education, 2004.
4.	Deitel and Choffnes, "Operating System", Third edition, Prentice Hall, 2003.

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B.E.	B19CSE605 - ARTIFICIAL INTELLIGENCE (Common to CSE & ECE)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the various characteristics of Intelligent agents.
2.	To learn the different search strategies in AI.
3.	To learn to represent knowledge in solving AI problems.
4.	To implement the use of planning and simple decision making.
5.	To know about the various applications of AI.

UNIT - I	INTRODUCTION	9

Introduction – Definition Future of Artificial Intelligence – Characteristics of Intelligent Agents – Typical Intelligent Agents – Agents and environments - Good behavior – The nature of environments - Structure of agents Problem Solving Approach to Typical AI problems.

UNIT - II	PROBLEM SOLVING METHODS	9

Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics Local Search Algorithms and Optimization Problems -Local search in continuous spaces Online search agents and unknown environments - Searching with Partial Observations Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing Optimal Decisions in Games – Alpha - Beta Pruning Stochastic Games.

UNIT - III	KNOWLEDGE REPRESENTATION	9

First Order Predicate Logic – Knowledge engineering in first order logic Inference in First order logic Prolog Programming – Unification and lifting – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories Reasoning with Default Information.

UNIT - IV	PLANNING	9

Planning problem- Planning with state space search - Partial order planning Planning graphs - proportional logic - Time, Schedules, and Resources - Hierarchical task Planning – Multi-agent Planning - Conditional PlanningExecution monitoring and re planning-Continuous planning.

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UNIT - V	APPLICATIONS	9
AI applications – Language Models – Text Classification Information Retrieval- Information Extraction – Human computer interaction (HCI) Knowledge management technologies, AI for customer relationship management – Expert Systems - Natural Language Processing Machine Translation – Speech Recognition.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Outline the basic concepts of AI and Intelligent Agents
CO2	Identify Searching techniques for problem solving in AI
CO3	Apply First-order Logic and chaining techniques for problem solving
CO4	Demonstrate knowledge representation techniques for problem solving
CO5	Apply and integrate various artificial intelligence techniques in intelligent system development

Text Books	
1.	S. Russell and P. Norvig, “Artificial Intelligence: A Modern Approach”, Prentice Hall, 4th Edition, 2020.
2.	I. Bratko, “Prolog: Programming for Artificial Intelligence”, 4th Edition, Addison-Wesley Educational Publishers Inc., 2011.

Reference Books	
1.	Rich E, Knight K, Nair S B, “Artificial Intelligence”, 3rd Edition, Tata McGraw-Hill, 2009.
2.	Luger George F, “Artificial Intelligence: Structures and Strategies for Complex problem solving”, 6th Edition, Pearson Education, 2009.
3.	M. Tim Jones, “Artificial Intelligence: A Systems Approach”, Jones and Bartlett Publisher, 2010.
4.	Fabio Bellifemine, Giovanni Caire, Dominic Greenwood, “Developing Multi agent Systems with JADE”, John Wiley and Sons Ltd, 2007.

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Open Elective - I

B.E. / B.TECH	B19AEO501- BASICS OF FLIGHT MECHANICS (Common to all Except AERO)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understands of basic concepts like lift, drag, pressure distribution and airfoil characteristics.
2.	To understand the effect of weight and height, range and endurance of the aircraft.
3.	To know about the different aerobatics and maneuvers performance in the aircraft.
4.	To get introduce to the basic concepts of shock waves, vortex formation and its effects on the aircraft.
5.	To understand the nature of supersonic flow, C-D nozzle expansion and Flight at hypersonic speeds.

UNIT - I	SUBSONIC SPEED AERO FOILS	9

Introduction to Lifting Surfaces - Lift and drag - Airflow and pressure over Airfoil - Chord line and angle of attack - Pressure distribution- Airfoil characteristics - Camber - Design and nomenclature of airfoil sections.

UNIT - II	LEVELING OF FLIGHT	9

Forces Acting on the Aircraft - Balancing the four forces- Loads on tail plane - Effects of downwash - Tail load determination - Relation between air speed and angle of attack - Effect of Weight and Height - Flying for maximum Range and Endurance.

UNIT - III	MANEUVERS	9

Introduction to Degrees of freedom - Diving - Turning - Angles of bank - Turning Problems - Controls on Steep Banks - Aerobatics - Loops, Spins, Rolls, Sideslips, and Nose-Dives- Inverted maneuvers.

UNIT - IV	TRANSONIC FLIGHTS	9

Speed of Sound - Compressibility and Incompressibility - Shock waves Effects of shock waves - Mach Number Critical Mach Number - Drag rise in the Transonic Region - Drag and Power Required - Behavior of airplane at shock stall - Shock – wave patterns - Pressure distribution-Slimness and Sweep Back - Area rule - Vortex generators.

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UNIT - V	SUPERSONIC FLIGHTS	9
Introduction to Supersonic flow - Supersonic flow over an aero foil - Convergent divergent nozzle Expanding – contracting duct - Supersonic wing shapes - Supersonic Wing and body shapes - Kinetic heating - Flight at hypersonic speeds.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the Characteristics, Design and Nomenclature of Airfoil Sections
CO2	Identify the Forces Acting on the Aircraft and Its Effects to make the Aircraft Flying for Maximum Range and Endurance
CO3	Illustrate the different types of Aircraft maneuvering during flight
CO4	Outline the effect of shock waves, critical Mach number during transonic
CO5	Identify the supersonic flow over an Aero foil and able to examine its effects

Text Books	
1.	A.C. Kermode cbe, Ma, Ceng, Fraes, “Mechanics of flights”, .revised by R.H. barnard phd, Ceng, Fraes and D. R. Philpott Phd, Ceng, Mraes, Maiaa, 11th edition.

Reference Books	
1.	Hull DG, “Fundamentals of airplane flight mechanics”, Berlin: Springer, 2007.
2.	Cook MV, “Flight dynamics principles: a linear systems approach to aircraft stability and control”, Butterworth-Heinemann, 2012.
3.	Miele A, “Flight mechanics: theory of flight paths”, Courier Dover Publications, 2016.
4.	Kermode AC, “Mechanics of flight”, Longman Scientific & Technical, 1987.
5.	Von Mises R, “Theory of flight ”,Courier Corporation, 1959.

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B.E. / B.TECH	B19AG0501 - ENVIRONMENT AND AGRICULTURE (Common to all Except AGRI)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the importance of land, water and social structure in agriculture.
2.	To remember the impacts of mechanization, irrigation and urbanization in agriculture.
3.	To know the ecological issues, climate change, environmental policies and sustainable agriculture.
4.	To learn about the Ecological diversity in agricultural applications.
5.	To understand the emerging issues in environment and agriculture.

UNIT - I	ENVIRONMENTAL CONCERNS	9

Environmental basis for agriculture and food – Land use and landscape changes – Water quality issues – Changing social structure and economic focus – Globalization and its impacts – Agro ecosystems.

UNIT - II	ENVIRONMENTAL IMPACTS	9

Irrigation development and watersheds – mechanized agriculture and soil cover impacts – Erosion and problems of deposition in irrigation systems – Agricultural drainage and downstream impacts – Agriculture versus urban impacts.

UNIT - III	CLIMATE CHANGE	9

Global warming and changing environment – Ecosystem changes – Changing blue-green - grey water cycles – Water scarcity and water shortages – Desertification.

UNIT - IV	ECOLOGICAL DIVERSITY AND AGRICULTURE	9

Ecological diversity, wild life and agriculture – GM crops and their impacts on the environment – Insets and agriculture – Pollination crisis – Ecological farming principles – Forest fragmentation and agriculture – Agricultural biotechnology concerns.

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UNIT - V	EMERGING ISSUES	9
Global environmental governance – alternate culture systems – Mega farms and vertical farms – Virtual water trade and its impacts on local environment – Agricultural Biodiversity. Agricultural environment policies and its impacts – Sustainable agriculture.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the environmental concerns and impacts in agriculture
CO2	Outline about the interventions like mechanization, watershed development and irrigation in agriculture
CO3	Summarize about the climate change and its issue in agriculture
CO4	Illustrate a capacity building on the focus areas for ecological farming and agriculture biotechnology issues
CO5	Explain the agriculture environmental policies for sustainable agriculture

Text Books	
1.	M.Lakshmi Narasaiah, “Environment and Agriculture”, Discovery Pub. House, 2006.
2.	Arvind Kumar, “Environment and Agriculture”, ABH Publications, New Delhi, 2005.

Reference Books	
1.	T.C. Byerly, “Environment and Agriculture”, United States. Dept. of Agriculture. Economic Research Service, 2006.
2.	Robert D. Havener, Steven A. Breth, “Environment and agriculture: rethinking development issues for the 21st century: proceedings of a symposium”, Winrock International Institute for Agricultural Development, 1994.
3.	“Environment and agriculture: environmental problems affecting agriculture in the Asia and Pacific region; World Food Day Symposium”, Bangkok, Thailand. 1989.
4.	https://nptel.ac.in/courses/126/105/126105014/

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B.E. / B.TECH	B19BMO501 – INTRODUCTION TO MEDICAL PHYSICS (Common to all Except BME)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To outline the effects of non ionizing radiation and its application.
2.	To summarize the principles of radioactive nuclides.
3.	To explain the interaction of radiation with matter.
4.	To illustrate the radiation detectors.
5.	To explain the radiation quantities.

UNIT - I	NON IONIZING RADIATION AND ITS MEDICAL APPLICATION	9

Overview of non-ionizing radiation effects - Low Frequency Effects - Higher frequency effects. Thermography – Application. Ultrasound Transducer - Interaction of Ultrasound with matter; Cavitations, Conditions for reflection, Transmission-Scanning systems – Artefacts - Ultrasound Doppler - Double Doppler shift Clinical Applications.

UNIT - II	PRINCIPLES OF RADIO ACTIVE NUCLIDES	9

Radioactive Decay – Spontaneous Emission – Isometric Transition – Gamma ray emission, alpha, beta, Positron decay, electron capture, Sources of Radioisotopes Natural and Artificial radioactivity, Radionuclide used in Medicine and Technology ,Decay series, Production of radionuclides – Cyclotron produced Radionuclide - Reactor produced Radio- nuclide-fission and electron Capture reaction, radionuclide Generator - Milking process (Technetiumgenerator).

UNIT - III	INTERACTION OF RADIATION WITH MATTER	9

Interaction of charged particles with matter – Specific ionization, Linear energy transfer range, Bremsstrahlung, Annihilation, Interaction of X and Gamma radiation with matter- Photoelectric effect, Compton Scattering, Pair production, Attenuation of Gamma Radiation, Interaction of neutron with matter and their clinical significance.

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UNIT - IV	PRINCIPLES OF RADIATION DETECTION AND DOSIMETERS	9
Principles of radiation detection, Properties of dosimeters, Theory of gas filled detectors, Ionization Chamber, Proportional chamber, G.M. Counter, Film dosimetry, luminescence dosimetry, scintillation detectors, Radiation detection instruments, Area survey meters, Personal Radiation monitoring device, Film badge, TLD, OSLD.		

UNIT - V	BASIC RADIATION QUANTITIES	9
Introduction - exposure - Inverse square law-KERMA-Kerma and absorbed dose – stopping power - relationship between the dosimetric quantities – Bremsstrahlung radiation, Bragg‟s curve- concept of LD 50- Stochastic and Non-stochastic effects, Different radiation Unit, Roentgen, gray, Sievert.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Recall the effect of non ionising radiation in human body and applications in the field of medicine
CO2	Interpret radioactive decay and production of radio nuclides
CO3	Discuss the interaction of radiation with matter
CO4	Illustrate the measurement of ionizing radiation
CO5	Summarize about the radiation quantities

Text Books	
1.	John. R Cameron, James G Skofronick, “Medical Physics”, John-Wiley & Sons, 1978.
2.	Muhammad Maqbool, “An Introduction to Medical Physics”, Springer International Publishing AG 2017.

Reference Books	
1.	P. Uma Devi, A.Nagarathnam, BS Satish Rao, “Introduction to Radiation Biology”, B.I Chur Chill Livingstone Pvt. Ltd, 2000.
2.	By B.H Brown, R.H Smallwood, D.C. Barber, P.V Lawford, D.R Hose J.P.Woodcock, “Medical Physics and Biomedical Engineering”, CRC Press,1998.
3.	Hylton B. Meire and Pat Farrant, “Basic Ultrasound”, John Wiley & Sons, 1995.

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B.E. / B.TECH	B19BTO501 - FOOD PROCESSING AND PRESERVATION (Common to all Except BT)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To make the students acquire the basics of food processing.
2.	To able to understand the food preservation techniques.
3.	To be able to understand the significance of food processing.
4.	To familiarize with the recent methods of processing of foods
5.	To understand the principles of food preservation.

UNIT - I	FOOD PROCESSING	9

Principles, importance, food processing methods : pasteurization (definition, time-temperature combination and equipments) sterilization (definition, time-temperature combination and equipments), blanching (definition, time-temperature combination and equipments, adequacy in blanching), canning (definition, time-temperature combination and equipments), packaging (Introduction, Metal Containers, Glass Containers, Rigid Plastic Containers, Retortable Pouches).

UNIT - II	FOOD FREEZING AND DRYING	9

Freezing : Introduction, freezing point and freezing rate, freezing methods: Air freezing, plate freezing, liquid immersion freezing and cryogenic freezing, Freezer selection, Advantages and disadvantages of freezing.

Drying : Definition, free and bound moisture, concept of water activity, factors affecting drying, Drying methods and equipments: sun/solar drying, Cabinet drying, tunnel dryer, spray dryer, freeze dryer, fluidized bed dryer, Nutritional, physico-chemical changes during drying.

UNIT - III	PROCESSING OF FOOD PRODUCTS	9

Evaporation - Definition, types of evaporator (single effect, double effect and multiple effect evaporator); Freeze concentration - General principles and applications, basic elements, ice crystal nucleation, growth and crystallization, separation techniques (filtration and wash column).

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UNIT - IV	MEMBRANE TECHNOLOGIES IN FOOD PROCESSING	9
General principles and advantages, dead end and cross flow, Classification of membrane system: Reverse Osmosis, Nanofiltration, Ultra Filtration, Micro Filtration, Electodialysis and Pervaporation; Membrane technology comparison chart, Membrane application in the food industries and industrial effluent treatments; Membrane performance, and Limitation of membrane processes.		

UNIT - V	FOOD PRESERVATION	9
Introduction and principles. Traditional methods of preservation; Types of food based on its perishability; Importance of food preservation, Wastage of processed foods; Shelf life of food products. Advantages of food preservation.		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Understand the different methods applied in the processing of foods.
CO2	Understand the significance of food processing and the role of food and beverage industries in the supply of foods.
CO3	Acquire knowledge on the changes occurring in the food during processing and storage.
CO4	Explain the food preservation and various food processing techniques.
CO5	Understand effective food preservation techniques.

Text Books	
1.	Ramaswamy H. and Marcotte M, “Food Processing: Principles and Applications”, by Taylor & Francis, 2005.
2.	Norman N Potter and Joseph H. Hotchkiss, “Food Science”, 5th Edition, CBS Publishers and Distributors, 1996.
3.	Barbosa-Canovas, “Novel Food Processing Technologies”, Tapia & Cano CRC Press, 2004.
4.	Gould GW, “New Methods of Food Preservation”, Springer Science & Business Media, 2012.

BoS Chairman

5.	Rahman MS, "Food Preservation", In: Handbook of Food Preservation, 2nd Edition, (pp. 14-29), CRC press, 1999.
6.	Subbulakshmi G and AS Udipi, "Food Processing and Preservation", New Age Publications, 2006.

Reference Books	
1.	Manay S and MS Swamy, "Foods: Facts and Principles", 4^{th} Ed., New Age Publishers, 2004.
2.	Deman JM, "Principles of Food Chemistry", 2^{nd} Ed., Van Nostrand Reinhold, NY., 1990.

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B.E. / B.TECH	B19CSO501 – FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEM (Common to all Except CSE, AI & DS, CSBS)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basic concepts of database management systems.
2.	To acquire basic knowledge about database models and its design.
3.	To reveal the role and functionalities of database in business community.
4.	To learn about the Structured Query Language (SQL)
5.	To learn the client / server relation.

UNIT - I	INTRODUCTION	9
Database Types and Systems – An Overview – Meaning, Definition – Components – Objectives – Advantages and Disadvantages – Evolution.		

UNIT - II	MODELS	9
DBMS Architecture – Associations – Relationship – Generalization – Classifications – Conceptual Data Modeling – File Organization.		

UNIT - III	DATABASE DESIGN	9
Relational Data Model – ER Diagram – Data Dictionary – Normalization – Boyce Code Normal Form Integrity – Relational Database Languages – Database Administration.		

UNIT - IV	UNDERSTANDING SQL	9
SQL Data Definition and Data Types - SQL - Specifying Constraints – Key and Referential Integrity Constraints - Basic Retrieval Queries in SQL- Joins –Sub queries – Nested.		

UNIT - V	OPERATIONS AND MANAGEMENT	9
Client / Server and Databases – Data Warehousing – Query Processing – Heterogeneous and Homogeneous – Controls.		
		Total Instructional hours : 45

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Course Outcomes : Students will be able to	
CO1	Infer the basics of database management systems.
CO2	Demonstrate basic knowledge about database and its design with models.
CO3	Translate ER model to Relational model to perform database design effectively.
CO4	Apply SQL for DB creation and updation.
CO5	Construct client / server relation.

Text Books	
1.	Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Seventh Edition, Pearson Education, 2017.

Reference Books	
1.	Abraham Silberschatz, Henry F Korth and Sudarshan S, “Database System Concepts”, Sixth Edition, McGraw-Hill, 2011.
2.	Martin Gruber, “Understanding SQL”, Sybex Inc, 1990. (4th unit 50%)
3.	C.J. Date, A. Kannan, S. Swamynathan, “An Introduction to Database Systems”, Eighth Edition, Pearson Education, 2006.
4.	Raghu Ramakrishnan, “Database Management Systems”, Fourth Edition, McGraw-Hill College Publications, 2015.

BoS Chairman

B.E. / B.TECH	B19EEO501 - ROTATING MACHINES AND TRANSFORMERS (Common to all Except EEE)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To impact knowledge on magnetic-circuit analysis and introduce magnetic materials.
2.	To understand the Working principles of DC Generator.
3.	To understand the Working principles of DC Motor.
4.	To understand the Working principles of Induction and synchronous machines.
5.	To understand the Working principles of Transformer.

UNIT - I	MAGNETIC CIRCUITS AND MAGNETIC MATERIALS	9

Magnetic circuits – Laws governing magnetic circuits – Flux linkage, Inductance and energy – Statically and Dynamically induced EMF Torque – Properties of magnetic materials, Hysteresis and Eddy Current losses AC excitation, introduction to permanent magnets - Transformer as a magnetically coupled circuit (Qualitative Only).

UNIT - II	DC GENERATORS	9

Construction and components of DC Machine – Principle of operation Lap and wave windings - EMF equations – circuit model – armature reaction – methods of excitation commutation – inter poles compensating winding – characteristics of DC generators (Qualitative Only).

UNIT - III	DC MOTORS	9

Principle and operations types of DC Motors – Speed Torque Characteristics of DC Motors starting and speed control of DC motors – Plugging, dynamic and regenerative braking testing and efficiency – Permanent Magnet DC (PMDC) motors-applications of DC Motor (Qualitative Only).

UNIT - IV	INDUCTION AND SYNCHRONOUS MACHINES	9

Single phase motor - Double revolving field theory - starting methods no load and block rotor test - equivalent circuit - types of single phase motor 3 Phase induction motor – Construction – types - principle of operation - speed control of 3 phase motor starting methods for 3 phase induction motor. Synchronous Machine Alternator, Construction and Basic principle - Synchronous motor Basic principle, methods of starting, applications (Qualitative Only).

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UNIT - V	TRANSFORMERS	9
Transformers - Construction and types - Operation of single phase transformers – EMF equation - Voltage regulation - Losses and Efficiency - All day efficiency Parallel operation Testing: Open circuit and Short circuit tests 3 Phase transformers: (Construction & connections) Autotransformers (Qualitative Only).		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the magnetic-circuits and materials
CO2	Explain the construction and operation of DC Generator
CO3	Explain the construction and operation of DC Motor
CO4	Explain the construction and operation of induction and Synchronous machines
CO5	Explain the construction, working principle of transformer and Autotransformer

Text Books	
1.	Nagrath, I.J. and Kothari D.P., “Electrical Machines”, Tata McGraw Hill Publishing Company Ltd., 4th Edition, 3rd Reprint, New Delhi, 2011.
2.	P.C.Sen, “Principles of Electric Machines and Power Electronics”, John Wiley & Sons; 3rd Edition, 2013.

Reference Books	
1.	S.K. Bhattacharya, “Electrical Machines”, McGraw-Hill Education, New Delhi, 3rd Edition, 2009.
2.	B.R. Gupta, “Fundamental of Electric Machines”, New age International Publishers, 3rd Edition, Reprint, 2015.
3.	Vincent Del Toro, “Basic Electric Machines”, Pearson India Education, 2016.
4.	Surinder Pal Bali, “Electrical Technology Machines & Measurements”, Vol.II, Pearson, 2013.

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B.E. / B.TECH	B19MEO501 – ROBOTICS (Common to all Except MECH)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the concepts of the basic components of a robot.
2.	To apply the distinct drive systems and end effectors to control the robot actuation.
3.	To study the role and application of various types of sensors and machine vision system.
4.	To make use of the knowledge in the robot kinematics and to write Robot Programs.
5.	To identify the social and economic challenges while implementing the robot systems.

UNIT - I	FUNDAMENTALS OF ROBOT	9

Robot - Definition - Robot Anatomy Coordinate Systems, Work Envelope Types and Classification - Specifications Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load- Robot Parts and their Functions- Different Applications A view on Global and Indian manufacturers of Robots Need for Robots in Indian environment.

UNIT - II	ROBOT DRIVE SYSTEMS AND END EFFECTORS	9

Drives hydraulic, pneumatic, mechanical, electrical, Servo motors, Stepper motors - salient features, application; End effectors – types; Grippers- mechanical, pneumatic, hydraulic, magnetic, vacuum limitations, Multiple grippers.

UNIT - III	SENSORS AND MACHINE VI	9

Requirements of sensors, principles, types and applications of Proximity (Inductive, Hall effect, Capacitive, Ultrasonic and Optical); – Range (Triangulation, Structured light approach); Speed, Position (resolvers, optical encoders); – Force – Torque – Touch sensors (binary, analog sensor). Introduction to Machine Vision; applications, functions; image processing and analysis; training the vision system.

UNIT - IV	ROBOT KINEMATICS AND ROBOT PROGRAMMING	9

Forward kinematics and Reverse kinematics of manipulators; two, three degrees of freedom, homogeneous transformation matrix; introduction to manipulator dynamics, trajectory generator, manipulator mechanism, Degeneracy and Dexterity; Lead through programming, Robot programming languages; VAL programming, motion commands, sensor commands, end effecter commands, simple programs (for loading, unloading and palletizing operations), introduction to advances in Robot Programming.

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UNIT - V	APPLICATION, IMPLEMENTATION AND ROBOT ECONOMICS	9
Robot cell design; types, application of robots in processing, assembly, inspection, material handling in automobile, medical, Nuclear Industries, RGV, AGV; Implementation of Robots in Industries; S afety considerations for robot operations, safety codes, Economic analysis of robots.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the concepts of industrial robots, classification, specifications and coordinatesystems
CO2	Illustrate the different types of robot drive systems as well as robot end effectors
CO3	Apply the different sensors and image processing techniques in robotics to Improve the ability of robots
CO4	Develop robotic programs for different operations and familiarize with the kinematicsmotions of robot
CO5	Examine the implementation of robots in various industrial sectors and interpolate theeconomic analysis of robots

Text Books	
1.	Groover M.P., “Industrial Robotics -Technology Programming and Applications”, McGraw Hill, 2012.
2.	Deb S R and Deb S, “Robotics Technology and Flexible Automation”, Tata McGraw Hill Education Pvt. Ltd, 2010.
3.	Saha S K, “Introduction to Robotic”, Tata McGraw Hill Education Pvt. Ltd, 2010, 2nd Ed, 2014.

Reference Books	
1.	Craig J.J., “Introduction to Robotics Mechanics and Control”, Pearson Education, Global Edition, 3rd Edition, 2014.
2.	Deb S.R., “Robotics Technology and Flexible Automation”, Tata McGraw Hill Book Co., 2013.
3.	Ashitava Ghoshal, “Robotics - Fundamental Concepts and Analysis”, Oxford University Press, Sixth impression, 2010.

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B.E.	B19ECP501 - DIGITAL SIGNAL PROCESSING LABORATORY (Common to ECE and BME)	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To implement generation of sequences.
2.	To realize Linear and Circular Convolution.
3.	To design and realize FIR and IIR filters.
4.	To implement signal processing algorithms using digital signal processor.

List of Experiments	
Expt. No.	**Description of the Experiments**
MAT LAB / Equivalent Software package	
1.	Generation of sequences
2.	Linear and Circular Convolutions
3.	Auto correlation and Cross Correlation DFT
4.	DFT
5.	FIR filter design
6.	IIR filter design
7.	Finite word length effects
DSP Processor (TMS320C5x and TMS320C3x) Implementation	
8.	Study of architecture of Digital Signal Processor
9.	MAC operation using various addressing modes
10.	Implementation of difference equations

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11.	Linear Convolution and Circular Convolution
12.	Waveform generation
	Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Prove the simulation of sequence generation using MATLAB
CO2	Interpret the frequency domain analysis in MATLAB platform by using DFT.
CO3	Evaluate system realization using digital signal processor.
CO4	Examine about the DSP architecture with applications.
CO5	Inspect the difference equations, convolutions and waveform generation using digital signal processor.

List of Equipment Required : Requirements for a Batch of 30 Students

S.No.	**Description of the Equipment**	**Qty.**
1.	PCs with Fixed / Floating point DSP Processors (Kit / Add-on Cards)	15
2.	MATLAB with Simulink and Signal Processing Tool Box or Equivalent Software in desktop systems	15
3.	Signal Generators (1MHz)	15
4.	CRO (20MHz)	15

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B.E.	B19ECP502 - COMMUNICATION SYSTEMS LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To introduce the relevance of this course to the existing technology through demonstrations, case studies, simulations, contributions of scientist, national/international policies with a futuristic vision along with socio-economic impact and issues.
2.	It is intended to demonstrate the architecture of analog and digital communication link components to the students.
3.	Students must understand the role of each module present in the communication links.
4.	They have to study by evaluating the comparing the performance of each techniques used in various modules.

List of Experiments

Expt. No.	Description of the Experiments
1.	AM / FM Modulator and Demodulator
2.	Time Division Multiplexing
3.	Signal Sampling and reconstruction
4.	Pulse Code Modulation and Demodulation
5.	Delta Modulation and Demodulation
6.	Line coding schemes
Simulation using MATLAB/SIMULINK/ SDR equivalent	
7.	Simulation of FSK, PSK and DPSK schemes
8.	Simulation of Error control coding schemes
9.	Simulation of Symbol Timing Synchronization

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10.	Simulation of Spread spectrum communication
11.	Communication link simulation
	Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Determine sampling and reconstruction, TDM.
CO2	Analyze modulation and demodulation of AM, FM, DM, PCM.
CO3	Discover Line coding schemes and communication link simulation.
CO4	Examine Model Digital communication techniques and its constellation diagram using MATLAB.
CO5	Inspect symbol timing synchronization and spread spectrum & Error control coding schemes.

List of Equipment Required : Requirements for a Batch of 30 Students

S.No.	Description of the Equipment	Qty.
1.	Kits for Signal Sampling, TDM, AM, FM, PCM, DM and Line Coding Schemes, Error control code	14
2.	CROs	4
3.	MATLAB/ SCILAB or equivalent software package for simulation experiments	20
4.	PCs	20
5.	Probes(CRO)	30
6.	Patch cords	30
7.	SDR	1
8.	DSO	10

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Semester - VI

B.E.	B19ECT601 – MICROPROCESSORS AND MICROCONTROLLERS (Common to ECE, CSE and BME)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To study the architecture of 8085, 8086.
2.	To explore the need and use of Peripherals and Interfacing.
3.	To study the architecture of 8051.
4.	To develop skill to explore system design technique.
5.	To study the ARM architecture.

UNIT - I	8 - BIT and 16 - BIT MICROPROCESSOR	9
Introduction to 8085, 8086 Architecture, Instruction set and programming, Addressing modes, Minimum and Maximum mode configurations, Coprocessor, Multiprocessor.		
UNIT - II	**PERIPHERALS AND INTERFACING**	**9**
Programmable Peripheral Interface (8255), Keyboard display controller (8279), ADC0808 and DAC0808 Interface, Programmable Timer Controller (8254), Programmable interrupt controller (8259), Serial Communication Interface (8251), DMA controller (8257)		
UNIT - III	**MICROCONTROLLER**	**9**
8051 – Architecture, Special Function Registers (SFRs), Instruction set, Addressing modes, Assembly language programming, I/O Ports, Timers / counters, Interrupts and serial communication.		
UNIT - IV	**MICROCONTROLLER BASED SYSTEM DESIGN**	**9**
Interfacing to: matrix display, (16 x 2) LCD, high power devices, optical motor shaft encoder, Stepper Motor, DC Motor speed Control using PWM, RTC and EEPROM interface using I2C protocol.		
UNIT - V	**32- BIT ARM PROCESSOR**	**9**
RISC Vs CISC Architecture, ARM Processor Architecture, ARM Core data flow model, Barrel Shifter, ARM processor modes and families, pipelining , ARM instruction Set and its Programming.		
		Total Instructional hours : 45

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Course Outcomes : Students will be able to	
CO1	Outline the architectures of 8085 and 8086.
CO2	Build and verify applications using peripheral interfacing with8085/8086.
CO3	Construct the 8051 microcontroller based systems.
CO4	Apply the 8051 microcontroller programs in various interfacing circuits.
CO5	Categorize different processor organization.

Text Books	
1.	Ramesh S. Gaonkar, “Microprocessor Architecture, Programming and Applications with 8085”, Penram International Publishing reprint, 6^{th} Edition, 2017.
2.	Douglas V. Hall, “Microprocessor and Interfacing, Programming and Hardware”, Tata McGraw Hill, Revised 2^{nd} Edition 2006, 11^{th} Reprint, 2015.
3.	Raj kamal, “Embedded Systems: Architecture, Programming and Design”, 3^{rd} Edition McGraw-Hill Education, 2008.

Reference Books	
1.	Muhammad Ali Mazidi, Janice GillispieMazidi and Rolin D. McKinley, “The 8051 Microcontroller and Embedded Systems”, 2^{nd} Edition, Pearson Education, 12^{th} impression, 2018.
2.	Krishna Kant, “Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051 and 8096”, PHI, 2007, 7^{th} Reprint, 2015.
3.	Kenneth J. Ayala., “The 8051 Microcontroller”, 3^{rd} Edition, Thompson Delmar Learning, 2012.
4.	A.K. Ray, K.M. Bhurchandi, “Advanced Microprocessor and Peripherals”, Tata McGraw- Hill, 2^{nd} Edition, 2010.
5.	Barry B. Brey, “The Intel Microprocessors Architecture, Programming and Interfacing”, Pearson Education, 2007, 2^{nd} impression, 2010.

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B.E.	B19ECT602 – VLSI DESIGN	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To Study the fundamentals of CMOS circuits and its characteristics.
2.	To Learn the design and realization of combinational & sequential digital circuits.
3.	To Learn the design and realization of combinational & sequential digital circuits.
4.	To Introduce the Arithmetic building blocks and memory systems.
5.	To Learn the different FPGA architectures and testability of VLSI circuits.

UNIT - I	MOS TRANSISTOR	12

MOS Transistor Theory, Fabrication & Operation - MOS Characteristics: I-V Characteristics, C-V Characteristics, Non ideal I-V Effects, DC Transfer Characteristics Layout Diagram - Stick Diagram Delay Model : RC Delay Model, Elmore Delay, Linear Delay Model, Logical effort, Parasitic Delay, Delay in Logic Gate.

UNIT - II	COMBINATIONAL MOS LOGIC CIRCUITS	8

Static CMOS Logic Dynamic CMOS Logic – Pass Transistor Logic – Transmission Gates – Static Power Dissipation and Dynamic Power Dissipation.

UNIT - III	SEQUENTIAL CIRCUIT DESIGN	8

Static Latches & Register - Dynamic Latches & Register – Pipelining Timing Issues – Timing classification of digital system.

UNIT - IV	DESIGN OF ARITHMETIC BUILDING BLOCKS	8

Arithmetic Building Blocks : Adders: High Speed Adders (Carry Save, Carry Skip, Carry Select) – Multipliers: Array Multiplier, Wallace Tree Multiplier, Baugh Wooley Multiplier and Booth Multiplier – Shifters – ALU.

Memory : Random Access Memory (RAM) and Read Only Memory (ROM).

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UNIT - V	IMPLEMENTATION STRATEGIES AND TESTING	9
Application Specific Integrated Circuit (ASIC) – Field Programmable Gate Array – Design for Testability (DFT) – Ad-hoc DFT – Built in Self-Test (BIST).		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the characteristics and the models of MOS Transistors.
CO2	Identify combinational MOS circuits and power strategies.
CO3	Build Sequential Circuits and Timing systems.
CO4	Construct arithmetic building blocks and memory subsystems.
CO5	Apply and implement FPGA design flow and testing.

Text Books	
1.	Neil H.E. Weste, David Money Harris, "CMOS VLSI Design: A Circuits and Systems Perspective", 4th Edition, Pearson, 2017.
2.	Jan M. Rabaey, Anantha Chandrakasan, Borivoje. Nikolic, "Digital Integrated Circuits:A Design perspective", Second Edition, Pearson, 2016.

Reference Books	
1.	M.J. Smith, , "Application Specific Integrated Circuits", Addisson Wesley, 1997.
2.	Sung-Mo kang, Yusuf leblebici, Chulwoo Kim, "CMOS Digital Integrated Circuits:Analysis & Design", 4th Edition, McGraw Hill Education, 2013.
3.	Wayne Wolf, "Modern VLSI Design: System On Chip", Pearson Education, 2007.
4.	R.Jacob Baker, Harry W.LI., David E.Boyee, "CMOS Circuit Design, Layout and Simulation", Prentice Hall of India, 2005.

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B.E.	B19ECT603 – COMMUNICATION NETWORKS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To develop an understanding of computer networking basics.
2.	To develop an understanding of different components of computer networks, various protocols, modern technologies and their applications.
3.	To understand the division of network functionalities into layers.
4.	To be familiar with the components required to build different types of network layers.
5.	To learn about network security algorithms.

UNIT - I	DATA COMMUNICATIONS	9

Introduction to networks –Topologies – Protocols and Standards – ISO/OSI model TCP/IP- Transmission Media and Connectors, Switching Techniques, Connecting devices – Switches, Routers, Gateways.

UNIT - II	DATA LINK LAYER	9

LAN: Ethernet IEEE 802.3, IEEE802.5, IEEE802.11, FDDI, Bridges. Error detection and correction – Forward Error Correction – Flow Control and Error control techniques Stop and wait – Go back N ARQ – Selective repeat ARQ sliding window techniques – HDLC.

UNIT - III	NETWORK LAYER	9

Internetworks – Packet Switching and Datagram approach – IPv4 addressing methods – Subnetting & Supernetting – IPv6. Routing – Distance Vector Routing, Link State Routing, Path Vector Routing, Quality of services (QOS) – methods to improve QOS parameters Trunking, VPN.

UNIT - IV	TRANSPORT LAYER AND APPLICATION LAYER	9

Functions of transport layer – Multiplexing – Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Differentiated and Integrated Services – RSVP, Application layer: Domain Name Space (DNS), SMTP, FTP, HTTP, WWW.

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UNIT - V	NETWORK SECURITY	9
Symmetric key cryptography – Data Encryption standard & Advanced Encryption Standard, Asymmetric key cryptography – RSA & Diffie-Hellman algorithms, Internet Security – Application layer security and firewalls Case study on NV, SDN for IoT Systems.		
		Total Instructional hours : 45

Course Outcomes	
CO1	Explain about the network topologies, protocols and models.
CO2	Compare data link layer protocols and LAN standards.
CO3	Analyze routing algorithms and methods to improve QoS.
CO4	Summarize transport layer protocols and congestion controls methods.
CO5	Identify cryptographic and security techniques.

Text Books	
1.	Behrouz. A. Foruzan, "Data Communication and Networking", Fifth Edition, Tata McGraw - Hill, 2013.
2.	Andrew S. Tannenbaum, "Computer Networks", Fourth Edition, PHI, 2003.

Reference Books	
1.	James.F.Kurouse & W. Rouse, "Computer Networking: A Top down Approach Featuring", Addison Wesley, 2009.
2.	Larry.L.Peterson & Peter .S. Davie, "Computer Networks", Third Edition, Harcourt Asia Pvt.Ltd, 2007.
3.	Leon, Garica, Widjaja, , "Communication Networks", TMH.
4.	Walrand, "Communication Networks", TMH.
5.	Comer, "Internetworking with TCP / IP", vol. 1, 2, 3, 4th Edition, Pearson Education / PHI.

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Professional Elective - II

B.E.	B19ECE601 – ANTENNAS AND WAVE PROPAGATION	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To give insight into the radiation phenomena.
2.	To understand the antenna arrays.
3.	To give a thorough understanding of the radiation characteristics of different types of antennas.
4.	To study the various parameter measurements.
5.	To create awareness about the different types of propagation of radio waves.

UNIT - I	FUNDAMENTALS OF RADIATION	9

Antenna parameters Gain, Directivity, Effective aperture, Radiation Resistance, Bandwidth, Beam width, Impedance analysis using S parameters and Impedance matching: BALUNS, Polarization mismatch, Antenna noise temperature, Radiation from oscillating dipole, half wave dipole and folded dipole, yagi-Uda array, Spiral antenna, log periodic antenna. (ADS based Simulation approach is mandatory).

UNIT - II	ANTENNA ARRAYS	9

Two element array, N-element linear array, Pattern multiplication, Broadside and end fire array, Array synthesis: Binomial array, Tschebyscheff array, planar array antennas.

UNIT - III	APERTURE AND MODERN ANTENNAS	9

Huygens' principle, radiation from rectangular aperture, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, parabolic reflector antennas and feeding techniques, microstrip patch antenna, Phased array antennas, Smart antennas – switched beam and adaptive arrays, UWB antennas, RFID Antennas, Wearable antennas, Reconfigurable antennas, Dielectric resonator antennas, bandwidth enhancement techniques, gain enhancement techniques.

UNIT - IV	ANTENNA MEASURMENTS	9

Measurements: Spectrum Analyzer, Network analyzer, Anechoic chamber, Measurement of frequency, S-parameters, Antenna Gain, Radiation pattern and polarization. (ADS based Simulation approach is mandatory).

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UNIT - V	WAVE PROPAGATION	9
Modes of propagation, Structure of atmosphere, Ground wave propagation, Tropospheric propagation, Duct propagation, Troposcatter propagation , Flat earth and Curved earth concept ,Sky wave propagation – Virtual height, critical frequency , Maximum usable frequency – Skip distance, Fading, Multi hop propagation. (ADS based Simulation approach is mandatory).		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the fundamentals of the antenna by gaining technical knowledge regarding antenna parameters
CO2	Outline the radiation phenomena of Antenna and Antenna arrays
CO3	Construct the design of Aperture and modern Antennas by applying acquired knowledge
CO4	Explain the various parameter measurements
CO5	Identify the different types of propagation of radio waves at various frequencies

Text Books	
1.	John D. Kraus, "Antennas for all Applications", Mc Graw Hill, 5th Edition, 2005.
2.	R.E. Collin, "Antennas and Radio wave propagation", Mc Graw Hill, 1985.

Reference Books	
1.	Constantine. A. Balanis, "Antenna Theory Analysis and Design", Wiley student edition, 3rd Edition, 2009.
2.	Edward C. Jordan and Keith G. Balmain, "Electromagnetic Waves and Radiating Systems", Prentice Hall of India, 2006.
3.	S. Drabowitch, "Modern Antennas", Springer Publications, 2nd Edition, 2007.
4.	Robert S. Elliott, "Antenna theory and Design", Wiley student edition, 2010.
5.	H.Sizun, "Radio Wave Propagation for Telecommunication Applications", First Indian Reprint, Springer Publications, 2007.

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B.E.	B19ECE602 – WIRELESS COMMUNICATION	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To study the characteristic of wireless channel.
2.	To understand the design of a cellular system.
3.	To study the various digital signalling techniques.
4.	To study the various multipath mitigation techniques.
5.	To understand the concepts of multiple antenna techniques.

UNIT - I	WIRELESS CHANNELS	9

Large scale path loss – Path loss models: Free Space and Two-Ray models Link Budget design – Small scale fading - Parameters of mobile multipath channels – Time dispersion parameters - Coherence bandwidth – Doppler spread & Coherence time, fading due to Multipath time delay spread – flat fading – frequency selective fading – Fading due to Doppler spread – fast fading – slow fading.

UNIT - II	CELLULAR ARCHITECTURE	9

Multiple Access techniques – FDMA, TDMA, CDMA – Capacity calculations – Cellular concept - Frequency reuse channel assignment - hand off - interference & system capacity trunking & grade of service – Coverage and capacity improvement.

UNIT - III	DIGITAL SIGNALING FOR FADING CHANNELS	9

Structure of a wireless communication link, Principles of Offset-QPSK, p/4-DQPSK, Minimum Shift Keying, Gaussian Minimum Shift Keying, Error performance in fading channels, OFDM principle – Cyclic prefix, Windowing, PAPR.

UNIT - IV	MULTIPATH MITIGATION TECHNIQUES	9

Equalisation – Adaptive equalization, Linear and Non-Linear equalization, Zero forcing and LMS Algorithms. Diversity – Micro and Macro diversity, Diversity combining techniques, Error probability in fading channels with diversity reception, Rake receiver.

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UNIT - V	MULTIPLE ANTENNA TECHNIQUES	9
MIMO systems – spatial multiplexing -System model -Pre-coding - Beam forming transmitter diversity, receiver diversity - Channel state information - capacity in fading and non-fading channels.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Classify various parameters of wireless channels.
CO2	Identify different types of multiple access techniques for cellular systems.
CO3	Identify suitable signaling techniques for the wireless communication systems.
CO4	Identify suitable multipath mitigation techniques for the wireless communication techniques.
CO5	Analyse about the multiple input and multiple output antenna techniques.

Text Books	
1.	Rappaport, T.S., “Wireless communications”, Pearson Education, Second Edition, 2010. (UNIT I, II, IV)
2.	Andreas. F. Molisch, “Wireless Communications”, John Wiley – India, 2006. (UNIT III, V)

Reference Books	
1.	Andrea Goldsmith, , “Wireless Communication”, Cambridge University Press, 2011.
2.	Van Nee, R. and Ramji Prasad, “OFDM for wireless multimedia communications”, Artech House, 2000.
3.	David Tse and Pramod Viswanath, “Fundamentals of Wireless Communication”, Cambridge University Press, 2005.
4.	Upena Dalal, “Wireless Communication”, Oxford University Press, 2009.

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B.E.	B19ECE603 – WIRELESS NETWORKS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the concept about Wireless networks, protocol stack and standards.
2.	To understand and analyse the network layer solutions for Wireless networks.
3.	To study about fundamentals of 3G Services, its protocols and applications.
4.	To have in depth knowledge on internetworking of WLAN and WWAN.
5.	To learn about evolution of 4G Networks, its architecture and applications.

UNIT - I	WIRELESS LAN	9

Introduction-WLAN technologies: – IEEE802.11: System architecture, protocol architecture, 802.11b, 802.11a – Hiper LAN: WATM, BRAN, HiperLAN2 – Bluetooth:

UNIT - II	MOBILE NETWORK LAYER	9

Introduction – Mobile IP: IP packet delivery, Agent discovery, tunneling and encapsulation, IPV6-Network layer in the internet- Mobile IP session initiation protocol – mobile ad-hoc network: Routing: Destination Sequence distance vector, IoT: CoAP.

UNIT - III	3G OVERVIEW	9

Overview of UTMS Terrestrial Radio access network - UMTS Core network Architecture: 3GPP Architecture, User equipment, CDMA2000 overview - Radio and Network components, Network structure, Radio Network, TD-CDMA, TD – SCDMA.

UNIT - IV	INTERNETWORKING BETWEEN WLANS AND WWANS	9

Internetworking objectives and requirements, Schemes to connect WLANS and 3G Networks, Session Mobility, Internetworking Architecture for WLAN and GPRS, System Description, Local Multipoint Distribution Service, Multichannel Multipoint Distribution System.

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UNIT - V	4G & BEYOND	9
Introduction – 4G vision – 4G features and challenges – Applications of 4G – 4G Technologies: Multicarrier Modulation, Smart antenna techniques, IMS Architecture, LTE, Advanced Broadband Wireless Access and Services, MVNO.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Contrast with the WLAN technologies
CO2	Design and implement wireless network environment for any application using latest wireless protocols and standards
CO3	Examine the 3G Wireless Technologies
CO4	Analyze about internetworking requirements
CO5	Explain the 4G Wireless Technologies

Text Books	
1.	Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2012. (Unit I, II, III)
2.	Vijay Garg, "Wireless Communications and networking", First Edition, Elsevier, 2007. (Unit IV, V).

Reference Books	
1.	Erik Dahlman, Stefan Parkvall, Johan Skold and Per Beming, "3G Evolution HSPA and LTE for Mobile Broadband", Second Edition, Academic Press, 2008.
2.	Simon Haykin, Michael Moher, David Koilpillai, "Modern Wireless Communications", First Edition, Pearson Education, 2013.

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B.E.	B19ECE604 – NEURAL NETWORKS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the characteristics of neural networks.
2.	To introduce the artificial neural networks.
3.	To understand the single layer neural networks.
4.	To study the multilayer neural networks.
5.	To introduce various training algorithms.

UNIT - I	INTRODUCTION TO NEURAL NETWORKS	9
Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Characteristics of ANN, McCulloch - Pitts Model, Historical Developments, Potential Applications of ANN, Case Study (MATLAB or Python Based simulation Approach is Mandatory).		

UNIT - II	ESSENTIALS OF ARTIFICIAL NEURAL NETWORKS	9
Operations of Artificial Neuron, Types of Neuron Activation Function, ANN Architectures, Classification Taxonomy of ANN – Connectivity, Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Case Study. (MATLAB or Python Based simulation Approach is Mandatory).		

UNIT - III	SINGLE LAYER FEED FORWARD NETWORKS	9
Introduction, Perceptron Models: Discrete, Continuous and Multi-Category, Training Algorithms: Discrete and Continuous Perceptron Networks, Limitations of the Perceptron Model, Case Study. (MATLAB or Python Based simulation Approach is Mandatory).		

UNIT - IV	MULTI- LAYER FEED FORWARD NETWORKS	9
Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Back propagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements, Case Study (MATLAB or Python Based simulation Approach is Mandatory).		

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UNIT - V	ASSOCIATIVE MEMORIES	9
Paradigms of Associative Memory, Pattern Mathematics, Hebbian Learning, General Concepts of Associative Memory, Bidirectional Associative Memory (BAM) Architecture, BAM Training Algorithms: Storage and Recall Algorithm, BAM Energy Function. Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis. Neural network applications: Process identification, control, fault diagnosis.		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Outline about the artificial neural network models
CO2	Analyze about ANN architecture
CO3	Develop the perceptron model with different category
CO4	Analyze BP algorithm with learning difficulties and improvements
CO5	Analyze about the BAM architecture

Text Books	
1.	Laurene Fausett, “Fundamentals of Neural Networks”, Pearson Education, 2004.
2.	Simon Haykin, “Neural Networks- A comprehensive foundation”, Pearson Education, 2003.
3.	S. N. Sivanandam, S. Sumathi, S. N. Deepa, “Introduction to Neural Networks using MATLAB 6.0”, TATA McGraw Hill Inc, 2006.

Reference Books	
1.	S. Rajasekharan and G. A. Vijayalakshmi pai, “Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications”, PHI Publication, 2004.
2.	Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, Tata McGraw-Hill Inc. 2000

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B.E.	B19CSE613 – INTRODUCTION TO WEB TECHNOLOGY	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To introduce the basic concepts of websites basics, HTML and WEB 2.0
2.	To understand Object Oriented Programming concepts and basic characteristics of Java
3.	To know the principles of packages, inheritance and interfaces
4.	To study about the client side scripting with JavaScript and DHTML.
5.	To understand about the server side programming.

UNIT - I	WEBSITE BASICS, HTML 5, CSS 3	9

Web Essentials : Clients, Servers and Communication – The Internet – Basic Internet protocols – World Wide Web – HTTP Request Message – HTTP Response Message – Web Clients – Web Servers – HTML5 – Forms Tables – Lists – Image – HTML5 control elements - Audio – Video controls CSS3 – Inline, embedded and external style sheets.

UNIT - II	JAVA FUNDAMENTALS	9

OOP in Java - Characteristics of Java - The Java Environment - Java Source File Structure – Compilation - Fundamental Programming - Structures in Java Defining classes in Java – constructors- methods - access specifier - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.

UNIT - III	INHERITANCE AND INTERFACES	9

Inheritance – Super classes - sub classes – Protected members – constructors in sub classes - the Object class – abstract classes and methods - final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning inner classes, Array Lists – Strings.

UNIT - IV	CLIENT SIDE PROGRAMMING	9

JavaScript : Client side scripting with JavaScript, variables, functions, conditions, loops and repetition, Pop up boxes, browser environments, Manipulation using DOM, forms and validations, DHTML : Combining HTML, CSS and JavaScript, Events and buttons Advance JavaScript: JavaScript and objects, JavaScript own objects, the DOM and web.

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UNIT - V	SERVER SIDE PROGRAMMING	9
Servlets : Java Servlet Architecture - Servlet Life Cycle- Form GET and POST actions - Session Handling - Understanding Cookies - Installing and Configuring Apache Tomcat Web Server - DATABASE CONNECTIVITY: JDBC perspectives, JDBC program example.		
	Total Instructional hours : 45	

Course Outcomes : Students will be able to	
CO1	Develop an application using HTML and CSS
CO2	Develop simple Java Programs
CO3	Build Java programs using the concept of packages, inheritance, and interfaces.
CO4	Build applications using JavaScript and DHTML
CO5	Develop server side programs using Servlet

Text Books	
1.	Kogent Learning Solutions Inc., “Web Technologies Black Book”,Dreamtech Press, 2018.
2.	Budi Kurniawan, “Servlet & JSP: A Tutorial”, Second Edition, Brainy Software Inc., 2015

Reference Books	
1.	P.J. Deitel& H.M. Deitel, “Internet and World Wide Web How to program”, Pearson Education, 2020.
2.	Jeffrey C and Jackson, “Web Technologies A Computer Science Perspective”, Pearson Education, 2011
3.	Herbert Scheldt, “The Complete Reference JAVA2”, 5th Edition, Tata McGraw Hill, 2017

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Professional Elective - III

B.E.	B19ECE605 – COGNITIVE RADIO	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the software defined radio and cognitive radio techniques and their essential functionalities.
2.	To study the basic architecture and standard for cognitive radio.
3.	To understand the spectrum sensing and access cognitive radio.
4.	To study the different layers and routings in cognitive radio.
5.	To introduce new advancements in cognitive radio.

UNIT - I	INTRODUCTION TO SOFTWARE - DEFINED RADIO AND COGNITIVE RADIO	9

Evolution of Software Defined Radio and Cognitive radio: goals, benefits, definitions, architectures, relations with other radios, issues, enabling technologies, radio frequency spectrum and regulations.

UNIT - II	COGNITIVE RADIO ARCHITECTURE	9

Cognitive Radio - functions, components and design rules, Cognition cycle orient, plan, decide and act phases, Inference Hierarchy, Architecture maps, Building the Cognitive Radio Architecture on Software defined Radio Architecture, Overview of IEEE 802.22 standard for broadband wireless access in TV bands.

UNIT - III	SPECTRUM SENSING AND DYNAMIC SPECTRUM ACCESS	9

Introduction - Primary user detection techniques energy detection, feature detection, matched filtering, cooperative detection, Bayesian Approach, Neyman Pearson fusion rule for spectrum sensing, Optimum spectrum sensing – Kullback Leibler Divergence and other approaches, Fundamental Tradeoffs in spectrum sensing, Spectrum Sharing Models of Dynamic Spectrum Access Unlicensed and Licensed Spectrum Sharing, Fundamental Limits of Cognitive Radio.

UNIT - IV	MAC AND NETWORK LAYER DESIGN FOR COGNITIVE RADIO	9

MAC for cognitive radios - Multichannel MAC - slotted ALOHA CSMA, Network layer design Routing in cognitive radios, Flow control and Error control techniques.

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UNIT - V	ADVANCED TOPICS IN COGNITIVE RADIO	9
Cognitive radio for Internet of Things - Features and applications Enabling technologies and protocols - M2M technologies - Data storage and analysis techniques Requirement and challenges of IoT- Energy efficiency - MIMO Cognitive Radio Power allocation algorithms.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Outline the design principles on software defined radio and cognitive radio.
CO2	Analyse about cognitive radio architecture.
CO3	Develop the ability to design and implement algorithms for cognitive radio spectrum sensing and dynamic spectrum access.
CO4	Build experiments and projects with real time wireless applications.
CO5	Apply the knowledge of advanced features of cognitive radio for real world applications.

Text Books	
1.	Alexander M. Wyglinski, Maziar Nekovee, Thomas Hou, “Cognitive Radio Communications and Networks”, Academic Press, Elsevier, 2010. (Unit I to IV)
2.	Bruce Fette, “Cognitive Radio Technology”, Newnes, 2006.
3.	Huseyin Arslan (Ed.), “Cognitive Radio, Software Defined Radio and Adaptive Wireless Systems”, Springer, 2007.

Reference Books	
1.	Markus Dillinger, Kambiz Madani, Nancy Alonistioti, “Software Defined Radio”, John Wiley, 2003.
2.	Huseyin Arslan, “Cognitive Radio, SDR and Adaptive System”, Springer, 2007.
3.	Joseph Mitola, “Cognitive Radio Architecture”, John Wiley & Sons, 2006.
4.	Kwang-Cheng Chen, Ramjee Prasad, “Cognitive Radio Networks”, John Wiley and Sons, 2009.
5.	Qusay. H. Mahmoud, “Cognitive Networks: Towards Self Aware Network”, John Wiley & Sons Ltd. 2007.

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B.E.	B19ECE606 – FOUNDATION SKILLS IN INTEGRATED PRODUCT DEVELOPMENT	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the global trends and development methodologies of various types of products and services.
2.	To understand requirement engineering and know how to collect, analyse and arrive at requirements for new product development and convert them in to design specification.
3.	To conceptualize, prototype and develop product management plan for a new product based on the type of the new product and development methodology.
4.	To understand system test specifications and coordinate with various teams to validate.
5.	To develop a system and apply it for copyright.

UNIT - I	FUNDAMENTALS OF PRODUCT DEVELOPMENT	9

Global Trends Analysis and Product decision - Social Trends Technical Trends – Economical Trends - Environmental Trends - Political/Policy Trends Introduction to Product Development Methodologies and Management Overview of Products and Services - Types of Product Development - Overview of Product Development methodologies Product Life Cycle – Product Development Planning and Management.

UNIT - II	REQUIREMENTS AND SYSTEM DESIGN	9

Requirement Engineering - Types of Requirements Requirement Engineering – raceability Matrix and Analysis - Requirement Management - System Design & Modeling Introduction to System Modeling - System Optimization - System Specification – Sub System Design – Interface Design.

UNIT - III	DESIGN AND TESTING	9

Conceptualization - Industrial Design and User Interface Design Introduction to Concept generation Techniques – Challenges in Integration of Engineering Disciplines – Concept Screening & Evaluation - Detailed Design Component Design and Verification – Mechanical, Electronics and Software Subsystems High Level Design / Low Level Design of S/W Program Types of Prototypes, S/W Testing - Hardware Schematic, Component design, Layout and Hardware Testing – Prototyping Introduction to Rapid Prototyping and Rapid Manufacturing System Integration, Testing, Certification and Documentation.

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UNIT - IV	SUSTENANCE ENGINEERING AND END-OF-LIFE (EOL) SUPPORT	9
Introduction to Product verification processes and stages Introduction to Product Validation processes and stages Product Testing Standards and Certification – Product Documentation - Sustenance -Maintenance and Repair – Enhancements Product EoL – Obsolescence Management – Configuration Management EoL Disposal.		

UNIT - V	BUSINESS DYNAMICS – ENGINEERING SERVICES INDUSTRY	9
The Industry - Engineering Services Industry Product Development in Industry versus Academia – The IPD Essentials Introduction to Vertical Specific Product Development processes - Manufacturing/ Purchase and Assembly of Systems Integration of Mechanical, Embedded and Software Systems – Product Development Trade-offs Intellectual Property Rights and Confidentiality – Security and Configuration Management.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the fundamentals of product development
CO2	Analyse the requirements for system designing
CO3	Apply the concepts for design and testing
CO4	Analyse the product verification process
CO5	Design a system and apply it for IPR

Text Books	
1.	Book specially prepared by NASSCOM as per the MoU.
2.	Karl T Ulrich and Stephen D Eppinger, “Product Design and Development”, Tata McGraw Hill, Fifth Edition, 2011.
3.	John W Newstorm and Keith Davis, “Organizational Behavior”, Tata McGraw Hill, Eleventh Edition, 2005.

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Reference Books	
1.	Hiriyappa B, "Corporate Strategy – Managing the Business", Author House, 2013.
2.	Peter F Drucker, " People and Performance", Butterworth – Heinemann [Elsevier], Oxford, 2004.
3.	Vinod Kumar Garg and Venkita Krishnan N K, "Enterprise Resource Planning – Concepts", Second Edition, Prentice Hall, 2003.
4.	Mark S Sanders and Ernest J McCormick, "Human Factors in Engineering and Design", McGraw Hill Education, Seventh Edition, 2013.

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B.E.	B19ECE607 – SATELLITE COMMUNICATION	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To study the basics of satellite orbits.
2.	To understand the satellite segment and earth segment.
3.	To analyse the parameters and characteristics involved in link design.
4.	To understand the satellite access and coding methods.
5.	To introduce the applications of satellite.

UNIT - I	SATELLITE ORBITS	9
Kepler"s Laws, Newton"s law, orbital parameters, orbital perturbations, station keeping, geo stationary and non-Geo-stationary orbits – Look Angle Determination - Limits of visibility – eclipse - Sub satellite point – Sun transit outage - Launching Procedures launch vehicles and propulsion.		

UNIT - II	SPACE SEGMENT	9
Spacecraft Technology - Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command-Transponders - The Antenna Subsystem.		

UNIT - III	SATELLITE LINK DESIGN	9
Basic link analysis, Interference analysis, Rain induced attenuation and interference, Ionospheric characteristics, Link Design with and without frequency reuse.		

UNIT - IV	SATELLITE ACCESS AND CODING METHODS	9
Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, DAMA Assignment Methods, compression – encryption, Coding Schemes.		

UNIT - V	SATELLITE APPLICATIONS	9
INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. GPS Position Location Principles, Differential GPS, Direct Broadcast satellites (DBS/DTH)		
		Total Instructional hours : 45

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Course Outcomes : Students will be able to	
CO1	Analyse the satellite orbits.
CO2	Analyse the earth segment and space segment.
CO3	Examine the satellite Link design.
CO4	Identify various access and coding methods involved in satellite design.
CO5	Identify various satellite applications.

Text Books	
1.	Dennis Roddy, "Satellite Communication", 4^{th} Edition, Mc Graw Hill International, 2006.
2.	Timothy, Pratt, Charles, W.Bostain, Jeremy E. Allnutt, "Satellite Communication", 2^{nd} Edition, Wiley Publications, 2002.

Reference Books	
1.	Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, "Satellite Communication Systems Engineering", Prentice Hall / Pearson, 2007.
2.	N. Agarwal, "Design of Geosynchronous Space Craft", Prentice Hall, 1986.
3.	Bruce R. Elbert, "The Satellite Communication Applications", Hand Book, Artech House Bostan London, 1997.
4.	Tri T. Ha, "Digital Satellite Communication", 2^{nd} Edition, 1990.
5.	Emanuel Fthenakis, "Manual of Satellite Communications", Mc Graw Hill Book Co., 1984.
6.	Robert G. Winch, "Telecommunication Trans Mission Systems", Mc Graw-Hill Book Co., 1983.
7.	Brian Ackroyd, "World Satellite Communication and earth station Design", BSP professional Books, 1990.
8.	G.B. Bleazard, "Introducing Satellite Communications" , NCC Publication, 1985.
9.	M. Richharia, "Satellite Communication Systems-Design Principles", Macmillan 2003.

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B.E.	B19AGE607 - DISASTER MANAGEMENT	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To know the various types of disasters.
2.	To understand the various approaches of disaster risk reduction.
3.	To analyze the various vulnerability factors and impacts of development.
4.	To understand various institutional arrangements for disaster relief, response and preparedness and damage assessment.
5.	To apply vulnerability assessment of infrastructure and to conduct case studies.

UNIT - I	INTRODUCTION TO DISASTERS	9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks — Disasters: Types of disasters — Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc. - Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change - Dos and Don" ts during various types of Disasters.

UNIT - II	APPROACHES TO DISASTER RISK REDUCTION (DRR)	9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural - nonstructural measures, Roles and responsibilities of- community, Panchayati Raj Institutions / Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake - holders - Institutional Processess and Framework at State and Central Level- State Disaster Management Authority (SDMA) — Early Warning System — Advisories from Appropriate Agencies.

UNIT - III	INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT	9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc. - Climate Change Adaptation- IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

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UNIT - IV	DISASTER RISK MANAGEMENT IN INDIA	9
Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation — Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster — Disaster Damage Assessment.		

UNIT - V	DISASTER MANAGEMENT: APPLICATIONS AND CASE STUDIES AND FIELD WORKS	9
Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Classify different disasters and its impacts
CO2	Infer various disaster risk reduction methods
CO3	Explain disaster vulnerability factors influencing the development
CO4	Applying various disaster relief measures and policy suggestion including preparedness
CO5	Solve the vulnerability assessment and results of case studies

Text Books	
1.	Srivastava A.K., “Text Book of Disaster Management”,Scientific Publishers, 2021.
2.	Singhal J.P., “Disaster Management”, Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
3.	Tushar Bhattacharya, “Disaster Science and Management”, McGraw Hill India Education Pvt. Ltd., 2012. ISBN-10: 1259007367, ISBN-13: 978-1259007361
4.	Gupta Anil K, Sreeja S. Nair.,“ Environmental Knowledge for Disaster Risk Management”, NIDM, New Delhi, 2011
5.	Kapur Anu ,“Vulnerable India: A Geographical Study of Disasters”, IIAS and Sage Publishers, New Delhi, 2010.

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B.E.	B19CSE611 – MACHINE LEARNING TECHNIQUES (Common to CSE & ECE)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the need for machine learning for various problem solving.
2.	To study the various supervised, semi-supervised and unsupervised learning algorithms in machine learning.
3.	To learn about the Bayesian concepts to machine learning.
4.	To understand the latest trends in machine learning.
5.	To design appropriate machine learning algorithms for problem solving.

UNIT - I	INTRODUCTION	9

Learning Problems – Perspectives and Issues – Concept Learning – Version Spaces and Candidate Eliminations – Inductive bias – Decision Tree learning – Representation – Algorithm – Heuristic Space Search.

UNIT - II	NEURAL NETWORKS	9

Neural Network Representation – Problems – Perceptrons – Multilayer Networks and Back Propagation Algorithms – Advanced Topics – Genetic Algorithms – Hypothesis Space Search – Genetic Programming – Models of Evaluation and Learning.

UNIT - III	BAYESIAN AND COMPUTATIONAL LEARNING	9

Bayes Theorem – Concept Learning – Maximum Likelihood – Minimum Description Length Principle – Bayes Optimal Classifier – Gibbs Algorithm – Naïve Bayes Classifier – Bayesian Belief Network – EM Algorithm – Probability Learning – Sample Complexity – Finite and Infinite Hypothesis Spaces – Mistake Bound Model.

UNIT - IV	INSTANT BASED LEARNING	9

K- Nearest Neighbor Learning – Locally weighted Regression – Radial Basis Functions – Case Based Learning.

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UNIT - V	ADVANCED LEARNING	9
Learning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – Induction on Inverted Deduction – Inverting Resolution – Analytical Learning – Perfect Domain Theories – Explanation Base Learning – FOCL Algorithm – Q Learning		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Compare and contrast supervised, unsupervised, semi-supervised machine learning approaches
CO2	Outline the decision tree algorithm and identity and overcome the problem of over fitting.
CO3	Apply the back-propagation algorithm and genetic algorithms to various problems.
CO4	Apply the Bayesian concepts to machine learning.
CO5	Analyze and suggest appropriate machine learning approaches for various types of problems.

Text Books	
1.	Tom M. Mitchell, " Machine Learning", McGraw-Hill Education (India) Private Limited, 2013.

Reference Books	
1.	Jason Bell, "Machine learning – Hands on for Developers and Technical Professionals", First Edition, Wiley, 2014.
2.	Kevin P. Murphy, " Machine Learning -A Probabilistic Perspective", the MIT Press, 2012.
3.	Peter Flach, " Machine Learning: The Art and Science of Algorithms that Make Sense of Data", First Edition, Cambridge University Press, 2012.
4.	Stephen Marsland, " Machine Learning: An Algorithmic Perspective", CRC Press, 2009.
5.	Ethem Alpaydin, "Introduction to Machine Learning (Adaptive Computation and Machine Learning)", The MIT Press 2004.

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Open Elective - II

B.E.	B19AEO601 - AIRCRAFT ELECTRICAL AND ELECTRONIC SYSTEMS (Common to all Except AERO)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To know the working principles of aircraft engine and fuel systems.
2.	To understand the lighting technologies and pressurization system of the aircraft cabin.
3.	To realize the warning and protection systems of the aircraft.
4.	To expose on terrain warning systems of the safety of the aircraft.
5.	To gain knowledge on FDR and anti-fire protection system.

UNIT - I	AERO ENGINE AND FUEL MANAGEMENT SYSTEMS	9

Introduction to Starting and Ignition Systems - Primary, secondary and Electronic Indicating Systems. Fuel Management system - Fuel quantity measurement and indication - Fuel feed and distribution - Fuel transfer - Refueling and defueling - Fuel jettison - Fuel Tank Venting and Inerting.

UNIT - II	LIGHTS AND CABIN SYSTEMS	9

Overview of Lighting technologies - Flight compartment lights - Passenger cabin lights - Exterior lights. Cabin systems - Passenger address system - Galley equipment - In-flight entertainment - Satellite communications - Air conditioning – Pressurization - Airstairs.

UNIT - III	WARNING AND PROTECTION SYSTEMS	9

Stall warning and protection - Airframe ice and rain protection - Windscreen ice and rain protection - Anti-skid - Configuration warning - Aural warnings.

UNIT - IV	TERRAIN AWARENESS WARNING SYSTEM	9

System overview - System warnings and protection - External references - Ground proximity modes - Forward - looking terrain avoidance - Rotorcraft TAWS - Architecture and configurations.

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UNIT - V	FLIGHT DATA RECORDER AND FIRE PROTECTION SYSTEM	9
Introduction to FDR - Equipment Requirement - FDR Specifications - Cockpit Voice Recorders - Health and usage monitoring system. Fire Protection - Engine fire Detection - Cargo Bay Area- Fire Extinguishing systems.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the Basics of Ignition and Fuel System of an Aircraft.
CO2	Illustrate the Flight Compartment Lighting Technologies and Cabin Air Conditioning system.
CO3	Identify the Warning and Protection Systems for the Ice Formation and Rain in the Airframe of the Aircraft During Flight.
CO4	Apply the Terrain Warning Systems to avoid the Terrain Collision of an Aircraft.
CO5	Examine the FDR and Fire Protection System to Monitor the Flying Performance of the Aircraft.

Text Books	
1.	"Aircraft Electrical and Electronic Systems", Principles, operation and maintenance by Mike Tooley and David Wyatt.

Reference Books	
1.	Pallet .E.H.J., "Aircraft Instruments and Integrated Systems", Pearsons, Indian edition 2011.
2.	Spitzer, C.R. "Digital Avionics Systems", Prentice-Hall, Englewood Cliffs, N.J., U.S.A. 1993.
3.	Spitzer. C.R. "The Avionics Hand Book", CRC Press, 2000.

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B.E. / B.TECH	B19AGO601- INTEGRATED WATER RESOURCES MANAGEMENT (Common to all Except AGRI)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the key elements of IWRM.
2.	To know about the water economics and policies related to IWRM.
3.	To understand the water supply with reference to human health.
4.	To learn the concept of water security for agriculture practices.
5.	To know the water regulation acts and international water scenarios.

UNIT - I	CONTEXT FOR IWRM	9

Water as a global issue: key challenges and needs – Definition of IWRM within the broader context of development – Complexity of the IWRM process – Examining the key elements of IWRM process.

UNIT - II	WATER ECONOMICS	9

Economic view of water issues: economic characteristics of water good and services – Non-market monetary valuation methods – Water economic instruments, policy options for water conservation and sustainable use – Private sector involvement in water resources management - PPP experiences through case studies.

UNIT - III	WATER SUPPLY AND HEALTH WITHIN THE IWRM CONSIDERATION	9

Links between water and human health: options to include water management interventions for health – Health protection and promotion in the context of IWRM – Health impact assessment of water resources development.

UNIT - IV	AGRICULTURE IN THE CONCEPT OF IWRM	9

Water for food production: blue" versus "green" water debate – Conjunctive use of surface and groundwater - Virtual water trade for achieving global water security –- Irrigation efficiencies, irrigation methods and current water pricing.

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UNIT - V	WATER LEGAL AND REGULATORY SETTINGS	9
Basic notion of law and governance: principles of international and national law in the area of water management. Understanding UN law on non-navigable uses of international water courses – Development of IWRM in line with legal and regulatory framework.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the concepts of IWRM.
CO2	Build an economic conservation of water under PPP and IWRM.
CO3	Identify the linkages between human health and water
CO4	Summarize the water use effectiveness in agriculture.
CO5	Make use of knowledge on regulatory acts and policies of water

Reference Books	
1.	Technical Advisory Committee, Integrated Water Resources management, Technical Advisory Committee Background Paper No: 4. Global water partnership, Stockholm, Sweden. 2002.
2.	Technical Advisory Committee, Poverty Reduction and IWRM, Technical Advisory Committee Background paper no: 8. Global water partnership, Stockholm, Sweden, 2003.
3.	Technical Advisory Committee, Regulation and Private Participation in Water and Sanitation section, Technical Advisory Committee Background paper No:1. Global water partnership, Stockholm, Sweden, 1998.
4.	Technical Advisory Committee, Dublin principles for water as reflected in comparative assessment of institutional and legal arrangements for Integrated Water Resources Management, Technical Advisory Committee Background paper No: 3. Global water partnership, Stockholm, Sweden. 1999.

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5.	Technical Advisory Committee, Water as social and economic good: How to put the principles to practice. Technical Advisory Committee Background paper No: 2. Global water partnership, Stockholm, Sweden, 1998.
6.	Technical Advisory Committee, Effective Water Governance.Technical Advisory Committee Background paper No: 7. Global water partnership, Stockholm, Sweden, 2003.
7.	Cech Thomas V., "Principles of water resources: history, development, management and policy", John Wiley and Sons Inc., New York, 2003.
8.	Mollinga .P. etal, "Integrated Water Resources Management", Water in South Asia Volume I, Sage Publications, 2006.
9.	Iyer R. Ramaswamy, "Towards Water Wisdom: Limits, Justice, Harmony", Sage Publications, New Delhi, 2007.
10.	https://nptel.ac.in/courses/105/105/105105110/

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B.E. / B.TECH	B19BMO601 - INTRODUCTION TO BIOMEDICAL ENGINEERING (Common to all Except BME)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basics of biomedical engineering technology
2.	To learn the working principles of diagnostic devices
3.	To study the principles of therapeutic devices
4.	To know the concepts of medical imaging techniques present in biomedical field.
5.	To learn various prevention and safety tools

UNIT - I	INTRODUCTION TO BIOMEDICAL ENGINEERING	9
Introduction – History of medical devices – Characteristics of human anatomy and physiology that relate to medical devices – Electrical signals and conductivity – Physiological monitoring systems.		

UNIT - II	DIAGNOSTIC DEVICES AND MEASUREMENTS	9
ECG Machine – Blood pressure measurements – Temperature measurements – Pulse oximeters – Biochemical analysers – Blood flow detectors – Respiration monitor.		

UNIT - III	THERAPEUTIC DEVICES AND MEASUREMENTS	9
Introduction – Defibrillators- Pacemakers – Ventilators – Heart lung machine – CPAP/BPAP – Humidifiers.		

UNIT - IV	DIAGNOSTIC IMAGING	9
Basic Principles of X-ray- CT -MRI – PET – SPECT		

UNIT - V	PREVENTION AND PATIENT SAFETY TOOLS	9
Electrical Safety – testing methods – other safety considerations – Troubleshooting techniques – general test equipment – Specialized biomedical test equipment – tools.		
Total Instructional hours : 45		

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Course Outcomes : Students will be able to	
CO1	Outline the basics of biomedical Engineering
CO2	Discuss about the diagnostic devices and measurements
CO3	Summarize about the therapeutic devices and measurements
CO4	Explain about diagnostic imaging
CO5	Describe about prevention and patient safety tools

Reference Books	
1.	Laurence J. Street, “Introduction to Biomedical Engineering Technology”, 3rd Edition, CRC Press, 2017.
2.	John Enderle, “Introduction to Biomedical Engineering”, 3rd Edition, Academic Press, 2011.
3.	Germin Nisha. M, John Robert Prince. M, Sivagama Sundari Meenakshi Sundaram, “Bio-Medical Instrumentation: Medical Applications”, Lambert Academic Publishing, 2020
4.	Shakti Chatterjee, Aubert Miller, “Biomedical Instrumentation Systems”, Thomson Press (India) Ltd, 2012

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B.E. / B.TECH	B19BTO601 – BASIC BIOINFORMATICS (Common to all Except BT)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the units of various physical parameters, conversion factors.
2.	To understand about the various material balances and difference between steam and heat and their balances.
3.	To explain about the application of energy balance in bioprocesses.
4.	To explain about the fluid flow in packed columns and their flow patterns.
5.	To understand about the process of agitation and various agitator vessels.

UNIT - I	BIOLOGICAL DATABASES	9
Biological databases – types of databases – DNA database: GenBank, EMBL – DNA database: ESTs, STS, HTGS- NCBI, Pubmed, Entrez, BLAST, OMIM – Protein databases: SWISSPORT, PIR – DNA and protein sequences: ExPASy, Locus link, Unigene, Entrez, EBI, IMGT.		

UNIT - II	SEQUENCE ALIGNMENT	9
Multiple sequence alignment – models of sequence alighment- databases of sequence alignments: SMART, Pfam – Conserved domains in biomolecules – databases of conserved domains: PRINTS, BLOCKS – integrated multiple sequence alighment – ClustalW, ClustalX, Interpro, MetaFam, PopSet resources of sequence mining.		

UNIT - III	DATABASE SEARCH	9
Sequence homology – similarity, identity and sequence gaps – Pairwise alignment, detection, significance and limitations: Needleman Wunsch, Smith Waterman Algorithm – BLAST: List, scan, extent, E value and P value, alignment, search strategies – principles of BLAST search – types of BLAST.		

UNIT - IV	STRUCTURE PREDICTION TOOLS	9
Analysis of 3D protein structure data – protein data bank (PDB) – SCOB – CATH – Dali Domain directory – FSSP – Protein structure modeling – comparative modeling – Abinitio prediction – Threading – Protein folding.		

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UNIT - V	EVOLUTION ANALYSIS	9
Phylogenetic analysis and molecular evolution – nomenclature of phylogenetic trees – interpretation of phylogenetic data – phenotypic and gene trees – molecular visualization – tools of visualization: Swiss PDB viewer, RasMol, QMol – applications of phylogeny and molecular visualization.		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Recall the basics of about Bioinformatics tools.
CO2	Outline the numerous algorithms for sequence alignments.
CO3	Explain about a brief knowledge on similarity analysis.
CO4	Illustrate about the structural genomics of ancestry.
CO5	Make use of brief understanding of evolution study.

Text Books	
1.	David W M, "Bioinformatics: Sequence and Genome Analysis", CBS publishers, New York, 2004.

Reference Books	
1.	Attwood TK and DJP Smith, "Introduction to Bioinformatics", Addison Wesley Longman Limited, 1999.
2.	Mount DW, "Bioinformatics Sequence and Genome Analysis", Cold Spring Harbour Laboratory Press, 2001.
3.	Pevsner J, "Bioinformatics and Functional Genomics", John Wiley, 2003.
4.	Rastogi SC, Mendiratta N, Rastogi P, "Bioinformatics: Methods and Applications: Genomics, Proteomics and Drug Discovery", 3rd Edition, Prentice Hall Inc., 2005.

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B.E.	B19CSO601 - E-COMMERCE TECHNOLOGY AND MANAGEMENT (Common to all Except CSE, AI&DS, CSBS)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To learn the E-Commerce Platform and its concepts.
2.	To understand the Technology, infrastructure and Business in E-Commerce.
3.	To understand the Security and Challenges in E-Commerce.
4.	To build an own E-Commerce using Open Source Frameworks.
5.	To apply the security and learn the payment systems.

UNIT - I	INTRODUCTION	9

Infrastructure : Working of Web – Web Browsers - Traditional commerce and E commerce – Internet and WWW – role of WWW – value chains – strategic business and Industry value chains – role of E commerce.

UNIT - II	BUILDING E-COMMERCE SITES AND APPS	9

Systematic approach to build an E-Commerce - Planning - System Analysis - System Design - Building the system - Testing the system - Implementation and Maintenance, Optimize Web Performance – Choosing hardware and software – Other E-Commerce Site tools – Developing a Mobile Website and Mobile App.

UNIT - III	E-COMMERCE SECURITY AND PAYMENT SYSTEMS	9

E-Commerce Security Environment – Security threats in E-Commerce – Technology Solutions: Encryption - Securing Channels of Communication - Protecting Networks - Protecting Servers and Clients – Management Policies - Business Procedure and Public Laws - Payment Systems.

UNIT - IV	BUSINESS CONCEPTS IN E-COMMERCE	9

Digital Commerce Marketing and Advertising strategies and tools – Internet Marketing Technologies – Social Marketing – Mobile Marketing – Location based Marketing – Ethical- Social - Political Issues in E-Commerce

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UNIT - V	TOOLS FOR E-COM	9
Web server – performance evaluation - web server software feature sets – web server software and tools – web protocol – search engines – intelligent agents – EC software – web hosting – cost analysis - Mini Project: Develop E-Commerce project in any one of Platforms like Woo-Commerce, Magento or Opencart.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Build Website using HTML CSS and JS.
CO2	Develop Responsive Sites.
CO3	Infer Manage, Maintain and Support Web Applications.
CO4	Choose the marketing and advertising strategies and tools for marketing.
CO5	Identify the security technique and learn the payment systems.

Text Books	
1.	Kenneth C.Laudon, Carol Guercio Traver "E-Commerce", Pearson, 10th Edition, 2016.
2.	Harvey M. Deitel, Paul J.Deitel, Kate Steinbuhler, "E-business and E-commerce for managers", Pearson, 2011.

Reference Books	
1.	Robbert Ravensbergen, "Building E-Commerce Solutions with Woo Commerce", PACKT, 2nd Edition
2.	Parag Kulkarni, Sunita Jahirabad kao, Pradeep Chande, "E-business", Oxford University Press, 2012.
3.	Kala kota et al, "Frontiers of Electronic Commerce", Addison Wesley, 2004.
4.	Micheal Papaloelon and Peter Robert, "E-business", Wiley India, 2006.
5.	Efraim Turban, Jae K.Lee, avid King, Ting Peng Liang, Deborrah Turban, "Electronic Commerce – A managerial perspective", Pearson Education Asia, 2010.

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B.E. / B.TECH	B19EEO601 - FUNDAMENTALS OF POWER ELECTRONICS (Common to all Except EEE)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To get an overview of different types of power semiconductor devices and their switching.
2.	To understand the operation, characteristics and performance parameters of controlled rectifiers.
3.	To study the operation, switching techniques and basics topologies of DC-DC switching regulators.
4.	To learn the different modulation techniques of pulse width modulated inverters and to understand harmonic reduction methods.
5.	To understand the operation of AC Voltage controller and Cyclo converter with various Configurations.

UNIT - I	POWER SWITCHING DEVICES	9

Study of switching devices - Diode, SCR, DIAC,TRIAC, GTO, BJT, MOSFET, IGBT - Static and Dynamic characteristics – Gate triggering circuit and commutation circuit for SCR - Introduction to Driver and snubber circuits - Heat sink calculation.

UNIT - II	AC TO DC CONVERTERS	9

Introduction - Single Phase and Three Phase controlled Rectifiers - Effect of source inductance – performance parameters - Firing Schemes for converter – Dual converters, Applications - Solar PV Systems, Light Dimmer.

UNIT - III	DC TO DC CONVERTER	9

Step-down and step-up chopper - control strategy – Introduction to types of choppers - A, B, C, D and E - Switched mode regulators - Buck, Boost, Buck - Boost regulator, Introduction to Resonant Converters, Applications - Battery operated vehicles.

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UNIT - IV	DC TO AC CONVERTERS	9
Single phase half bridge inverter and Full bridge inverter - Three phase voltage source inverters (both 120° mode and 180° mode) - Voltage & harmonic control - PWM techniques: Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM - Introduction to Space Vector. Pulse Width Modulation - Current Source Inverter - Multilevel Inverter - Applications-Induction heating, UPS.		

UNIT - V	AC TO AC CONVERTERS	9
Single phase and three phase AC voltage Controllers – Control strategy - Power Factor Control – Multistage sequence control - Single Phase and Three Phase Cyclo Converters – Introduction to Matrix converters, Applications: welding.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Outline the operation, characteristic and turn on methods of different types of Power semiconductor devices.
CO2	Explain the operation of phase controlled Converters and its performance parameters.
CO3	Classify different types of DC-DC converter and switching regulators and explain its operation with control techniques.
CO4	Choose the different modulation techniques for pulse width modulated inverters and to infer the harmonic reduction methods.
CO5	Explain the operation of AC voltage controller and Cyclo converter with various configurations.

Text Books	
1.	M.H. Rashid, “Power Electronics : Circuits, Devices and Applications”, Pearson Education, Fourth Edition, New Delhi, 2014.
2.	P.S. Bimbra, “Power Electronics”, Khanna Publishers, Fifth Edition, 2012.
3.	M.D. Singh and K.B. Khanchandani, “Power Electronics”, Mc Graw Hill India, 2013.

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Reference Books	
1.	Joseph Vithayathil, “Power Electronics, Principles and Applications”, McGraw Hill Series, 6th Reprint, 2013.
2.	L. Umanand, “Power Electronics Essentials and Applications”, Wiley, 2010.
3.	Ned Mohan Tore. M. Undel and, William. P. Robbins, “Power Electronics: Converters, Applications and Design”, John Wiley and sons, Third Edition, 2003.
4.	S.Rama Reddy, “Fundamentals of Power Electronics”, Narosa Publications, 2014.
5.	J.P. Agarwal, “Power Electronic Systems: Theory and Design”, 1e, Pearson Education, 2002.

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B.E. / B.TECH	B19MEO601 - ENTREPRENEURSHIP DEVELOPMENT (Common to all Except MECH)	L	P	TU	C
		3	0	0	3

Course Objectives	
1.	To interpret the entrepreneurial aspects.
2.	To comprehend the distinct inspirational practices to execute entrepreneurial plans.
3.	To introduce various elements involved in establishing a business.
4.	To understand the sources of finance and accounting.
5.	To throw the light on various supporting institutions for the entrepreneurs.

UNIT - I	ENTREPRENEURSHIP	9

Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur Entrepreneurship in Economic Growth, Factors Affecting Entrepreneurial Growth.

UNIT - II	MOTIVATION	9

Major Motives Influencing an Entrepreneur – Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management, Entrepreneurship Development Programs – Need, Objectives.

UNIT - III	BUSINESS	9

Small Enterprises – Definition, Classification – Characteristics, Ownership Structures – Project Formulation – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project Appraisal – Sources of Information – Classification of Needs and Agencies.

UNIT - IV	FINANCING AND ACCOUNTING	9

Need – Sources of Finance, Term Loans, Capital Structure, Financial Institution, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

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UNIT - V	SUPPORT TO ENTREPRENEURS	9
Sickness in small Business – Concept, Magnitude, Causes and Consequences, Corrective Measures Business Incubators – Government Policy for Small Scale Enterprises – Growth Strategies in small industry – Expansion, Diversification, Joint Venture, Merger and Sub Contracting.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Classify and compare the entrepreneurship in society.
CO2	Identify the interpersonal attributes needed to become entrepreneur.
CO3	Demonstrate the various facets of business.
CO4	Summarize the components of finance and accounting.
CO5	Outline the comprehensive business entities.

Text Books	
1.	Donald F Kuratko, "Entrepreneurship – Theory, Process and Practice", 9th Edition, Cengage Learning, 2014.
2.	Khanka. S.S., "Entrepreneurial Development", S. Chand & Co. Ltd., Ram Nagar, New Delhi, 2013.

Reference Books	
1.	Hisrich R D, Peters M P, "Entrepreneurship", 8th Edition, Tata McGraw-Hill, 2013.
2.	Rajeev Roy, "Entrepreneurship", 2nd Edition, Oxford University Press, 2011.

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B.E.	B19ECP601 - COMMUNICATION NETWORKS LABORATORY	T	P	TU	C
		0	2	0	1

Course Objectives	
1.	To learn to communicate between two desktop computers.
2.	To learn to implement the different protocols.
3.	To be familiar with IP Configuration.
4.	To be familiar with the various routing algorithms.
5.	To be familiar with simulation tools.

List of Experiments

Expt. No.	Description of the Experiments
1.	Implementation of CSMA/CD protocol for Ethernet LAN
2.	Implementation of Error Detection / Error Correction Techniques
3.	Implementation of Token passing access in BUS-LAN and RING-LAN
4.	Analysis of QoS parameters in ARQ Techniques
5.	Simulation of Distance Vector Routing protocol
6.	Simulation of Link State Routing protocol
7.	Configuration of a Network Topology using Packet tracer
8.	Analysis of Network packets transmission using Wire shark.
9.	Analysis of Encryption and Decryption algorithm
10.	Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS
	Total Instructional hours : 30

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Course Outcomes : Students will be able to	
CO1	Inspect the communication process of two desktop computers.
CO2	Categorize the different protocols.
CO3	Examine the Programming using sockets.
CO4	Compare the various routing algorithms.
CO5	Examine the working of simulation tool.

List of Equipment Required: Requirements for a Batch of 30 Students

Sl. No.	Description of the Equipment	Quantity required
1.	C / Python / Java / Equivalent Compiler	30
2.	Standard LAN Trainer Kits	4
3.	Qualnet /Optisim /Matlab /NS2/ Netsim	30
4.	PCs	30

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B.E.	B19ECP602 - MICROPROCESSORS AND MICROCONTROLLERS LABORATORY (Common to ECE, CSE and BME)	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To study the Architecture of 8085 & 8086 microprocessor.
2.	To learn the design aspects of I/O and Memory Interfacing circuits.
3.	To study the Architecture of 8051 microcontroller.

List of Experiments	
Expt. No.	**Description of the Experiments**
PROGRAMMING with 8085 and 8086 MICROPROCESSOR	
1.	Arithmetic and Logical operations
2.	Code conversion
3.	Sorting
4.	Searching
5.	Stepper Motor Control
6.	Serial interface / Parallel interface
7.	A/D and D/A interface
8.	Waveform Generation
9.	Develop an application using Microprocessor
PROGRAMMING with 8051	
10.	Arithmetic and Logical operations
11.	Square and Cube program, Find 2"s complement of a number
12.	Unpacked BCD to ASCII
	Total Instructional hours : 60

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Course Outcomes : Students will be able to	
CO1	Analyse the programs on 8085 microprocessor.
CO2	Analyse the programs on 8086 microprocessor.
CO3	Inspect the interfacing circuits with 8086.
CO4	Build 8051 microcontroller based systems.
CO5	Evaluate the concepts related to I/O and memory interfacing.

List of Equipment Required: Requirements for a Batch of 30 Students

Sl. No.	Description of the Equipment	Quantity required
1.	8086 Microprocessor trainer kit with power supply	15
2.	8051 Microcontroller trainer kit	15
3.	Traffic light control interfacing card compatible with 8086 & 8051 kits	5
4.	Stepper motor control interfacing compatible with 8086 & 8051kits	5
5.	Digital clock interfacing board compatible with 8086 & 8051 kits	5
6.	Keyboard & Display interface board compatible with 8086 & 8051 kits	5
7.	Printer interfacing card compatible with 8086 & 8051 kits	5
8.	A/D and D/A interfacing card compatible with 8086 & 8051 kits	5
9.	Serial and Parallel interfacing card compatible with 8086 & 8051 kits	5

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B.E.	B19ECP603 – VLSI DESIGN LABORATORY	T	P	TU	C
		0	2	0	1

Course Objectives	
1.	To learn Hardware Descriptive Language (Verilog / VHDL).
2.	To learn the fundamental principles of VLSI circuit design in digital and analog domain.
3.	To familiarize fusing of logical modules on FPGAs.
4.	To provide hands on design experience with professional design (EDA) platforms.

List of Experiments	
Expt. No.	**Description of the Experiments**
1.	Design a 8 bit Adder using HDL, Simulate and implement it by Xilinx/Altera tool (FPGA)
2.	Design a 4 bit Multiplier using HDL, Simulate and implement it by Xilinx/Altera tool (FPGA)
3.	Design an ALU using HDL, Simulate and implement it by Xilinx/Altera tool (FPGA)
4.	Design a Universal Shift Register using HDL, Simulate and implement it by Xilinx / Altera tool (FPGA)
5.	Design a Finite State Machine using HDL, Simulate and implement it by Xilinx / Altera tool (FPGA)
6.	Design Memories using HDL, Simulate and implement it by Xilinx / Altera tool (FPGA)
Compare pre synthesis and post synthesis simulation and implementation for experiments 1 to 6.	
7.	Design and simulate a CMOS inverter using EDA tools
8.	Design and simulate a CMOS basic gates and flip – flops using EDA tools
9.	Design and simulate a CMOS 4 bit Synchronous Counter using EDA tools
Manual / Automatic Layout Generations and Post Layout Generation for Experiments 7, 8 & 9. Analyze the power, area and timing for experiments 7,8 & 9 by performing Pre Layout and Post Layout Simulations.	
10.	Design and Simulate basic Common Source Amplifier using EDA tools
Requirements: Cadence / Synopsis / Mentor Graphics/Tanner/equivalent EDA Tools	
Total Instructional hours : 30	

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Course Outcomes : Students will be able to	
CO1	Examine the HDL coding for testing the basic circuits.
CO2	Estimate the FPGA Boards for interfacing logic modules.
CO3	Inspect the synthesis processing of Place and Route.
CO4	Evaluate the layouts of Digital IC Blocks using EDA tools.
CO5	Inspect the layouts of Analog IC Blocks using EDA tools.

List of Equipment Required: Requirements for a Batch of 30 Students

Sl. No.	Description of the Equipment	Quantity required
1.	Xilinx ISE / Altera Quartus/ equivalent EDA Tools	10
2.	Xilinx / Altera / equivalent FPGA Boards	10
3.	Cadence / Synopsis / Mentor Graphics / Tanner/equivalent EDA Tools	10
4.	Personal Computer	30

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B.E.	B19ECP604 – MINI PROJECT	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To enable a student to do an individual project work (mini project) which may involve design, modelling, simulation and/or fabrication.
2.	To analyse a problem both theoretically and practically.
3.	To motivate the students to involve in research activities leading to innovative solutions for industrial and societal problems.

COURSE DESCRIPTION

Mini Project work shall be carried out by maximum three member batch of student under the supervision of a faculty of the department. The student batch shall meet the supervisor periodically and attend the periodic reviews for evaluating the progress.

Project work will be carried out in single phase during the entire semester. There will be three reviews for continuous internal assessment and one final review and viva voce at the end of the semester. The Project Report prepared according to approved guidelines and duly signed by the supervisor(s) and the Head of the Department shall be submitted to the department.

Course Outcomes : Students will be able to	
CO1	Identify the area of the work to be done
CO2	Inspect the problem thoroughly and provide an appropriate solution
CO3	Summarize systematic literature survey which helps to build the knowledge in the chosen field by using the existing models and references
CO4	Model the system under study
CO5	Choose and get proficiency over the software for simulation and analysis

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Semester - VII

B.E.	B19ECT701 – OPTICAL COMMUNICATION	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To study about the various optical fiber modes, configuration and transmission characteristics of optical fibers.
2.	To learn about the various transmission characteristics.
3.	To learn about the various optical sources and detectors.
4.	To explore various idea about optical fiber measurements and various coupling techniques.
5.	To enrich the knowledge about optical communication systems and networks.

UNIT - I	INTRODUCTION TO OPTICAL FIBERS	9

Introduction - general optical fiber communication system - basic optical laws and definitions - optical modes and configurations - mode analysis for optical propagation through fibers - modes in planar wave guide - modes in cylindrical - optical fiber - transverse electric and transverse magnetic modes - fiber optic cables - classification of optical fiber - single mode fiber - graded index fiber.

UNIT - II	TRANSMISSION CHARACTERISTIC OF OPTICAL FIBER	9

Attenuation - absorption - scattering losses - bending losses - core and cladding losses - signal dispersion – inter symbol interference and bandwidth - intra model dispersion - material dispersion - waveguide dispersion - polarization mode dispersion - intermodal dispersion - dispersion optimization of single mode fiber - characteristics of single mode fiber-R-I Profile - cutoff wave length - dispersion calculation - mode field diameter.

UNIT - III	OPTICAL SOURCES AND DETECTORS	9

Sources : Intrinsic and extrinsic material-direct and indirect band gaps - LED - LED structures - surface emitting LED - Edge emitting LED - quantum efficiency and LED power - light source materials - modulation of LED - LASER diodes - modes and threshold conditions - Rate equations - external quantum efficiency - resonant frequencies - structures and radiation patterns - single mode laser -external modulation - temperature effort.

Detectors : PIN photo detector - Avalanche photo diodes - Photo detector noise - noise sources - SNR - detector response time - Avalanche multiplication noise - temperature effects - comparisons of photo detectors.

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UNIT - IV	OPTICAL RECEIVER, MEASUREMENTS AND COUPLING	9

Fundamental receiver operation - preamplifiers - digital signal transmission - error sources - Front end amplifiers - digital receiver performance - probability of error - receiver sensitivity - quantum limit. Optical power measurement - attenuation measurement - dispersion measurement - Fiber Numerical Aperture Measurements - Fiber cut - off Wave length Measurements - Fiber diameter measurements - Source to Fiber Power Launching - Lensing Schemes for Coupling Management - Fiber to Fiber Joints - LED Coupling to Single Mode Fibers - Fiber Splicing - Optical Fiber connectors.

UNIT - V	OPTICAL COMMUNICATION SYSTEMS AND NETWORKS	9

System design consideration Point – to – Point link design – Link power budget – rise time budget, WDM – Passive DWDM Components - Elements of optical networks - SONET / SDH - Optical Interfaces - SONET / SDH Rings and Networks - High speed light wave Links - OADM configuration - Optical ETHERNET - Soliton.

Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the various concepts of optical communication systems.
CO2	Identify different loss characteristics involved in optical fibers.
CO3	Interpret about the optical sources and detectors used in fiber communication.
CO4	Analyze the performance of optical receiver with its measurements.
CO5	Apply the concepts of optical fiber communication towards networking.

Text Books	
1.	P Chakrabarti, “Optical Fiber Communication”, McGraw Hill Education (India) Private Limited, 2016. (UNIT I, II, III)
2.	Gred Keiser, “Optical Fiber Communication”, McGraw Hill Education (India) Private Limited. Fifth Edition, Reprint 2013. (UNIT I, IV, V)

Reference Books	
1.	John M.Senior, “Optical fiber communication”, Pearson Education, Second edition, 2007.
2.	Rajiv Ramaswami, “Optical Networks”, Second Edition, Elsevier, 2004.
3.	J.Gower, “Optical Communication System”, Prentice Hall of India, 2001.
4.	Govind P. Agrawal, “Fiber-optic communication systems”, Third edition, John Wiley & sons, 2004.

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B.E.	B19ECT702 – EMBEDDED AND REAL TIME SYSTEMS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the concepts of embedded system design and analysis.
2.	To learn the architecture and programming of ARM processor.
3.	To be exposed to the basic concepts of embedded programming.
4.	To learn the real time systems concepts.
5.	To understand operating system types and choosing RTOS.

UNIT - I	INTRODUCTION TO EMBEDDED SYSTEM DESIGN	9

Complex systems and microprocessors – Embedded system design process – Design example: Model train controller- Design methodologies - Design flows - Requirement Analysis – Specifications - System analysis and architecture design – Quality Assurance techniques - Designing with computing platforms – consumer electronics architecture – platform - level performance analysis.

UNIT - II	ARM PROCESSOR AND PERIPHERALS	9

ARM Architecture Versions – ARM Architecture – Instruction Set – Stacks and Subroutines – Features of the LPC 214X Family – Peripherals – The Timer Unit – Pulse Width Modulation Unit – UART – Block Diagram of ARM9 and ARM Cortex M3 MCU.

UNIT - III	EMBEDDED PROGRAMMING	9

Components for embedded programs - Models of programs - Assembly, linking and loading – compilation techniques - Program level performance analysis – Software performance optimization – Program level energy and power analysis and optimization – Analysis and optimization of program size - Program validation and testing.

UNIT - IV	REAL TIME SYSTEMS	9

Structure of a Real Time System – Estimating program run times – Task Assignment and Scheduling – Fault Tolerance Techniques – Reliability, Evaluation – Clock Synchronisation.

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UNIT - V	PROCESS AND OPERATING SYSTEMS	9
Multiple tasks and Multi processes – Processes – Context Switching – Operating Systems – Priority based Scheduling - RMS and EDF - Inter Process Communication mechanisms – Evaluating operating system performance – Power optimization strategies for processes. Example Real time operating systems - POSIX - Windows CE.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Identify the concepts of embedded system design.
CO2	Explain the architecture and programming of ARM processor.
CO3	Apply the basic concepts of embedded programming.
CO4	Illustrate real time operating systems.
CO5	Explain Processes and operating systems.

Text Books	
1.	Marilyn Wolf, "Computers as Components – Principles of Embedded Computing System Design", Third Edition, Morgan Kaufmann Publisher (An imprint from Elsevier), 2012. (UNIT I, II, III, V)
2.	Jane W.S.Liu, "Real Time Systems", Pearson Education, Third Indian Reprint, 2003. (UNIT IV)

Reference Books	
1.	Lyla B. Das, "Embedded Systems: An Integrated Approach", Pearson Education, 2013.
2.	Jonathan W. Valvano, "Embedded Microcomputer Systems Real Time Interfacing", Third Edition, Cengage Learning, 2012.
3.	David. E. Simon, "An Embedded Software Primer", 1st Edition, Fifth Impression, Addison Wesley Professional, 2007.
4.	Raymond J.A. Buhr, Donald L.Bailey, "An Introduction to Real-Time Systems - From Design to Networking with C/C++", Prentice Hall, 1999.
5.	C.M. Krishna, Kang G. Shin, "Real-Time Systems, International Editions", Mc Graw Hill 1997.
6.	K.V.K.K.Prasad, "Embedded Real-Time Systems: Concepts, Design & Programming", Dream Tech Press, 2005.
7.	Sriram V Iyer, Pankaj Gupta, "Embedded Real Time Systems Programming", Tata Mc Graw Hill, 2004.

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B.E.	B19ECT703 – MICROWAVE ENGINEERING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basics for circuit representation of R F networks.
2.	To deal with the issues in the design of microwave amplifier.
3.	To instill knowledge on the properties of various microwave components.
4.	To deal with the microwave generation techniques.
5.	To deal with the microwave measurement techniques.

UNIT - I	TWO PORT RF NETWORKS - CIRCUIT REPRESENTATION	9

Low frequency parameters - impedance, admittance, hybrid and ABCD. High frequency parameters - Formulation of S parameters, properties of S parameters - Reciprocal and lossless networks, transmission matrix, Introduction to component basics, wire, resistor, capacitor and inductor.

UNIT - II	MICROWAVE TRANSISTOR AMPLIFIER DESIGN AND MATCHING NETWORKS	9

Amplifier power relation, stability considerations, gain considerations, noise figure, impedance matching networks, frequency response, T and Π matching networks, microstripline matching networks.

UNIT - III	PASSIVE AND ACTIVE MICROWAVE DEVICES AND CIRCUITS	9

Open, short and matched terminations; coupling probes and loops; power divider; directional coupler; attenuators; phase shifter; circulator; isolator; Impedance matching Devices – Tuning screw, stub and quarter - wave transformers. Crystal diodes and Schottkey diode detector and mixers; PIN diode switch, Gunn diode oscillator; IMPATT diode oscillator and amplifier; varactor diode; Introduction to MIC.

UNIT - IV	MICROWAVE GENERATION	9

High frequency effects in Tubes, Two cavity klystron amplifier; Reflex klystron oscillator; TWT amplifier, Backwards wave oscillator; Magnetron oscillator – Theory and applications.

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UNIT - V	MICROWAVE MEASUREMENTS	9
Measuring Instruments – VSWR meter, Power meter, Spectrum Analyser, Network Analyser – principles; Measurement of Impedance, frequency, power, VSWR, Q factor,dielectric constant, S-Parameter.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain about various parameters in microwave system.
CO2	Analyze the multi- port RF networks and RF transistor amplifiers.
CO3	Analyze the various microwave devices and circuits.
CO4	Apply microwave systems for the generation of microwave signals.
CO5	Examine Microwave signal and parameters.

Text Books	
1.	Robert E.Colin, “ Foundations for Microwave Engineering”, 2nd edition, Mc Graw Hill, 2001.
2.	Reinhold.Ludwig and Pavel Bretshko, “RF Circuit Design”, Pearson Education, Inc.,2006.
3.	Guillermo Gonzalez, “Microwave transistor amplifier design”, Second edition.Prentice hall,1997.
4.	Annapurna Das and Sisir K Das, “ Microwave Engineering”, Tata Mc Graw Hill Inc., 2004.

Reference Books	
1.	David M. Pozar, “Microwave Engineering”, Wiley India (P) Ltd, New Delhi, 2008.
2.	Thomas H Lee, “Planar Microwave Engineering: A Practical Guide to Theory, Measurements andCircuits”, Cambridge University Press, 2004.
3.	Mathew M Radmanesh, “RF and Microwave Electronics”, Prentice Hall, 2000.

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Professional Elective - IV

B.E.	B19ECE701 – CMOS ANALOG IC DESIGN	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To Study the fundamentals of analog circuits and MOS devices models.
2.	To gain the knowledge on various configurations of MOS Transistors and feedback concepts.
3.	To study the characteristics of noise and frequency response of the amplifier.
4.	To learn the concepts of Op-Amp frequency compensation and switched capacitors.
5.	To learn the concepts of Op-Amp based switched capacitors.

UNIT - I	INTRODUCTION TO ANALOG IC DESIGN AND CURRENT MIRRORS	9

Concepts of Analog Design - General consideration of MOS devices – MOS I/V Characteristics – Second order effects – MOS device models. Basic current mirrors - Cascode current mirrors - Active current mirrors - large and small signal analysis - Common mode properties.

UNIT - II	AMPLIFIERS AND FEEDBACK	9

Basic Concepts – Common source stage - Source follower - Common gate stage - Cascode stage. Single ended and differential operation - Basic Differential pair - Common mode response - Differential pair with MOS loads- Gilbert Cell. Feedback - General Consideration of feedback circuits - Feedback topologies - Effect of loading - Effect of feedback on Noise.

UNIT - III	FREQUENCY RESPONSE OF AMPLIFIERS AND NOISE	9

General considerations - Miller Effect and Association of Poles with Nodes, Common source stage - Source followers - Common gate stage - Cascode stage - Differential pair. Noise - Statistical characteristics of noise - Types of noise - Representation of noise in circuits - Noise in single stage amplifiers - Noise in differential pairs - Noise Bandwidth. Case study.

UNIT - IV	OP- AMP STABLITY AND FREQUENCY COMPENSATION	9

General Considerations - One and Two Stage Op Amps - Gain Boosting - Input range limitations - Slew rate - Power Supply Rejection - Noise in Op Amps - General consideration of stability and frequency compensation - Multipole system - Phase margin - Frequency compensation - Compensation of two stage op Amps - Other compensation techniques.

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UNIT - V	INTRODUCTION TO SWITCHED - CAPACITOR CIRCUITS	9
General Considerations - Sampling switches - Switched Capacitor Amplifiers - Switched Capacitor Integrator - Switched Capacitor Common mode feedback.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the concepts of Analog MOS devices and current mirror circuits.
CO2	Design different configuration of Amplifiers and feedback circuits.
CO3	Analyze the characteristics of frequency response of the amplifier.
CO4	Analyze the performance of the stability and frequency compensation techniques of Op-Amp Circuits.
CO5	Construct the switched capacitor circuits.

Text Books	
1.	Behzad Razavi, "Design of Analog CMOS Integrated Circuits", Tata McGraw Hill, 2001, 33rd re-print, 2016.

Reference Books	
1.	Phillip Allen and Douglas Holmberg, "CMOS Analog Circuit Design", Second Edition, Oxford University Press, 2004.
2.	Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, "Analysis and Design of Analog Integrated Circuits", 5th Edition, Wiley, 2009.
3.	Grebene, "Bipolar and MOS Analog Integrated circuit design", John Wiley & sons, Inc., 2003.

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B.E.	B19ECE702 – DIGITAL IMAGE PROCESSING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To become familiar with digital image fundamentals.
2.	To get exposed to image enhancement techniques in Spatial and Frequency domain.
3.	To learn concepts of degradation function and restoration techniques.
4.	To study the image segmentation and representation techniques.
5.	To become familiar with image compression and recognition methods.

UNIT - I	DIGITAL IMAGE FUNDAMENTALS	9
Steps in Digital Image Processing – Components – Elements of Visual Perception – Image Sensing and Acquisition – Image Sampling and Quantization – Relationships between pixels – Color image fundamentals – RGB, HSI models, Two-dimensional mathematical preliminaries, 2D transforms – DFT, DCT.		

UNIT - II	IMAGE ENHANCEMENT	9
Spatial Domain: Gray level transformations – Histogram processing – Basics of Spatial Filtering – Smoothing and Sharpening Spatial Filtering, Frequency Domain: Introduction to Fourier Transform – Smoothing and Sharpening frequency domain filters – Ideal, Butterworth and Gaussian filters, Homomorphic filtering, Color image enhancement.		

UNIT - III	IMAGE RESTORATION	9
Image Restoration – degradation model, Properties, Noise models – Mean Filters – Order Statistics – Adaptive filters – Band reject Filters – Band pass Filters – Notch Filters – Optimum Notch Filtering – Inverse Filtering – Wiener filtering.		

UNIT - IV	IMAGE SEGMENTATION	9
Edge detection, Edge linking via Hough transform – Thresholding – Region based segmentation – Region growing – Region splitting and merging – Morphological processing - erosion and dilation, Segmentation by morphological watersheds – basic concepts – Dam construction – Watershed segmentation algorithm.		

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UNIT - V	IMAGE COMPRESSION AND RECOGNITION	9
Need for data compression, Huffman, Run Length Encoding, Shift codes, Arithmetic coding, JPEG standard, MPEG. Boundary representation, Boundary description, Fourier Descriptor, Regional Descriptors – Topological feature, Texture – Patterns and Pattern classes – Recognition based on matching. Applications of face recognition.		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Explain the fundamental concepts of a digital image processing.
CO2	Analyze image enhancement in the spatial and frequency domain using various transforms.
CO3	Identify the techniques for image restoration.
CO4	Examine the image segmentation methods.
CO5	Interpret Image compression standards and recognition techniques.

Text Books	
1.	Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Pearson, Third Edition, 2010.
2.	Anil K. Jain, “Fundamentals of Digital Image Processing”, Pearson, 2002.

Reference Books	
1.	Kenneth R. Castleman, “Digital Image Processing”, Pearson, 2006.
2.	Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, “Digital Image Processing using MATLAB”, Pearson Education Inc., 2011.
3.	D.E. Dudgeon and R.M. Mersereau, “Multidimensional Digital Signal Processing”, Prentice Hall, Professional Technical Reference, 1990.
4.	William K. Pratt, “Digital Image Processing”, John Wiley, New York, 2002.
5.	Milan Sonka et al “Image processing analysis and machine vision”, Brookes / Cole, Vikas Publishing House, 2nd edition, 1999.

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B.E.	B19EEE804 – TOTAL QUALITY MANAGEMENT	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the concept of quality and Philosophies of Total Quality Management.
2.	To understand the TQM principles and concepts of continuous improvement.
3.	To acquire knowledge on quality tools, management tools and statistical fundamentals to improve quality.
4.	Develop skills to use TQM tools for domain specific applications.
5.	To understand the quality systems and procedures.

UNIT - I	INTRODUCTION	9
Introduction - Need for quality - Definitions of quality - Dimensions of product and service quality - Basic concepts of TQM - TQM Framework - Contributions of Deming, Juran and Crosby - Barriers to TQM Implementation.		

UNIT - II	TQM PRINCIPLES	9
Customer satisfaction - Customer Perception of Quality, Customer complaints and Customer retention - Leadership - Quality Statements, Strategic quality planning, Quality Councils - Employee involvement - Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDCA cycle,5S,Kaizen,Just-In-Time and TPS.		

UNIT - III	TQM TOOLS AND TECHNIQUES I	9
The seven traditional tools of quality - New management tools - Six sigma: Concepts, Methodology, applications to manufacturing, service sector including IT - Bench marking - Reason to bench mark, Bench marking process - FMEA - Stages, Types.		

UNIT - IV	TQM TOOLS AND TECHNIQUES II	9
Quality Circles - Cost of Quality - Quality Policy Deployment (QPD) - Quality Function Deployment (QFD) - Taguchi quality loss function - TPM - Concepts, improvement needs - Performance measures.		

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UNIT - V	QUALITY SYSTEMS	9
Introduction - Benefits of ISO Registration - ISO 9000 Series of Standards - Sector - Specific Standards - AS 9100, TS16949 and TL 9000 - ISO 9001 Requirements - Implementation, Documentation, Internal Audits - ISO 14000 Series Standards - Concepts of ISO 14001 - Requirements of ISO 14001 - Benefits of Environmental Management System (EMS) - ISO 31000 Risk Management.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the concept of quality and Philosophies of Total Quality Management.
CO2	Apply TQM principles and concepts of continuous improvement.
CO3	Explain the quality tools, management tools and statistical fundamentals to improve quality.
CO4	Apply TQM tools and concept to improve quality.
CO5	Explain the quality systems and procedures for implementation.

Text Books	
1.	James R. Evans and William M. Lindsay, "The Management and Control of Quality", 8th Edition, First Indian Edition, Cengage Learning, 2012.
2.	Dale H.Besterfield etal, "Total Quality Management", Third edition, Pearson Education - First Indian Reprints, 2004.
3.	Shridhara Bhat K., "Total Quality Management – Text and Cases", Himalaya Publishing House, First Edition, 2002.

Reference Books	
1.	Narayana V. and Sreenivasan N.S., "Quality Management – Concepts and Tasks", New Age International, 2007.
2.	Janakiraman. B and Gopal .R.K., "Total Quality Management - Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

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B.E.	B19CSE704 – SOFT COMPUTING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To learn the basic concepts of various computing techniques.
2.	To understand the principles of soft computing with its usage in various application.
3.	To familiarize with various techniques like neural networks, genetic algorithms and fuzzy systems.
4.	To understand different soft computing tools to solve real life problems.
5.	To apply soft computing techniques to solve problems.

UNIT - I	INTRODUCTION TO SOFT COMPUTING	9

Overview of Soft Computing, Difference between Soft and Hard Computing - Artificial Intelligence - Artificial Neural Networks - Fuzzy Systems - Genetic Algorithm and Evolutionary Programming - Classification of ANNs - McCulloch and Pitts Neuron Model - Learning Rules: Hebbian and Delta - Perceptron Network - Adaline Network - Madaline Network.

UNIT - II	ARTIFICIAL NEURAL NETWORKS	9

Back propagation Neural Networks - Kohonen Neural Network - Learning Vector Quantization - Hamming Neural Network - Hopfield Neural Network - Bi-directional Associative Memory - Adaptive Resonance Theory Neural Networks - Support Vector Machines - Spike Neuron Models.

UNIT - III	FUZZY SYSTEMS	9

Introduction to Fuzzy Logic, Classical Sets and Fuzzy Sets - Classical Relations and Fuzzy Relations - Membership Functions - Defuzzification - Fuzzy Arithmetic and Fuzzy Measures - Fuzzy Rule Base and Approximate Reasoning - Introduction to Fuzzy Decision Making, Case studies on decision making problems

UNIT - IV	GENETIC ALGORITHMS	9

Basic Concepts - Working Principles - Encoding - Fitness Function - Reproduction - Inheritance Operators - Cross Over - Inversion and Deletion - Mutation Operator - Bit-wise Operators - Convergence of Genetic Algorithm.

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UNIT - V	APPLICATIONS OF SOFT COMPUTING	9
Swarm intelligence – Hate speech detection – Extractive Text Summarization using Conv - Net – Intelligent Health care systems		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Relate various soft computing techniques.
CO2	Develop application on soft computing techniques such as Neural network.
CO3	Explain various parts of fuzzy logic-based decision making process.
CO4	Apply Genetic algorithm techniques for various applications.
CO5	Interpret various soft computing applications for complex problems.

Text Books	
1.	S.Rajasekaran, G.A.Vijayalakshmi Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithm, Synthesis and Applications”, PHI, 2017.
2.	Samarjeet Borah, Ranjit Panigrahi, “Applied Soft Computing Techniques and Applications”, CRC Press, 2022

Reference Books	
1.	S.N Sivanandam and S.N Deepa, “Principles of Soft Computing”, 2^{nd} Edition Wiley, 2013.
2.	N.P.Padhy, S.P.Simon, “Soft Computing with MATLAB Programming”, Oxford University Press, 2015.
3.	Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI, 2002.

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B.E.	B19MCP701 – PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP	T	P	TU	C
		0	6	0	3

Course Objectives	
1.	To empower students with overall Professional and Technical skills required to solve a real world problem.
2.	To mentor the students to approach a solution through various stages of Ideation, Research, Design Thinking, workflows, architecture and building a prototype in keeping with the end-user and client needs.
3.	To provide experiential learning to enhance the Entrepreneurship and employability skills of the students.

This course is a four months immersive program to keep up with the industry demand and to have critical thinking, team based project experience and timely delivery of modules in a project that solves world problems using emerging technologies.

To prepare the students with digital skills for the future, the Experiential Project Based Learning is introduced to give them hands-on experience using digital technologies on open-source platforms with an end-to-end journey to solve a problem. By the end of this course, the student understands the approach to solve a problem with team collaboration with mentoring from Industry and faculties. **This is an EEC category course offered as an elective, under the type, "Experiential Project Based Learning"**.

Highlights of this course	
❍	Students undergo training on emerging technologies
❍	Students develop solutions for real-world use cases
❍	Students work with mentors to learn and use industry best practices
❍	Students access and use Self-Learning courses on various technologies, approaches and methodologies

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❍	Collaborate in teams with other students working on the same topic
❍	Have a dedicated mentor to guide

Course Outcomes : Students will be able to	
CO1	Up skill in emerging technologies and apply to real industry-level use cases
CO2	Understand agile development process.
CO3	Develop career readiness competencies, Team skills/Leadership qualities.
CO4	Develop Time management, Project management skills and communication skills.
CO5	Use Critical Thinking for Innovation Problem Solving.
CO6	Develop entrepreneurship skills to independently work on products

The course will involve 40-50 hours of technical training, and 40-50 hours of project development. The activities involved in the project along with duration are given in Table 1.

TABLE 1. ACTIVITIES

Activity Name	**Activity Description**	**Time (weeks)**
Choosing a Project	Selecting a project from the list of projects categorized various technologies & business domains	2
Team Formation	Students shall form a team of 4 Members before enrolling to a project. Team members shall distribute the project activities among themselves.	1
Hands on Training	Students will be provided with hands-on training on selected technology in which they are going to develop the project.	2
Project Development	Project shall be developed in agile mode. The status of the project shall be updated to the mentors via appropriate platform	6

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Code submission, Project Doc and Demo	Project deliverables must include the working code, project document and demonstration video. All the project deliverables are to be uploaded to cloud based repository such as Git Hub.	3
Mentor Review and Approval	Mentor will be reviewing the project deliverables as per the milestone schedule and the feedback will be provided to the team.	1
Evaluation and scoring	Evaluators will be assigned to the team to evaluate the project deliverables, and the scoring will be provided based on the evaluation metrics.	1
TOTAL		**16 WEEKS**

Essentially, it involves 15 weeks of learning and doing, and one week for evaluation. The evaluation will be carried out to assess technical and soft skills as given in Table 2.

TABLE 2 : EVALUATION SCHEMA

PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP

Technical Skills		**Soft Skills**	
Criteria	Weightage	Criteria	Weightage
Project Design using Design Thinking	10	Teamwork	5
Innovation & Problem Solving	10	Time Management	10
Requirements Analysis using Critical Thinking	10	Attendance and Punctuality	5
Project Planning using Agile Methodologies	5	Project Documentation	5
Technology Stack (APIs, tools, Platforms)	5	Project Demonstration	5

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Coding & Solutioning	15		
User Acceptance Testing	5		
Performance of Product / Application	5		
Technical Training & Assignments	5		
Total	**70**	**Total**	**30**
Total Weightage			100
Passing Requirement			50
Continuous Assessment Only			

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Open Elective - III

B.E. / B.TECH	B19AEO701 - UNMANNED AIRCRAFT SYSTEMS OPERATION & MRO (Common to all Except AERO)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To apprehend the concepts of UAV and its types.
2.	To gain knowledge regarding the control and communications.
3.	To observe the aerodynamics performance and navigation operation.
4.	To know about the drone alignment maintenance.
5.	To recognize the safety take-off and landing and to manage failure factors.

UNIT - I	DRONE RULES & BASIC PRINCIPLES OF FLIGHT	9

International Rules - Regulations, Standards & Practices, Dos and Do not – Civil Aviation Requirements – AIPs, NOTAM, Classification & Categorization of drones – Type Certification of Drones – Registration – Sale & De-Registration of Drones – Operations of Drones – Dos and Don‟ts – Remote Pilot Licensing – Drone Insurance Fundamentals of flight – Aerodynamics – Take-off, flight, and landing – Maneuvers turns and circuit pattern.

UNIT - II	ATC PROCEDURES & RADIO TELEPHONY (NON FRTOL) WEATHER AND METEOROLOGY	9

Understanding ATC operations – Airspace structure and Airspace – Restrictions with knowledge of no drone zones – RT Phraseology & Communicating with ATC including Position and Altitude Reporting – Flight Planning Procedures including Altimeter setting procedures – Collision avoidance – Radio Telephony (RT) techniques – The standard atmosphere, Measuring air pressure, Heat and temperature, Wind – Moisture, cloud formation, icing and its effects – Effect of atmosphere on RPAS operation & hazardous weather avoidance – Met Terminal Aviation Routine Weather Report (METAR).

UNIT - III	FIXED - WING & ROTORCRAFT OPERATIONS AND AERODYNAMICS	9

Types of fixed wing drones, make, parts, terminology, Operation and maneuvers of fixed wing drones, Flight Performance. Intro to Mission Planning, Instrument Flying & Navigation (GCS) – Applications of fixed-wing UAVs. Pros and Cons of Fixed Wing Drones Rotorcraft- Basic drone terminology & parts, Types of drones, material used and size of drones, Drone Anatomy: Different parts of drones, Avionics & C2 Link, Intro to Mission Planning, Instrument Flying & Navigation (GCS). Applications and operations of Multirotor, Flight Performance. Pros and Cons of Rotorcraft Drones.

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UNIT - IV	HYBRID OPERATIONS, AERODYNAMICS & EQUIPMENT MAINTENANCE	9
Principles of Aerodynamics – Types of Hybrid Drones & Parts – Intro to Mission Planning – Instrument Flying & Navigation (GCS) – Applications of Hybrid UAVs – Comparison with Rotorcraft & Aero plane Drone Equipment Maintenance – Maintenance of drone – flight control box – ground station – Maintenance of ground equipment – batteries and payloads – Scheduled servicing, Repair of equipment, Fault finding and rectification.		

UNIT - V	SAFTY MANAGEMENT, PAYLOAD, & DATA & ANALYSIS	9
Drothe Emergency & Handling – Loss of C2-link – Fly-aways (Straying) – Loss of power, Other Emergencies, Control surface failures, Human Performance & Pilot Incapacitation – Fail - Safe Features – Types of payloads – What to carry , what not to carry – Parts of payloads – Installation – Features of payloads – Utilization, Principles of Observation, Elements of Image & Video Interpretation – Introduction to Photogrammetry – Types of Image & Video Data – Analysis.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Summarize the basic operations and principles of flight.
CO2	Explain about the various avionics hardware operation and ATC procedure.
CO3	Apply the aerodynamic principle on the airframe configuration.
CO4	Examine the operations of the hybrid drones and maintenance of equipment.
CO5	Determine the payload distribution and safety management procedure of the UAV.

Text Books	
1.	Paul G Fahlstrom, Thomas J Gleason, “Introduction to UAV Systems”, UAV Systems,Inc, 1998.
2.	Kimon P. Valavanis, “Advances in Unmanned Aerial Vehicles: State of the Art and the Road to Autonomy”, Springer, 2007

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Reference Books	
1.	Swatton P.J., “Ground studies for pilots flight planning”, Sixth Edition, 2002.
2.	Ian Heywood., “An Introduction to GIS”, Pearson Education, New Delhi, 2001.
3.	Patel A.N & Surendra Singh, “Remote sensing principles & applications”, Scientific Publishers, Jodhpur, 1992.
4.	Lille sand, T. M., and Kiefer, R.W., “Remote Sensing and Image Interpretation”, John Wiley and Sons, New York, 2000.
5.	Unmanned Aerial Vehicle (UAV) application for societal applications (https://www.cbinsights.com/research/drone-impact-society-uav/).

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B.E. / B. TECH.	B19AGO701 – PRODUCTION TECHNOLOGY FOR AGRICULTURAL MACHINERY (Common to all Except AGRI)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basic concepts of engineering materials
2.	To know the principles of machining and welding concepts
3.	To remember the farm mechanization and sowing implements
4.	To learn about the plant protection equipment
5.	To create knowledge on harvesting machinery

UNIT - I	ENGINEERING MATERIALS	9

Engineering materials - classification - Mechanical properties of materials, strength, elasticity, plasticity, stiffness, malleability, ductility, brittleness, toughness, hardness, resilience, machinability, formability, weldability. Steels and cast irons: Carbon steels, their classification - low, mild, medium & high carbon steel, their properties & applications. Wrought iron, cast iron. Alloy steels: Stainless steel, tool steel.

UNIT - II	MACHINING AND WELDING	9

Basic principles of lathe - machine and operations - Basic description of machines and operations of Shaper - Planner, Drilling, Milling & Grinding - classification of welding processes. Gas welding, types of flames and their applications. Electric Arc welding. Resistance welding, Soldering & Brazing processes and their uses.

UNIT - III	TILLAGE AND SOWING IMPLEMENTS	9

Mould board plough - attachments – mould board shapes and types. Disc plough – force representation on disc – Types of disc ploughs – Subsoiler plough - Rotary plough – Chisel plough - Cultivators - types - construction. Disc harrows - Bund former – Rotavator - ridger – leveller. Basin lister - Wetland preparation implements – Crop Planting – methods – row crop planting systems – Devices for meeting seeds – furrow openers – furrow closers – types – Types of seed drills and planters – Seed cum fertilizer drills – paddy transplanters.

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UNIT - IV	WEEDING AND PLANT PROTECTION EQUIPMENT	9
Weeding equipment – hand hoe – long handled weeding tools – dryland star weeder – wetland conoweeder and rotary weeder – Engine operated and tractor weeders Sprayers – types - classification – methods of atomization, spray application rate, droplet size determination – volume median diameter, numerical median diameter – drift control.		

UNIT - V	HARVESTING AND THRESHING MACHINERY	9
Principles of cutting crop, types of harvesting machinery, vertical conveyor reaper and binder, combine harvesters, balers, threshers, combine losses.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Knowing the concepts of engineering materials and steel properties
CO2	Remembering the different machining and welding process
CO3	Knowing the different tillage and sowing implements
CO4	Understanding the concepts of plant protection equipment's.
CO5	Creating the knowledge on harvesting mechanism

Text Books	
1.	Kalpakjian and Schmid, "Manufacturing Engineering and Technology", Pearson, 2010.
2.	Hajra Choudry, "Elements of workshop technology - Vol II", Media promoters, 2002.
3.	Jagdishwar Sahay.,"Elements of Agricultural Engineering",Standard Publishers Distributors, Delhi 6.,2010.
4.	Michael and Ohja.,"Principles of Agricultural Engineering", Jain brothers, New Delhi., 2005.

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Reference Books	
1.	Gupta. K.N., and Kaushik, J.P., “Workshop Technology Vol I and II”, New Heights, Daryaganj, New Delhi, 1998.
2.	Arthur. D., et. al., “General Engineering Workshop Practice”, Asia Publishing House, Bombay, 1998.
3.	Chapman W.A.J., “Workshop Technology”, Part I, II, III, E.L.B.S. and Edward Amold Publishers Ltd, London, 1992.
4.	Kepner, R.A., et al. “Principles of farm machinery”, CBS Publishers and Distributers, Delhi, 1997.
5.	Harris Pearson Smith et al. ,“Farm machinery and equipment”, Tata McGraw-Hill pub., New Delhi.,1996.
6.	Srivastava, A.C. ,“Elements of Farm Machinery” ,Oxford and IBH Pub. Co., New Delhi, 1990.
7.	https://nptel.ac.in/courses/126/105/126105009/

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B.E. / B. TECH.	B19BMO701 – TELEMEDICINE (Common to all Except BME)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To gain the knowledge on the basic principles for telemedicine.
2.	To understand the legal aspects of telemedicine.
3.	To learn the key principles for telemedicine standards.
4.	To study the concepts for secure transmission of data.
5.	To know health education, mobile telemedicine and it applications.

UNIT - I	INTRODUCTION TO TELEMEDICINE	9

History and Evolution of telemedicine, Functional diagram of telemedicine system, Telemedicine, Telehealth, Tele care, Organs of telemedicine, Global and Indian scenario, Ethical and legal aspects of Telemedicine.

UNIT - II	ETHICAL, SECURITY AND LEGAL ASPECTS OF TELEMEDICINE	9

Confidentiality, patient rights and consent : confidentiality and the law, the patient - doctor relationship, access to medical records, consent treatment - data protection & security, jurisdictional issues, intellectual property rights, Security in Telemedicine systems - Access control, Fire wall, Encryption, Authentication, Digital certificate, Digital Timestamp.

UNIT - III	TELEMEDICINE STANDARDS	9

Principles of Multimedia - Text, Audio, Video, data, PSTN, POTS, ANT, ISDN, Internet, Wireless Communication - GSM satellite and Micro wave, Modulation techniques, Types of Antenna, Satellite communication, Mobile hand-held devices and mobile communication. Internet technology and telemedicine using worldwide, Video and audio conferencing.

UNIT - IV	DATA ACQUISTION AND STORAGE SYSTEM	9

Acquisition System - Camera, Scanners, Display Systems - Analogue Devices, LCD, Laser Displays, Holographic Representation, Virtual Screen devices, Storage System - Magnetic System, Optical System, Solid State Disk.

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UNIT - V	APPLICATIONS OF TELEMEDICINE	9
Telemedicine access to health care services, health education and self-care. Introduction to robotics surgery, telesurgery. Telecardiology, Teleoncology, Telemedicine in neurosciences, Electronic Documentation, e-health services security and interoperability.		
		Total Instructional hours : 45

Course Outcomes : At the end of the course, the student should be able to	
CO1	Recall the basic concepts of telemedicine and health
CO2	Interpret the legal aspects of Telemedicine
CO3	Explain telemedicine standards in communication
CO4	Make use of data acquisition and storage.
CO5	Illustrate about the medical applications and usage of telemedicine

Text Books	
1.	Norris, A.C. "Essentials of Telemedicine and Telecare", Wiley, 2002.
2.	Wootton, R., Craig, J., Patterson, V. (Eds.), "Introduction to Telemedicine", Royal Society of MedicinePress Ltd.Taylor & Francis 2006.
3.	O'Carroll, P.W., Yasnoff, W.A., Ward, E., Ripp, L.H., Martin, E.L. (Eds), "Public Health Informatics and information Systems", Springer, 2003.

Reference Books	
1.	Ferrer - Roca, O., Sosa - Iudicissa, M. (Eds.), "Handbook of Telemedicine",IOS Press (Studies in Health Technology and Informatics, Volume 54, 2002.
2.	Simpson, W. Video over IP. " A practical guide to technology and applications", Focal Press Elsevier, 2006.
3.	Mohan Bansal, "Medical Informatics", Tata McGraw-Hill, 2004.

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B.E. / B.TECH.	19BTO701 – FUNDAMENTALS OF NANOTECHNOLOGY (Common to all Except BT)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basics of nanomaterials and their characteristics.
2.	To gain knowledge on the relationship between nano and biosystems.
3.	To acquire information on nanobiocomposites.
4.	To enhance skill and knowledge on analysis of nanomaterials and
5.	To apply the knowledge and skills of nanotechnology in medicine and related fields.

UNIT - I	INTRODUCTION TO NANOTECHNOLOGY	9
Definition- history of nanomaterials- classification of nanomaterials, Properties of nanomaterials – concept of nanoscale engineering - size and confinement effects.		

UNIT - II	SYNTHESIS AND CHARACTERIZATION OF NANOPARTICLES	9
Strategies for nano architecture, bottom-up, top down and functional approaches; Chemical and physical synthesis of nanoparticles - characteristics of nanoparticles; Characterization of nanoscale materials using UV spectroscopy, TEM, AFM/STM, XRD and FTIR.		

UNIT - III	INTERLINKING BIOLOGY WITH NANOTECHNOLOGY	9
Bionanomaterials – DNA, protein and lipids based nanostructures- synthesis, characterization and applications; Bionanopores-Biological synthesis of nanoparticles – bacteria, fungi, yeast and plants- mechanism; Molecular Self-assembly in biology.		

UNIT - IV	BIOLOGICAL FUNCTIONALISATION OF NANOMATERIALS	9
DNA / protein - gold nanoparticle conjugates; DNA nanostructures for mechanics and computing; DNA as smart glue - DNA analyser as biochips; Biologically inspired nanocomposites; Peptide nanostructures and their applications – electronics, antibacterial agents.		

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UNIT - V	APPLICATION OF NANOBIOTECHNOLOGY	9
Antimicrobial activity of nanoparticles and its mechanism; Nanoanalytics - Quantum dots - Bioconjugates in cell and tissue imaging; Diagnosis of cancer and other diseases using bionanosystems; Drug and gene delivery; Protein targeting- targeting signals, translocation and sorting; Micelles for drug delivery; Proteins and DNA coupled nanoparticles for biosensors; Nanotechnology in agriculture.		
Total Instructional hours : 45		

Course Outcomes : At the end of the course student will be able to	
CO1	Understand the fundamentals of nanoscience and technology.
CO2	Explain synthesis and characterization of nanoparticles.
CO3	Understand the potential applications of bionanomaterials in various fields.
CO4	Understand the design and development of health related nanomaterials.
CO5	Apply bionanomaterials in various fields.

Text Books	
1.	Rao CNR, A Muller and AK Cheetham, “The Chemistry of Nanomaterials - Synthesis, Properties and Applications”, John Wiley & Sons, 2006.
2.	Pradeep T, “Nano: The Essentials”, Tata McGraw Hill, New Delhi, 2007.
3.	Niemeyer CM, and CA Mirkin, “Nanobiotechnology: Concepts, Applications and perspectives”, John Wiley & Sons, 2004.

Reference Books	
1.	Nicolini C, “Nanobiotechnology and Nanobiosciences”, Pan Stanford Publishing Pvt. Ltd, 2009.
2.	Goodsell SD, “Bionanotechnology - Lessons from Nature”, Wiley-Liss, Inc, 2004.
3.	Bhushan B, “Handbook of Nanotechnology”, Springer, Heidelberg, 2006.

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B.E. / B. TECH.	B19CSO701 - FUNDAMENTAL OF CLOUD COMPUTING (Common to all Except CSE, AI & DS, CSBS)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To introduce the basic concepts of Computer Networks and Cloud Computing.
2.	To understand the broad perceptive design of cloud architecture and model.
3.	To study the concept of Virtualization and design of cloud Services
4.	To be familiar with the storing data in cloud and secure to data in cloud.
5.	To apply different cloud programming model as per need and design the trusted cloud Computing system.

UNIT - I	CLOUD COMPUTING FUNDAMENTALS	9

Introduction to computer networks - evolution of computer networks and its uses – Types of Networks - Advantages and Disadvantages of Computer Network - Introduction to Cloud Computing - Essential characteristics, Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.

UNIT - II	CLOUD ARCHITECTURE AND MODELS	9

NIST Cloud Computing Reference Architecture - Cloud Models: Characteristics – Cloud Services – IaaS, PaaS, SaaS – Public vs Private Cloud – Cloud Solutions - Cloud ecosystem – Service management – Computing on demand.

UNIT - III	CLOUD VIRTUALIZATION	9

Basics of Virtualization - Types of Virtualizations - Implementation Levels of Virtualization - Virtualization Structures - Tools and Mechanisms - Virtualization of CPU, Memory, I/O Devices - Virtual Clusters and Resource management – Virtualization for Data - Center Automation.

UNIT - IV	CLOUD COMPUTING STORAGES AND SECURITY	9

Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3 - Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

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UNIT - V	CLOUD TECHNOLOGIES AND ADVANCEMENTS	9
Hadoop – MapReduce – Virtual Box -- Google App Engine – Programming Environment for Google App Engine - Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Compare the strengths and limitations of cloud computing
CO2	Identify the architecture, infrastructure and delivery models of cloud computing
CO3	Outline various virtualization concepts.
CO4	Summarize the core issues of cloud such as storage, security, and privacy.
CO5	Show Cloud Services with appropriate tools.

Text Books	
1.	Curtis Franklin, Jr. ,Brian J.S. Chee, “Securing the Cloud: Security Strategies for the Ubiquitous Data Center”, CRC Press, 2019.
2.	Rittinghouse, John W., and James F. Ransome, “Cloud Computing: Implementation, Management and Security”, CRC Press, 2017.

Reference Books	
1.	Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, “Mastering Cloud Computing”, TMH, 2013.
2.	Toby Velte, Anthony Velte, Robert Elsenpeter, “Cloud Computing - A Practical Approach”, Tata Mcgraw Hill, 2009.

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B.E. / B.TECH	B19EEO701 – HYBRID ELECTRIC VEHICLE (Common to all Except EEE)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To present a comprehensive overview of Electric and Hybrid Electric Vehicles.
2.	To understand the concept of hybrid electric vehicles and its operations.
3.	To impart knowledge on applications of drives in hybrid electric vehicles.
4.	To impart knowledge on vehicular communication in hybrid electric vehicles.
5.	To provide knowledge about various possible energy storage technologies that can be used in hybrid electric vehicles.

UNIT - I	INTRODUCTION TO HYBRID ELECTRIC VEHICLES	9

History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Basics of vehicle performance, vehicle power source characterization, transmission characteristics and mathematical models to describe vehicle performance.

UNIT - II	HYBRID ELECTRIC DRIVE - TRAIN	9

Basic concept of electric traction, Transmission configuration - Components - Gears - Differential - Clutch – Brakes, Regenerative braking, motor sizing. Hybrid traction: Various hybrid drive-train topologies, Power flow control in hybrid drive-train topologies, Fuel Efficiency Analysis.

UNIT - III	ELECTRIC COMPONENTS IN HYBRID AND ELECTRIC VEHICLES	9

Electric Drives in HEV/EVs, Classification and Characteristics, configuration and Control of DC Motor drives, Induction Motor drives, Permanent Magnet Motor drives and Switched Reluctance Motor drives for HEV/EVs applications, Drive System efficiency.

UNIT - IV	SIZING THE DRIVE SYSTEM	9

Performance matching of Electric Machine and the Internal Combustion Engine (ICE), Sizing the propulsion motor, Communications, supporting subsystems, sizing the power electronic devices and Energy Storage Technology.

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UNIT - V	ENERGY MANAGEMENT STRATEGIES	9
Introduction to energy management strategies used in hybrid and electric vehicle, classification – implementation issues. Battery based energy storage: fuel cell based and super capacitor based energy storage and its analysis. Hybridization of different energy storage devices. Case study: Volvo XC90 T8 Plug-In Hybrid, Nissan X-Trial hybrid		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Infer the hybrid electric vehicles and its impact on environment.
CO2	Outline the working of hybrid electric drive train.
CO3	Interpret the electric components used in hybrid and electric vehicles.
CO4	Illustrate the various communication protocols and technologies used in vehicle. networks
CO5	Explain the different energy storage systems for vehicle applications.

Text Books	
1.	M. Ehsani, Y. Gao, S. Gay and Ali Emadi, “Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design”, CRC Press, 2015.
2.	Iqbal Hussain, “Electric & Hybrid Vechicles – Design Fundamentals”, Second Edition, CRC Press, 2011.
3.	Mehrdad Ehsani, Yimi Gao, Sebastian E. Gay, Ali Emadi, “Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design”, CRC Press, 2009.

Reference Books	
1.	Sheldon S. Williamson, “Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles”, Springer, 2013.
2.	Chris Mi, MA Masrur, and D W Gao, “Hybrid Electric Vehicles- Principles and Applications with Practical Perspectives”, Wiley, 2011.
3.	Davide Andrea, “Battery management Systems for Large Lithium-Ion Battery Packs”, Artech House, 2010.
4.	Sira -Ramirez, R. Silva Ortigoza, “Control Design Techniques in Power Electronics Devices”, Springer, 2006.
5.	James Larminie and John Lowry, “Electric Vehicle Technology”, Wiley Publishers, 2003.

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B.E. / B.TECH	B19MEO701 – 3D PRINTING AND TOOLING (Common to all Except MECH)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To explore the technology used in additive manufacturing.
2.	To develop CAD models for 3D printing.
3.	To acquire knowledge, techniques and skills to select relevant additive manufacturing process.
4.	To select a 3D printing process for an application.
5.	To produce a product using 3D Printing or Additive Manufacturing (AM).

UNIT - I	INTRODUCTION TO ADDITIVE MANUFACTURING (AM)	9

Overview – History – Need – classification - Additive Manufacturing Technology in product development – Materials for Additive Manufacturing.

UNIT - II	CAD AND REVERSE ENGINEERING	9

Basic concept – 3D scanning – digitization techniques – Model reconstruction – data processing for reverse engineering - Additive Manufacturing Technology: CAD model preparation – Part orientation and support generation – Model slicing – Tool path generation.

UNIT - III	LIQUID BASED AND SOLID BASED ADDITIVE MANUFACTURING	9

Classification – liquid based system – stereo lithography apparatus (SLA) – principle, process, advantages and applications – solid based system – Fused Deposition Modeling – principle, process, advantages.

UNIT - IV	LASER BASED ADDITIVE MANUFACTURING SYSTEMS	9

Selective laser sintering – principles of SLS process – process, advantages and applications, 3D Printing - principle, process, advantages - Laser Engineered Net Shaping (LENS).

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UNIT - V	RAPID TOOLING AND APPLICATIONS OF ADDITIVE MANUFACTURING	9
Principles and typical process for quick batch production of plastic and metal parts through quick tooling – applications for Aerospace, defence, automobile, Bio-medical and general engineering industries		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Understand the importance of Additive Manufacturing.
CO2	Apply technique of CAD and reverse engineering for geometry transformation in Additive Manufacturing.
CO3	Define the various process used in Additive Manufacturing.
CO4	Identify and select suitable process used in Additive Manufacturing.
CO5	Understand the basic concept of quick tooling and additive manufacturing application.

Text Books	
1.	Lan Gibson, David W. Rosen and Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.
2.	Andreas Gebhardt, "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing", Hanser Publisher, 2011.
3.	Khanna Editorial, "3D Printing and Design", Khanna Publishing House, Delhi.

Reference Books	
1.	J.D. Majumdar and I. Manna, "Laser-Assisted Fabrication of Materials", Springer Series in Material Science, 2013.
2.	Dougles Bryden, "CAD and Prototyping for Product Design", 2014.
3.	CK Chua, Kah Fai Leong, "3D Printing and Rapid Prototyping - Principles and Applications", World Scientific, 2017.

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B.E.	B19ECP701 – EMBEDDED SYSTEMS LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To learn the working of ARM processor.
2.	To understand the Building Blocks of Embedded Systems.
3.	To learn the concept of memory map and memory interface.
4.	To write programs to interface memory, I/Os with processor.
5.	To study the interrupt performance.

List of Experiments	
Expt. No.	**Description of the Experiments**
1.	Study of ARM evaluation system
2.	Interfacing ADC and DAC.
3.	Flashing of LEDS, Interfacing LED and PWM.
4.	Interfacing real time clock and serial port.
5.	Interfacing keyboard and LCD.
6.	Interfacing EPROM and interrupt.
7.	Mailbox.
8.	Interrupt performance characteristics of ARM and FPGA.
9.	Interfacing stepper motor and temperature sensor
10.	Implementing zigbee protocol with ARM.
	Total Instructional hours : 60

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Course Outcomes : Students will be able to	
CO1	Explain the programs in ARM for a specific application
CO2	Estimate the memory, A/D converter with ARM system.
CO3	Analyze the performance of interrupts.
CO4	Interpret the interfacing of keyboard, display, motor and sensors.
CO5	Formulate a mini project using embedded system.

List of Equipment Required : Requirements for a Batch of 30 Students

Sl. No.	Description of Equipment	Quantity required
1.	Embedded trainer kits with ARM board	10
2.	Embedded trainer kits suitable for wireless communication	10
3.	Adequate quantities of Hardware, software and consumables	10

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B.E.	B19ECP702 – ADVANCED COMMUNICATION LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To understand the working principle of optical sources, detector and microwave components.
2.	To study the simple optical communication link.
3.	To learn about the characteristics and measurements in optical fiber.
4.	To know about the behavior of microwave components.
5.	To practice microwave measurement procedures.

List of Experiments

Expt. No.	Description of the Experiments
OPTICAL EXPERIMENTS	
1.	DC Characteristics of LED and PIN Photo diode
2.	Mode Characteristics of Fibers
3.	Measurement of connector and bending losses
4.	Fiber optic Analog and Digital Link- frequency response(analog) and eye diagram (digital)
5.	Numerical Aperture determination for Fibers
6.	Attenuation Measurement in Fibers
MICROWAVE EXPERIMENTS	
1.	Reflex klystron and Gunn diode characteristics and basic microwave parameter measurement such as VSWR, frequency, wavelength.
2.	Directional Coupler Characteristics
3.	Radiation Pattern of Horn Antenna.
4.	Gain of Horn Antenna
5.	S-parameter Measurement of the following microwave components (Isolator, Circulator, Eplane Tee, H Plane Tee, Magic Tee)
6.	Attenuation and Power Measurement
	Total Instructional hours : 60

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Course Outcomes : Students will be able to	
CO1	Analyze the performance of simple optical link, losses mode characteristics of fiber.
CO2	Interpret the Eye Pattern, Pulse broadening of optical fiber and the impact on BER.
CO3	Inspect the Channel Characteristics of Wireless Communication.
CO4	Analyze the performance of Wireless Communication System.
CO5	Test for the Microwave System design.
CO6	Evaluate scattering parameters of different microwave components.

List of Equipment Required : Requirements for a Batch of 30 Students

Sl. No.	Description of Equipment	Quantity required
1.	Trainer kit for carrying out LED and PIN diode characteristics, Digital multi meter, optical power meter	2
2.	Trainer kit for determining the mode characteristics, losses in optical fiber	2
3.	Trainer kit for analyzing Analog and Digital link performance, 2 Mbps PRBS Data source, 10 MHz signal generator, 20 MHz Digital storage Oscilloscope	2
4.	Kit for measuring Numerical aperture and Attenuation of fiber	2
5.	MM/SM Glass and plastic fiber patch chords with ST/SC/E2000 connectors	2 Set
6.	LEDs with ST / SC / E2000 receptacles– 650 / 850 nm	2 Set
7.	PiN PDs with ST / SC / E2000receptacles – 650 / 850 nm	2 Set
8.	Microwave test Bench at X band to determine Directional coupler characteristics	2
9.	Microwave test Bench at X band and Antenna turn table to measure Radiation pattern of Horn antenna, 2 Horn Antennas	2
10.	Microwave test Bench at X band to determine VSWR for Isolator and Circulator, VSWR meter, Isolator, Circulator, E Plane Tee, H planeTee	2
11.	Microwave test Bench at X band, Variable attenuator, Detector and 20MHz Digital / Analog Oscilloscope	2
12.	Digital Communication Teaching Bundle (Lab View / MATLAB / Equivalent software tools)	10

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B.E.	B19ECP703 – PROJECT WORK PHASE – I	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To develop their own innovative ideas into prototype.
2.	To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
3.	To Design and develop projects based on hardware and software for electrical systems.
4.	To improve the team building, communication and management skills among the students.
5.	To train the students in preparing project reports and viva voce examination.

Project work may be assigned to a single student or to a group of students not exceeding 4 per group, under the supervision of faculty guide(s). The Head of the Department shall constitute a review committee for each programme. There shall be a minimum of three faculty members in the review committee. There shall be three reviews in total, during the semester by a review committee. The student shall make presentation on the progress made before the committee.

Interim project report shall be submitted before the project reviews with the approval of the guide. The Project Report, prepared according to the approved guidelines and duly signed by the guide and the Head of the Department, shall be submitted to the department as per the timeline announced by the department. The End Semester Examination for project work shall consist of evaluation of the final project report by an external examiner, followed by a viva-voce examination conducted separately for each student, by a committee consisting of the external examiner, and an internal examiner. The Controller of Examinations (CoE) shall appoint Internal and External Examiners for the End Semester Examination of the Project Work.

Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Identify the problems of society with current relevance
CO2	Apply theoretical concepts to societal/Industrial complex problems with team work and multidisciplinary approach
CO3	Design Engineering solution by utilizing a systems approach with appropriate software/ Hardware tools for the identified problems
CO4	Test for the software / Hardware modules and communicate effectively the developed project
CO5	Develop the confidence for the self education and ability for life long learning

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Semester - VIII

Professional Elective - V

B.E.	B19ECE801 – NANO TECHNOLOGY AND APPLICATIONS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To become familier in the basics of nanoscience and nanotechnology.
2.	To explore the basics of nanomaterial synthesis and characterization.
3.	To study about the properties and measurements of nanotechnology.
4.	To introduce nanostructures and its applications.
5.	To learn about the applications of nanotechnology.

UNIT - I	INTRODUCTION TO NANOTECHNOLOGY	9
Basic Structure of Nanoparticles - Kinetics in Nanostructured Materials - Zero dimensional, size and shape of nanoparticles; one-dimensional and two dimensional nanostructures - clusters of metals and semiconductors, bio nano-particle		

UNIT - II	FABRICATION AND CHARACTERIZATION OF NANOMATERIALS	9
Types of Nanomaterials (Quantum dots, Nanoparticles, Nanocrystals, Dendrimers, Buckyballs, Nanotubes); Gas, liquid, and solid –phase synthesis of nanomaterials; Lithography techniques (Photolithography, Dip-pen and Electron beam lithography); Thin film deposition; Electrospinning. Bio-synthesis of nanomaterials		

UNIT - III	PROPERTIES AND MEASUREMENT OF NANOMATERIALS	9
Optical Properties: Absorption, Fluorescence, and Resonance; Methods for the measurement of nanomaterials; Microscopy measurements: SEM, TEM, AFM and STM. Confocal and TIRF imaging.		

UNIT - IV	NANO STRUCTURES	9
Carbon Nanotubes, Fullerenes, Nanowires, Quantum Dots. Applications of nanostructures. Reinforcement in Ceramics, Drug delivery, Giant magnetoresistance, etc. Cells response to Nanostructures.		

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UNIT - V	APPLICATIONS OF NANOTECHNOLOGY	9
Nano electronics, Nanosensors, Nanotechnology in Diagnostics applications, Environmental and Agricultural Applications of nanotechnology, Nano technology for energy systems		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Identify the structure of nanoparticles
CO2	Choose the various types of nanoparticles and its fabrication technique
CO3	Explain the properties and manufacturing techniques of nanoparticles
CO4	Build the structure of nanoparticles
CO5	Make use of application of nanotechnology

Text Books	
1.	Bharat Bhushan , "Handbook of Nanotechnology", Springer, 2012. (Unit I – V)
2.	Hari Singh Nalwa, "Encyclopedia of Nanotechnology", American Scientific Publishers 2011. (Unit I – V)

Reference Books	
1.	D. Michael Ashby, Paulo Ferreira, Daniel L. Schodek, "Nanomaterials, Nanotechnologies and Design: an Introduction to Engineers and Architects", Butterworth-Heinemann, 2009.
2.	Z.L. Wang, Y. Liu, Z. Zhang, "Handbook of Nanophase and Nanostructured Materials", in four volumes, Kluwer Academic/Plenum Publishers, 2003.
3.	Tseung-Yuen Tseng and Hari Singh Nalwa, "Handbook of Nanoceramics and their Based Nanodevices", Vol. 2, American Scientific Publishers.

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B.E.	B19ECE802 – ELECTRONICS PACKAGING AND TESTING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To become familier in the basics of electronic packaging.
2.	To explore the electrical issues in packaging.
3.	To study about the various types of packaging.
4.	To introduce about PCB designing methods.
5.	To study the various testing related to electronic packaging.

UNIT - I	OVERVIEW OF ELECTRONIC SYSTEMS PACKAGING	9

Functions of an Electronic Package, Packaging Hierarchy, IC packaging: MEMS packaging, consumer electronics packaging, medical electronics packaging, Trends, Challenges, Driving Forces on Packaging Technology, Materials for Microelectronic packaging, Packaging Material Properties, Ceramics, Polymers, and Metals in Packaging, Material for high density interconnect substrates

UNIT - II	ELECTRICAL ISSUES IN PACKAGING	9

Electrical Issues of Systems Packaging, Signal Distribution, Power Distribution, Electromagnetic Interference, Transmission Lines, Clock Distribution, Noise Sources, Digital and RF Issues. Design Process Electrical Design: Interconnect Capacitance, Resistance and Inductance fundamentals; Packaging roadmaps - Hybrid circuits - Resistive, Capacitive and Inductive parasitics.

UNIT - III	CHIP PACKAGES	9

IC Assembly - Purpose, Requirements, Technologies, Wire bonding, Tape Automated Bonding, Flip Chip, Wafer Level Packaging, reliability, wafer level burn – in and test. Single chip packaging: functions, types, materials processes, properties, characteristics, trends. Multi chip packaging: types, design, comparison, trends. System – in - package (SIP); Passives: discrete, integrated, and embedded.

UNIT - IV	PCB, SURFACE MOUNT TECHNOLOGY AND THERMAL CONSIDERATIONS	9

Printed Circuit Board: Anatomy, CAD tools for PCB design, Standard fabrication, Micro via Boards. Board Assembly: Surface Mount Technology, Through Hole Technology, Process Control and Design challenges. Thermal Management, Heat transfer fundamentals, Thermal conductivity and resistance, Conduction, convection and radiation Cooling requirements.

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UNIT - V	TESTING	9
Reliability, Basic concepts, Environmental interactions. Thermal mismatch and fatigue – failures – thermo mechanically induced – electrically induced – chemically induced. Electrical Testing: System level electrical testing, Interconnection tests, Active Circuit Testing, Design for Testability.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Identify the various functions in packaging.
CO2	Explain the various electrical issues in packaging.
CO3	Analyse various chip packaging methods.
CO4	Design of PCBs which minimize the EMI and operate at higher frequency.
CO5	Analyze the concepts of Testing and testing methods.

Text Books	
1.	Tummala, Rao R., “Fundamentals of Microsystems Packaging”, McGraw Hill, 2001

Reference Books	
1.	R.G. Kaduskar and V.B. Baru, “Electronic Product design”, Wiley India, 2011
2.	Blackwell (Ed), “The Electronic packaging handbook”, CRC Press, 2000
3.	Tummala, Rao R, “Microelectronics packaging handbook”, McGraw Hill, 2008
4.	Bosshart, “Printed Circuit Boards Design and Technology”, TataMcGraw Hill, 1988.
5.	R.S.Khandpur, “Printed Circuit Board”, Tata McGraw Hill, 2005
6.	Michael L. Bushnell & Vishwani D. Agrawal, “Essentials of Electronic Testing for Digital, memory & Mixed signal VLSI Circuits”, Kluwer Academic Publishers, 2000.
7.	M. Abramovici, M. A. Breuer, and A.D. Friedman, “Digital System Testing and Testable Design”, Computer Science Press,1990.

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B.E.	B19ECE803 – PRINCIPLES OF SPEECH PROCESSING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the speech production mechanism and the various speech analysis techniques and speech models.
2.	To understand the speech compression techniques.
3.	To understand the speech recognition techniques.
4.	To know the speaker recognition techniques.
5.	To know about the text to speech synthesis techniques.

UNIT - I	SPEECH SIGNAL CHARACTERISTICS & ANALYSIS	11

Speech production process - speech sounds and features - Phonetic Representation of Speech – representing – speech in time and frequency domains - Short - Time Analysis of Speech - Short-Time Energy and Zero-Crossing Rate - Short-Time Autocorrelation Function - Short-Time Fourier Transform (STFT) - Speech Spectrum - Cepstrum - Mel-Frequency Cepstrum Coefficients - Hearing and Auditory Perception - Perception of Loudness - Critical Bands - Pitch Perception.

UNIT - II	SPEECH COMPRESSION	12

Sampling and Quantization of Speech (PCM) - Adaptive differential PCM - Delta Modulation - Vector Quantization - Linear predictive coding (LPC) - Code excited Linear predictive Coding (CELP)

UNIT - III	SPEECH RECOGNITION	12

LPC for speech recognition - Hidden Markov Model (HMM) - training procedure for HMM - subword unit model based on HMM - language models for large vocabulary speech recognition - Overall recognition system based on subword units - Context dependent subword units - Semantic post processor for speech recognition.

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UNIT - IV	SPEAKER RECOGNITION	5
Acoustic parameters for speaker verification - Feature space for speaker recognition - similarity measures - Text dependent speaker verification - Text independent speaker verification techniques.		

UNIT - V	SPEAKER RECOGNITION AND TEXT TO SPEECH SYNTHESIS	5
Text to speech synthesis(TTS)-Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness-role of prosody.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the speech signal characteristics
CO2	Design models for speech compression techniques
CO3	Examine speech recognition techniques
CO4	Design speaker recognition systems
CO5	Design text to speech synthesis systems

Text Books	
1.	L. R. Rabiner and R. W. Schafer, “Introduction to Digital Signal Processing Foundations and Trends in Signal Processing”, Vol. 1, Nos. 1–2 (2007) 1–194.
2.	Ben Gold and Nelson Morgan, “Speech and Audio signal processing - processing and perception of speech and music”, John Wiley and sons, 2006.

Reference Books	
1.	Lawrence Rabiner, Biiing and Hwang Juang and B.Yegnanarayana, “Fundamentals of Speech Recognition”, Pearson Education, 2009.
2.	Claudio Becchetti and Lucio Prina Ricotti, “Speech Recognition”, John Wiley and Sons, 1999.
3.	Donglos O shanhnessy, “Speech Communication: Human and Machine”, 2nd Edition, University press, 2001.

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B.E.	B19EEE701 – POWER ELECTRONICS APPLICATION FOR RENEWABLE ENERGY SYSTEMS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the various Non-Conventional sources of energy and the impact of renewable energy generation on environment.
2.	To equip with required skills to derive the criteria for the design of power converters for renewable energy applications.
3.	To apply the principle of operation of electrical machines for wind energy conversion and their performance characteristics.
4.	To provide knowledge about the stand alone, grid connected renewable energy systems and grid connection issues.
5.	To understand the needs for Hybrid Renewable Energy Systems and maximum power point tracking algorithms for PV & wind Systems.

UNIT - I	INTRODUCTION TO RENEWABLE ENERGY SOURCES	9

World energy scenario - Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Geothermal Heat energy and Hydrogen energy systems.

UNIT - II	POWER ELECTRONICS FOR SOLAR PHOTO VOLTAIC SYSTEM	9

Block diagram of solar photo voltaic system – Buck / Boost and Buck - Boost converters - bidirectional converters and multilevel Inverter - Grid Interactive Inverters - selection of inverters - battery sizing, array sizing - Stand alone operation of solar system - Grid connection Issues - grid Integrated solar system - Control of Grid - Connected PV Systems.

UNIT - III	ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION	9

Review of reference theory fundamentals - principle of operation and analysis: IG, PMSG, SCIG and DFIG.

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UNIT - IV	POWER ELECTRONICS FOR WIND ENERGY CONVERSION SYSTEM	9
Introduction - Wind Energy Conversion System - Three phase AC voltage controllers, AC-DC-AC converters, uncontrolled rectifiers, PWM Inverters, matrix converters - Stand - alone operation of fixed and variable speed Wind Energy Conversion Systems - Grid connection Issues - Grid integrated PMSG, SCIG Based WECS - Doubly fed induction generator with rotor side converter topologies.		

UNIT - V	HYBRID RENEWABLE ENERGY SYSTEMS	9
Need for Hybrid Systems - Range and type of Hybrid systems - Power extraction (MPP) and MPPT schemes - Case studies of Wind - PV Maximum Power Point Tracking (MPPT) - Grid connection Issues.		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Explain the operation of various Non-Conventional energy sources and the impact of renewable energy generation on environment.
CO2	Make use of power converters to develop Solar Photo Voltaic System and Wind Energy Conversion System.
CO3	Apply the operating principle of various Electrical Machines for Wind Energy Conversion System.
CO4	Interpret the stand alone and grid connected renewable energy systems.
CO5	Develop the maximum power point tracking algorithms for PV and wind Systems and explain the needs for Hybrid Renewable Energy Systems.

Text Books	
1.	Khan B.H., “Non-conventional Energy sources” ,Tata McGraw-Hill Publishing Company, New Delhi, 2016.
2.	Sudipta Chakraborty, Marcelo G. Simes, and William E. Kramer, “Power Electronics for Renewable and Distributed Energy Systems: A Sourcebook of Topologies, Control and Integration”, Springer Science & Business, 2013.

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3.	Nicola Femia, Giovanni Petrone, Giovanni Spagnuolo, Massimo Vitelli, “Power Electronics and control for maximum Energy Harvesting in Photovoltaic Systems”, CRC Press, 2013.
4.	Bhadra S. N., Kastha D., Banerjee S., “Wind Electrical Systems”, Oxford University Press, 2005.

Reference Books	
1.	Muhammad H. Rashid, “Power Electronics: Circuits, Devices, and Applications”, Pearson Education India, 2017.
2.	Seyezhai R. and Ramaprabha R., “Power Electronics for Renewable Energy Systems”, Scitech Publications, 2015.
3.	Fang Lin Luo Hong Ye, “Renewable Energy systems”, Taylor & Francis Group,2013.
4.	Remus Teodorescu, Marco Liserre, Pedro Rodriguez, “Grid Converters for Photovoltaic and Wind Power Systems”, John Wiley and Sons, Ltd., 2011.
5.	Ion Boldea., “Variable speed generators”, Taylor & Francis group, 2006.
6.	Rai. G.D., “Non conventional energy sources”, Khanna publishes, 2004.

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B.E.	B19EEE703 – PRINCIPLES OF MANAGEMENT AND PROFESSIONAL ETHICS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To enable the students to study the evolution of management and organization.
2.	To understand the functions and principles of management.
3.	To learn the application of the principles in an organization.
4.	To create an awareness on engineering ethics and human values.
5.	To understand and appreciate the ethical issues faced by an individual in profession, society and polity.

UNIT - I	INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS	9

Meaning, Definition and Significance of Management - Basic functions of Management - Development of Management Thought - Current trends and issues in Management - Types of Business organization - Sole proprietorship, partnership, company - public and private sector enterprises - Organization culture and Environment.

UNIT - II	MANAGEMENT CONCEPTS & ORGANIZATIONAL BEHAVIOR	9

Planning, Organizing, Staffing, Directing and Controlling- MBO-Six sigma-Significance of OB, Role of Leadership, Personality and Motivation, Stress, Attitudes, Values and Perceptions at work - Case Study: Management by Objectives – Super Department Stores MBO Programme.

UNIT - III	HUMAN RESOURCE MANAGEMENT	9

Evolution of Management - Development of Managerial skills - Human Resource Management - Objectives - Job analysis - Recruitment - Selection and Placement and Training Development.

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UNIT - IV	HUMAN VALUES	9
Morals, values and Ethics – Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.		

UNIT - V	ENGINEERING ETHICS	9
Senses of Engineering Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Models of professional roles - Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the Management functions for a given organization.
CO2	Analyze the behavior of individuals and groups in organizations in terms of the key factors.
CO3	Outline the procedure for recruitment, selection, training of staff to establish an organization.
CO4	Illustrate the various social problems and learn to act ethically.
CO5	Explain the ethical issues related to engineering and realize the responsibilities and rights in the society.

Text Books	
1.	Harold Koontz, Heinz Weihrich and Ramachandra Aryasri, "Principles of Management", Tata McGraw Hill, New Delhi, 2013.
2.	Mamoria, CB, "Personnel Management", Sultan Chand and Sons, New Delhi, 2013.
3.	M. Govindarajan, S. Natarajan and V.S. Senthilkumar, "Engineering Ethics", Prentice Hall of India, 1st Edition, 2009.

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Reference Books	
1.	Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility”, McGraw Hill education, India Pvt. Ltd., New Delhi, 2013.
2.	Henry Dreyfuss, “The Measure of Man and Woman: Human Factors in Design”, John Wiley and Sons Publications, 2012.
3.	Stephen A. Robbins & David A. Decenzo & Mary Coulter, “Fundamentals of Management”, 7th Edition, Pearson Education, 2011.
4.	World Community Service Centre, “Value Education”, Vethathiri publications, Erode, 2011.
5.	Mike W. Martin and Roland Schinzinger, “Ethics in Engineering”, McGraw Hill, 4th Edition, New York, 2005.

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Open Elective - IV

B.E. / B.TECH.	B19AEO801 - VEHICLE AERODYNAMICS (Common to all Except AERO)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basic concepts of vehicle and its internal design.
2.	To know the principles of process, planning, and ventilation system.
3.	To know the different type of noises and acoustics.
4.	To learn about the ergonomics and occupant accommodation.
5.	To create knowledge on various control systems.

UNIT - I	INTRODUCTION TO VEHICLE DESIGN	9

Timeline developments in design - Mass production – Streamlining for style and low drag - Commercial vehicles - Engine developments - Transmission system development – Steering – Suspension – Brakes - Interior refinement - Safety design.

UNIT - II	VEHICLE BODY DESIGN	9

The styling process - Working environment and structure - Product planning - Concept sketching and package related sketching - Full sized tape drawing – Clay modelling - Aerodynamics - Aerodynamic forces – Drag & Drag reduction - Stability during cross – winds – Wind Noise - Under-hood ventilation - Cabin ventilation - Introduction to Computational fluid dynamics - Wind tunnel testing of scale models.

UNIT - III	NOISE AND VIBRATION	9

Vibration – fundamentals & control – Acoustics – fundamentals - Human response to sound - Sound measurement - Automotive noise criteria - Drive-by noise tests, Noise from stationary vehicles, Interior noise in vehicles, Automotive noise sources and control techniques - Engine noise, Transmission noise, Intake & exhaust noise, Aerodynamic noise, Tyre noise, Brake noise.

UNIT - IV	CRASHWORTHINESS AND ERGONOMIC APPROACH	9

Accident and injury analysis - Vehicle impacts: general dynamics & crush characteristics - Structural collapse and its influence upon safety - Occupant accommodation – Ergonomics in the automotive industry - Ergonomics methods and tools - Case studies of Fiat Punto - Strategies for improving occupant accommodation and comfort.

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UNIT - V	VEHICLE CONTROL SYSTEMS	9
Automotive application of sensors - Chassis control systems - Anti-lock braking systems, Traction control systems, Electronically controlled power - assisted steering - Vehicle safety and security systems - Air-bag and seat belt pre-tensioner systems, Remote keyless entry and vehicle immobilization, Introduction to On-board navigation systems.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Outline the periodical developments in design, production and various components of vehicle bodies.
CO2	Make use of sketching concept like tape drawing and clay modelling to reduce the aerodynamics drag on vehicle body.
CO3	Analyze the various automotive noise sources and its control techniques.
CO4	Evaluate the vehicle crash worthiness requirements for improving passengers and comfort.
CO5	List the different control system and sensors used in controlling the vehicle.

Text Books	
1.	Julian Happian-Smith, “An Introduction to Modern Vehicle Design”, Butterworth- Heinemann Ltd., 2002.

Reference Books	
1.	Wolf-Heinrich Hucho (Eds.), “Aerodynamics of Road Vehicles: From Fluid Mechanics to Vehicle Engineering”, Butterworth-Heinemann Ltd., 1987.
2.	Ian R Sinclair, “Sensors and Transducers”, Butterworth - Heinemann Ltd., 2001.
3.	T.K. Garrett, K. Newton & W. Steeds, “The Motor Vehicle”, Butterworth - Heinemann Ltd., 2001

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B.E. / B.TECH.	B19AGO801 – AGRICULTURE FINANCE, BANKING AND COOPERATIVES (Common to all Except AGRI)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To impart knowledge on principles basic agriculture finance system.
2.	To understand the different farm financial analysis
3.	To acquire the knowledge on different functions of financial institutions
4.	To understand banking and cooperation for agricultural and agro based industries and financial system
5.	To know the functions of various institutions involved in farm financing crop insurance products.

UNIT - I	AGRICULTURAL FINANCE - NATURE AND SCOPE	9
Agricultural Finance: Definition, Importance, Nature and Scope - Agricultural Credit: Meaning, Definition, Need and Classification - Sources of credit - Role of institutional and non-Institutional agencies: Advantages and Disadvantages - Rural indebtedness: consequences of rural indebtedness - History and Development of rural credit in India.		

UNIT - II	FARM FINANCIAL ANALYSIS	9
Principles of Credit - 5C's, 5R's and & 7P's of Credit - Project Cycle and Management - Preparation of bankable projects / Farm credit proposals - Feasibility - Time value of money: Compounding and Discounting - Appraisal of farm credit proposals - Undiscounted and discounted measures - Repayment plans - Farm Financial Statements: Balance Sheet, Income Statement and Cash Flow statement - Financial Ratio Analysis.		

UNIT - III	FINANCIAL INSTITUTIONS	9
Institutional Lending Agencies - Commercial banks: Nationalization, Agricultural Development Branches - Area Approach - Priority Sector Lending - Regional Rural Banks, Lead bank, Scale of finance - Higher financial institutions: RBI, NABARD, AFC, ADB, World Bank and Deposit Insurance and Credit Guarantee Corporation of India - Microfinance and its role in poverty alleviation - Self-Help Groups - Non -Governmental Organizations - Rural credit policies followed by State and Central Government - Subsidized farm credit, Differential Interest Rate (DIR), Kisan Credit Card (KCC) Scheme - Relief Measures and Loan Waiver Scheme and Know Your Customer (KYC).		

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UNIT - IV	CO-OPERATION	9

Co-operation: Philosophy and Principles - History of Indian Cooperative Credit Movement: Pre and Post-Independence periods and Cooperation in different plan periods - Cooperative credit institutions: Two tier and three tier structure, Functions: provision of short term and long term credit, Strength and weakness of cooperative credit system, Policies for revitalizing cooperative credit: Salient features of Vaithiyananthan Committee Report on revival of rural cooperative credit institutions, Reorganisation of Cooperative credit structure in Andhra Pradesh and single window system and successful cooperative credit systems in Gujarat, Maharashtra, Punjab etc, - Special cooperatives: LAMPS and FSS: Objectives, role and functions - National Cooperative Development Corporation (NCDC) and National Federation of State Cooperative Banks Ltd., (NAFSCOB) - Objectives and Functions.

UNIT - V	BANKING AND INSURANCE	9

Negotiable Instruments: Meaning, Importance and Types - Central Bank: RBI - functions - credit control - objectives and methods: CRR, SLR and Repo rate - Credit rationing - Dear money and cheap money - Financial inclusion and Exclusion: Credit widening and credit deepening monetary policies. Credit gap: Factors influencing credit gap - Non - Banking Financial Institutions (NBFI) – Preparation of Bankable Projects - Assessment of crop losses, Determination of compensation - Crop insurance: Schemes, Coverage, Advantages and Limitations in implementation - Estimation of crop yields - Livestock, insurance schemes - Agricultural Insurance Company of India Ltd (AIC): Objectives and functions.

Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Acquiring the knowledge on sources of Agricultural Micro-Macro financing and credit systems.
CO2	Understanding the history of financing agriculture in India.
CO3	Learning the significance and limitations of crop insurance.
CO4	Developing the knowledge on cooperative systems.
CO5	Creating the knowledge on insurance policies and financial system.

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Text Books	
1.	Muniraj, R., “Farm Finance for Development”, Oxford & IBH, New Delhi, 1987.
2.	Subba Reddy S. and P. Raghu Ram, “Agricultural Finance and Management”, Oxford & IBH, New Delhi, 2011.
3.	Lee, W.F., M.D. Boehlje, A.G. Nelson and W.G. Murray, “Agricultural Finance”, Kalyani Publishers, New Delhi, 1998.
4.	Mammoria, C.B. and R.D. Saxena, “Cooperation in India”, Kitab Mahal, Allahabad, 1973.
5.	Patnaik, V.E. and A.K. Roy, “Cooperation and Cooperative Management”, Kalyani Publishers, Ludhiana, 1988.

Reference Books	
1.	Ghosal, SN., “Agricultural Financing in India”, Asia Publishing House, Bombay, 1966.
2.	John, J. Hamptron., “Financial Decision Making: Concepts, Problems and Cases”,Prentice-Hall of India , New Delhi, 1983
3.	https://www.nabard.org/

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B.E. / B. TECH.	B19BMO801 – HOSPITAL MANAGEMENT (Common to all Except BME)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the fundamentals of hospital administration.
2.	Learn human resource management in hospital.
3.	Know the market-related research process.
4.	Explore various information management systems and relative supportive services.
5.	Learn the quality and safety aspects of the hospital.

UNIT - I	OVERVIEW OF HOSPITAL ADMINISTRATION	9
Distinction between Hospital and Industry, Challenges in Hospital Administration - Hospital Planning - Equipment Planning - Functional Planning - Current Issues in Hospital Management - Telemedicine - Bio-Medical Waste Management.		

UNIT - II	HUMAN RESOURCE MANAGEMENT IN HOSPITAL	9
Principles of HRM - Functions of HRM - Profile of HRD Manager - Tools of HRD - Human Resource Inventory - Manpower Planning. Different Departments of Hospital, Recruitment, Selection, Training Guidelines - Methods of Training - Evaluation of Training - Leadership grooming and Training, Promotion - Transfer, Communication - nature, scope, barriers, styles and modes of communication.		

UNIT - III	MARKETING RESEARCH PROCESS	9
Marketing information systems - assessing information needs, developing & disseminating information - Market Research process - Other market research considerations - Consumer Markets & Consumer Buyer Behavior - Model of consumer behavior - The buyer decision process - Model of business buyer behavior - Major types of buying situations - WTO and its implications.		

UNIT - IV	HOSPITAL INFORMATION SYSTEMS & SUPPORTIVE SERVICES	9
Management Decisions and Related Information Requirement - Clinical Information Systems - Administration Information Systems - Support Service Technical Information Systems - Medical Transcription, Medical Records Department - Central Sterilization and Supply Department - Pharmacy - Food Service - Laundry Services.		

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UNIT - V	QUALITY AND SAFETY ASPECTS IN HOSPITAL	9
Quality system - Elements, Implementation of quality system, Documentation, Quality auditing, International Standards ISO 9000 - 9004 - Features of ISO 9001 - ISO 14000 - Environment Management Systems. NABA, JCI, NABL. Security - Loss Prevention - Fire Safety - Alarm System - Safety Rules. Health Insurance & Managing Health Care - Medical Audit - Hazard and Safety in a hospital Setup.		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Explain the principles of Hospital adminstration.
CO2	Identify the importance of Human resource management.
CO3	List various marketing research techniques.
CO4	Identify Information management systems and its uses.
CO5	Summarize the quality and safety procedures followed in hospitals

Text Books	
1.	R.C. Goyal, "Hospital Administration and Human Resource Management", PHI - Fourth Edition, 2006.
2.	G.D. Kunders, "Hospitals – Facilities Planning and Management" - TMH, New Delhi, Fifth Reprint 2007.

Reference Books	
1.	Cesar A. Caceres and Albert Zara, "The Practice of Clinical Engineering", Academic Press, New York, 1977.
2.	Norman Metzger, "Handbook of Health Care Human Resources Management", 2nd edition Aspen Publication Inc. Rockville, Maryland, USA, 1990.
3.	Peter Berman, "Health Sector Reform in Developing Countries", Harvard University Press, 1995.
4.	William, A. Reinke, "Health Planning For Effective Management", Oxford University Press, 1988.
5.	Blane, David, Brunner, "Health and SOCIAL Organization: Towards a Health Policy for the 21st Century", Eric Calrendon Press 2002.
6.	Arnold D. Kalcizony & Stephen M. Shortell, "Health Care Management", 6th Edition Cengage Learning, 2011.

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B.E. / B. TECH.	B19BTO801 – BIOLOGICAL WASTE MANAGEMENT (Common to all Except BT)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To develop conceptual schematics for biological treatment of wastes.
2.	To understand the role of microbes in waste treatment
3.	To equip students to understand the basics of biodegradation and bioremediation.
4.	To provide the overview integrated biotechnology approaches for effective waste management.

UNIT - I	INTRODUCTION	9

Industrial waste generation, disposal and environmental impacts; Toxicity of industrial effluents and Bioassay tests; Brief introduction about Regulatory requirements and pollution control boards. Biological treatment processes – objectives; Choice of treatment method; Environmental impact and other considerations in planning the treatment.

UNIT - II	MICROBIAL TREATMENT OF WASTE WATER	9

Biological waste water treatment - Aerobic suspended growth; Aerobic attached - growth (TF, RBC, PBR); Anaerobic suspended growth; Anaerobic attached growth; Advanced tertiary process:-Solids removal; Biological nitrogen removal; Biological phosphorus removal; Disinfection.

UNIT - III	BIODEGRADATION	9

Aerobic vs. anaerobic Degradation; Mechanism of biodegradation; Microbial basis of Biodegradation; Biodegradation of Xenobiotics; Microbial degradation of pesticides. Role of nanoparticles in biodegradation.

UNIT - IV	BIOREMEDIATION	9

Introduction of Bioremediation; advantages and applications; Types of bioremediation; Natural (attenuation); ex situ and in situ; Bioaugmentation and biostimulation; Solid phase and slurry phase bioremediation; Phytoremediation. Case study on bioremediation of xenobiotic compounds.

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UNIT - V	INTEGRATED BIOTECHNOLOGY FOR WASTE MANAGEMENT	9
Bioenergy – biogas and biodiesel; Biosorption, mechanism of biosorption; Biosensors and its application in environmental issues; Biomonitoring; Biotransformation, mineral leaching, mining and mineral biotechnology – reference to copper and iron.		
		Total Instructional hours : 45

Course Outcomes : Student will be able to	
CO1	Understand the industrial waste generation and its environmental impact
CO2	Understand the role microbes in waste water treatment.
CO3	Explain the mechanism of biodegradation of organic wastes.
CO4	Understand the bioremediation of toxic compounds.
CO5	Understand the integrated biotechnology methods for waste management.

Text Books	
1.	Eckenfelder WW, “Industrial Water Pollution Control”, Mc-Graw Hill, 1999.
2.	Metcalf and Eddy, “Waste Water Engineering – Treatment and reuse”, Tata McGraw-Hill, New Delhi, 2003.
3.	Agarwal S.K., “Environmental Microbiology”, APH Publishing Corporation, New Delhi, 2009.
4.	Chatterji A.K., “Introduction to Environmental Biotechnology”, PHI Learning Pvt. Ltd., New Delhi, 2011.
5.	Maier RM, IL Pepper and CP Gerba, “Environmental Microbiology”, Academic Press. 2000.
6.	Pelczar MJ, ECS Chan and NR Kreig, “Microbiology”, 5th Ed., Tata McGraw Hill, New Delhi, 2002.

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B.E.	B19CSO801 – FUNDAMENTAL OF IOT (Common to all Except CSE, AI & DS, CSBS)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand and gain complete knowledge about internet of things.
2.	To study about network protocols.
3.	To learn basic programming and IoT tools.
4.	To understand the basics of embedded systems in IoT.
5.	To explore various IoT applications

UNIT - I	INTRODUCTION	9

Basics of IoT, Characteristics of IoT, Physical Design of IoT, Logical Design of IoT, Functional Blocks of IoT, Communication Models & APIs, Machine to Machine, Difference between IoT and M2M.

UNIT - II	NETWORK AND COMMUNICATION ASPECTS	9

Wireless Medium Access Issues, MAC Protocol Survey, Survey Routing protocols, Sensor Deployment & Node Discovery, Data Aggregation & Dissemination.

UNIT - III	ISSUES AND CHALLENGES IN IOT	9

Design Challenges, Development Challenges, Security Challenges, Issues related to Privacy, Standards and Regulation.

UNIT - IV	DEVELOPING INTERNET OF THINGS	9

Introduction to different IoT Tools, Developing Applications through IoT Tools, Developing Sensor based Application through Embedded System Platform, Implementing IoT concepts with examples.

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UNIT - V	DOMAIN SPECIFIC APPLICATIONS	9
IoT applications - Home Automation-Agriculture- Health care - Surveillance Applications - Smart Grid - Introduction to Industrial IoT (IIoT).		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the concepts of Internet of Things.
CO2	Analyze basic protocols in Wireless Sensor Network.
CO3	Outline the issues of IoT application design in different domains.
CO4	Illustrate the use of IoT tools and its performance.
CO5	Identify the IoT concepts and applications.

Text Books	
1.	Perry Lea, “Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security”, 2018.
2.	David Hanes, “IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things”, Cisco press, 2017.

Reference Books	
1.	Samuel Greengard, “The Internet of Things”, MIT Press, 2015.
2.	Olivier Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things: Key Applications and Protocols”, 2nd Edition, Wiley, 2012.
3.	Waltenegus Dargie, Christian Poellabauer, “Fundamentals of Wireless Sensor Networks: Theory and Practice”, 2010.

BoS Chairman

B.E./ B.TECH	B19EEO801 – ENERGY CONSERVATION AND MANAGEMENT (Common to all Except EEE)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To acquire the knowledge about the current energy scenario and importance of energy conservation, audit and management.
2.	To understand about the economics associated with energy conservation..
3.	To understand about the different electrical systems and the methods of improving energy efficiency.
4.	To improve the thermal efficiency by designing suitable systems for heat recovery and co-generation.
5.	To understand how to conserve energy in Major utilities

UNIT - I	INTRODUCTION	9

Energy - Power – Past and Present scenario of World; National Energy consumption Data – Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers - Instruments for energy auditing - energy security - Material and energy balance diagrams.

UNIT - II	ECONOMICS	9

Energy Economics – energy pricing - Fixed and variable costs, Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing – ESCO concept.

UNIT - III	ELECTRICAL SYSTEMS	9

Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.

UNIT - IV	THERMAL SYSTEMS	9

Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation – Steam Distribution and Usage: Steam Traps, Condensate Recovery, Flash Steam Utilization and Insulators - Waste Heat Recovery - Cogeneration.

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UNIT - V	ENERGY CONSERVATION IN MAJOR UTILITIES	9
Energy conservation in Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Interpret the basic knowledge of current energy scenario and importance of energy conservation and management.
CO2	Summarize the knowledge of economics associated with energy conservation.
CO3	Apply the methods of improving energy efficiency in different electrical systems.
CO4	Make use of the heat utilization, saving and recovery in different thermal systems.
CO5	Interpret the knowledge of energy conservation in Major utilities.

Text Books	
1.	Murphy W.R. and G. Mckay Butter worth, "Energy Management", Heinemann Publications, 2013.
2.	Guide books for National Certification Examination for Energy Managers and Energy Auditors, Book 1, 2, 3 & 4. Bureau Energy Efficiency, a statutory body under Ministry of Power, Government of India, New Delhi. 2005.
3.	W.C.Turner, "Energy Management Handbook", John Wiley and Sons, Fifth edition, 2013.

Reference Books	
1.	Amlan Chakrabarti, "Energy Engineering and Management", Prentice hall India, 2011.
2.	John.C.Andreas, "Energy Efficient Electric Motors", Marcel Dekker Inc Ltd., 2nd edition, 2015.
3.	Paul o' Callaghan, "Energy Management", Mc-Graw Hill Book Company, 1st edition, 2012.
4.	Witte. L.C., P.S. Schmidt, D.R. Brown, "Industrial Energy Management and Utilisation" Hemisphere Publications, Washington, 1988.
5.	www.em-ea.org/gbook1.asp

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B.E./ B.TECH	B19MEO801 – LEAN SIX SIGMA (Common to all Except MECH)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To describe about introduction to Six Sigma.
2.	To discuss the importance of Set up time, TQM, 5S, VSM.
3.	To describe about introduction to lean manufacturing.
4.	To study the various tools for lean manufacturing.
5.	To describe about lean involvement and culture.

UNIT - I	INTRODUCTION TO SIX SIGMA	9

Six Sigma – Definition, statistical considerations, variability reduction, design of experiments – Six Sigma implementation.

UNIT - II	SET UP TIME REDUCTION, TQM, 5S, VSM	9

Set up time reduction – Definition, philosophies and reduction approaches. TQM – Principles and implementation. 5S Principles and implementation - Value stream mapping - Procedure and principles.

UNIT - III	INTRODUCTION TO LEAN MANUFACTURING	9

Conventional Manufacturing versus Lean Manufacturing – Principles of Lean Manufacturing – Basic elements of lean manufacturing – Introduction to LM Tools.

UNIT - IV	LEAN TOOLS AND METHODOLOGY	9

Primary tools – Workplace organization – Stability - Just-In-Time – Takt time - One piece flow – Pull, Cellular systems, Six Sigma. SMED: Single minute exchange of dies – theory and practice of the SMED system - TPM, Pillars of TPM, Conditions for TPM success,TPM implementation process - Overall Equipment Effectiveness - computation of OEE.

UNIT - V	LEAN INVOLVEMENT AND CULTURE	9

Necessity of involvement – Waste of Humanity – Activities supporting involvement – Kaizen Circle Activity – Practical Kaizen Training – Key factors in Practical Kaizen Training – Lea Culture – Standardization – Standards and abnormality control – Five Why analysis.

Total Instructional hours : 45

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Course Outcomes : Students will be able to	
CO1	Understand the fundamental principle of six sigma.
CO2	Apply techniques, skills and modern engineering tools necessary for production design.
CO3	Understand the principles of Lean Manufacturing.
CO4	Identify the various lean tools and methodologies.
CO5	Understand the implementation of lean and work culture in shop floor.

Text Books	
1.	Dennis P, "Lean Production Simplified: A Plain Language Guide to the World's Most powerful Production System", Productivity Press, New York, 2009.
2.	Liker J. and Meier D., "The Toyota Way", Field book, McGraw-Hill, 2010.
3.	N.Gopalakrishnan, "Simplified Lean Manufacture", PHI, 2010.

Reference Books	
1.	Devadasan S. R., Mohan Sivakumar V., Murugesh R. and Shalij P. R., "Lean and Agile Manufacturing: Theoretical, Practical and Research Futurities", Prentice Hall of India Learning Limited, New Delhi, 2012.
2.	Gopalakrishnan N., "Simplified Lean Manufacture: Elements, Rules, Tools and implementation", Prentice Hall of India Learning Private Limited, India, 2010.
3.	Bill Carr ira, "Lean Manufacturing that Works: Powerful Tools for Dramatically Reducing Wastes and Maximizing Profits", Prentice Hall of India Learning Private Limited, India, 2009.
4.	Don Tapping, Tom Lu ster and Tom Shuker, "Value Stream Management: Eight Steps to Planning, Mapping and Sustaining Lean Improvements", Productivity Press, New York, USA, 2007.

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B.E.	B19ECP801 – PROJECT WORK PHASE – II	T	P	TU	C
		0	16	0	8

Course Objectives	
1.	To develop their own innovative ideas into prototype.
2.	To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same.
3.	To Design and develop projects based on hardware and software for electrical systems.
4.	To improve the team building, communication and management skills among the students.
5.	To train the students in preparing project reports and viva voce examination.

Project work may be assigned to a single student or to a group of students not exceeding 4 per group, under the supervision of faculty guide(s). The Head of the Department shall constitute a review committee for each programme. There shall be a minimum of three faculty members in the review committee. There shall be three reviews in total, during the semester by a review committee. The student shall make presentation on the progress made before the committee.

Interim project report shall be submitted before the project reviews with the approval of the guide. The Project Report, prepared according to the approved guidelines and duly signed by the guide and the Head of the Department, shall be submitted to the department as per the timeline announced by the department. The End Semester Examination for project work shall consist of evaluation of the final project report by an external examiner, followed by a viva-voce examination conducted separately for each student, by a committee consisting of the external examiner, and an internal examiner. The Controller of Examinations (CoE) shall appoint Internal and External Examiners for the End Semester Examination of the Project Work.

Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Identify the problems of society with current relevance.
CO2	Originate theoretical concepts to societal/Industrial complex problems with team work and multidisciplinary approach.
CO3	Design Engineering solution by utilizing a systems approach with appropriate software/Hardware tools for the identified problems.
CO4	Improve the software/Hardware modules and communicate effectively the developed project.
CO5	Develop the confidence for the self-education and ability for lifelong learning.

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