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, AERO & MBA)
An ISO 9001 : 2015 Certified Institution

Coimbatore - 641 402.

REGULATIONS, CURRICULUM & SYLLABUS - 2019

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

I to VIII Semester

BACHELOR OF ENGINEERING DEGREE
IN
COMPUTER SCIENCE AND ENGINEERING

DEPARTMENT OF
COMPUTER SCIENCE AND ENGINEERING

Vision and Mission of the Department

Vision

◎	To produce intellectual graduates to excel in the field of Computer Science Engineering and Technologies.

Mission

◎	Providing excellent and intellectual inputs to the students through qualified faculty members.
◎	Imparting technical knowledge in latest technologies through the industry institute interaction and thereby making the graduates ready for the industrial environment.
◎	Enriching the student's knowledge for active participation in co-curricular and extracurricular activities.
◎	Promoting research-based projects in contexts to social, legal and technical aspects.

Program Educational Objectives (PEO's)

PEO 1	Graduates will be successful in their profession by taking part actively in the field of software and technology.
PEO 2	Graduates will be proficient in analyzing and facing the challenges in Computer Science and Engineering.
PEO 3	Graduates will engage in lifelong learning activities by adapting to the advanced software technologies for continuous professional development.

Programme Outcomes (PO's)

A graduate of the Computer Science and Engineering will be able to

PO 1	**Engineering Knowledge :** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex Computer Science Engineering problems.
PO 2	**Problem Analysis :** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and computer engineering sciences.
PO 3	**Design / Development of Solutions :** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations in the field of Computer Science and Engineering.

PO 4	**Conduct Investigations of Complex Problems :** Using research-based knowledge and computer science-oriented research methodologies 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 engineering and IT tools including prediction and modelling to complex computer science 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 Computer Science Engineering solutions in societal and environmental contexts, and demonstrate the knowledge, 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 computer science engineering and management principles and apply these to one's own work, as a member and leader in a team and, to manage projects in multidisciplinary environments.
PO 12	**Lifelong Learning :** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcome (PSO's)	
A graduate of the Computer Science and Engineering will be able to	
PSO 1	Categorize the basic engineering knowledge to solve the problems in Computer Science and Engineering according to the environmental needs.
PSO 2	Apply the modern tools to design and develop the software system ethically to the industrial needs.

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	
Bio Medical Engineering	
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 training activities 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 assessment 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-1, CIA-2, CIA-3 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 (1st semester) / 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 (2nd to 8th 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		
3.	Project Work		
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 Attendance Mark

Marks are awarded for the attendance earned by the students for individual courses as per the following table.

Attendance Range in %	Marks to be earned by the students
96 - 100	5
91 - 95	4
86 - 90	3
81 - 85	2
75 - 80	1

13.2 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

13.3 Theory Courses

Continuous Internal Assessment tests are conducted by the Office of the Controller of Examination. Continuous Internal Assessment comprises three Continuous assessment tests, Assignment / Class test / Presentation / Online Test / Mini projects / Tutorials and Attendance. By adopting this method, the students will go through a continuous and systematic study pattern. The Corresponding weightages are given below.

Table 8 : Continuous Internal Assessment Test for UG Theory Courses

Particulars	Syllabus	Duration	Exam Mark	Internal Mark
Continuous Internal Assessment I	1.5 Units	1.5 hours	50 marks	10
Continuous Internal Assessment II	1.5 Units	1.5 hours	50 marks	10
Continuous Internal Assessment III	1.5 Units	1.5 hours	50 marks	10
Assignment / Class Test / Online Test / Mini Project / Tutorial / Presentation/ Online course/Certificate Course				5
Attendance				5
Total				40

13.4 Criteria for Assessment for Lab Courses

Every exercise / experiment in all practical courses shall be evaluated on a continuous basis. The criteria for Continuous Assessment (for each cycle of exercise/experiment) are given in Table 9.

Table 9 : Assessment for Lab Courses

Sl. No.	Description		Weightage
1.	Continuous Internal Assessment Marks (CIAM)		
	a.	Average of Experimental Report / Workbook	25
	b.	Model examination	10
	c.	Attendance	5
	Total CIAM		**40**
2.	Semester End Exam Marks (ESEM)		
	a.	Lab Examination with Viva Voce	60
	Total ESM		**60**
		Total Marks	**100**

13.5 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

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

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

Sl. No.	Redressal Sought	Methodology	
		Regular Exam	Arrear Exam
1.	Revaluation	⊙ Apply for photo copy of answer book ⊙ Then apply for revaluation after course expert recommendation	
2.	Challenge of Evaluation	⊙ Apply for photo copy of answer book ⊙ Then apply for revaluation after course expert recommendation ⊙ Next apply for challenge of evaluation	
Note : All applications to be made to COE along with the payment of the prescribed fee.			

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 favor 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

Absolute grading system is adopted in converting marks to grads.

16.1 Absolute Grading Policy

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

Table - 13 : Absolute Grading - Letter Grade and its Range

Sl.No.	Range of percentage of total marks	Letter Grade	Grade Points
1.	91 - 100	O (Outstanding)	10
2.	81 - 90	A+ (Excellent)	9

3.	71 - 80	A (Very Good)	8
4.	61 - 70	B+ (Good)	7
5.	50 - 60	B(Average)	6
6.	<50	RA (Re-appearance)	0
7.	Shortage of Attendance	RA (Re-appearance due to shortage of attendance)	0
8.	Absent	RA (Re-appearance due to absence	0
9.	Withdrawal from examination	W	0
10.	Pass in Mandatory non-credit courses	P	0
11.	Fail in Mandatory non-credit courses	F	0

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”. ‘RA’ indicates that Reappearance is mandatory for that course concerned. ‘SA’ denotes shortage of attendance (as per Clause 9) and hence prevented from writing the End Semester Examination. P and F are grades for mandatory, but non-credit courses.

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.

$$\textbf{S}\text{emester }\textbf{G}\text{rade }\textbf{P}\text{oint }\textbf{A}\text{verage} = \frac{\sum(C_i \times GP_i)}{\sum C_i}$$

where $\mathbf{C_i}$ is the credit for a course in that semester and $\mathbf{GP_i}$ 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 **C**umulative **G**rade **P**oint **A**verage **(CGPA)** up to that point of time

$$\textbf{C}\text{umulative }\textbf{G}\text{rade }\textbf{P}\text{oint }\textbf{A}\text{verage} = \frac{\sum(C_i \times GP_i)}{\sum C_i}$$

where $\mathbf{C_i}$ is the credit for each course in each of the completed semesters at that stage and $\mathbf{GP_i}$ 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

Sl.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 8 semesters and 6 semesters in the case of Lateral Entry) in the student's First Appearance within five years 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 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 passed the examination in **First class** : ⊙ Should have passed the examination in all the courses of all eight semesters and 6 semesters in the case of Lateral Entry) **within Six years** and Five 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 six years and five years in the case of lateral entry) for award of First class ⊙ Should have secured a CGPA of not less than **7.00**.
3.	**Second Class**	All other students (not covered in clauses Sl.No.1 and 2 under clause 18) who qualify for the award of the degree (vide Clause 19) 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 planning 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 :	**Course Type**
Bachelor Degree (B.E./B.Tech) - B	T - Theory
Master's Degree (M.E./M.Tech/MBA/MCA) - M	P - Practical / Project/ Internship
Regulation :	E - Elective
R - 19	O - Open Elective
Department Code :	C - One Credit Courses
AE - Aeronautical Engineering	N - Online courses
AG - Agricultural Engineering	S-Special Electives
BT - Bio Technology	
BM - Bio Medical Engineering	**Semester**
CS - Computer Science and Engineering	1 - First Semester
EC - Electronics and communication Engineering	2 - Second Semester
	3 - Third Semester
EE - Electrical and Electronics Engineering	4 - Fourth Semester
ME - Mechanical Engineering	5 - Fifth Semester
CA - Computer Application	6 - Sixth Semester
MB - Management Studies	7 - Seventh Semester
CH - Chemistry	8 - Eighth Semester
EN - English	
PH - Physics	**Sequence Number**
MA - Mathematics	00-99
MC - Mandatory Course	
CE - Career Enhancement	

ANNEXURE - II

POLICY ON MALPRACTICES

GENERAL

- It shall be the endeavor 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 honor 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 neighboring 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	

8.	The candidate possessing cell phones/ programmable calculator(s)/any other electronic storage device(s) gadgets	Invalidating the examination of the particular subject written by the candidate
9.	The candidate possessing cell phones/ programmable calculator(s)/any other electronic storage device(s) gadgets	Invalidating the examination of the particular subject written by the candidate
10.	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.	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.
11.	The candidate possessing cell phone(s)/ programmable calculator(s)/any other electronic storage device(s) gadgets and containing incriminating materials (whether used or not).	
12.	The Candidate possessing the question paper of another candidate with additional writing on it.	
13.	The candidate passing his/her question paper to another candidate with additional writing on it	
14.	The candidate passing incriminating materials brought into the examination hall in any medium (hard/soft) to other candidate(s).	
15.	The candidate copying from neighboring candidate.	
16.	The candidate taking out of the examination hall answer booklet(s), used or unused	
17.	Appeal by the candidate in the answer script coupled with a promise of any form of consideration.	
18.	Candidate destroying evidence relating to an alleged irregularity.	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.
19.	Vulgar/offensive writings by the candidate in the answer script.	Invalidating the examinations of all the theory and practical subjects of the current semester and all the arrears -subjects registered by the candidate.
20.	The candidate possessing the answer script of another candidate	
21.	The candidate passing his /her answer script to another candidate	
22.	Involved in any one or more of the malpractices of serial no. 8 to 21 for the second or subsequent times.	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. ii. If the candidate has completed the programme, he/she is prevented from writing the examinations of the arrears - subjects for two subsequent semesters.
23.	The candidate substituting an answer book let prepared outside the examination hall for the one already distributed to the candidate	

24.	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.	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.
25.	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.	
26.	Candidate possessing any fire arm / weapon inside the examination hall.	
27.	Cases of Impersonation	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.

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	40	60	100	2
B19CSP101	Problem Solving and Python Programming Laboratory	ES	4	0	4	0	3	40	60	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
B19CST201	Programming in C	PC	3	0	0	3	3	40	60	100	3
B19ECT203	Digital Logic and System Design	PC	3	0	0	3	3	40	60	100	3
B19HST201	தமிழ்மரபு / Heritage of Tamils	HS	1	1	0	0	3	40	60	100	1
B19CHP101	Chemistry Laboratory	BS	4	0	4	0	3	40	60	100	2
B19CSP201	C Programming Laboratory	PC	0	4	2	3	3	40	60	100	2
B19MEP201	Basic Workshop Practice Laboratory	ES	4	0	4	0	3	40	60	100	2
B19CEP201	Soft Skills - I	CEC	2	0	2	0	-	100	-	100	1
Total Contact Hours/Week			30	15	12	1	Total Credits				24

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Semester - III											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19MAT301	Discrete Mathematics	**BS**	4	3	0	1	**3**	40	60	100	**4**
B19CST301	Computer Architecture	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CST302	Data Structures	**PC**	4	3	0	1	**3**	40	60	100	**4**
B19CST303	Operating Systems	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CST304	Object Oriented Programming	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19MCT301	Environmental Sciences	**MC**	3	3	0	0	**3**	-	-	-	**NC**
B19HST301	தமிழரும் தொழில் நுட்பமும் / Tamils and Technology	**HS**	1	1	0	0	**3**	40	60	100	1
B19CSP301	Data Structures Laboratory	**PC**	2	0	2	0	**3**	40	60	100	**1**
B19CSP302	Operating Systems Laboratory	**PC**	2	0	2	0	**3**	40	60	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**
Total Contact Hours / Week			**28**	**18**	**8**	**2**	**Total Credits**				**22**

In-plant Training : Minimum ONE week duration has to be completed (Review will be conducted in first week of Sem IV and its credit will be included in Sem IV)

BoS Chairman

Semester - IV											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19MAT401	Probability and Queuing Theory	BS	4	3	0	1	3	40	60	100	4
B19CST401	Computer Networks	PC	3	3	0	0	3	40	60	100	3
B19CST402	Database Management Systems	PC	3	3	0	0	3	40	60	100	3
B19CST403	Design and Analysis of Algorithms	PC	4	3	0	1	3	40	60	100	4
B19CST404	Programming in Java	PC	3	3	0	0	3	40	60	100	3
B19MCT302	Indian Constitution	MC	3	3	0	0	3	-	-	-	NC
B19CSP401	Database Management and Systems Laboratory	PC	4	0	4	0	3	40	60	100	2
B19CSP402	Java Programming Laboratory	PC	4	0	4	0	3	40	60	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 - Duration 15 days (Review will be conducted in first week of Sem v and its credit will be included in Sem V)

Online Certificate Course (like NPTEL, Course era, Udemy) has to be completed within second year (NC)

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	
B19CST501	Software Engineering	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19ECT601	Microprocessors and Microcontrollers	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CST503	Theory of Computation	**PC**	4	3	0	1	**3**	40	60	100	**4**
B19CST504	Web Technology	**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**
B19CSP501	Internet Programming Laboratory	**PC**	4	0	4	0	**3**	40	60	100	**2**
B19ECP602	Microprocessors and Microcontrollers Laboratory	**PC**	4	0	4	0	**3**	40	60	100	**2**
B19CSP502	Mini Project	PW	4	0	4	0	**3**	100		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**	**16**	**1**	**Total Credits**				**27**

Semester - VI											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19CST601	Data Science and Big Data Analytics	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CST602	Compiler Design	**PC**	4	3	0	1	**3**	40	60	100	**4**
B19CST603	Cloud Computing	**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**
B19CSP601	Compiler Design Laboratory	**PC**	4	0	4	0	**3**	40	60	100	**2**
B19CSP602	Cloud Computing Laboratory	**PC**	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			**29**	**18**	**10**	**1**	**Total Credits**				**23**

Online Certificate Course (like NPTEL,COURSERA, UDEMY) has to be completed within Third year (NC)

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	
B19CST701	Cryptography and Network Security	PC	3	3	0	0	3	40	60	100	3
B19CST702	Internet of Things	PC	3	3	0	0	3	40	60	100	3
	Professional Elective - IV	PE	3	3	0	0	3	40	60	100	3
	Professional Elective - V	PE	3	3	0	0	3	40	60	100	3
	Open Elective - III	OE	3	3	0	0	3	40	60	100	3
B19CSP701	Network Security Laboratory	PC	4	0	4	0	3	40	60	100	2
B19CSP702	Advanced Data Analytics Laboratory	PC	4	0	4	0	3	40	60	100	2
B19CSP703	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-VI	PE	3	3	0	0	3	40	60	100	3
	Open Elective- IV	OE	3	3	0	0	3	40	60	100	3
B19CSP801	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

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**	40	60	100	**2**
B19MAT201	Integral Calculus and Complex Analysis	**BS**	4	3	0	1	**3**	40	60	100	**4**
B19CHT!01	Engineering Chemistry	**BS**	3	3	0	0	**3**	40	60	100	**3**
B19CHP101	Chemistry Laboratory	**BS**	4	0	4	0	**3**	40	60	100	**2**
B19MAT301	Discrete Mathematics	**BS**	4	3	0	1	**3**	40	60	100	**4**
B19MAT401	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**	40	60	100	**2**
B19ECT203	Digital Logic and System Design	**3**	3	0	0	3	**40**	60	100	3	**2**
B19MEP201	Basic Workshop Practices Laboratory	**ES**	4	0	4	0	**3**	40	60	100	**2**

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PROFESSIONAL CORE (PC)											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19CST201	Programming in C	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CSP201	C Programming Laboratory	**PC**	4	0	2	0	**3**	40	60	100	**2**
B19CST301	Computer Architecture	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CST302	Data Structures	**PC**	4	3	0	1	**3**	40	60	100	**4**
B19CST303	Operating Systems	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CST304	Object oriented Programming	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CSP301	Data Structures Laboratory	**PC**	2	0	2	0	**3**	40	60	100	**1**
B19CSP302	Operating Systems Laboratory	**PC**	2	0	2	0	**3**	40	60	100	**1**
B19CST401	Computer Networks	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CST402	Database Management Systems	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CST403	Design and Analysis of Algorithms	**PC**	4	3	0	1	**3**	40	60	100	**4**
B19CST404	Programming in Java	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CSP401	Database Management and Systems Laboratory	**PC**	4	0	4	0	**3**	40	60	100	**2**
B19CSP402	Java Programming Laboratory	**PC**	4	0	4	0	**3**	40	60	100	**2**
B19CST501	Software Engineering	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CST502	Microprocessors and Microcontrollers	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CST503	Theory of Computation	**PC**	4	3	0	1	**3**	40	60	100	**4**
B19CST504	Web Technology	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CSP501	Internet Programming Laboratory	**PC**	4	0	4	0	**3**	40	60	100	**2**
B19CSP502	Microprocessors and Microcontrollers Laboratory	**PC**	4	0	4	0	**3**	40	60	100	**2**
B19CST601	Cloud Computing	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CST602	Internet of Things	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CST603	Compiler Design	**PC**	4	3	0	1	**3**	40	60	100	**4**
B19CSP602	Cloud Computing Laboratory	**PC**	4	0	4	0	**3**	40	60	100	**2**
B19CSP601	Compiler Design Laborator	**PC**	4	0	4	0	**3**	40	60	100	**2**
B19CST701	Cryptography and Network Security	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CST702	Internet of Things	**PC**	3	3	0	0	**3**	40	60	100	**3**
B19CSP701	Network Security Laboratory	**PC**	4	0	4	0	**3**	40	60	100	**2**
B19CSP702	Advanced Data Analytics Laboratory	**PC**	4	0	4	0	**3**	40	60	100	**2**

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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	
B19CSE501	Data Warehousing and Data Mining	PE	3	3	0	0	3	40	60	100	3
B19CSE502	TCP/IP socket Programming	PE	3	3	0	0	3	40	60	100	3
B19CSE503	Distributed Systems	PE	3	3	0	0	3	40	60	100	3
B19CSE504	Object Oriented Modeling and Design	PE	3	3	0	0	3	40	60	100	3
B19CSE505	Natural Language Processing (NLP)	PE	3	3	0	0	3	40	60	100	3
B19CSE506	Computer Graphics	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	
B19CSE601	Software Testing	PE	3	3	0	0	3	40	60	100	3
B19CSE602	Multimedia Systems	PE	3	3	0	0	3	40	60	100	3
B19CSE603	Mobile Computing	PE	3	3	0	0	3	40	60	100	3
B19CSE604	Web Service and Service Oriented Architecture	PE	3	3	0	0	3	40	60	100	3
B19CSE605	Artificial Intelligence	PE	3	3	0	0	3	40	60	100	3
B19CSE606	Speech Processing	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	
B19CSE607	Agile and Xtreme Programming	PE	3	3	0	0	3	40	60	100	3
B19CSE608	Wireless and Sensor Networks	PE	3	3	0	0	3	40	60	100	3
B19CSE609	Biometrics Systems	PE	3	3	0	0	3	40	60	100	3
B19CSE610	E-Commerce	PE	3	3	0	0	3	40	60	100	3
B19CSE611	Machine Learning Techniques	PE	3	3	0	0	3	40	60	100	3
B19CSE612	Social Network Analysis	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	
B19CSE701	Software Quality Assurance	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE702	Multi-core Architectures and Programming	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE703	High performance Computing	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE704	Soft Computing	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE705	Deep Learning	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19ECE702	Digital Image Processing	**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	
B19EEE703	Principles of Management and Professional Ethics	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE708	Enterprise Computing	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE709	Information Retrieval Techniques	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE710	Real Time Systems	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE711	Agent based Intelligent Systems	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE712	Intellectual Property Rights	**PE**	3	3	0	0	**3**	40	60	100	**3**

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SEMESTER - VIII											
ELECTIVE - VI											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19CSE801	Software Project Management	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE802	Network and Routing Protocols	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE803	Financial Management	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE804	Green Computing	**PE**	3	3	0	0	**3**	40	60	100	**3**
B19CSE805	Digital Forensics	**PE**	3	3	0	0	3	40	60	100	3
B19CSE806	Fundamentals of Nano Science	**PE**	3	3	0	0	3	40	60	100	3

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**
B19ECO501	Logic and Distributed Control 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**

BoS Chairman

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	Geographic Information System	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

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 Nanotechnology	OE	3	3	0	0	3	40	60	100	3
B19ECO701	Introduction to Communication Systems	OE	3	3	0	0	3	40	60	100	3
B19EEO701	Hybrid Electrical Vehicles	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

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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	0	3	0	**3**	40	60	100	**3**
B19BTO801	Biological Waste Management	**OE**	3	3	0	0	**3**	40	60	100	**3**
B19ECO801	Wireless Technologies	**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	0	3	0	**3**	40	60	100	**3**

PROJECT WORK (PW)											
Course Code	Course Name	Category	Instructional Hours				Assessment				Credit
			Contact Periods	T	P	TU	Hours of Exam. (ESE)	CIA	ESE	Total	
B19CSP502	Mini Project	**PW**	4	0	4	0	**3**	100	-	100	**2**
B19CSP703	Project work Phase - I	**PW**	6	0	6	0	**3**	40	60	100	**2**
B19CSP801	Project Work Phase - II	**PW**	16	0	16	0	**3**	40	60	100	**8**

BoS Chairman

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**
	In plant Training	**CEC**	-	-	-	-	**-**	-	-	-	**NC**
B19CEP401	Career Ability Course - I	**CEC**	2	0	2	0	**-**	100	-	100	**NC**
	NPTEL Online Certificate Courses	**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**
	NPTEL Online Certificate Courses	**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**
B19MCP701	Professional Readiness for Innovation Employability and Entrepreneurship	**MC**	6	0	6	0	**3**	100	-	100	**3**

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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	Short comprehension passages, practice in skimming-scanning
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
Language development	Spelling and Punctuations, modal verbs
Vocabulary development	Collocations
	Total Instructional hours : 60

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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

BoS Chairman

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.		

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).		

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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	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.

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.

BoS Chairman

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, Einstein„s 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.

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; Schroedinger„s time independent and time dependent equations, particle in a one-dimensional rigid box- Applications; Scanning Electron Microscope(SEM) and Transmission Electron Microscope (TEM).

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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 applications.
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.

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.

BoS Chairman

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	Make use of 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.

27/7/19

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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 basic engineering curves and freehand sketching of basic geometrical constructions and multiple views of objects.
CO2	Construct the projections of points, straight lines, planes.
CO3	Construct the various projection of simple solids.
CO4	Identity intricate detours of components through and develop its surface.
CO5	Develop visualization skills in isometric perspective views.

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

Reference Books

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1.	K.R.Gopalakrishna., “Engineering Drawing” (Vol.I&II combined) SubhasPublications, Bangalore, 2018.
2.	K.V.Natarajan, “A text book of Engineering Graphics”, 28th 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 : Students will be able to	
CO1	Classify the elastic properties of the materials by using uniform, non- uniform Bending method and torsional pendulum apparatus.
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	Interpret the thermal conductivity of bad conductor using Lee's Disc apparatus.

BoS Chairman

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 ltrasonic 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.	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.
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

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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 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	B19CEP101 - LIFE SKILLS (COMMON TO ALL BRANCHES)	T	P	TU	C
		0	2	0	NC

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 Life time 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
Vocabulary development	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.
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, 2ndEdition, 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.

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.

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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 about the basics of Polymer Chemistry.
CO3	Relate the principles of electrochemical reactions and corrosion.
CO4	Outline the concepts of energy devices and its engineering applications.
CO5	Outline the basics of Nano-chemistry and its applications.

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.	B19CST201 - PROGRAMMING IN C	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basics of Structured Programming.
2.	To learn about the arrays, strings and their operations.
3.	To develop an application using functions and its methods.
4.	To develop a C program by using pointers and call by reference methods.
5.	To create a simple application using structures, Union and Files

UNIT - I	STRUCTURED PROGRAMMING	7

Algorithms, building blocks of algorithms(instructions/statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving.

UNIT - II	ARRAYS AND STRINGS	11

Introduction to C Programming - Operators and Expressions - Data Input and Output - Control Statements. Array: Defining an array - Processing an array - Multidimensional Arrays Character Arithmetic - Defining a string - NULL character - Initialization of Strings - Reading and Writing
Strings: Processing Strings -Searching and Sorting of Strings.

UNIT - III	FUNCTIONS, STORAGE CLASSES	9

Defining a function - Accessing a function - Function prototypes - Passing arguments to a function - Passing arrays to functions - Function with string - Recursion - Storage classes.

UNIT - IV	POINTERS	9

Pointer Fundamentals - Pointer Declaration - Passing Pointers to a Function - Pointers and one dimensional arrays - operations on pointers- Dynamic memory allocation.

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UNIT - V	STRUCTURES, UNIONS AND FILES	9
Structures and Unions: Defining a Structure - Processing a Structure - User defined data types (Typedef) - Unions. **Files:** Opening and Closing a Data File - Reading and writing a data file - Processing a data file - Unformatted data files - Concept of binary files - Accessing a file randomly using seek.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Compare different problem-solving techniques.
CO2	Make use of appropriate data types and control structures for solving a given problem.
CO3	Utilize different array and string operations GH112.
CO4	Identity the usage of pointers and functions.
CO5	Organize data using structures and unions and files.

Text Books	
1.	Anita Goel and Ajay Mittal, “Computer Fundamentals and Programming in C”, Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2016.
2.	Yashavant P. Kanetkar. “Let Us C”, 16th Edition, BPB Publications, 2016.

Reference Books	
1.	Byron S Gottfried, “Programming with C”, Schaum"s Outlines, Fourth Edition, Tata McGraw-Hill, 2018
2.	Reema Thareja, “Programming in C”, Second Edition, Oxford University Press, 2016.
3.	Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009.
4.	Dromey R.G., “How to Solve it by Computer”, Pearson Education, Fourth Reprint, 2007.
5.	Kernighan, B.W and Ritchie, D.M, “The C Programming language”, Second Edition, Pearson Education, 2006.

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B.E.	B19ECT203 - DIGITAL LOGIC AND SYSTEM DESIGN	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To design digital circuits using simplified Boolean functions
2.	To analyze and design combinational circuits
3.	To analyze and design synchronous and asynchronous sequential circuits
4.	To understand Programmable Logic Devices
5.	To write HDL code for combinational and sequential circuits

UNIT - I	BOOLEAN ALGEBRA AND LOGIC GATES	9

Number Systems - Arithmetic Operations - Binary Codes- Boolean Algebra and Logic Gates - Theorems and Properties of Boolean Algebra - Boolean Functions - Canonical and Standard Forms - Simplification of Boolean Functions using Karnaugh Map - Logic Gates - NAND and NOR Implementations.

UNIT - II	COMBINATIONAL LOGIC	9

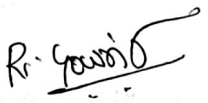
Combinational Circuits - Analysis and Design Procedures - Binary Adder-Subtractor - Decimal Adder - Binary Multiplier - Magnitude Comparator - Decoders - Encoders - Multiplexers - Introduction to HDL - HDL Models of Combinational circuits.

UNIT - III	SYNCHRONOUS SEQUENTIAL LOGIC	9

Sequential Circuits - Storage Elements: Latches , Flip-Flops - Analysis of Clocked Sequential Circuits - State Reduction and Assignment - Design Procedure - Registers and Counters - HDL Models of Sequential Circuits.

UNIT - IV	ASYNCHRONOUS SEQUENTIAL LOGIC	9

Analysis and Design of Asynchronous Sequential Circuits - Reduction of State and Flow Tables - Race-free State Assignment - Hazards.



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UNIT - V	MEMORY AND PROGRAMMABLE LOGIC	9
RAM - Memory Decoding - Error Detection and Correction - ROM - Programmable Logic Array - Programmable Array Logic - Sequential Programmable Devices.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Simplify digital circuits using Boolean function and K-Map.
CO2	Analyze and design of combinational circuits.
CO3	Analyze and design of Synchronous sequential circuits.
CO4	Develop combinational and sequential circuits using HDL codes.
CO5	Explain the concept of memories and programmable logic devices.

Text Books	
1.	M. Morris R. Mano, Michael D. Ciletti, “Digital Design: With an Introduction to the Verilog HDL, VHDL, and System Verilog”, 6th Edition, Pearson Education, 2017.

Reference Books	
1.	G. K. Kharate, “Digital Electronics”, Oxford University Press, 2010.
2.	John F. Wakerly,“Digital Design Principles and Practices”, Fifth Edition, Pearson Education, 2017.
3.	Charles H. Roth Jr, Larry L. Kinney, “Fundamentals of Logic Design”, Sixth Edition, Cengage Learning, 2013.
4.	Donald D. Givone, “Digital Principles and Design”, Tata Mc Graw Hill, 2003.

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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 - மிருதங்கம், 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

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	Outline 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.

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

BoS Chairman

B.E.	B19CSP201 - C PROGRAMMING LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To understand the loops and decision-making statements to solve the problem.
2.	To develop the programs using one dimensional and two-dimensional arrays.
3.	Use functions to solve the given problem.
4.	To understand the pointers, structures and unions.
5.	To develop applications in C using file Operations.

LIST OF EXPERIMENTS	
Expt. No.	**Description of the Experiments**
1.	Writing algorithms, flowcharts and pseudo codes for simple problems.
2.	Demonstrate expressions and conversions.
3.	Develop a C program by using if, if-else, switch and nested if statements.
4.	Construct a C Program by using while, do-while and for loops.
5.	Implement one dimensional array, passing arrays to functions and perform array operations insertion, deletion, searching.
6.	Implement two dimensional arrays and passing 2D arrays to functions.
7.	Develop a C Program to perform the String operation using build in methods and arrays.
8.	Construct a C program using function calls, recursion and call by value
9.	Generate a simple application using pointers, call by reference and pointers with arrays.
10.	Implement a C program using structures and unions.
11.	Write a C Program to perform the file operations and modes.
12.	Working with text files, random files and binary files
	Total Instructional hours : 45

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Course Outcomes : Students will be able to	
CO1	Discover algorithms, flowcharts and pseudo code for simple problems.
CO2	Develop a program using control structures.
CO3	Divide use of arrays and strings.
CO4	Inspect use of functions and pointers.
CO5	Choice a heterogeneous data using structures, unions and files.

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, TCC 4.0	30

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	

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Sheet metal	
1.	Tray Funnel
2.	Funnel
	Machine assembly practice and Demonstration
1.	Machine assembly practice on:
2.	Study of centrifugal pump
3.	Study of air conditioner

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 am simple wooden joints using wood working tools and simple components using lathe and drilling machine.
CO3	Analyze simple lap, butt and tee joints using arc welding equipment and simple parts using sheet metal.
CO4	Residential house wiring, Fluorescent lamp wiring and Stair case 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	Assess logic gates (AND, OR, EOR and NOT), Electronic components and equipment’s.

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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.
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. - CSE	B19MAT301 - DISCRETE MATHEMATICS	T	P	TU	C
		3	0	1	4

Course Objectives	
1.	To extend student‘s logical and mathematical maturity and ability to deal with abstraction.
2.	To solve counting problems involving the Combinatorics.
3.	To understand the basic concepts of graph theory.
4.	To familiarize the applications of algebraic structures.
5.	To understand the concepts of lattices and boolean algebra.

UNIT - I	LOGIC AND PROOFS	12

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers - Rules of inference - Introduction to proofs – Proof methods and strategy.

UNIT - II	COMBINATORICS	12

Mathematical induction – Strong induction and well ordering – The basics of counting – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications.

UNIT - III	GRAPHS	12

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism - Euler and Hamilton Paths.

UNIT - IV	ALGEBRAIC STRUCTURES	12

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism‘s – Normal subgroup and cosets – Lagrange‘s theorem - Definition and examples of rings and fields.

UNIT - V	LATTICES AND BOOLEAN ALGEBRA	12

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra.

Total Instructional hours : 60

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Course Outcomes : Students will be able to	
CO1	Construct the Propositional and Predicate Calculus.
CO2	Solve the Mathematical Induction and recurrence relation.
CO3	Make use of Graph models and special types of graphs.
CO4	Develop the concepts of groups.
CO5	Identify the Lattice and Boolean algebra.

Text Books	
1.	Tremblay, J.P. and Manohar.R, " Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011.
2.	Rosen, K.H., "Discrete Mathematics and its Applications", 8th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2018.
3.	NarsinghDeo, Graph Theory with Applications to Engineering and computer Science, Prentice – Hall of India, 2016.

Reference Books	
1.	Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 5th Edition, Pearson Education Asia, Delhi, 2007.
2.	Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
3.	Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.

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B.E. - CSE	B19CST301 - 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, memory hierarchies, cache memories and virtual memories.
5.	To learn the different ways of communication with I/O devices.

UNIT - I	BASIC STRUCTURE OF A COMPUTER SYSTEM	9
Functional Units - Basic Operational Concepts - Performance - Instructions: Language of the Computer - Operations, Operands - Instruction representation - Logical operations - decision making - MIPS Addressing.		

UNIT - II	ARITHMETIC FOR COMPUTERS	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 Datapath - Control Implementation Scheme - Pipelining - Pipelined datapath 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 - Introduction to Graphics Processing Units, Clusters, Warehouse Scale Computers and other Message - Passing 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	Show the basics structure of computers, operations and instructions.
CO2	Model arithmetic and logic unit.
CO3	Outline pipelined execution and design control unit.
CO4	Illustrate parallel processing architectures.
CO5	Summarize the various memory systems and 1/0 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. - CSE	B19CST302 - DATA STRUCTURES	T	P	TU	C
		3	0	1	4

Course Objectives	
1.	To understand the concepts of ADTs.
2.	To design and implement stacks, queues and linked lists.
3.	To understand the complex data structures such as trees and graph.
4.	To understand sorting and searching algorithms.
5.	To understand various hashing Techniques.

UNIT - I	LISTS	12

Abstract Data Types (ADTs) , List ADT, Linked list, Singly linked lists - Representation in memory - Algorithms of several operations: Traversing, Searching, Insertion into, Deletion from linked list - Doubly linked list - operations on it with their algorithms - Circular Linked Lists -all operations and their algorithms.

UNIT - II	STACKS AND QUEUES	12

Stack ADT - Operations - Applications: Evaluating arithmetic expressions, Conversion of Infix to postfix expression - Queue ADT - Types of Queue: Simple Queue, Circular Queue, Priority Queue, deQueue - Operations on each types of Queues- applications of queues.

UNIT - III	TREES	12

Basic Tree Terminologies-Tree Traversals-Different types of Trees: Binary Tree, Expression tree, Threaded Binary Tree, Binary Search Tree, AVL Tree - Tree operations on each of the trees and their algorithms - Applications of Binary Trees - B Tree, B+ Tree: definitions and algorithms.

UNIT - IV	GRAPHS	12

Definition - Representation of Graph - Types of graph - Breadth-first traversal - Depth-first traversal - Topological Sort- Applications of graphs: Shortest path algorithms(Dijkstra's and Floyd's algorithms); Minimum spanning tree (Prim's and Kruskal's algorithms).

UNIT - V	SEARCHING, SORTING AND HASHING TECHNIQUES	9

Searching: Linear Search - Binary Search. Sorting: Bubble sort - Selection sort - Insertion sort -Quick Sort-Merge Sort -Heap Sort. Hashing- Hash Functions - Separate Chaining - Open Addressing - Rehashing - Extendible Hashing.

Total Instructional hours : 60

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Course Outcomes : Students will be able to	
CO1	Build programs to implement linear data structures such as list.
CO2	Apply the linear data structures such as stacks and queues to problems.
CO3	Apply the concept of tree data structure in real world scenarios.
CO4	Develop programs to implement nonlinear data structures such as graph to solve problems.
CO5	Analyze the various searching, sorting and hashing algorithms.

Text Books	
1.	Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2nd Edition, Pearson Education, 2010.

Reference Books	
1.	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, University Press, 2008.
2.	Reema Thareja, “Data Structures Using C”, Second Edition, Oxford University Press, 2011.
3.	M. Tenenbaum and Augestien, “Data Structures using C”, Third Edition, Pearson Education 2007.
4.	J. P. Tremblay and P. G. Sorenson, “An Introduction to Data Structures with applications”, Second Edition, Tata McGraw Hill, 2007
5.	Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education,1983.

BoS Chairman

B.E. - CSE	B19CST303 - 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 TO OPERATING SYSTEMS	9

Overview - Types of systems - Computer system operations - System calls - System structure - Virtual machines. Process Management: Process concepts - Process scheduling - Operations on Process - Cooperating process - 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 - Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel 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; File System Implementation- File System Structure, Directory implementation, Allocation Methods, Free Space Management.

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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 - Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Apply various scheduling algorithms.
CO2	Utilize deadlock, prevention and avoidance algorithms.
CO3	Compare and contrast different memory management schemes.
CO4	Interpret the functionality of file systems.
CO5	Infer 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.

BoS Chairman

B.E. - CSE	B19CST304 - OBJECT ORIENTED PROGRAMMING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To learn the fundamentals of Object oriented programming and to study OOP concepts through C++.
2.	To understand the concepts such as classes and member functions in C++.
3.	To understand the fundamental concepts of object creation and deletion through constructors and destructors.
4.	To study the concepts of inheritance, pointer to classes, virtual and pure virtual functions.
5.	To have knowledge on file processing system and its techniques.

UNIT - I	INTRODUCTION TO OOP	9
Principles of OOP- Applications and structure of C++ program, Different Data types, Variables, Different Operators, expressions, operator overloading and control structures in C++.		

UNIT - II	FUNCTIONS, CLASSES AND OBJECTS	9
Functions, Inline function, function overloading, friend and virtual functions, Specifying a class, C++ program with a class, arrays within a class, memory allocation to objects, array of objects, members, pointers to members and member functions.		

UNIT - III	CONSTRUCTORS, DESTRUCTORS AND OPERATOR OVERLOADING	9
Constructors, Multiple constructors in a class, Copy constructor, Dynamic constructor, Destructors, Operator overloading, Overloading Unary and binary operators, Manipulation of strings using operators.		

UNIT - IV	INHERITANCE, POINTERS, VIRTUAL FUNCTIONS, POLYMORPHISM	9
Derived Classes, Single, multilevel, multiple inheritance, Pointers to objects and derived classes, this pointer, Virtual and pure virtual functions.		

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UNIT - V	FILE OPERATIONS	9
C++ streams and stream classes, formatted and unformatted I/O operations, Output with manipulators, Classes for file stream operations, opening and closing a file, EOF.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the basics of Object Oriented Programming concepts.
CO2	Apply the concept of functions, classes and objects.
CO3	Apply the object initialization and destroy concept using constructors and destructors.
CO4	Build the concept of inheritance to reduce the length of code and evaluate the usefulness, run time polymorphism by using virtual functions, overriding functions and abstract class in programs.
CO5	Apply the concept of I/O operations and file streams.

Text Books	
1.	Object Oriented Programming with C++, E.Balaguruswamy, TMH, 6th Edition, 2013.
2.	Object Oriented Programming using C++, Robert Lafore, Galgotia publication 2010

Reference Books	
1.	The C++ programming Language,Bjarnestroustrup, Addison Wesley, 4th edition, 2013
2.	C++ primer, Fifth edition, Stanley B Lippman, JoseeLajoie, Barbara E, Moo, Addison Wesly 2012.
3.	C++ How to Program, 7th Edition, Harvey M. Deitel and Paul J. Deitel, Prentice Hall, 2010.

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B.E. / B.Tech	B19MCT301 - ENVIRONMENTAL SCIENCES	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 anecosystem - structure and function of an ecosystem - producers, consumers and decomposers - energy flow in the ecosystem - ecological succession - food chains, food webs and ecologicalpyramids - Introduction, types, characteristic features, structure and function of the (a) forestecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams,lakes, rivers, oceans, estuaries) - Introduction to biodiversity definition: genetic, species andecosystem diversity - biogeographical classification of India - value of biodiversity: consumptive use,productive use, social, ethical, aesthetic and option values - Biodiversity at global, national and locallevels - India as a mega-diversity nation - hot-spots of biodiversity - threats to biodiversity: habitatloss, 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 commonplants, 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) Soilpollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards - solid wastemanagement: causes, effects and control measures of municipal solid wastes - role of an individual inprevention of pollution - pollution case studies - disaster management: floods, earthquake, cycloneand landslides. Field study of local polluted site - Urban / Rural / Industrial / Agricultural.

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UNIT - III	NATURAL RESOURCES	9

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 ofsurface and ground water, floods, drought, conflicts over water, dams-benefits and problems - Mineralresources: Use and exploitation, environmental effects of extracting and using mineral resources,case studies - Food resources: World food problems, changes caused by agriculture andovergrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, casestudies - 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 ofnatural resources - Equitable use of resources for sustainable lifestyles. Field study of local area todocument environmental assets - river / forest / grassland / hill / mountain.

UNIT - IV	SOCIAL ISSUES AND THE ENVIRONMENT	9

From unsustainable to sustainable development - urban problems related to energy - waterconservation, rain water harvesting, watershed management - resettlement and rehabilitation ofpeople; 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 ofPollution) act - Water (Prevention and control of Pollution) act - Wildlife protection act - Forestconservation act - enforcement machinery involved in environmental legislation- central and statepollution 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 childwelfare - role of information technology in environment and human health - Case studies.

Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the basic concepts of environment, ecosystem and biodiversity.
CO2	Recognize thedifferent types of pollution and their control measures.
CO3	Discuss various natural resources.

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CO4	Summarize Development and improvement in the standard of living that has lead to serious environmental disasters.
CO5	Explain the causes of population 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.ஃ.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

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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
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
		1	0	0	1

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. - CSE	B19CSP301- DATA STRUCTURES LABORATORY	T	P	TU	C
		0	2	0	1

Course Objectives	
1.	To understand the practical application of linear data structures.
2.	To understand the different operations of search trees.
3.	To familiarize graphs and their applications.
4.	To demonstrate different sorting and searching techniques.
5.	To implement the different hashing techniques.

List of Experiments	
Expt. No.	**Description of the Experiments**
1.	Implementation of Singly, Doubly and Circular Linked list.
2.	Array implementation of Stack and Queue ADTs.
3.	Linked list implementation of Stack and Queue ADTs.
4.	Applications of Stack and Queue ADTs.
5.	Implementation of Binary Search Trees.
6.	Implementation of AVL Trees.
7.	Graph representation and Traversal algorithms.
8.	Applications of Graphs.
9.	Implementation of searching and sorting algorithms.
10.	Hashing - collision resolution techniques.

Course Outcomes : Students will be able to	
CO1	Discover functions to implement linear and non-linear data structure Operations.
CO2	Choose the appropriate linear data structures for solving a given problem.
CO3	Simplify the we of appropriate non-linear data structures for solving a given problem.

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CO4	Assess of-optimal algorithms for searching and sorting.
CO5	Construe approach function algorithm for searching and sorting.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS		
S. No.	**NAME OF THE EQUIPMENT**	**Qty.**
1.	Inter® CoreTM 2 Duo CPU 4600 @ 2.40 Ghz Processor 2 GB DDR 2 RAM 800 MHZ 1 GB SATA Hard Disk Drive Windows 10. Dosbox 4.7 and above, Turbo C 4.0	30

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B.E. / CSE	B19CSP302 - OPERATING SYSTEMS LABORATORY	T	P	TU	C
		0	2	0	1

Course Objectives	
1.	To learn Linux commands and shell programming
2.	To implement various CPU Scheduling Algorithms
3.	To implement Process Creation and Inter Process Communication.
4.	To implement Deadlock Avoidance and Deadlock Detection Algorithms
5.	To implement Page Replacement Algorithms
6.	To implement File Allocation Strategies

List of Experiments	
Expt. No.	**Description of the Experiments**
1.	Basic Linux Commands
2.	Shell Programming
3.	Process Management using System Calls: Fork, Exit, Getpid, Exit, Wait, Close, Stat
4.	Inter-Process Communication using Pipes, Shared Memory and Message Queues
5.	CPU Scheduling Algorithms
6.	Implementation of Semaphores
7.	Deadlock Management: Banker's algorithm of Deadlock Avoidance, Deadlock Detection algorithm
8.	Memory Management Schemes - a)Page Replacement Algorithms b)Implementation of file allocation strategies Implementation of the following Memory Allocation
9.	Implementation of the following Memory Allocation Methods for fixed partition a) First Fit b) Worst Fit c) Best Fit
10.	Disk Scheduling Algorithms
	Total Instructional hours : 45

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Course Outcomes : Students will be able to	
CO1	Function Linux commands and shell programming
CO2	Choose the best CPU scheduling algorithm for a given problem instance
CO3	Analyze 'C' program for Process Creation, synchronization and Inter Process Communication.
CO4	Inspect algorithm for Deadlock Avoidance and Deadlock Detection Algorithms.
CO5	Assess the performance of various page replacement algorithms and file allocation Strategies.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. No.	NAME OF THE EQUIPMENT	Qty.
1.	Intel® CoreTM 2 Duo CPU E4600 @ 2.40 Ghz Processor operating systems : Windows* 7 or later / macOS / Linux. Dosbox 4.7, Turbo C 4.0 and above	30

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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, ShaliniUpadhyay, '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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B.E.	B19CEP302 - PROFESSIONAL CERTIFICATE COURSE - I (INTRODUCTION TO MATLAB)	T	P	TU	C
		0	2	0	1

Course Objectives	
1.	To familiarize the students in introducing and exploring MATLAB software.
2.	To enable the students on how to approach for solving Engineering problems using simulation tools.
3.	To provide a foundation in use of this software for real time applications.
4.	To prepare the students to use MATLAB in the higher semesters includingtheir project works

Module - I	Introduction TO MATLAB, Programs and Functions	10
Introduction - MATLAB Environment- Quick Start - Built-in Functions - MATLAB Variables, Statements, Elementary Math Functions - Help Facility - Programs, Current Folder - Program Development - Electric Current, Voltage and resistor- Functions - Code Analyzer - Tool Box.		

Module - II	Matrices, Vectors, Scalars and Program Flow Control	10
Matrix Definition - Matrix Arithmetic - Method of Least Squares - Function of a Matrix - Special Matrix Manipulations - Resistive Circuit Analysis - Linear Transformations - Singular Value Decomposition - System of Nonlinear Equations - Relational Operators - Logical Operators - If-Elseif-Else-End - For Loop - While Loop - Method of Steepest Descent - Numerical Integration - Switch-Case-Otherwise.		

Module - III	Graphics	10
Figure - Plots - Edit GUI - Color Map - 3-D Plots - Introduction to Simulink.		

Total Instructional hours : 30

Course Outcomes : Students will be able to	
CO1	Apply programming & simulation for engineering problems.
CO2	Assume the importance of this software for Lab Experimentation.
CO3	Test for basic mathematical, electrical, electronic problems in MATLAB.
CO4	Develop basic electrical circuit in Simulink.
CO5	Demonstrate the programming files with GUI & Simulink.

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Semester - IV

B.E.	B19MAT401 - PROBABILITY AND QUEUEING THEORY (CSE)	T	P	TU	C
		3	0	1	4

Course Objectives	
The aim of this course is to	
1.	Understand and conduct computer systems modeling and performance analysis.
2.	Expose to the concepts of one and two dimensional random variables and apply in engineeringdomain.
3.	Introduce the basic probability tools and concepts useful in modeling, such as Markov models.
4.	Develop the fundamental knowledge of basic characteristic features of a queuing system and acquire skills in analyzing queueing models.
5.	Provide the significance of advanced queueing models

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 - Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.		

UNIT - IV	QUEUEING MODELS	12
Markovian queues – Birth and death processes – Single and multiple server queueing models – Little‘s formula - Queues with finite waiting rooms – Queues with impatient customers : Balking and reneging.		

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UNIT - V	ADVANCED QUEUEING MODELS	12
Finite source models - M/G/1 queue – PollaczekKhinchin formula (including proof) - M/D/1 and M/EK/1 as specialcases – Series queues – Open Jackson networks.		
		Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Interpret the concepts of probability and standard distributions.
CO2	Develop the concepts of one and two dimensional random variables and apply in engineering domain.
CO3	Identify the concept of random processes in engineering disciplines.
CO4	Apply the basic characteristic features of a queuing system and acquire skills.
CO5	Construct the network of queues with Poisson external arrivals, exponential service requirements and Jackson networks.

Text Books	
1.	Gross, D., Shortle, J.F, Thompson, J.M and Harris.C.M., Fundamentals of Queueing Theory", Wiley Student 4th Edition, 2014.
2.	Ibe, O.C., Fundamentals of Applied Probability and Random Processes", Elsevier, 2nd Indian Reprint, t2014.

Reference Books	
1.	Hwei Hsu, "Schaum's Outline of Theory and Problems of Probability, Random Variables and Random Processes", Tata McGraw Hill Edition, New Delhi, 2011.
2.	Taha, H.A., "Operations Research", 9th Edition, Pearson India Education Services, Delhi, 2016.
3.	Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2016.
4.	Yates, R.D. and Goodman. D. J., "Probability and Stochastic Processes", 2nd Edition, Wiley India Pvt. Ltd., Bangalore, 2012.

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B.E. - CSE	B19CST401 - COMPUTER NETWORKS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To study the foundational principles, architectures, and techniques employed in computer networks.
2.	To study the concepts of communication networks, protocols and their performance.
3.	To understand the protocol layering and physical level communication.
4.	To analyze the performance of a network.
5.	To learn the functions of network layer and the various routing protocols.

UNIT - I	INTRODUCTION	9

Data Communications - Data Flow - Networks - The Internet - Protocols and Standards - Network Models: Layered Tasks - The OSI Model - TCP/IP Protocol Suite - Addressing - Transmission Media - Connecting LANs, Backbone Networks, and Virtual LANs: Connecting Devices-Circuit Switching and Packet Switching.

UNIT - II	DATA LINK LAYER	9

Introduction - Block Coding - Cyclic codes - Checksum -Data Link Control: Framing - Flow and Error Control - Noiseless Channels - Noisy Channels - HDLC -Multiple Access: Random Access - Channelization-Wired LANs: IEEE Standards- Standard Ethernet

UNIT - III	NETWORK LAYER	9

IPv4 Addresses- IPv6 Addresses - Internetworking - IPv4 - IPv6 - Transition from IPv4 to IPv6 -Address Mapping - Internet Control Message Protocol (ICMP) -Internet Group Management Protocol (IGMP) - Network Layer: Delivery, Forwarding, and Routing.

UNIT - IV	TRANSPORT LAYER	9

Process-to-Process Delivery - User Datagram Protocol (UDP) - Transmission Control Protocol (TCP) - Stream Control Transmission Protocol (SCTP) - Congestion Control and Quality of Service: Data Traffic - Congestion Control - Quality of Services (QoS) - POP3 - IMAP.

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UNIT - V	APPLICATION LAYER	9
Domain Name System (DNS): Domain Name Space - Distribution of Name Space - DNS in the Internet World Wide Web and HTTP - Simple Mail Transfer Protocol - File Transfer Protocol - Security - IPSec - SSL services - Secure Shell (SSH) - TELNET - PGP - Firewalls.		

Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Illustrate the basic concept in modern data communication and computer networking.
CO2	Apply the functions of different layers and in depth knowledge of data link layer.
CO3	Analyze the different protocols and network layer components.
CO4	Outline the basic functions of transport layer and congestion in networks.
CO5	Analyze the working of application layer along with the protocols used.

Text Books	
1.	Behrouz A. Forouzan, “Data Communication and Networking”, 5th Edition, Tata McGraw Hill, 2014
2.	Larry L.Peterson and Bruce S.Davie, “Computer Networks”, Elsevier, 2009

Reference Books	
1.	James F.Kurose and Keith W.Ross, “Computer Networking : A Top-Down Approach Featuring the Internet”, Pearson Education, 2005
2.	Andrew S.Tanenbaum, “Computer Networks”, Pearson Education, 2008
3.	William Stallings, “Data and Computer Communication”, Pearson Education, 2007
4.	Douglas E. Comer and M.S. Narayanan, “Computer Networks and Internets”, Pearson Education, 2008

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B.E. - CSE	B19CST402 - DATABASE MANAGEMENT SYSTEMS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basic concepts of Database Management Systems.
2.	To know different normalization techniques
3.	To learn about the Structured Query Language (SQL)
4.	To provide knowledge in PL/SQL.
5.	To provide knowledge of transaction, locks and recovery strategies of DBMS.

UNIT - I	INTRODUCTION TO DATABASE	9

Databases and Database Users - Actors on the Scene - Advantages of Using the DBMS Approach; Database System Concepts and Architecture - Data Models, Schemas, and Instances - Database Languages and Interfaces - The Database System Environment - Centralized and Client/Server Architectures for DBMSs.

UNIT - II	DATA MODELING AND DATABASE DESIGN	9

Entity-Relationship model - Entity Types, Entity Sets, Attributes, and Keys - Conceptual Design of the COMPANY Database - Relationship Types, Relationship Sets, Roles, and Structural Constraints - Weak Entity Types - Functional dependencies and normalization for relational databases (up to BCNF).

UNIT - III	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 subquery - Single row subquery - Multiple row sub query - Correlated sub query - Views -Index -Different types of indexes

UNIT - IV	ADVANCED SQL	9

Basics of PL / SQL variables - Constants - Procedures parameters - Procedures - Functions - Triggers - Embedded SQL - Case study for NOSQL databases - Cassandra and Mongo DB

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UNIT - V	TRANSACTION PROCESSING	9
Transaction processing: Introduction - ACID Properties -Need for concurrency control - Desirable properties of transaction -Schedule and recoverability - RAID -Shadow paging - Types of locks -Two phase locking - Deadlock - Timestamp based concurrency control - Recovery techniques -Concepts - Immediate update - Deferred update		
		Total Instructional hours : 45

Course Outcomes : Upon completion of the course, students will be able to	
CO1	Outline the basics of database management systems.
CO2	Translate ER model to Relational model to perform database design effectively.
CO3	Apply various normalization techniques on database table.
CO4	Identify the SQL for DB creation and updation.
CO5	Demonstrate transaction and locking protocols.

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

Reference Books	
1.	Understanding SQL - Martin Gruber (3rd unit 50%)
2.	C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
3.	Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, McGraw-Hill College Publications, 2015.

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B.E - CSE	B19CST403 - DESIGN AND ANALYSIS OF ALGORITHMS	T	P	TU	C
		3	0	1	4

Course Objectives	
1.	To understand and apply the algorithm analysis techniques.
2.	To critically analyze the efficiency of alternative algorithmic solutions for the same problem
3.	To explain various computational problem-solving techniques.
4.	To apply appropriate method to solve a given problem.
5.	To demonstrate a familiarity with major algorithms and data structures.

UNIT - I	INTRODUCTION	12

Introduction: Algorithm - Specification - Analysis Framework - Performance Analysis: Space complexity, Time complexity. Asymptotic Notations: Big-Oh notation (O), Omega notation (Ω), Theta notation (Θ), and Little-oh notation (o), Important Problem Types, Mathematical analysis of Non-Recursive and recursive Algorithms.

UNIT - II	DIVIDE AND CONQUER METHODS	12

Divide and Conquer: General method, Binary search, Recurrence equation for divide and conquer, Finding the maximum and minimum, Merge sort, Quick sort, Strassen's matrix multiplication, Advantages and Disadvantages of divide and conquer. Decrease and Conquer Approach: Topological Sort.

UNIT - III	GREEDY METHODS	6

Greedy Method: General method, Knapsack Problem, Job sequencing with deadlines. Minimum cost spanning trees: Prim's Algorithm, Kruskal's Algorithm. Single source shortest paths: Dijkstra's Algorithm. Optimal Tree problem: Huffman Trees and Codes.

UNIT - IV	DYNAMIC PROGRAMMING	6

Dynamic Programming: General method with Examples, Multistage Graphs. Transitive Closure: Warshall's Algorithm, All Pairs Shortest Paths: Floyd's Algorithm, Optimal Binary Search Trees, Knapsack problem.

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UNIT - V	BACKTRACKING AND BRANCH & BOUND METHODS	6
P, NP, NP-Complete, and NP-Hard Problems, Backtracking: N-Queens problem, Sum of subsets problem, Graph coloring, Hamiltonian cycles. Branch and Bound: Assignment Problem, Travelling Sales Person problem, 0/1 Knapsack problem, LC Program and Bound solution.		

Course Outcomes : Students will be able to	
CO1	Analyze the computational complexity of different algorithms.
CO2	Identify computational solution to well known problems like searching, sorting etc
CO3	Apply various problem solving techniques for greedy problems.
CO4	Develop an algorithm using appropriate design strategies for a given problem.
CO5	Examine all the possible solutions for a given problem using Backtracking and Branch & Bound.

Text Books	
1.	Anany Levitin, “Introduction to the Design and Analysis of Algorithms”, Pearson Education, New Delhi, 2013.

Reference Books	
1.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, “Fundamentals of Computer Algorithms”, Galgotia publications, New Delhi, 2013.
2.	Thomas H Cormen, Charles E Leiserson, Ronald L Rivest and Clifford Stein, “Introduction to Algorithms”, MIT Press, New Delhi, 2010.
3.	Basu S K, “Design Methods and Analysis of Algorithms”, PHI Learning, New Delhi, 2010.
4.	Aho A V, Hopcroft J E, and Ullman J D, “The Design and Analysis of Computer Algorithms”, Pearson Education, New Delhi, 2003.

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B.E - CSE	B19CST404 - PROGRAMMING IN JAVA	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand Object Oriented Programming concepts and basic characteristics of Java
2.	To know the principles of inheritance and multithreading
3.	To define exceptions and use I/O streams
4.	To develop a Java Interface and Database Connectivity
5.	To understand dynamic web applications using Servlets and JSP

UNIT - I	INTRODUCTION TO OOP AND 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 - Java Doc comments.

UNIT - II	INHERITANCE AND MULTI THREADING	9

Inheritance - Super classes - sub classes - Protected members - constructors in sub classes- the Object class - abstract classes and methods - final methods and classes. Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication.

UNIT - III	EXCEPTION HANDLING AND I/O	9

Exceptions - exception hierarchy - throwing and catching exceptions - built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics - Streams - Byte streams and Character streams - Reading and Writing Console - Reading and Writing Files.

UNIT - IV	INTERFACE AND DATABASE CONNECTIVITY	12

Interfaces - defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes. Introduction - Establishing Connection - Creation of Data Tables - Entering Data into the Tables - Table Updating.

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UNIT - V	SERVLET AND JSP	12
Introduction to servlet - Servlet life cycle - Developing and Deploying Servlets - JSP Tags and Expressions - JSP Expression Language (EL) - Using Custom Tag. Case study.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Develop simple Java Programs .
CO2	Build the Java programs using the concept of inheritance and multithreading.
CO3	Develop the Java Programs using Exceptions and I/O streams
CO4	Construct a Java database connectivity programs
CO5	Design, Develop and Deploy dynamic web applications using Servlets and JSP

Text Books	
1.	Herbert Schildt, The Complete Reference - Java, Tata McGraw-Hill Education, Tenth Edition, 2017.
2.	Paul J. Deitel, Harvey Deitel ,Java SE8 for Programmers (Deitel Developer Series) 3rd Edition, 2014
3.	Y. Daniel Liang, Introduction to Java programming - comprehensive version - Tenth Edition, Pearson ltd 2015

Reference Books	
1.	Paul Deitel Harvey Deitel ,Java, How to Program, Prentice Hall; 9th edition, 2011.
2.	Cay Horstmann BIG JAVA, 4th edition, John Wiley Sons,2009
3.	Nicholas S. Williams, Professional Java for Web Applications, Wrox Press, 2014.

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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	Develop the knowledge on organization of Indian constitution
CO2	Explain the hierarchy organization of Indian Government
CO3	Explain various systems and applications of State Governments
CO4	Illustrate the power and functional systems of local administration
CO5	Summarize the role and administration of 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 - CSE	B19CSP401- DATABASE MANAGEMENT AND SYSTEMS LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To understand data definitions and data manipulation commands
2.	To learn the use of nested and join queries
3.	To understand functions, procedures and procedural extensions of data bases
4.	To be familiar with the use of a front end tool
5.	To understand design and implementation of typical database applications

List of Experiments	
Expt. No.	**Description of the Experiments**
1.	Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements.
2.	Database Querying - Simple queries, Nested queries, Sub queries and Joins.
3.	Views, Sequences, Synonyms.
4.	Database Programming: Implicit and Explicit Cursors.
5.	Procedures and Functions.
6.	Triggers.
7.	Exception Handling.
8.	Database Design using ER modeling, normalization and Implementation for any application.
9.	Database Connectivity with Front End Tools
10.	Case Study using real life database applications
	Total Instructional hours : 45

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Course Outcomes : Upon completion of the course, students will be able to	
CO1	Categorize typical data definitions and manipulation commands.
CO2	Develop applications to test Nested and Join Queries
CO3	Take part in simple applications that use Views
CO4	Construct PL/SQL blocks using Cursors
CO5	Identify the use of Tables, Views, Triggers, Functions and Procedures
CO6	Make use of Front-end Tool in Database applications

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. No.	NAME OF THE EQUIPMENT	Qty.
1.	Dell optiplex 390 PCs Operating Systems : Windows" 7 or Later, macOS, and Linux. Oracel 10G, XAMPP Server 7.X, Rational Roase 7.X	30

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B.E - CSE	B19CSP402 - JAVA PROGRAMMING LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To teach fundamentals of object oriented programming in Java. Understand various concepts of JAVA.
2.	To familiarize Java environment to create, debug and run simple Java programs.
3.	To demonstrate java compiler and learn how to use swing functionalities to create Java Application.

List of Experiments	
Expt. No.	**Description of the Experiments**
1.	Develop a java application to generate Electricity Bill. Given an integer U denoting the amount of KWh units of electricity consumed, the task is to calculate the electricity bill with the help of the below charges: 1 to 100 units - Rs.10/ Unit 100 to 200 units - Rs. 15/ Unit 200 to 300 units - Rs. 20/ unit above 300 units - Rs. 25/ unit
2.	Develop a java Program to calculate the net salary of an employee by considering the parameters called HRA(House rent allowance),DA(Dearness allowance),GS (Gross salary) and income tax. Let us assume some parameters. HRA=10% of basic salary DA=73% of basic salary GS=basic salary+DA+HRA Income tax=30% of gross salary net salary= GS-income tax
3.	Develop a java Program for Currency Conversion and Currency Exchange generating constructor and get.
4.	Write a java program that implements a multi-threaded program has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd the third thread will print the value of cube of the number
5.	Write a program that creates a user interface to perform integer divisions. The user enters two numbers in the textfields, Num1 and Num2. The division of Num1 and Num2 is displayed in the Result field when the Divide button is clicked. If Num1 or Num2 were not an integer, the program would throw NumberFormatException. If Num2 were Zero, the program would throw an ArithmeticException.Display theexception in a message dialog box

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6.	Define a java program in consideration with the example of vehicles like bicycle, car, bike, etc., they have common functionalities. Define an interface and put all these common functionalities and implement all these functionalities in their own class in their own way.
7.	Write a java program that works as a simple calculator. Use a GridLayout to arrange Buttons for digits and for the + - * % operations. Add a text field to display the result. Handle any possible exceptions like divide by zero.
8.	Write an Applet that illustrates how to process mouse click, enter, exit, press and release events. The background color changes when the mouse is entered, clicked, pressed, released or exited.
9.	Write a java program to create an abstract class named shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class shape. Each one of the class contains only the method print Area() that print the area of the given shape.
10.	Write a java program to simulate a traffic light. The program lets the user select one of the three lights: red, yellow or green. On selecting a button, an appropriate message with ”Stop” or “Ready” or “ Go” should appear above the buttons selected color. Initially, there is no message shown.
11.	Write a java program that displays area of different Figures(Rectangle, Square, Triangle) using the method overloading.
12.	Write a java program to find the details of the students eligible to enroll for the examination (Students, Department and give the eligibility criteria for the enrollment class) using interfaces.
13.	Write a java program to use the HttpSession object to find out the creation time and the last-accessed time for a session.
	Total Instructional hours : 45

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Course Outcomes : Students will be able to	
CO1	Discreate Object oriented features using java.
CO2	Analyze concept of interface and inheritance.
CO3	Determine the concept of exception handing .
CO4	Develop network and window application using awt and swings.
CO5	Examine the concept of session and cookies in application.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. No.	NAME OF THE EQUIPMENT	Qty.
1.	Hp Pro 3090 - Operating Systems : Windows* 7 or later, macOS, and Linux. Java 11 and above, Tomcat Apache. Netbeans 8.X and above	30

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B.E.	B19CEP401 CAREER ABILITY COURSE - I	T	P	TU	C
		0	2	0	1

S. No.	Topics	Hours
1.	**NUMBER SYSTEM** Numbers, HCF and LCM of Numbers, Decimal Fractions, Square Roots & Cube Roots, Problems on Numbers, Surds and Indices	6
2.	**SIMPLIFICATION** Addition, Subtraction, Multiplication, Division, Decimal Fractions BODMAS Rule.	6
3.	**ARITHMETIC ABILITY - I** Average, Problems on Ages, percentage, Profit & Loss, Ratio and Proportion, Partnership.	6
4.	**ARITHMETIC ABILITY - II** Chain Rule, Time and Work, Pipes and cisterns, Time and Distance.	6
5.	**ARITHMETIC ABILITY - III** Problems on trains, Boats and Streams, Allegation or Mixture, Simple interest, Compound Interest.	6
		Total Instructional hours : 30

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Semester - V

B.E. - CSE	B19CST501 - SOFTWARE ENGINEERING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To introduce the basic knowledge of software Engineering and Agile development.
2.	To elucidate the knowledge of requirement analysis.
3.	To provide the knowledge of software design.
4.	To understand the various types of software testing techniques.
5.	To introduce the project management techniques.

UNIT - I	INTRODUCTION	9

Software Engineering Fundamentals - A generic view of Process - Classification of Software- Software Process Models - Process assessment models - Overview of Project Management activities - Introduction to Agility - Agile process - Extreme programming - XP Process.

UNIT - II	REQUIREMENTS AND ANALYSIS	9

Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document - Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management, Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

UNIT - III	SOFTWARE DESIGN	9

Design Engineering: Design Process and Quality - Design Concept - Model - Creating an Architectural Design - Software Architecture - Data Design - Architectural Styles and Patterns - Architectural Design - Mapping Data Flow into Software Architecture - Modelling Component level design - Component- Class based Components - Conducting component level design - Designing conventional components.

UNIT - IV	SOFTWARE VALIDATION MAINTENANCE	9

Validation planning - Testing fundamentals - Test plan Creation and test case generation Black box and White box testing techniques, Unit testing, Integration, Validation, Regression Testing and System testing-Object-oriented testing. Software Implementation Techniques: Refactoring - Maintenance and Reengineering.

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UNIT - V	SOFTWARE CONFIGURATION MANAGEMENT	9
Software Project Management: Estimation - LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model - Project Scheduling - Scheduling, Earned Value Analysis Planning - Project Plan, Planning Process, RFP Risk Management - Identification, Projection - Risk Management-Risk Identification-RMMM Plan. Team management, Project tracking, Software measurement and estimation techniques		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Outline various life cycle models and agile flavous.
CO2	Summarize requirements engineering.
CO3	Outline various design concepts.
CO4	Analyze various testing fundamentals.
CO5	Outline software project management and quality Assurance.

Text Books	
1.	Roger S. Pressman, “Software Engineering - A Practitioner’s Approach”, 8th Edition, Tata McGraw-Hill International Edition, 2015.

Reference Books	
1.	Lan Sommerville, “Software Engineering”, 10th Edition, Pearson Education, Asia, 2016. reference
2.	B. B. Agarwal, S.P. Tayal, Mahesh Gupta, “Software Engineering and Testing”, Jones and Bartlett Publisher, 2010.
3.	Limaye, “Software Testing Principles, Techniques and Tools”, Tata McGraw-Hill, 2016.
4.	Bob, Mike and Rajib, “Software Project Management”, Tata McGraw-Hill, 5th Edition, 2016.

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B.E. - CSE	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
Indrodution 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, Programma ble 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, (16x2) LCD, high power devices, optical motorshaft 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 architecture of 8085 and 8086.
CO2	Build and verify application using peripheral interface with 8085/8086.
CO3	Apply the 8051 Microcontroller based systems.
CO4	Construct the 8051 Microcontroller program in various interfacing circuits.
CO5	Categorical different processor organization.

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

Reference Books:	
1.	Muhammad Ali Mazidi, Janice GillispieMazidi and Rolin D. McKinley, “The 8051 Microcontroller and Embedded Systems”, 2nd Edition, Pearson Education 2008. 12th impression 2018
2.	Krishna Kant, “Microprocessor and Microcontroller Architecture, programming and system design using 8085, 8086, 8051 and 8096’’, PHI, 2007, 7th Reprint, 2015.
3.	Kenneth J. Ayala., “The 8051 Microcontroller, 3rd Edition, Thompson Delmar Learning’’, 2012.
4.	A.K. Ray, K.M. Bhurchandi, “Advanced Microprocessor and Peripherals’’, Tata McGraw-Hill, 2nd Edition, 2010.
5.	Barry B. Brey, “The Intel Microprocessors Architecture, Programming and Interfacing’’, Pearson Education, 2007, 2nd impression, 2010.

BoS Chairman

B.E - CSE	B19CST503 - THEORY OF COMPUTATION	T	P	TU	C
		3	0	1	4

Course Objectives	
1.	To introduce the basic concepts of FSA and languages.
2.	To study the CFL and its properties.
3.	To study PDA and its applications.
4.	To study about Turing machine along with variety of configurations.
5.	To understand the complexities involved in decidability.

UNIT - I	INTRODUCTION TO FINITE AUTOMATA	12

Introduction, Finite State systems - Finite Automata, Deterministic finite automata - Non- deterministic finite automata-NFA with moves - Regular expressions - Equivalence of NFA and DFA - Equivalence of NFA's with and without - moves - Equivalence of FA and Regular expressions -Closure properties - Pumping lemma for Regular sets - Problems - Finite state machines

UNIT - II	CONTEXT FREE LANGUAGES	12

Grammars - Derivations and Languages - Relationship between derivation and derivation trees -Ambiguity - Reduced Grammars - Normal forms - Chomsky normal forms - Greibach normal form

UNIT - III	PUSH DOWN AUTOMATA	12

Definitions - Moves - Instantaneous descriptions-Acceptance by final state and empty stack -Deterministic pushdown automata - Equivalence to CFG and Deterministic PDA - Closure properties of CFL - Pumping lemma for CFL - problems. NDPA - types

UNIT - IV	TURING MACHINE	12

Turing machines - Computable languages and functions - Techniques for Turing machine construction - Storage in finite control - multiple tracks - checking of symbols - subroutines - TM as acceptor and i/o device - Two way infinite tape - Variants of TM

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UNIT - V	UNDECIDABILITY	12
Unsolvable, Halting problems - recursive and Recursively enumerable languages and Properties - Universal TM - Decidability - Rice's Theorem - Post's correspondence problem - emptiness and equivalence problems of languages - classes of P and NP - NP - completeness.		
		Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Illustrate the capabilities and limitations of the abstract machines including finite automata and their associated languages
CO2	Classify grammar, language and its forms and prove using pumping lemma.
CO3	Solve simple computing problems using PDA and its relationship with CFG
CO4	Show that Turing machine along with various computing models.
CO5	Outline the parameters involved in deciding complexities of problems and their types

Text Books	
1.	J.E. Hopcroft, R. Motwani and J.D. Ullman, "Introduction to Automata Theory", Languages and Computations, 3rd Edition, Pearson Education, 2008.

Reference Books	
1.	H.R. Lewis and C.H. Papadimitriou, "Elements of the theory of Computation", Second Edition, Pearson Education, 2003.
2.	Thomas A. Sudkamp, "An Introduction to the Theory of Computer Science", Languages and Machines, Third Edition, Pearson Education, 2007.
3.	Raymond Greenlaw an H.James Hoover, "Fundamentals of Theory of Computation", Principles and Practice, Morgan Kaufmann Publishers, 1998.
4.	Micheal Sipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997
5.	J. Martin, "Introduction to Languages and the Theory of computation", Third Edition, Tata McGraw Hill, 2007.

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B.E - CSE	B19CST504 - 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 study the about the client side scripting with JavaScript and DHTML.
3.	To understand about Web data representation.
4.	To study about the server side scripting with PHP.
5.	To develop web applications dynamically using the database connectivity.

UNIT - I	WEBSITE BASICS, HTML 5, CSS 3, WEB 2.0	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	JAVASCRIPT AND DHTML	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.

UNIT - III	REPRESENTING WEB DATA	9

XML - Documents and Vocabularies - Versions and Declaration - Namespaces JavaScript and XML: Ajax - DOM based XML processing Event - oriented Parsing: SAX - Transforming XML Documents - Selecting XML Data : XPATH - Template-based Transformations : XSLT - Displaying XML Documents in Browsers - Case Study.

UNIT - IV	PHP	9

PHP : Introduction and basic syntax of PHP, decision and looping with examples, PHP and HTML, Arrays, Functions, Browser control and detection, string, Form processing, Files, Advance Features: Cookies and Sessions, Object Oriented Programming with PHP

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UNIT - V	MYSQL	9
Basic commands with PHP examples, Connection to server, creating database, selecting a database, listing database, listing table names, creating a table, inserting data, altering tables, queries, deleting database, deleting data and tables, PHP myadmin and database bugs- case study		
		Total Instructional hours :45

Course Outcomes : Students will be able to	
CO1	Develop an application using HTML
CO2	Build an application using JavaScript and DHTML
CO3	Construct a web page using XML
CO4	Develop an web applications using PHP.
CO5	Develop the modern Web applications using the client and server side technologies and the web design fundamentals.

Text Books	
1.	Kogent Learning Solutions Inc., “Web Technologies Black Book”, Dreamtech Press, 2018.
2.	Robin Nixon, “Learning PHP, MySQL & JavaScript With JQuery, CSS & HTML5”, O’Reilly Media, Incorporated, Sixth Edition, 2020.

Reference Books	
1.	P.J. Deitel & H.M. Deitel, “Internet and World Wide Web How to program”, Pearson, 2020.
2.	B. M. Harwani, “Developing Web Applications in PHP and AJAX”, McGraw-Hill Education (India) Pvt Limited, 2010
3.	Luke Welling, Laura Thomson, “PHP and MySQL Web Development”, 5th Edition, Pearson Education, 2016.

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B.E. CSE	B19CSP501 - INTERNET PROGRAMMING LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To understand Web page design using HTML/XML and style sheets.
2.	To create user interfaces using Java frames and applets.
3.	To learn to create dynamic web pages using server side scripting.
4.	To learn to write Client Server applications and MySQL.
5.	To learn PHP and Java Script programming.

List of Experiments	
Expt. No.	**Description of the Experiments**
1.	Write HTML Program using standard Tags, Table Tags, List Tags, Image Tags and Forms
2.	Create a home page development for any simple application using HTML, FRAMES and CSS.
3.	Client Side Scripts for Validating Web Form Controls using DHTML.
4.	Create and save an XML document at the server, which contains 10 users' information. Write a program which takes User Id as input and returns the user details by taking the user information from the XML document.
5.	Write an XML file which will display the Book information which includes the following: 1) Title of the book 2) Author Name 3) ISBN number 4) Publisher name 5) Edition 6) Price Write a Document Type Definition (DTD) to validate the above XML file.
6.	Create a valid XML document containing details of a car like: id, company name, model, engine and mileage using XML Schema.
7.	Create a XML program for Information Retrieval From Xml Document.
8.	Create a form validation using PHP and Javascript.

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9.	Create a web application for implementation of student information system using PHP and MYSQL.
10.	Create a web application for implementation of Employee information system using PHP and MYSQL.
	Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Construct web page using HTML/XML and style sheets.
CO2	Process the web pages with validation using java script object and by applying different event handling mechanisms
CO3	Category dynamic web pages using server side scripting.
CO4	Discover use of PHP programing to develop web application.
CO5	Test for application using MySQL.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. No.	NAME OF THE EQUIPMENT	Qty.
1.	Intel® Core TMi5 - 4570CPU @ 3.20 GHz Processor Windows 10, Java 1.8, Netbeans 8.X, Tomcat 8.X and above, XAMPP 7.X.	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 2s complement of a number
12.	Unpacked BCD to ASCII
	Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Design and implement programs on 8085 microprocessor.
CO2	Design and implement programs on 8086 microprocessor.
CO3	Design interfacing circuits with 8086.
CO4	Design and implement 8051 microcontroller based systems
CO5	Understand the concepts related to I/O and memory interfacing

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B.E. / B.TECH	B19CEP501 - CAREER ABILITY COURSE - II	T	P	TU	C
		0	2	0	1

S. No.	Topics	Hours
1.	**GENERAL MENTAL ABILITY- I** Analogy, Classification, Series Completion, Coding and Decoding, Blood Relations.	6
2.	**GENERAL MENTAL ABILITY- II** Direction Sense Test, Logical Venn Diagram, Data Sufficiency, Assertion and Reason	6
3.	**NON VERBAL REASONING - I** Mirror Images, Water Images, Embedded Figures, Paper folding and paper cutting, Cubes and Dice	6
4.	**NON VERBAL REASONING - II** Completion of incomplete pattern, Dot Situation, Construction of Squares and Triangles.	6
5.	**DATA INTERPRETATION** Tabulation, Bar Graphs, Pie Chart, Line Graphs	6
		Total Instructional hours : 30

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Professional Elective - I

B.E - CSE	B19CSE501 - DATA WAREHOUSING AND DATA MINING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand data warehouse concepts, architecture, business analysis and tools
2.	To understand the data mining and data pre-processing techniques
3.	To study algorithms for finding hidden and interesting patterns in data.
4.	To understand and apply various classification techniques.
5.	To understand and apply various clustering techniques using weka tool.

UNIT - I	INTRODUCTION	9

Data Warehouse: Introduction - Data warehousing Components - Building a Data warehouse - Database Architectures for Parallel Processing - Parallel DBMS Vendors -- DBMS Schemas for Decision Support. Business Analysis: Multidimensional Data Model - Concept Hierarchies - Characteristics of OLAP Systems - Typical OLAP Operations, OLAP and OLTP.

UNIT - II	DATA MINING	9

Introduction: Knowledge Discovery Process - Data Mining Techniques - Issues - applications- Interestingness of Patterns - Classification of Data Mining Systems. Data

Preprocessing: Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization - Data similarity and dissimilarity measures.

UNIT - III	ASSOCIATION RULE MINING	9

Market Basket Analysis - Frequent Itemsets, Closed Itemsets, and Association Rules- Mining Methods - The Apriori Algorithm - Generating Association Rules, Improving the Efficiency - Pattern Evaluation Method - Introduction to Mining Multilevel Association Rules and Multidimensional Association Rules

UNIT - IV	CLASSIFICATION AND PREDICTION	9

Classification: Basic Concepts - Classification methods - Decision Tree Induction - Bayesian Classification - Rule Based Classification - Classification by Back propagation - Support Vector Machines - Lazy Learners -Techniques to improve Classification Accuracy - **Combining Classifiers:** Bagging, Boosting, Random Forests.- Prediction.

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UNIT - V	CLUSTERING	9
Clustering Techniques: Cluster analysis-Partitioning Methods - Hierarchical Methods - Density Based Methods - Grid Based Methods - Evaluation of clustering - Clustering high dimensional data - Clustering with constraints - Outlier analysis - Introduction to WEKA: Datasets - The Explorer - Getting started, Exploring the explorer, Learning algorithms, Clustering algorithms, Association - rule learners.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Illustrate the functionality of the various data warehousing components and Multidimensional Data Model.
CO2	Explain the concepts of data mining and preprocessing techniques.
CO3	Apply frequent pattern and association rule mining techniques for data analysis
CO4	Apply appropriate classification techniques for data analysis
CO5	Make use of weka tool for data mining applications and apply clustering techniques.

Text Books	
1.	Jiawei Han and Micheline Kamber, “Data Mining Concepts and Techniques”, Third Edition, Elsevier, 2012.

Reference Books	
1.	Alex Berson and Stephen J. Smith, “Data Warehousing, Data Mining & amp; OLAP”, Tata McGraw Hill Edition, 35th Reprint 2016.
2.	Pang-Ning Tan, Michael Steinbach and Vipin Kumar, “Introduction to Data Mining”, Tools and Techniques, Elsevier, Second Edition.

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B.E. - CSE	B19CSE502 - TCP / IP SOCKET PROGRAMMING	L	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand basics of network programming concepts.
2.	To understand client and server interaction process and .
3.	To know socket programming aspects related to IPV6.
4.	To gain knowledge about name convensions, functions and support in IPV6.
5.	To know the features of.

UNIT - I	INTRODUCTION TO NETWORK PROGRAMMING	9

OSI model, Unix standards, TCP and UDP & TCP connection establishment and Format, Buffer sizes and limitation, standard internet services, Protocol usage by common internet application. Sockets: Address structures, value - result arguments, Byte ordering and manipulation function and related functions Elementary TCP sockets - Socket, connect, bind, listen, accept, fork and exec function, concurrent servers. Close function and related function.

UNIT - II	TCP CLIENT / SERVER	9

TCP client server: Introduction, TCP Echo server functions, Normal startup, terminate and signal handling server process termination, Crashing and Rebooting of server host shutdown of server host. Elementary UDP sockets: Introduction UDP Echo server function, lost datagram, summary of UDP example, Lack of flow control with UDP, determining outgoing interface with UDP. I/O Multiplexing: I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server

UNIT - III	SOCKET OPTIONS	9

Socket options: getsockopt and setsockopt functions. Socket states, Generic socket option IPV6 socket option ICMPV6 socket option IPV6 socket option and TCP socket options. Advanced I/O Functions- Introduction, Socket Timeouts, recv and send Functions, read and write Functions, recvmsg and sendmsg Functions, Ancillary Data, Data Queue, Sockets and Standard I/O, T/TCP: TCP for Transactions.

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UNIT - IV	ELEMENTARY NAME AND ADDRESS CONVERSIONS	9
Elementary name and Address conversions: DNS, gethost by Name function, Resolver option, Function and IPV6 support, uname function, other networking information. Daemon Processes and inetd Superserver - Introduction, syslogd Daemon, syslog Function, daemon_init Function, inetd Daemon, daemon_inetd Function Broadcasting- Introduction, Broadcast Addresses, Unicast versus Broadcast, dg_cli Function Using Broadcasting, Race Conditions.		

UNIT - V	RAW SOCKETS	9
Introduction, Raw Socket Creation, Raw Socket Output, Raw Socket Input, Ping Program, Traceroute Program, An ICMP Message Daemon, Datalink Access- Introduction, BPF: BSD Packet Filter, DLPI: Data Link Provider Interface, Linux: SOCK_PACKET, libpcap: Packet Capture Library, Examining the UDP Checksum Field. Remote Login: Terminal line disciplines, Pseudo-Terminals, Terminal modes, Control Terminals, rlogin Overview, RPC Transparency Issues.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Infer the basics of TCP and UDP network concepts.
CO2	Illustrate techniques used in Client Server interaction.
CO3	Outline the socket programming with respect to IPV6.
CO4	Identify the functions and its usage of name conversions in network programming.
CO5	Choose appropriate platform and socket programming techniques for information processing.

Text Books	
1.	Terrance Chan, “Unix system programming using C++”, Prentice Hall, New Delhi, 1997
2.	Stevens W.R, Fenner B, Andrew M, “Unix network programming”, 3rd Edition, Addison Wesly, 2004.

Reference Books	
1.	Lewis van Winkle, “Hands-on Network programming with C”, Packt, 2019.

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B.E. CSE	B19CSE503 - DISTRIBUTED SYSTEMS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the foundations of distributed systems.
2.	To learn issues related to clock Synchronization and the need for global state in distributed systems.
3.	To learn distributed mutual exclusion and deadlock detection algorithms.
4.	To understand the significance of agreement, fault tolerance and recovery protocols in distributed systems.
5.	To learn the characteristics of peer-to-peer and distributed shared memory systems.

UNIT - I	INTRODUCTION	9

Introduction: Definition - Relation to computer system components - Motivation - Relation to parallel systems - Message-passing systems versus shared memory systems - Primitives for distributed communication - Synchronous versus asynchronous executions - Design issues and challenges. **A model of distributed computations :** A distributed program -A model of distributed executions -Models of communication networks - Global state - Cuts - Past and future cones of an event - Models of process communications.

UNIT - II	MESSAGE ORDERING & SNAPSHOTS	9

Message ordering and group communication : Message ordering paradigms - Asynchronous execution with synchronous communication - Synchronous program order on an asynchronous system -Group communication - Causal order (CO) - Total order. **Global state and snapshot recording algorithms**: Introduction - System model and definitions - Snapshot algorithms for FIFO channels.

UNIT - III	DISTRIBUTED MUTEX & DEADLOCK	9

Distributed mutual exclusion algorithms: Introduction - Preliminaries - Lamport‘s algorithm -Ricart-grawala algorithm - Maekawa‘s algorithm - Suzuki-Kasami‘s broadcast algorithm. Deadlock detection in distributed systems: Introduction - System model - Preliminaries -Models of deadlocks - Knapp‘s classification - Algorithms for the single resource model, the AND model and the OR model.

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UNIT - IV	RECOVERY & CONSENSUS	9

Check pointing and rollback recovery: Introduction - Background and definitions - Issues in failure recovery - Checkpoint-based recovery - Log-based rollback recovery - Coordinated check pointing algorithm - Algorithm for asynchronous check pointing and recovery. **Consensus and agreement algorithms :** Problem definition - Overview of results - Agreement in a failure - free system - Agreement in synchronous systems with failures.

UNIT - V	P2P & DISTRIBUTED SHARED MEMORY	9

Peer-to-peer computing and overlay graphs: Introduction - Data indexing and overlays - Chord- Content addressable networks - Tapestry. Distributed shared memory: Abstraction and advantages - Memory consistency models - Shared memory Mutual Exclusion.

Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Outline the foundations and issues of distributed systems.
CO2	Explain the various synchronization issues and global state for distributed systems.
CO3	Illustrate the Mutual Exclusion and Deadlock detection algorithms.
CO4	Explain the agreement protocols and fault tolerance mechanisms.
CO5	Illustrate the features of peer-to-peer and distributed shared memory systems.

Text Books	
1.	K. Shemkalyani, Ajay D., and Mukesh Singhal, “Distributed Computing : Principles, Algorithms, and Systems”, Cambridge University Press, 2011.
2.	George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012.

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Reference Books	
1.	Pradeep K Sinha, “Distributed Operating Systems: Concepts and Design”, Prentice Hall of India, 2007.
2.	Tanenbaum A.S., Van Steen M., “Distributed Systems : Principles and Paradigms”, Pearson Education, 2007.
3.	Liu M.L., “Distributed Computing, Principles and Applications”, Pearson Education, 2004.
4.	Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, USA, 2003.

BoS Chairman

B.E. CSE	B19CSE504 - OBJECT ORIENTED MODELLING AND DESIGN	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To introduce the basic concepts of involved in Object-Oriented modelling and their benefits.
2.	To introduce the basic concepts of use-case model, sequence model and state chart model for a given problem.
3.	To introduce the facts of the unified process approach to design and build a Software system.
4.	Translate the requirements into implementation for Object Oriented design.
5.	Choose an appropriate design pattern to facilitate development procedure.

UNIT - I	INTRODUCTION	9

Object orientation - OO development - OO modelling history- Modelling as Design technique - Modelling abstraction- Objects - Link and associations - Generalization and Inheritance - Advanced object and class concepts - Association ends - N ary associations - Aggregation- Multiple inheritance - Constraints - Derived Data - Packages.

UNIT - II	ADVANCED CLASS MODELING AND UML DIAGRAMS	9

Use Case Modeling and Detailed Requirements - Object Oriented Requirements - Sample class model - Navigation of class models - Advanced Class Modeling - Abstract classes - System Processes - A use case Scenario view - Identifying Input and outputs- System sequence diagram - Identifying Object Behavior - State chart Diagram.

UNIT - III	SYSTEM CONCEPTION, DOMAIN ANALYSIS	9

System Conception and Domain Analysis - Development stages in life Cycle - Domain Class model - Communication Diagrams - State machine diagram and Modeling - Domain state model - Domain interaction model - Iterating the analysis - Interaction Diagrams.

UNIT - IV	PROCESS OVERVIEW AND DESIGNS	9

Use case Realization - Design Discipline within iterations - Design Class Diagrams - Realizing Use Case and defining methods - Designing with Communication Diagrams - Activity diagram - Package Diagrams - Component Diagram.

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UNIT - V	APPLICATION ANALYSIS AND DESIGN PATTERNS	9
GRASP - Designing objects with responsibilities - Creator - Information expert - Low Coupling - High Cohesion - Controller Design Patterns - Creational - Factory method - Structural - Bridge - Adapter - Behavioral - Strategy - Observer - Applying GoF design patterns - Mapping design to code		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Develop the capacity to analyzing the modeling in the software development life cycle.
CO2	Apply the Unified modeling Language.
CO3	Identify the object-oriented approach to analyzing and designing systems and software solutions and effective and efficient system designs.
CO4	Show the difference between writing programs for the software and doing analysis and design.
CO5	Identify Problem formulation and decomposition and solution building.

Text Books	
1.	Michael Blaha, James Rumbaugh: Object-Oriented Modeling and Design with UML, 2nd Edition, Pearson Education, 2005.

Reference Books	
1.	**Grady Booch et al:** Object-Oriented Analysis and Design with Applications, 3rd Edition, Pearson Education, 2007.
2.	Brahma Dathan, Sarnath Ramnath: Object-Oriented Analysis, Design, and Implementation, Universities Press, 2009.
3.	Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, 2007.
4.	Simon Bennett, Steve McRobb and Ray Farmer: Object-Oriented Systems Analysis and Design Using UML, 2nd Edition, Tata McGraw-Hill, 2002

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B.E. CSE	B19CSE505 - NATURAL LANGUAGE PROCESSING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To learn the fundamentals of natural language processing
2.	To understand the use of CFG and PCFG in NLP
3.	To implement basic grammar rules for English Language
4.	To understand the role of semantics and pragmatics
5.	To study the variety of NLP applications.

UNIT - I	UNIT I INTRODUCTION	9
Words - Regular Expressions and Automata - Words and Transducers - N-grams - Part-of Speech - Tagging - Hidden Markov and Maximum Entropy Models.		

UNIT - II	UNIT II SPEECH	9
Speech - Phonetics - Speech Synthesis - Automatic Speech Recognition - Speech Recognition - Advanced Topics - Computational Phonology		

UNIT - III	SYNTAX	9
Formal Grammars of English - Syntactic Parsing - Statistical Parsing - Features and Unification - Language and Complexity.		

UNIT - IV	SEMANTICS AND PRAGMATICS	9
The Representation of Meaning - Computational Semantics - Lexical Semantics - Computational Lexical Semantics - Computational Discourse		

UNIT - V	APPLICATIONS	9
Information Extraction - Question Answering and Summarization - Dialogue and Conversational Agents - Machine Translation		
		Total Instructional hours : 45

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Course Outcomes : Students will be able to	
CO1	Infer the given text with basic language features
CO2	Construct an innovative application using NLP components
CO3	Develop a rule based system to tackle morphology/syntax of a language
CO4	Build a tag set to be used for statistical processing for real-time applications
CO5	Compare and contrast the use of different statistical approaches for different types of NLP applications.

Text Books	
1.	Richard M Reese, “Natural Language Processing with Java”, O’ Reilly Media, 2015.
2.	Daniel Jurawsky, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech”, Pearson Publication, 2014.

Reference Books	
1.	Breck Baldwin, “Language Processing with Java and LingPipe Cookbook”, Atlantic Publisher, 2015.
2.	Nitin Indurkhya and Fred J. Damerau, “Handbook of Natural Language Processing”, Second Edition, Chapman and Hall / CRC Press, 2010.
3.	Steven Bird, Ewan Klein and Edward Loper, “Natural Language Processing with Python”, First Edition, O’Reilly Media, 2009.

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B.E. CSE	B19CSE506 - COMPUTER GRAPHICS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To acquire knowledge about graphics devices, software and basic algorithms for geometric objects
2.	To understand the two dimensional graphics with their transformations and clipping techniques.
3.	To understand the three dimensional graphics with their transformations and clipping techniques.
4.	To gain knowledge about illumination methods, rendering and color models.
5.	To understand the design of animations and its realistic features.

UNIT - I	BASIC OF COMPUTER GRAPHICS	9

Basic of Computer Graphics-Applications of computer graphics, Display devices, Random and Raster scan systems, Graphics input devices, Graphics software and standards. Scan conversion: Points & lines, Line drawing algorithms; DDA algorithm, Bresenham's line algorithm, Circle generation algorithm; Ellipse generating algorithm; Fill area primitives: scan-line polygon filling, inside-outside test, Scan-Line fill of Curved Boundary Areas boundary and flood-fill, line attributes, area-fill attributes, character attributes.

UNIT - II	2D TRANSFORMATION & VIEWING	9

Basic transformations: translation, rotation, scaling, matrix representation, homogeneous coordinates, composite transformations, reflection and shearing transformation. Viewing: viewing pipeline and coordinates system, window-to-viewport transformation, two dimensional viewing functions. Clipping: point clipping, line clipping (cohen-sutherland, liang- bersky, NLN), polygon clipping, curve clipping & text clipping.

UNIT - III	THREE DIMENSIONAL CONCEPTS	9

Three dimensional display methods, Three dimensional object representations - Polygon surfaces-Polygon tables- Plane equations - Polygon meshes; Curved Lines and surfaces, Quadratic surfaces, Blobby objects, spline representations, Bezier curves and surfaces -B- Spline curves and surfaces. 3D transformation: translation, scaling and rotation, composite transformation, viewing pipeline and coordinates, projection, visible surface detection methods.

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UNIT - IV	OBJECT RENDERING, ILLUMINATION & COLOR MODELS	9
Basic illumination methods - ambient, diffuse reflection, specular reflection and the phong model, warn model, Surface - rendering - gouraud shading, phong shading, constant intensity shading, Color models - properties of light, XYZ, RGB, YIQ and CMY color models.		

UNIT - V	COMPUTER ANIMATIONS & REALISM	9
ANIMATION: Design of Animation sequences - animation function - raster animation - key frame systems - motion specification - morphing - tweening. REALISM: Recursively defined curves - Koch curves - C curves - Dragons - space filling curves -- fractals - Mandelbrot sets - Julia Sets - Random Fractals - overview of ray tracing.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Design and manipulate graphical objects.
CO2	Apply two dimensional transformations and clipping techniques to graphics.
CO3	Design three dimensional graphics and apply three dimensional transformations
CO4	Apply Illumination, shading and colors to objects.
CO5	Design animation sequences and various curves.

Text Books	
1.	Donald Hearn and Pauline Baker M, “Computer Graphics”, Prentice Hall, New Delhi, 2007
2.	James D. Foley, Andries Van Dam, Steven K. Feiner, John F. Hughes, Computer Graphics - Principles and practice, Second Edition in C, Pearson Education, 2007.

Reference Books	
1.	Jeffrey McConnell, “Computer Graphics: Theory into Practice”, Jones and Bartlett Publishers, 2006.
2.	Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, Kelvin Sung, and AK Peters, Fundamental of Computer Graphics, CRC Press, 2010.

BoS Chairman

Open Elective - I

B.E.	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 flights.
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 flight s” 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 Feb 5.
2.	Cook MV. “Flight dynamics principles: a linear systems approach to aircraft stability and control”. Butterworth-Heinemann; 2012 Oct 3.
3.	Miele A. “Flight mechanics: theory of flight paths”. Courier Dover Publications; 2016 Mar 15.
4.	Kermode AC. “Mechanics of flight”. Longman Scientific & Technical”; 1987.
5.	Von Mises R. “Theory of flight. Courier Corporation”; 1959.

BoS Chairman

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	8
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	8
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	10
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.		

UNIT - V	EMERGING ISSUES	10
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		

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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/

BoS Chairman

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 RADIOACTIVE 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.

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.

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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.

BoS Chairman

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).

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.

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

Reference Books	
1.	Manay S. and M.S. Swamy, “Foods: Facts and Principles”, 4th Ed. New Age Publishers, 2004.
2.	Deman J.M., “Principles of Food Chemistry”, 2nd Ed., Van Nostrand Reinhold, NY., 1990.

BoS Chairman

B.E.	B19ECO501 - LOGIC AND DISTRIBUTED CONTROL SYSTEMS (Common to all Except ECE)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To give an introductory knowledge on Programmable Logic Controller (PLC) and their programming languages
2.	To give adequate knowledge about applications of PLC
3.	To give basic knowledge about Computer Controlled Systems
4.	To give basic knowledge on the architecture and local control unit of Distributed Control System (DCS)
5.	To give adequate information with respect to interfaces used in DCS

UNIT - I	PROGRAMMABLE LOGIC CONTROLLER	9

Evolution of PLCs - Components of PLC - Architecture of PLC - Discrete and analog I/O modules - Programming languages - Ladder diagram - Function block diagram (FBD) - Programming timers and counters.

UNIT - II	APPLICATIONS OF PLC	9

Instructions in PLC - Program control instructions, math instructions, data manipulation Instructions, sequencer and shift register instructions - Case studies in PLC.

UNIT - III	COMPUTER CONTROLLED SYSTEMS	9

Basic building blocks of computer controlled systems - Data acquisition system - Supervisory control - Direct digital control- SCADA - Hardware and software, Remote terminal units, Master Station and Communication architectures.

UNIT - IV	DISTRIBUTED CONTROL SYSTEM	9

DCS - Various Architectures - Comparison - Local control unit - Process interfacing issues - Communication facilities.

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UNIT - V	INTERFACES IN DCS	9
Operator interfaces - Low level and high level operator interfaces - Displays - Engineering interfaces - Low level and high level engineering interfaces - Factors to be considered in selecting DCS - Case studies in DCS.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Understand the PLC
CO2	Apply PLC in various applications
CO3	Understand the concepts of Computer Controlled Systems
CO4	Acquire knowledge about various architectures of DCS
CO5	Analyze the various interfaces in DCS

Text Books	
1.	F.D. Petruzella, Programmable Logic Controllers, Tata Mc-Graw Hill, Third edition, 2010
2.	Michael P. Lukas, Distributed Control Systems: Their Evaluation and Design, Van Nostrand Reinhold Co., 1986
3.	D. Popovic and V.P.Bhatkar, Distributed computer control for industrial Automation Marcel Dekker, Inc., Newyork ,1990

Reference Books	
1.	T.A. Hughes, “Programmable Controllers”, Fourth edition, ISA press, 2005
2.	Krishna Kant, “Computer Based Industrial Control”, Second edition, Prentice Hall of India, New Delhi, 2010.
3.	John W. Webb and Ronald A. Reis, “Programmable Logic Controllers”, Fifth edition, Prentice Hall of India, New Delhi, 2010.
4.	John R. Hackworth and Frederick D. Hackworth Jr, Programmable Logic Controllers, Pearson, New Delhi, 2004.
5.	Clarke, G., Reynders, D. and Wright, E., “Practical Modern SCADA Protocols: DNP3,4.60870.5 and Related Systems”, Newnes, 1st Edition, 2004.
6.	E.A.Parr, Programmable Controllers, An Engineer’s Guide, Elsevier, 2013.

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.

BoS Chairman

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 coordinate systems.
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 Robotics”, 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.

BoS Chairman

Semester - VI

B.E.	B19CST601 - DATA SCIENCE AND BIG DATA ANALYTICS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basics of data science and big data.
2.	To be familiar with the concepts of NoSQL, MapReduce and visualization methods.
3.	To learn the usage of mongoDB streams.
4.	To understand big data frameworks and applications.
5.	To perform data analysis using HADOOP and RHADOOP

UNIT - I	DATA SCIENCE BASICS	9

Introduction to Data Science - Applications -Data Science Process - Exploratory Data analysis -Collection of data - Graphical presentation of data - Classification of data - Storage and retrieval of data - Big data - Challenges of Conventional Systems - Web Data - Evolution Of Analytic Scalability - Analytic Processes and Tools -Analysis vs Reporting - Modern Data Analytic Tools.

UNIT - II	FRAME WORKS AND VISULIZATION	9

Introduction to MAPREDUCE Programming: Mapper - Reducer - Combiner - Partitioner - Searching - Sorting - Compression - Hadoop, Hive, MapR -Sharding -NoSQL Databases - Hadoop Distributed File Systems- Interaction Techniques -- Hive: Hive - Hive Architecture - Hive Data types, Pig: Feature of PIG - PIG on Hadoop - PIG Philosophy -Visualizations - Visual Data Analysis Techniques.

UNIT - III	MONGODB	9

Introduction to MongoDB - Need for MongoDB - Terms used in RDBMS and MongoDB - Data types in MongoDB - MongoDB Query Language: (Create, Read, Update, Delete, Insert, Save (), Count, Limit, Sort, Skip)- MapReduce function - Aggregate function.

UNIT - IV	BIGDATA BASICS	9

Big data framework -Fundamental concepts of Big Data management and analytics -Current challenges and trends in Big Data Acquisition. IBMPureData Systems -Netezzas Design Principles -The Netezza Appliance -Extending the Netezza Analytics

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UNIT - V	DATA ANALYSIS USING R AND HADOOP	9
Features of R language - HADOOP Features - HDFS and MapReduce architecture - R and Hadoop Integrated Programming Environment (RHIPE) Introduction -Architecture of RHIPE - RHIPE function reference -RHADOO Introduction -Architecture of RHADOOP -RHADOOP function reference, SQL on HADOOP.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Infer fundamentals of data science.
CO2	Outline the frameworks of MapReduce, NoSQL and PIG.
CO3	Make use of MongoDB concepts and its application.
CO4	Infer the basics of big data environment.
CO5	Utilize R and Hadoop techniques in data anlysis.

Text Books	
1.	Seema Acharya and Subhashini Chellappan, “Big Data and Analytics”, John Wiley, First Edition, 2017.

Reference Books	
1.	Venkat Ankam, “Big Data Analytics”, Packt Publishing, First Edition, 2016
2.	Murray S.J., “Learn R in a day”, SJ Murray, Second Edition, 2013
3.	Michael J. Crawley, “The R Book”, John Wiley, Second Edition, 2012

BoS Chairman

B.E.	B19CST602 - COMPILER DESIGN	T	P	TU	C
		3	0	1	4

Course Objectives	
1.	To learn the fundamentals of design of Compilers by applying mathematics and engineering principles.
2.	To design a system for parsing the sentences in a compiler grammar.
3.	To design a system to translate into various intermediate codes.
4.	To analyze and design the methods of developing a Code Optimizer.
5.	To analyze the methods of implementing a Code Generator for compilers.

UNIT - I	INTRODUCTION TO COMPILER & AUTOMATA	11

Compilers - Analysis of the source program, Phases of a compiler - Cousins of the Compiler, Grouping of Phases - Compiler construction tools, Lexical Analysis - Role of Lexical Analyzer, Input Buffering -Specification of Tokens - design of lexical analysis (LEX).

UNIT - II	SYNTAX ANALYSIS	13

Derivation -parse tree - ambiguity, Definition - role of parsers - top down parsing - bottom-up parsing, Left recursion - left factoring -Handle pruning , Shift reduce parsing, LEADING - TRAILING - Operator precedence parsing, FIRST-FOLLOW, Predictive parsing, Recursive descent parsing, LR parsing - LR (0) items -SLR parsing, Canonical LR parsing, LALR parsing

UNIT - III	INTERMEDIATE CODE GENERATION	12

Intermediate Languages - prefix - postfix - Quadruple - triple - indirect triples, Syntax tree-Evaluation of expression - three-address code, Synthesized attributes - Inherited attributes, Intermediate languages - Declarations, Assignment Statements, Boolean Expressions, Case Statements, Back patching -Procedure calls

UNIT - IV	CODE OPTIMIZATION	12

Introduction - Principal Sources of Optimization, Optimization of basic Blocks, Loop Optimization, Introduction to Global Data Flow Analysis, Runtime Environments - Source Language issues, Storage Organization, Storage Allocation strategies -Access to non-local names, Parameter Passing

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UNIT - V	CODE GENERATION	12
Issues in the design of code generator, the target machine -Runtime Storage management, Basic Blocks and Flow Graphs, Next-use Information -A simple Code generator, DAG representation of Basic Blocks, Peephole Optimization.		
		Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Summarize the basic functioning FA, compiler and its tools.
CO2	Develop various parsing, conversion , optimization and generation algorithms for the design of a compiler.
CO3	Analyze the issues in generation intermediate code and its procedures.
CO4	Mark use of various methods in optimizing code in compilers.
CO5	Organizations simple code generator and its operations.

Text Books	
1.	Alfred V. Aho, Ravi Sethi & Jeffrey. D. Ullman, “Compilers Principles, Techniques & Tools”, Pearson Education, third edition, 2011.
2.	Sudha Rani S, Karthi M, Rajkumar Y, “Compiler Design”, Wiley Dream tech Publishing Pvt. Ltd, 2019.

Reference Books	
1.	K. Muneeswaran, ”Compiler Design”, Oxford Higher Education, Fourth edition, 2015
2.	David Galles, “Modern Compiler Design”, Pearson Education, Reprint, 2012.
3.	Raghavan V., “Principles of Compiler Design”, Tata McGraw Hill Education Pvt. Ltd., 2010.

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B.E.	B19CST603 - CLOUD COMPUTING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basic concepts of cloud computing and cloud enables.
2.	To understand cloud services and Multi-tenancy computing.
3.	To study about various models of cloud environments and virtualization.
4.	To manage the cloud computing infrastructure with security.
5.	To gain knowledge of cloud and to understand about Fog, edge computing

UNIT - I	INTRODUCTION TO CLOUD COMPUTING	9

Origins and Influences - Basic Concepts and Terminology - Cloud Computing Architectural Framework - Types of Clouds - Goals and Benefits - Risks and Challenges - Cloud Characteristics - Elasticity in Cloud - On-demand Provisioning - Advantages of Cloud computing.

UNIT - II	CLOUD DELIVERY MODEL	9

Layers in cloud architecture- Infrastructure as a Service (IaaS) - features of IaaS and benefits - Platform as a Service (PaaS) - features of PaaS and benefits - Software as a Service (SaaS) - features of SaaS and benefits - Comparing and Combining Cloud delivery models.

UNIT - III	CLOUD DEPLOYMENT MODELS AND VIRTUALIZATION	9

Cloud deployment model- Public clouds - Private clouds - Community clouds - Hybrid clouds - other cloud deployment model - Need for virtualization - Types of Virtualization - Virtualization OS - VMware, KVM - System VM - Process VM - Virtual Machine Monitor - Properties.

UNIT - IV	MANAGEMENT IN CLOUD COMPUTING & SECURITY	9

Cloud data centres - Energy efficiency in data centre - Data Management in Cloud Computing - Mobile cloud computing service models - Open Source and Commercial Clouds, Cloud Simulator - sensor cloud - Fundamental Cloud security - Cloud security Threads - Additional considerations - Security solutions a case study.

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UNIT - V	CLOUD TECHNOLOGIES & FOG COMPUTING	9
Hadoop - MapReduce - Virtual Box -- Google App Engine - Programming Environment for Google App Engine- Open Stack- From Cloud to Fog - Fog Computing architecture - fog networks - Principles of Edge/P2P networking - Security and privacy in Fog.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Illustrate the Cloud computing setup with its vulnerabilities and applications using different architectures.
CO2	Identify and install the cloud tools to make enable the cloud computing infrastructures.
CO3	Apply and design suitable Virtualization concept, Cloud Resource Management and collaboration services.
CO4	Create combinatorial auctions for cloud resources and services for computing clouds Develop and make cloud services as commercial.
CO5	Illustrate fog computing architecture.

Text Books	
1.	Thomas Erl, Zaigham Mahmood, Ricardo Puttini, “Cloud computing concepts, technology and Architecture”, Pearson, 2017
2.	Mahmood Zaigham (Ed.), “Fog Computing Concepts, Frameworks and Technologies”, Springer, First edition, 2018.

Reference Books	
1.	Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, “Distributed and Cloud Computing, From Parallel Processing to the Internet of Things”, Morgan Kaufmann Publishers, 2012.
2.	Ritting house, John W, and James F. Ransome, “Cloud Computing: Implementation, Management and Security”, CRC Press, 2017.

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B.E.	B19CSP601 - COMPILER DESIGN LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To implement the different Phases of compiler.
2.	To understand the automata conversion techniques.
3.	To give exposure to compiler writing tools such lex, yacc.
4.	To understand the simple parsing technique using grammar.
5.	To implement and test simple optimization techniques.

List of Experiments		
Expt. No.	**Description of the Experiments**	
1.	Design and implement a lexical analyzer for given language using C and the lexical analyzer should ignore redundant spaces, tabs and new lines.	
2.	Implementation of Lexical Analyzer using Lex Tool	
3.	Generate YACC specification for a few syntactic categories.	
	a.	Program to recognize a valid arithmetic expression that uses operator +, -, * and /.
	b.	Program to recognize a valid variable which starts with a letter followed by any number of letters or digits.
	c.	Implementation of Calculator using LEX and YACC.
	d.	Convert the BNF rules into YACC form and write code to generate abstract syntax tree
4.	Write program to find ε - closure of all states of any given NFA with ε transition	
5.	Write program to convert NFA with ε transition to NFA without ε transition perform array operations insertion, deletion, searching	

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6.	Write program to convert NFA to DFA.
7.	Write program to minimize any given DFA.
8.	Write program to find Simulate First and Follow of any given grammar
9.	Construct a Shift Reduce Parser for a given language
10.	Implement the back end of the compiler which takes the three address code and produces the 8086 assembly language instructions that can be assembled and run using an 8086 assembler. The target assembly instructions can be simple move, add, sub, jump etc.
	Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Analyze the basic operatins of lexical analyzer.
CO2	Programming using lex and yacc tools.
CO3	Explain the simple FA from different forms.
CO4	Examine the process of FIRST and FOLLOW of parser.
CO5	Develop the program to generate assembly code ferom three address statement.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. No.	NAME OF THE EQUIPMENT	Qty.
1.	Intel® Core TMi5 - 4570CPU @ 3.20 GHz Processor Ubuntu 20.04, Windows 10, Flex 3.0, TCC 4.0	30

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B.E.	B19CSP602 - CLOUD COMPUTING LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To understand the installation of hypervisors.
2.	To deploy cloud services.
3.	To develop web applications in cloud.
4.	To learn the design and development process involved in creating a cloud based application.
5.	To learn to implement and use parallel programming using Hadoop.

List of Experiments		
Expt. No.	**Description of the Experiments**	
1.	Installation of various hypervisors and instantiation of VMs with image file using open source hypervisors such as Virtual Box, VMWare Player, Xen and KVM.	
2.	Familiarization and usage of the following cloud services with open source cloud tools (like Eucalyptus, Openstack, Open Nebula and others)	
	a.	Scheduling mechanisms
	b.	Load balancing mechanisms
	c.	Hashing and encryption mechanisms
3.	Familiarization and usage of collaborative applications (SaaS)	
4.	Implementing applications using Google App Engine (PaaS).	
5.	Use GAE launcher to launch the web applications	
6.	Client server communication between two virtual machine instances, execution of chat application	

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7.	Find a procedure to launch virtual machine using trystack (Online Openstack Demo Version)
8.	Install Hadoop single node cluster and run simple applications like wordcount
9.	Simulate a cloud scenario using CloudSim and run a scheduling algorithm that is not present in Cloud Sim
	Total Instructional hours : 60

Course Outcomes : Students will be able to	
CO1	Identify to run their application on the instantiated VMs over different hypervisors.
CO2	Construct a private cloud with open source cloud tools and deploy simple cloud services.
CO3	Design and deploy a web application in a Saas and PaaS environment.
CO4	Manipulate large data sets in a parallel environment.
CO5	Plan, how to simulate a cloud environment to implement new schedulers.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS

S. No.	NAME OF THE EQUIPMENT	Qty.
1.	Dell Optilplex390 CPU @ 3.20 GHz Processor Ubuntu 20.04, Windows 10, Hadoop 2.x, Cloudsim 5.x, GAE 7.x, Oracle Virtual Box 2.1, Eclipse 2.X	30

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B.E.	B19CEP601 - CAREER ABILITY COURSE - III	T	P	TU	C
		2	0	0	1

Sl. No.	Topics	Hours
	Programming and Data Structures Programming in C, Recursion. Arrays, stacks, queues, linked lists, binary search trees, binary heaps, graphs.	
1.	**Algorithms** Searching, sorting, hashing, time and space complexity, Algorithm design techniques, Graphs traversal	6
2.	**Computer Organization and Architecture** Machine instructions and addressing modes. ALU, data-path and I/O interface **Operating System** System calls, processes, threads, Deadlock, CPU scheduling **Databases** ER-model. Relational model, SQL, normal forms.	6
3.	**Computer Networks** OSI and TCP/IP Protocol Stacks, TCP/UDP and sockets, IP addressing, Network security	6
		Total Instructional Hours : 18

Text Books	
1.	Programming & Data Structure - Brian W. Kernighan, Dennis M. Ritchie & Debasis Samanta, 2012
2.	Algorithms - Introduction to Algorithms - Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, Clifford Stein, 2010
3.	Computer Organization & Architecture - Hamacher, Vranesic, Zaky 2016
4.	Operating Systems - Silberschatz, Galvin, Gagne 2016
5.	Databases - Silberschatz, Sudarshan, Korth 2016
6.	Computer Networks - A Top-Down Approach (Edition 6) - James F. Kurose, Keith W. Ross 2012
Web References	
7.	https://www.geeksforgeeks.org/gate-cs-notes-gq/

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Professional Elective - II

B.E.	B19CSE601 - SOFTWARE TESTING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basics of software testing.
2.	To learn the concept of graph testing.
3.	To understand the measure of problem-solving skills.
4.	To verify and validate both external and internal data.
5.	To understand the test management process.

UNIT - I	INTRODUCTION	9

Introduction to software testing and analysis - Error - Fault - Failure - Incident - Test Cases - Testing Process - Limitations of Testing - Coverage Criteria for Testing - Infeasibility and Subsumption - Characteristics of a Good Coverage Criterion. Methods of software Testing - White box testing - Black box testing - Grey box testing.

UNIT - II	TESTING TYPES	9

Unit Testing: Driver- Stub- Integration Testing: Top-Down Integration - Bottom- Up Integration - Bi-Directional Integration. Performance Testing: Load Testing- Stress Testing - Security Testing - Client - server Testing. Acceptance Testing: Alpha Testing and Beta Testing - Special Tests: Regression Testing - GUI Testing.

UNIT - III	LOGIC TESTING & INPUT SPACE PARTITIONING	9

Logic Predicates and Clauses - Logic Expression Coverage Criteria-Structural Logic Coverage of Programs - Specification - Based Logic Coverage - Logic Coverage of Finite State Machines - Disjunctive Normal Form Criteria. Input Domain Modeling - Combination Strategies Criteria - Constraints among Partitions

UNIT - IV	SYNTAX TESTING	9

People and organizational issues in testing - Organization structures for testing teams - testing services - Test Planning - Test Plan Components - Test Plan Attachments - Locating Test Items - test management - test process - Reporting Test Results - Introducing the test specialist - Skills needed by a test specialist - Building a Testing Group - The Structure of Testing Group.

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UNIT - V	TESTING TOOLS AND MESUREMENTS	9
Manual Testing and Need for Automated Testing Tools - Advantages and Disadvantages of Using Tools - Selecting a Testing Tool - When to use Automated Test tools - Testing Using Automated tools. Metrics and Measurement: Types of Metrics - Product Metrics and process Metrics - Object oriented metrics in testing.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Choose and conduct a software test process for a software testing project
CO2	Illustrate the different types of testing techniques.
CO3	Identify the input domain Modeling
CO4	Examine the duplication of data with test management tool.
CO5	Classify the testing tools and measurements.

Text Books	
1.	Paul Ammann, Jeff Offutt, “Introduction to Software Testing”, Cambridge University Press, 2nd edition, 2016.
2.	Desikan, Gopalaswamy Ramesh, “Software Testing: Principles and Practices”, Pearson, 2012.

Reference Books	
1.	Aditya P. Mathur, “Foundations of Software Testing”, Pearson, 2008.
2.	Paul C. Jorgensen, “Software Testing: A Craftsman’s Approach”, Auerbach Publications, 2008.
3.	Brian Marick, “The Craft of Software Testing”, Pearson Education, 2nd edition, 1995

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B.E.	B19CSE602 - MULTIMEDIA SYSTEMS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To introduce multimedia basics and its components.
2.	To understand audio formats and its usage.
3.	To learn the concepts of images and its formats.
4.	To explore video animation standards and its techniques.
5.	To learn the usage multimedia authoring tools.

UNIT - I	INTRODUCTION	9

Components of multimedia, Web and Internet multimedia applications, Transition from conventional media to digital media. Computer Fonts and Hypertext - Usage of text in Multimedia, Families and faces of fonts, outline fonts, bitmap fonts International character sets and hypertext, Digital fonts techniques.

UNIT - II	AUDIO FUNDAMENTALS	9

Digitization of sound, frequency and bandwidth, decibel system, data rate, audio file format, Sound synthesis, MIDI, wavetable, Compression and transmission of audio on Internet, Adding sound to your multimedia project, Audio software and hardware.

UNIT - III	IMAGE FUNDAMENTALS	9

Color Science , Color, Color Models, Color palettes, Dithering, 2D Graphics, Image Compression and File Formats :GIF, JPEG, JPEG 2000, PNG, TIFF, EXIF, PS, PDF, Basic Image Processing , Use of image editing software, White balance correction, Dynamic range correction, Gamma correction, Photo Retouching.

UNIT - IV	VIDEO AND ANIMATION	9

Video Basics , How Video Works, Broadcast Video Standards, Analog video, Digital video, Video Recording and Tape formats, Shooting and Editing Video (Use Adobe Premier for editing), Video Compression and File Formats. Video compression based on motion compensation, MPEG - 1, MPEG - 2, MPEG - 4, MPEG - 7, MPEG - 21, Animation: Cell Animation, Computer Animation, Morphing.

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UNIT - V	MULTIMEDIA AUTHORING	9
Multimedia Basics and Tools - Compression and Decompression - Data and File Format Standards - Digital voice and audio video image animation - Introduction to Photoshop - workshop tools - Navigating window - Importing and Exporting Images - Operations on Images - resize, Crop, rotate. Introduction to Flash - Elements of Flash Documents - Flash Environment- Drawing Tools - Flash Animation Importing and Exporting - Adding Sounds - Publishing Flash Movies.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Identify the basic components of multimedia.
CO2	Experiment with various audio formats and its usage.
CO3	Apply the concepts image editing in different formats using image editing tools.
CO4	Make use of video standards for animation.
CO5	Utilize multimedia authoring tools in real world applications.

Text Books	
1.	Tay Vaughan, “Multimedia making it work”, Tata McGraw-Hill, 9th edition, 2014.
2.	Rajneesh Aggarwal & B. B Tiwari, “ Multimedia Systems”, Excel Publication, New Delhi, 2007.
3.	Li & Drew, “ Fundamentals of Multimedia” , Pearson Education, 2009.

Reference Books	
1.	Ze-Nian Li, Mark S. Drew, Jiang chuan Liu, “Fundamentals of Multimedia”, Springer, 2014
2.	Parekh Ranjan, “Principles of Multimedia”, Tata McGraw-Hill, 2007
3.	D. McClelland, L.U.Fuller, “Photoshop CS2 Bible”, Wiley Publishing, 2005.

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B.E.	B19CSE603 - MOBILE COMPUTING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basics of Programming platforms.
2.	To learn about wireless energy management and localization.
3.	To understand about context sensing.
4.	To learn about activity and gesture recognition.
5.	To understand mobility, privacy and security.

UNIT - I	INTRODUCTION AND PROGRAMMING PLATFORMS	9

Introduction: Challenges in mobile computing - convergence of sensing- computing and communications- Introduction to smart phones- tablet- PDA or other digital mobile devices-. Programming platforms- Overview of different mobile programming environments-Difference with the classical programming practices - Introduction to mobile operating systems- iOS, Android - Windows - Mobile application development.

UNIT - II	WIRELESS ENERGY MANAGEMENT AND LOCALIZATION	11

Wireless Energy Management - Measurement of energy consumption - Wi-Fi Power Save Mode (PSM) - Constant Awake Mode (CAM) - Different Sleep States - Wi-Fi Energy management - Localization - User location and tracking system - Cell tower localization - Spot localization - Logical location - Ambience fingerprinting - War-driving - Localization without war - driving-Indoor localization - Crowd sourcing for localization.

UNIT - III	CONTEXT SENSING	7

Context Sensing - Context-Aware system - Automatic Image Tagging - Safety critical applications (case study: determining driver phone use) - Energy-efficient Context Sensing - Contextual Ads and Mobile Apps.

UNIT - IV	ACTIVITY AND GESTURE RECOGNITION	9

Activity and Gesture Recognition - Machine Recognition of Human Activities - Mobile Phones to Write in Air-Personalized Gesture Recognition - Content Rating - Recognizing Human without Face Recognition - Phone-to-Phone Action Games - Interface design issues - Touch screen - Gesture-based Input.

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UNIT - V	MOBILITY, PRIVACY AND SECURITY	9
Overview of Mobility models - Automatic Transit Tracking - Mapping - Arrival Time Prediction - Augmenting Mobile 3G with Wi-Fi - Vehicular Wi-Fi Hotspots - Code Offload - Privacy and Security - Authentication on Mobile Phones - Activity based Password - Finger Taps usage as Fingerprints.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Compare different problem-solving techniques in various programming platform.
CO2	Make use of appropriate wireless energy management and localization techniques.
CO3	Experiment with different context sensing.
CO4	Experiment with the usage of activity and gesture recognition.
CO5	Determine the functionality of mobility with privacy and security.

Text Books	
1.	Pei Zheng, Lionel Ni, “Smart Phone and Next Generation Mobile Computing”, Morgan Kaufmann Series, 2010.
2.	Hansmann, LotharMerk, Martin Niclous, “Stober, Principles of Mobile Computing”, 2nd edition, 2006.

Reference Books	
1.	Tomasz Imielinski, “Mobile Computing”, Springer, 1996.
2.	William.C.Y.Lee, “Mobile Cellular Telecommunications-Analog and Digital Systems”, Second Edition, Tata McGraw Hill Edition, 2006.
3.	Android Developers : http://developer.android.com/index.html

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B.E.	B19CSE604 - WEB SERVICES & SERVICE ORIENTED ARCHITECTURE	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To learn the web services standards and technologies.
2.	To understand about WS- Reliable Messaging and WS security.
3.	To learn about the fundamentals of XML.
4.	To provide an overview of Service Oriented Architecture and Web Services and their Importance.
5.	To learn the aspects of developing SOA based applications.

UNIT - I	WEB SERVICES AND STANDARDS	9

Web Services Platform - Service descriptions - WSDL - Messaging with SOAP - Service discovery - UDDI - Service-Level Interaction Patterns - Orchestration and Choreography.

UNIT - II	WEB SERVICES EXTENSIONS	9

WS-Addressing - WS-Reliable Messaging - WS-Policy - WS-Coordination -WS -Transactions - WS-Security - Examples.

UNIT - III	XML	9

XML document structure - Well-formed and valid documents - DTD - XML Schema - Parsing XML using DOM, SAX - XPath - XML Transformation and XSL - Xquery.

UNIT - IV	SERVICE ORIENTED ARCHITECTURE BASICS	9

Characteristics of SOA, Benefits of SOA , Comparing SOA with Client-Server and Distributed architectures - Principles of Service Orientation - Service layers.

UNIT - V	BUILDING SOA-BASED APPLICATIONS	9

Service Oriented Analysis and Design - Service Modeling - Design standards and guidelines - Composition - WS-BPEL - SOA support in J2EE.

Total Instructional hours : 45

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Course Outcomes : Students will be able to	
CO1	Infer web services and WS standards.
CO2	Make use of web services extensions to develop solutions.
CO3	Illustrate XML document processing methods.
CO4	Outline the architecture of SOA.
CO5	Summarize the concepts of building SOA applications.

Text Books	
1.	Michael P. Papazoglou, “Web Services & SOA Principles and Technology”, 2nd edition, 2012.
2.	R. Nagappan, R. Skoczylas, R.P. Sriganesh, “Developing Java Web Services”, Wiley, 2002.
3.	S. Chatterjee, J. Webber, “Developing Enterprise Web Services”, Pearson Education, 2003

Reference Books	
1.	D.A. Chappell & T. Jewell , “Java Web Services”, O’Reilly, 2002.
2.	McGovern, et al., “Java web Services Architecture”, Morgan Kaufmann Publishers, 2005.
3.	Richard Monson - Haefel , “J2EE Wer Services”, Pearson Education, 2004.
4.	F.P. Coyle, “XML, Web Services, and the Data Revolution”, Pearson Education, 2002.

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B.E.	B19CSE605 - ARTIFICIAL INTELLIGENCE	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 Planning - Execution 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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B.E.	B19CSE606 - SPEECH PROCESSING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the fundamentals of the speech processing.
2.	To explore the various speech models.
3.	To gather knowledge about the phonetics and pronunciation processing.
4.	To perform wavelet analysis of speech.
5.	To understand the concepts of speech recognition.

UNIT - I	INTRODUCTION	9

Introduction - knowledge in speech and language processing - ambiguity - models and algorithms - language - thought - understanding - regular expression and automata - words & transducers - N grams.

UNIT - II	SPEECH MODELLING	9

Word classes and part of speech tagging - hidden markov model - computing likelihood: the forward algorithm - training hidden markov model - maximum entropy model - transformation based tagging - evaluation and error analysis - issues in part of speech tagging - noisy channel model for spelling.

UNIT - III	SPEECH PRONUNCIATION AND SIGNAL PROCESSING	9

Phonetics - speech sounds and phonetic transcription - articulatory phonetics - phonological categories, pronunciation variation - acoustic phonetics and signals - phonetic resources - articulatory, gestural phonology.

UNIT - IV	SPEECH SYNTHESIS	8

Speech synthesis - text normalization - phonetic analysis - role of prosody - prosodic analysis - diphone waveform synthesis - unit selection waveform synthesis - Applications and present status.

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UNIT - V	SPEECH RECOGNITION	9
Automatic speech recognition - architecture - applying hidden markov model - feature extraction: mfcc vectors - computing acoustic likelihoods - search and decoding - embedded training - multi pass decoding: n-best lists and lattices - a* (stack') decoding - Language modelling. Large vocabulary recognition, Acoustic preprocessing for speech recognition.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Demonstrate algorithms for speech processing.
CO2	Show different speech models and its issues.
CO3	Outline various phonetic models.
CO4	Analyze different speech synthesis techniques.
CO5	Build a new speech recognition system.

Text Books	
1.	Daniel Jurafsky and James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Person education, 2013.

Reference Books	
1.	S.D Apte, "Speech and Audio Processing", Wiley India Edition, 2015
2.	Ikrami Eldirawy , Wesam Ashour, "Visual Speech Recognition", Wiley publications , 2011
3.	Lawrence Rabiner, Biing-Hwang Juang, "Fundamentals of Speech Recognition", Pearson Education, 2003.
4.	Kai-Fu Lee, "Automatic Speech Recognition", The Springer International Series in Engineering and Computer Science, 1999.
5.	Claudio Becchetti and Lucio Prina Ricotti, "Speech Recognition", John Wiley and Sons, 1999.

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Professional Elective - III

B.E.	B19CSE607- AGILE AND XTREME PROGRAMMING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To apply agile principles and practices in an actual project.
2.	To provide an insight to different areas of Agile Methodologies.
3.	To demonstrate the strengths and weakness of an agile approach given in a particular development context.
4.	To understand and apply Scrum and Extreme Programming.
5.	To tailor an agile method to the needs of the project.

UNIT - I	AGILE AND ITS SIGNIFICANCE	9

Agile development - Classification of methods - The agile manifesto and principles - Agile project management - Embrace communication and feedback- Simple practices and project tools - Empirical vs defined and prescriptive process- Principle-based versus Rule-Based-Key motivations for iterative development - Meeting the requirements challenge iteratively - Problems with the waterfall.

UNIT - II	AGILE METHODOLOGY	9

Method overview - Lifecycle - Work products, Roles and Practices values - Common mistakes and misunderstandings-agile project management - agile team interactions - ethics in agile teams - agility in design- testing - agile documentations - agile drivers- capabilities and values.

UNIT - III	AGILE PROCESSES	9

Lean production - SCRUM - Crystal - Feature Driven Development - Adaptive Software Development and Extreme Programming: Method overview - lifecycle - work products - roles and practices.

UNIT - IV	AGILITY AND KNOWLEDGE MANAGEMENT	9

Agile information systems - agile decision making - Earl's schools of KM - institutional knowledge evolution cycle - development, acquisition, refinement, distribution, deployment , leveraging - KM in software engineering - managing software knowledge - challenges of migrating to agile methodologies - agile knowledge sharing - role of story-cards - Story-card Maturity Model (SMM).

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UNIT - V	AGILE PRACTICING AND TESTING	9
Project management - Environment - Requirements - Test - The agile alliances - The manifesto - Supporting the values - Agile testing - Nine principles and six concrete practices for testing on agile teams. Case Study: Agile - Motivation - Evidence - Scrum - Extreme Programming - Unified Process - Practice Tips.		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Outline the basics of Agile approach to software development.
CO2	Apply design principles, refactoring, version control and continuous integration to achieve Agility.
CO3	Demonstrate iterative, incremental development process for faster delivery of software.
CO4	Identify the importance of interacting with business stakeholders in determining the requirements for a software system.
CO5	Apply the impact of social aspects on software development success.

Text Books	
1.	Mark C. Layton, Steven J. Ostermiller, Dean J. Kynaston, “Agile Project Management”, Wiley, 2020
2.	Kent Beck, Cynthia Andres, “Extreme programming Explained”, 2nd Edition, Addison - Wesley, 2004

Reference Books	
1.	Neil Perkin, Peter Abraham, “Building the Agile Business Through Digital Transformation”, Kogan Page, 2020
2.	Angel Medinilla, “Agile Management: Leadership in an Agile Environment”, Springer, 2012
3.	Elisabeth Hendrickson, “Agile Testing”, Quality Tree Software Inc., 2008.
4.	James shore, Shane Warden,“The Art of Agile Development (Pragmatic guide to agile software development)”, O’Reilly Media, 2008

BoS Chairman

B.E. - CSE	B19CSE608 - WIRELESS AND SENSOR NETWORKS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To introduce the characteristics, basic concepts and systems issues in WSN.
2.	To illustrate architecture and protocols in WSN.
3.	To identify the trends and latest development of the technologies in the Wi-Fi area.
4.	To provide a broad coverage of challenges and latest research results related to the design and management of WSN.
5.	To have knowledge on network sensors and tools.

UNIT - I	INTRODUCTION	9

Introduction - Applications of Wireless Sensor Networks - WSN Standards - IEEE 802.15.4 - Zigbee Network Architectures and Protocol Stack - Network architectures for WSN - classification of WSN - protocol stack for WSN.

UNIT - II	WIRELESS TRANSMISSION TECHNOLOGY AND SYSTEMS	9

Wireless Transmission Technology and Systems - Radio Technology - Available Wireless Technologies - Wireless Sensor Technology - Sensor Node Technology - Hardware and Software- Sensor Taxonomy, - WN Operating Environment.

UNIT - III	MAC PROTOCOLS	9

Fundamentals of MAC Protocols- MAC Protocols for WSNs- Contention-Based protocols- Power Aware Multi-Access with Signaling - Data-Gathering MAC- Contention-Free Protocols- Low Energy Adaptive Clustering Hierarchy- B-MAC- S-MAC - Dissemination Protocol for Large Sensor Network.

UNIT - IV	DEPLOYMENT AND CONFIGURATION	9

Target tracking - Localization and Positioning - Coverage and Connectivity - Single-hop and Multihop - Localization - Self-Configuring Localization Systems- Routing Protocols and Data Management for Wireless Sensor Networks - Routing Challenges and Design Issues in Wireless Sensor Networks- Routing Strategies in Wireless Sensor Networks - Routing protocols- data centric - hierarchical - location based energy efficient routing etc. - Querying - Data Dissemination and Gathering.

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UNIT - V	SENSOR NETWORK PLATFORMS AND TOOLS	9
Sensor Node Hardware - Berkeley Motes - Programming Challenges - Node-level software platforms - Node-level Simulators - State-centric programming.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the Application and Architectures of Wireless Sensor Networks.
CO2	Make use of appropriate Wireless Transmission Technology and Operating environment in WSN.
CO3	Determine suitable medium access protocols, localization techniques and routing protocol.
CO4	Explain Routing challenges and various routing protocols.
CO5	Illustrate various platform and tools for WSN.

Text Books	
1.	Ankur Dumka, Sandip K. Chaurasiya, Arindam Biswas, Hardwari Lal Mandoria, “A Complete Guide to Wireless Sensor Networks From Inception to Current Trends”, CRC Press, 2019.

Reference Books	
1.	Fahmy, Hossam Mahmoud Ahmad, “Concepts, Applications, Experimentation and Analysis of Wireless Sensor Networks”, Springer, 2021
2.	Singh, P.K, Bhargava, B.K., Paprzycki, M, Kaushal, N.C, Hong, W.-C, “Handbook of Wireless Sensor Networks: Issues and Challenges in Current Scenario’s”, Springer, 2020.
3.	Kazem Sohraby, Daniel Minoli, & Taieb Znati, “Wireless Sensor Networks- Technology, Protocols, and Applications”, John Wiley, 2007.
4.	Holger Karl & Andreas Willig, “Protocols and Architectures for Wireless Sensor Networks”, John Wiley, 2005.

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B.E.	B19CSE609 - BIOMETRICS SYSTEMS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To learn about the design and working of a generic biometric security system.
2.	To understand the technologies of fingerprint and face recognition.
3.	To understand the technologies of voice recognition and fusion in biometrics.
4.	To learn how Biometrics is used for network security.
5.	To recognize personal privacy, standards, and its day to day applications.

UNIT - I	FUNDAMENTALS OF BIOMETRIC SYSTEMS	9

Introduction- biometric technologies - Biometrics Vs traditional techniques - Benefits - Operation of a biometric system - Passive biometrics - active biometrics - Key biometric processes: verification-identification and biometric matching- Performance measures in biometric systems- FAR- FRR-FTE rate- FTA rate.

UNIT - II	FINGERPRINT RECOGNITION	9

Fingerprint Recognition : Introduction - Fingerprint Patterns - Fingerprint Features - Fingerprint Image and width between two ridges - Fingerprint Image Processing - Fingerprint Matching - Fingerprint Classification - Matching policies.

UNIT - III	FACE RECOGNITION	9

FACE RECOGNITION - Introduction- components - Facial Scan Technologies - Face Detection - Face Recognition - Representation and Classification - Kernel - based Methods and 3D Models- FERET Database.

UNIT - IV	VOICE RECOGNITION AND FUSION	9

Voice Recognition - Introduction - Components - Features and Models - Addition Method for managing Variability - Measuring Performance; FUSION IN BIOMETRICS- Introduction to Multibiometric - Information Fusion in Biometrics - Issues in Designing a Multibiometric System.

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UNIT - V	PRIVACY IN BIOMETRICS	9
Standards in Biometrics - Assessing the Privacy Risks of Biometrics - Designing Privacy - Sympathetic Biometric Systems - Need for standards - different biometric standards - Categorizing biometric applications.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Demonstrate knowledge engineering principles underlying biometric systems.
CO2	Outline the fingerprint and face recognition technologies.
CO3	Identify the voice recognition and fusion in biometrics.
CO4	Relate network security and privacy of biometric system.
CO5	Analyze and design basic biometric system applications.

Text Books	
1.	James Wayman, Anil Jain, Davide Maltoni, Dario Maio, “Biometric Systems, Technology Design and Performance Evaluation”, Springer, 2005.
2.	Arun A. Ross, Karthik Nandakumar, A.K.Jain, “Handbook of Multibiometrics”, Springer, New Delhi, 2006.
3.	Samir Nanavati, Micheal Thieme, Raj Nanavati, “Biometrics-Identity Verification in a Networked World”, 1st edition, Wiley, 2002.

Reference Books	
1.	John D. Woodward, Jr, Nicholas M.Orlans, Peter T. Higgins, “Biometrics, the Ultimate Reference”, Dream Tech press, 2009.
2.	Paul Reid, “Biometrics for Network Security”, Pearson Education, 2004.
3.	Nalini K Ratha, Ruud Bolle, “Automatic finger print Recognition System”, Springer, 2003.
4.	L.C. Jain, I Hayashi, S.B. Lee, U Halici, “Intelligent Biometric Techniques in Fingerprint and Face Recognition” CRC Press, 1999.

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B.E.	B19CSE610- E-COMMERCE	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the e-Commerce platform and its concepts.
2.	To provide analytical tools to understand opportunities in un served or underserved New Economy markets.
3.	To analyze the traditional and new communication/marketing approaches that creates competitive advantage in the New Economy.
4.	To provide an overview of the hardware, software, servers, and the parts that make up the enabling “railroad” for the New Economy.
5.	To understand the integrated futures of collaborative commerce.

UNIT - I	INTRODUCTION TO E-COMMERCE	9

Introduction to E-Commerce - Traditional Commerce vs E-Commerce- Benefits and limitations of E-Commerce- Forces Fueling E-Commerce- E-commerce Frame work -Challenges In E- Commerce - Model for E-Commerce

UNIT - II	TECHNICAL ASPECTS OF E-COMMERCE	9

Security on the Net - Implementation and Management Issues of E-commerce - Electronic Data Interchange - Benefits of EDI-EDI technology-EDI standards- EDI communications-EDI Implementation-EDI Agreements-EDI Security-Electronic Payment Systems.

UNIT - III	E-COMMERCE STRATEGIES	9

E-Commerce Strategies: E-Commerce Strategies for Development- Elements of National E- Commerce Strategies -Legal Aspects of E-Commerce - Planning Successful E-Commerce - Case Study

UNIT - IV	E-COMMERCE APPLICATIONS	9

E-Commerce Applications : Commercial Aspects of Ecommerce - E-Commerce And Banking - E-Commerce and Retailing - Electronic Commerce and Online Publishing - E-Business Issues & Internet Marketing.

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UNIT - V	E-COMMERCE AND OTHER INTEGRATION	9
Integrating E-Commerce with ERP, SCM and other Business applications Systems, Future of E- Commerce and Collaborative Commerce - Intellectual Property Rights: Types of Intellectual Property protection, Governance.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Summarize the basic terminologies and future of e-commerce and its further technological shifts in various business verticals.
CO2	Identify the opportunity and plan the E-Commerce venture.
CO3	Analyze the possible threats for the E Commerce and enabling them to evolve the solutions.
CO4	Outline the importance of dis-intermediation and re-intermediation in designing business solutions.
CO5	Identify the integrated business applications using e-commerce.

Text Books	
1.	Efraim Turban et. al, "Electronic Commerce-A Managerial Perspective", Pearson Education, 2010.
2.	Kenneth C. Laudon, "Carol Guercio Traver - E-Commerce", Pearson, 10th Edition, 2016.

Reference Books	
1.	R. Kalokota, Andrew V. Winston, "Electronic Commerce - A Manager's guide", Pearson Education, 2005.
2.	Jaffey F. Rayport& Bernard J. Joworski, "Introduction to E-Commerce", TMH, 2009.
3.	Bharat Bhasker, "Electronic Commerce", TMH, 2006.

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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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B.E.	B19CSE612 - SOCIAL NETWORK ANALYSIS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To apply knowledge for current web development in the era of Social Web.
2.	To develop a model for integrating data for knowledge representation.
3.	To apply the tools and an algorithm for mining in social networks.
4.	To understand the human behavior and trust disputes of social networks.
5.	To apply visualization technique in Social networks.

UNIT - I	INTRODUCTION	9

Introduction to Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Statistical Properties of Social Networks -Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks.

UNIT - II	MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION	9

Ontology languages for the Semantic Web: RDF and OWL - Modeling and aggregating social network data: State-of-the-art in network data representation-Ontological representation of social individuals-Ontological representation of social relationships- Aggregating and reasoning with social network data-Advanced Representations.

UNIT - III	MINING COMMUNITITES IN WEB SOCIAL NETWORKS	9

Extracting evolution of Web Community from a Series of Web Archive - Detecting Communities in Social Networks: Definition of Community - Evaluating Communities - Core Methods for Community Detection-Applications of Community Mining Algorithms - Tools for Detecting Communities Social Network Infrastructures and Communities - Decentralized Online Social Networks: Introduction- Challenges for DOSNs- General purpose DOSNs.

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UNIT - IV	PREDICTING HUMAN BEHAVIOR AND PRIVACY ISSUES	9
Understanding and Predicting Human Behavior for Social Communities - User Data Management- Inference and Distribution - Enabling New Human Experiences: Reality Mining - Context Awareness -Privacy in Online Social Networks: Trust in Online Environment - Trust Models Based on Subjective Logic - Trust Network Analysis - Trust Transitivity Analysis - Combining Trust and Reputation - Trust Derivation Based on Trust Comparisons.		

UNIT - V	VISUALIZATION & APPLICATIONS OF SOCIAL NETWORKS	9
Graph Theory - Centrality - Clustering - Node-Edge Diagrams, Matrix representation, Visualizing Online Social Networks - Visualizing Social Networks with Matrix-Based Representations- Matrix and Node - Link Diagrams - Hybrid Representations - Applications of social network analysis: Covert Networks - Community Welfare - Collaboration Networks.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the internals components of the social network.
CO2	Model and visualize the social network.
CO3	Inspect the behavior of the users in the social network.
CO4	Predict the possible next outcome of the social network.
CO5	Apply social network in real time applications.

Text Books	
1.	Peter Mika, “Social Networks and the Semantic Web:5”, Springer 2007.
2.	Borko Furht, “Handbook of Social Network Technologies and Applications”, Springer, 2010.

Reference Books	
1.	Guandong Xu , Yanchun Zhang and Lin Li, “Web Mining and Social Networking Techniques and applications”, Springer, 1st Edition, 2011.
2.	Max Chevalier, Christine Julien and Chantal Soule-Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling”, IGI Global Snippet, 2009.
3.	John G. Breslin, “Alexander Passant and Stefan Decker”, The Social Semantic Web, Springer, 2009.

BoS Chairman

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.

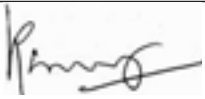
UNIT - IV	AGRICULTURE IN THE CONCEPT OF IWRM	9

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.

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



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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.
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/

BoS Chairman

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.

BoS Chairman

B.E. / B.TECH	B19ECO601 - GEOGRAPHIC INFORMATION SYSTEM	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To introduce the fundamentals and components of Geographic Information System.
2.	To provide details of spatial data models.
3.	To understand the input topology.
4.	To study the data analysis tools.
5.	To introduce the marketing and business applications.

UNIT - I	FUNDAMENTALS OF GIS	9

Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems - Definitions - History of GIS - Components of a GIS - Hardware, Software, Data, People, Methods - Proprietary and open source Software - Types of data - Spatial, Attribute data- types of attributes - scales / levels of measurements.

UNIT - II	SPATIAL DATA MODELS	9

Database Structures - Relational, Object Oriented - ER diagram - spatial data models - Raster Data Structures - Raster Data Compression - Vector Data Structures - Raster vs Vector Models - TIN and GRID data models - OGC standards - Data Quality.

UNIT - III	DATA INPUT AND TOPOLOGY	9

Scanner - Raster Data Input - Raster Data File Formats - Vector Data Input - Digitiser - Topology - Adjacency, connectivity and containment - Topological Consistency rules - Attribute Data linking - ODBC - GPS - Concept GPS based mapping.

UNIT - IV	DATA ANALYSIS	9

Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Education models - 3D data collection and utilisation.

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UNIT - V	APPLICATIONS	9
GIS Applicant - Natural Resource Management - Engineering - Navigation - Vehicle tracking and fleet management - Marketing and Business applications - Case studies.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Infer the basic idea about the fundamentals of GIS.
CO2	Illustrate the types of data models.
CO3	Analyze about data input and topology.
CO4	Analyze about tools and models used for data analysis.
CO5	Explain the data management functions and data output.

Text Books	
1.	Kang - Tsung Chang, "Introduction to Geographic Information Systems", McGraw Hill Publishing, 2nd Edition, 2011.
2.	Ian Heywood, Sarah Cornelius, Steve Carver, SrinivasaRaju, "An Introduction Geographical Information Systems", Pearson Education, 2nd Edition, 2007.

Reference Books	
1.	Lo.C.P, Albert K.W. Yeung, "Concepts and Techniques of Geographic Information Systems", Prentice - Hall India Publishers, 2006.

BoS Chairman

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.

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.

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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	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.

BoS Chairman

B.E. / B.TECH	19MEO601 - 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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Semester - VII

B.E.	B19CST701 - CRYPTOGRAPHY AND NETWORK SECURITY	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand Cryptography Theories, Algorithms and Systems.
2.	To study symmetric key cryptographic Techniques to build protection mechanisms in order to secure computer networks.
3.	To study Public key cryptographic Techniques to build protection mechanisms in order to secure computer networks.
4.	To study various Authentication schemes to simulate different applications.
5.	To understand various Security practices and System security standards.

UNIT - I	INTRODUCTION	9

Goals of Security, types of attacks, services and mechanism -OSI security architecture- Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels - Model of network security - Security attacks, services and mechanisms - Classical encryption techniques: substitution techniques, transposition techniques, steganography- stream and block ciphers- Foundations of modern cryptography: perfect security - information theory - product cryptosystem - cryptanalysis.

UNIT - II	SYMMETRIC KEY CRYPTOGRAPHY	9

Integer arithmetic, Modular arithmetic, Matrices, Linear congruence, Algebraic structures - Euclid"s algorithm- Groups, Rings, Fields- Finite fields- Symmetric Key Ciphers: DES structure and analysis, multiple DES - Strength of DES - Differential and linear cryptanalysis - Block cipher design principles - Block cipher mode of operation - AES- transformations, key expansion, ciphers, analysis.- RC4.

UNIT - III	ASYMMETRIC KEY CRYPTOGRAPHY	9

Primes, Cardinality of Primes, Primality testing and Factorization -Eulers totient function, Fermats and Eulers Theorem- - Exponentiation and logarithm - Asymmetric Key Ciphers: RSA cryptosystem - Diffie Hellman Key Exchange, ElGamal Cryptosystem, Elliptic curve Arithmetic and Elliptic Curve Cryptography, Key Management.

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UNIT - IV	AUTHENTICATION	9
Message Authentication Code - Hash function - Security of hash function and MAC - MD5- Hash Based MAC, SHA-512- Digital signature and authentication protocols - Entity Authentication: Biometrics, Passwords, Challenge Response protocols- Authentication applications - Kerberos, X.509.		

UNIT - V	SYSTEM SECURITY	9
IPSec - Architecture, Authentication Header, Encapsulating Security Payload, Security Policy - Email Security -PGP, S/MIM- Web Security - Intrusion Detection and Prevention: Host, Network, and Hybrid based systems - Malicious software - viruses. Firewalls: Characteristics, Types. Wireless Security: Network infrastructure, Wi-Fi.		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Outline the fundamentals of networks, architecture, Threats and Vulnerabilities.
CO2	Make use of different cryptographic operations of symmetric cryptographic algorithms.
CO3	Apply the different cryptographic operations of public key cryptography.
CO4	Apply the various Authentication schemes to simulate different applications.
CO5	Analyze the various types of Intrusions by detection and prevention mechanisms, firewalls.

Text Books	
1.	William Stallings, “Cryptography and Network Security: Principles and Practices”, 8th Edition, Pearson Education, 2019

Reference Books	
1.	C.K. Shyamala, N. Harini and Dr. T.R. Padmanabhan, “Cryptography and Network Security”, Wiley, 2011.

BoS Chairman

B.E.	B19CST702 - INTERNET OF THINGS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand Smart Objects and IoT Architectures.
2.	To learn about various IOT-related protocols.
3.	To build simple IoT Systems using Arduino and Raspberry Pi.
4.	To understand data analytics and cloud in the context of IoT.
5.	To develop IoT infrastructure for popular applications.

UNIT - I	FUNDAMENTALS OF IOT	9

Introduction to Computer Networks - Evolution of Internet of Things - Enabling Technologies - IoT Architectures: oneM2M - IoT World Forum (IoTWF) and Alternative IoT models - Simplified IoT Architecture and Core IoT Functional Stack - Cloud in IoT - Functional blocks of an IoT ecosystem - Sensors - Actuators - Smart Objects and Connecting Smart Objects.

UNIT - II	IoT PROTOCOLS	9

IoT Access Technologies: Physical and MAC layers - topology and Security of IEEE 802.15.4 - 802.15.4g - 802.15.4e - 1901.2a - 802.11ah and LoRaWAN - Network Layer: IP versions - Constrained Nodes and Constrained Networks - Optimizing IP for IoT: From 6LoWPAN to 6Lo - Routing over Low Power and Lossy Networks - Application Transport Methods: Supervisory Control and Data Acquisition - Application Layer Protocols: CoAP and MQTT.

UNIT - III	DESIGN AND DEVELOPMENT	9

Design Methodology - Embedded computing logic - Microcontroller - System on Chips - IoT system building blocks - Arduino Board details - IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

UNIT - IV	DATA ANALYTICS AND SUPPORTING SERVICES	9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest - Role of Machine Learning - No SQL Databases - Hadoop Ecosystem - Apache Kafka - Apache Spark - Edge Streaming Analytics and Network Analytics - Xively Cloud for IoT - Python Web Application Framework - Django AWS for IoT - System Management with NETCONF-YANG.

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UNIT - V	APPLICATIONS OF IoT	9
Cisco IoT system - IBM Watson IoT platform - Manufacturing - Converged Plantwide Ethernet Model (CPwE) - Power Utility Industry - Grid Blocks Reference Model - Smart and Connected Cities: Layered architecture - Smart Lighting - Smart Parking Architecture and Smart Traffic Control.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the basic concepts of IOT.
CO2	Analyze various network protocols used in IOT.
CO3	Develop poC of an iot system using resoerry pi/arduino.
CO4	Apply data analytics and use cloud offering related to IOT.
CO5	Analyze application of IOT in real time scenario.

Text Books	
1.	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton, and Jerome Henry, “IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things”, Cisco Press, 2017.

Reference Books	
1.	Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Ed, VPT, 2014
2.	Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, John Wiley and Sons 2014.
3.	Francis da Costa, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, A press Publications, 1st Ed, 2013.

BoS Chairman

B.E.	B19CSP701 - NETWORK SECURITY LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To learn different cipher techniques
2.	To implement the cryptographic algorithms DES, RSA
3.	To learn the authentication algorithms MD5,SHA-1
4.	To use network security tools
5.	To understand the vulnerability assessment tools

List of Experiments	
Expt. No.	**Description of the Experiments**
1.	Perform encryption and decryption using substitution techniques.
2.	Perform encryption and decryption using transposition techniques.
3.	Implementation of Data Encryption Standard
4.	Apply AES algorithm for practical applications.
5.	Implement RSA Algorithm using HTML and JavaScript
6.	Implementation of Least Significant Bit method in Image Steganography
7.	Implement the SIGNATURE SCHEME - Digital Signature Standard.
8.	Calculate the message digest of a text using the SHA-1 algorithm
9.	Defeating Malware i) Building Trojans ii) Rootkit Hunter
10.	Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.
11.	Analysis of Secure Socket Layer and IPSec protocol using wireshark
12.	Email log Reports using Pflogsum
	Total Instructional hours : 45

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Course Outcomes : Students will be able to	
CO1	Construct a program using substitution and transposition techniques.
CO2	Build cryptosystems by applying symmetric and public key encryption algorithms.
CO3	Develop a signature scheme using Digital signature standard.
CO4	Experiment with authentication algorithms.
CO5	Demonstrate the network security system using open source tools

Reference Books	
1.	Build Your Own Security Lab, Michael Gregg, Wiley India

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS		
S. No.	**NAME OF THE EQUIPMENT**	**Qty.**
1.	SOFTWARE: C / C++ / Java or equivalent compiler, Wire Shark, Pflogsumm HARDWARE: Standalone desktops - 30 Nos. (or) Server supporting 30 terminals or more	
2.	Dell Optiplex 380 PCs Operating Systems : Windows “7 or later , macOS, and Linux. TCC 4.0, Java 11 or equivalent compiler, Wire Shark, Pflogsumm	30

BoS Chairman

B.E.	B19CSP702 - ADVANCED DATA ANALYTICS LABORATORY	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To prepare and manipulate different R objects.
2.	To explore the data analysis techniques.
3.	To demonstrate the classification algorithms.
4.	To demonstrate the clustering and association rule mining.
5.	To experiment the data visualization techniques.

List of Experiments	
Expt. No.	**Description of the Experiments**
1.	Analytical data processing operations using R / Python
2.	Data manipulations using R / Python
3.	Load and Explore the Data using R / Python
4.	Chi-Square Test for Independence R / Python
5.	Linear or Logistic Regression using R / Python
6.	Decision Tree or Naïve Bayesian Classification using R / Python
7.	Cluster analysis using K-means, K-medoids algorithm using R/Python
8.	Apriori frequent pattern mining algorithm using R/Python
9.	Histograms and Boxplots using R / Python
10.	Data Visualization in R / Python for delivering graphical results
	Total Instructional hours : 45

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Course Outcomes : Students will be able to	
CO1	Build the data manipulation operations using R.
CO2	Digital using the various data analysis techniques.
CO3	Explain the various classification algorithms.
CO4	Justify the clustering and association rule mining algorithm.
CO5	Evaluate various data visualization techniques.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS		
S. No.	**NAME OF THE EQUIPMENT**	**Qty.**
1.	Intel@ CoreTM - i5 - 4570 CPU @ 3.20 GHz Processor Ubuntu 20.04, Windows 10, Python 3.6.5, R-Studio 2021.09.2-382, Google Colab.	30

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B.E.	B19CSP703 - PROJECT PHASE I	T	P	TU	C
		0	4	0	2

Course Objectives	
1.	To enable the students to assess a problem of societal importance both theoretically and practically.
2.	To allow the batch of students to work in a group to find solution to problem chosen.
3.	To enable the students learn modern concepts and experiment the same while proposing a solution.
4.	To understand and implement design and coding aspects of the project work using modern technology.

COURSE DESCRIPTION

Project work shall preferably be batch wise, the strength of each batch shall not exceed maximum of four students) under the supervision of a faculty of the department to be carried out either at institute or industry. They shall meet the supervisor periodically and attend the periodic reviews for evaluating the progress. In some cases, industry support can also be taken for projects under intern/inplant-training. In such cases, one supervisor from industry and other supervisor from the institute have to monitor the batch of students.

Project work will be carried out in two phases, Phase-I during the seventh semester and Phase-II during the final semester. Phase-I shall be pursued for a minimum of 4 periods per week and only one review will be conducted for finalising the project title based on the literature review done by each batch. The Project Report prepared according to the approved guidelines and duly signed by the supervisor and the Head of the Department shall be submitted to the concerned department at least one week before the viva-voce examination which will be conducted at the end of the semester.

Course Outcomes : Students will be able to	
CO1	Describe the problem area and analyze thoroughly to provide a solution in modular format.
CO2	Survey systemic literature survey by referring text book , journals to build relevant knowledge in the chosen field to prepare and present report.
CO3	Explain the concept and communication issues to be fixed.
CO4	Determine suitable coding techniques to match the needs of solutions.
CO5	The modules to be solved in phase I and show sample screenshot.

BoS Chairman

Professional Elective - IV

B.E.	B19CSE701 - SOFTWARE QUALITY ASSURANCE	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basics of software quality, Quality metrics & design and testing model
2.	To study the various types of test in the life cycle of the software product.
3.	To efficiently perform Testing & Quality assurance activities using modern software tools
4.	To develop T & QA project staffing requirements
5.	To effectively manage a T & QA project

UNIT - I	INTRODCUTION TO SQA	9

Software quality - People's Quality Expectations, Frameworks and ISO-9126, McCall's Quality Factors and Criteria - Relationship. Quality Metrics. Quality Characteristics ISO 9000:2000 Software Quality Standard. Maturity models- Test Process Improvement, Testing Maturity Model.

UNIT - II	SOFTWARE QUALITY ASSURANCE	9

Quality Assurance - Root Cause Analysis, modelling, technologies, standards and methodologies for defect prevention. Cost and Schedule estimation techniques, Fault Tolerance and Failure Containment - Safety Assurance and Damage Control, Hazard analysis using fault - trees and event - trees - Comparing Quality Assurance Techniques and Activities - QA Monitoring and Measurement, Risk Identification for Quantifiable Quality Improvement.

UNIT - III	SOFTWARE TESTING TOOLS	9

Selecting and Installing Software Testing tools - Automation and Testing Tools - Load Runner, Win runner and Rational Testing Tools, Silk test, Java Testing Tools, JMetra, JUNIT and Cactus.

UNIT - IV	TESTING PROCESS	9

Seven Step Testing Process - I: Overview of the Software Testing Process, Organizing of Testing, Developing the Test Plan, Verification Testing, Validation Testing.

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UNIT - V	SEVEN STEP TESTING PROCESS - II	9
Analyzing and Reporting Test results, Acceptance and Operational Testing, Post- Implementation Analysis Specialized Testing Responsibilities: Software Development Methodologies, Testing Client/ Server Systems		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Identify and apply various software metrics, which determines the quality level of software.
CO2	Identify and evaluate the quality level of internal and external attributes of the software product.
CO3	Examine the testing process by using several testing tools.
CO4	Analyze the quality of software product.
CO5	Identify and evaluate the quality level of internal and external attributes of the software product.

Text Books	
1.	Nina Godbole, Software Quality Assurance: Principles and Practices for the new Paradigm, ASIL Publishers, 2017.
2.	Software Quality Assurance - From Theory to Implementation, Daniel Galin, Pearson Education, 2009.

Reference Books	
1.	Software Testing - Principles and Practices, Naresh Chauhan, Oxford University Press, 2010.
2.	Software Quality Assurance, 1st Edition, R Chopra, MLI, 2018.

BoS Chairman

B.E.	B19CSE702 - MULTI-CORE ARCHITECTURES AND PROGRAMMING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the need for multi-core processors, and their architecture.
2.	To understand the challenges in parallel and multi-threaded programming.
3.	To learn about the various parallel programming paradigms.
4.	To utilizes the uses of Open MP libraries.
5.	To develop multicore programs and design parallel solutions.

UNIT - I	MULTI-CORE PROCESSORS	9

Single core to Multi-core architectures - SIMD and MIMD systems - Interconnection networks - Symmetric and Distributed Shared Memory Architectures - Cache coherence - Performance Issues - Parallel program design.

UNIT - II	PARALLEL PROGRAM CHALLENGES	9

Performance - Scalability - Synchronization and data sharing - Data races - Synchronization primitives (mutexes, locks, semaphores, barriers) - deadlocks and live locks - communication between threads (condition variables, signals, message queues and pipes).

UNIT - III	SHARED MEMORY PROGRAMMING WITH Open MP	9

OpenMP Execution Model - Memory Model - Open MP Directives - Work-sharing Constructs -Library functions - Handling Data and Functional Parallelism - Handling Loops
- Performance Considerations.

UNIT - IV	DISTRIBUTED MEMORY PROGRAMMING WITH MPI	9

MPI program execution - MPI constructs - libraries - MPI send and receive - Point-to-point and Collective communication - MPI derived data types - Performance evaluation

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UNIT - V	PARALLEL PROGRAM DEVELOPMENT	9
Case studies - n-Body solvers - Tree Search - Open MP and MPI implementations and comparison.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Outline the interaction between components in multi-core processors.
CO2	Illustrate the synchronization and communication mechanism available on latest multi-core machines.
CO3	Make use of Open MP and MPI programming to improve memory usage.
CO4	Construct Open MPI programming and its performance evaluation..
CO5	Summarize multi-core architectures and its uses in effective concurrent program performance.

Text Books	
1.	Peter S. Pacheco, Mathew Malensek, “An Introduction to Parallel Programming”, 2nd edition, Elsevier Science, 2021.
2.	K. Hwang, FA Briggs, “Computer Architecture and Parallel Processing”, MH, 2007.

Reference Books	
1.	Shameem Akhter and Jason Roberts, “Multi-core Programming”, Intel Press, 2006.
2.	Michael J Quinn, “Parallel programming in C with MPI and Open MP”, Tata McGraw Hill, 2003.

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B.E.	B19CSE703 - HIGH PERFORMANCE COMPUTING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basic concepts of high-performance computing and its applications.
2.	To obtain knowledge about high-performance computers and their architectures.
3.	To know the need of parallel algorithms and techniques involved.
4.	To study about parallel programming applications and task scheduling.
5.	To learn various challenges involved in achieving high performance with the available computational systems.

UNIT - I	INTRODUCTION	9

High Performance Computing disciplines - Impact of supercomputing on science, social and security, Anatomy of super computer, Performance of computing - History of Supercomputing - Applications - Real-world case studies.

UNIT - II	HIGH PERFOMANCE COMPUTING ARCHITECTURE	9

Key properties of HPC architecture - Memory Technologies - Multiprocessors : Homogeneous and Heterogeneous, Shared-memory Multiprocessors, Heterogenous Computer structures - Symmetric multiprocessor core architecture.

UNIT - III	PARALLEL ALGORITHMS	9

Parallel Algorithms: Parallel models: ideal and real frameworks, Basic Techniques: Balanced Trees, Pointer Jumping, Divide and Conquer, Partitioning, Regular Algorithms: Matrix operations and Linear Algebra, Irregular Algorithms: Lists, Trees, Graphs.

UNIT - IV	PARALLEL PROGRAMMING	9

Parallel Programming: Revealing concurrency in applications, Task and Functional Parallelism, Task Scheduling, Synchronization Methods, Parallel Primitives, SPMD Programming (threads, OpenMP, MPI), I/O and File Systems.

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UNIT - V	PERFORMANCE MEASUREMENT	9
Achieving Performance: Measuring performance, identifying performance bottlenecks, restructuring applications for deep memory hierarchies, Partitioning applications for heterogeneous resources, using existing libraries, tools, and frameworks.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Illustrate the importance of high-performance computing and its applications.
CO2	Analyze various system architectures of computer memory.
CO3	Explain the concepts of parallel algorithms and their frameworks.
CO4	Analyze the applications and scheduling of parallel algorithms.
CO5	Outline the performance of computation systems.

Text Books	
1.	Thomas Sterling, Matthew Anderson, Macie Brodowicz ,“High Performance Computing Modern Systems and Practices”, Morgan Kaufmann/Elsevier, 2018.
2.	Roman Trobec, Bostjan Slivnik, Patricio Bulic, Borut Robi, “Introduction to Parallel Computing: From Algorithms to Programming on State-of-the-Art Platforms”, Springer, 2018.

Reference Books	
1.	Robert Robey, Yuliana Zamora “Parallel and High Performance Computing”, Manning publications, 2021.
2.	Charles K. Alexander, Mathew, N.O. Sadiku, “High Performance Computing in Science and Engineering”, Springer International Publishing AG, 2016.

BoS Chairman

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.

BoS Chairman

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”, 2nd 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.

BoS Chairman

B.E.	B19CSE705 - DEEP LEARNING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To study the basic concepts of deep learning.
2.	To present models and convolution techniques.
3.	To introduce class of neural networks in modelling sequence data.
4.	To enable the students to understand encoding methods used in machine learning.
5.	To know about the applications of deep learning techniques.

UNIT - I	INTRODUCTION	9

Historical context and motivation for deep learning - basic supervised classification task- optimizing logistic classifier using gradient descent - stochastic gradient descent - momentum and adaptive sub-gradient method.

UNIT - II	DEEP LEARNING FOR NEURAL NETWORK	9

Feedforward neural networks-deep networks - regularizing a deep network - model exploration - hyperparameter tuning. Convolution Neural Networks: Introduction to convolution neural networks - stacking - striding and pooling - applications like image and text classification.

UNIT - III	RECURRENT NEURAL NETWORKS (RNN)	9

Unfolding computational graphs-recurrent neural networks (RNNs) - bidirectional RNNs - encoder - decoder sequence to sequence architectures - deep recurrent networks.

UNIT - IV	AUTO ENCODERS	9

Introduction - Features of auto encoder - Types of auto encoder - Boltzmann machine - RBM architecture - Types of RBM

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UNIT - V	DEEP LEARNING APPLICATIONS	9
Introduction - Image Classification Using CNN - Visual Speech Recognition Using 3D - CNN - Stock Market Prediction Using Recurrent Neural Network - Next - Word Prediction Using RNN - LSTM - Tamil Handwritten Character Optical Recognition Using CRNN.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Interpret the feedforward and deep networks.
CO2	Demonstrate different models and convolution techniques.
CO3	Identify various classes of recurrent neural networks.
CO4	Analyse single and multi-layer feed-forward deep networks and tune various hyper-parameters.
CO5	Examine performance of deep networks.

Text Books	
1.	Lan Good fellow, “Deep Learning”, MIT Press, 2016.
2.	S Lovelyn Rose, L Ashok Kumar, D Karthika Renuka, “Deep Learning Using Python”, Wiley, 2021.

Reference Books	
1.	Mindy L Hall, “Deep Learning”, VDM Verlag, 2011.
2.	Li Deng (Author), Dong Yu, “Deep Learning: Methods and Applications (Foundations and Trends in Signal Processing)”, Now Publishers Inc, 2009.
3.	Deep Learning with Tensor Flow, Giancarlo Zaccone, 2017.

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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 system.
CO2	Analyze image enhancement in the spatial and frequency domain using various transforms.
CO3	Evaluate the techniques for image restoration.
CO4	Evaluate 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.	B19MCE701 - 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.

COURSE DESCRIPTION

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.
❍	Collaborate in teams with other students working on the same topic
❍	Have a dedicated mentor to guide

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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
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**

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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
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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Professional Elective - V

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.

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.

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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 function 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.

Reference Books	
1.	Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw 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, NewYork, 2005.

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B.E.	B19CSE708 - ENTERPRISE COMPUTING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To introduce the basic concepts of Enterprise foundations.
2.	To study the applications of RMI.
3.	To study the services for Distributed Enterprise systems.
4.	To study the architectural aspects of Enterprise systems.
5.	To understand the search and analytical computing methods.

UNIT - I	ENTERPRISE FOUNDATIONS	9

Enterprise Architectural overview, object oriented software development for enterprise, Component Based software development for enterprise. Java Enterprise System. Enterprise Data, Basis of JDBC, interfaces, drivers. Advanced JDBC features.

UNIT - II	DISTRIBUTED ENTERPRISE COMMUNICATIONS ENABLING	9

Distributed Enterprise Communications Basis, RMI Communication, CORBA communication, DCOM Communication, Software Development for RMI Communication.

UNIT - III	SERVICES FOR DISTRIBUTED ENTERPRISE SYSTEMS	9

Naming Services, Directory and Trading services, Activation Services, Message Services, Transaction Services, Security Services and High assurance Enterprise applications.

UNIT - IV	ENTERPRISE ARCHITECTURE AND ROLE	9

Enterprise Data, Processes and Components - Enterprise Architecture Evolution and Frameworks - Monolithic, Application Integration, SOA and Micro services - enterprise Technical Architecture - Data Center Infrastructure: Coping with Complexity

BoS Chairman

UNIT - V	ENTERPRISE ANALYTICS AND SEARCH	9
Enterprise Knowledge : Goals and practices - Business Intelligence - Text and Data mining - Text and DB search.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Take part in understanding the foundation concepts of Enterprise Computing.
CO2	Apply the Distributed Enterprise Communication Methods.
CO3	Explain the concepts of services in Distributed Enterprise Systems.
CO4	Outline the architecture and its role in enterprise computing.
CO5	Explain the techniques of enterprise analytics and search.

Text Books	
1.	Gautam Shroff, "Enterprise Cloud Computing - Technology, Architecture, Applications", University Press, 2010.
2.	Thomas Erl, Zaigham Mahmood and Ricardo Puttini, "Cloud Computing Concepts, Technology & Architecture", PRENTICE HALL, 2013.

Reference Books	
1.	Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach" McGraw-Hill, 2009.
2.	John Ritting house, James Ransome, Cloud Computing: Implementation, Management, and Security, 2009

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B.E.	B19CSE709 - INFORMATION RETRIEVAL TECHNIQUES	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the design, implementation and evaluation of information retrieval systems.
2.	To understand the models for information retrieval.
3.	To understand machine learning techniques for text classification and clustering.
4.	To understand various search engine system operations.
5.	To learn different techniques of recommender system.

UNIT - I	BASICS OF INFORMATION RETRIEVAL	9

Boolean retrieval - The term vocabulary and posting lists - Scoring, term weighting and the vector space model - Computing scores in a complete search system - Evaluation in information retrieval.

UNIT - II	IR MODELLING	9

XML Retrieval - Probabilistic information retrieval : Review - Ranking principle - Binary independence model - Language models for information retrieval : Language models - query likelihood model.

UNIT - III	TEXT CLASSIFICATION AND CLUSTERING	9

A Characterization of Text Classification - Unsupervised Algorithms: Clustering - Naïve Text Classification - Supervised Algorithms - Decision Tree - k-NN Classifier - SVM Classifier - Feature Selection or Dimensionality Reduction - Evaluation metrics - Accuracy and Error - Organizing the classes - Indexing and Searching - Inverted Indexes - Sequential Searching - Multi-dimensional Indexing.

UNIT - IV	WEB SEARCH AND IR	9

The Web - Search Engine Architectures - Cluster based Architecture - Distributed Architectures - Search Engine Ranking - Link based Ranking - Search Engine Ranking - Search Engine User Interaction - Web crawling and indexes : Overview - Crawling - Link analysis : Page rank.

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UNIT - V	MULTIMEDIA IR	9
Multimedia information retrieval basics - Architecture of MMIR - Mutimedia search technologies.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Show knowledge on the underlying retrieval models, algorithms, and system implementations.
CO2	Make use of an open-source search engine framework and explore its capabilities.
CO3	Apply appropriate method of classification or clustering.
CO4	Analyze and implement innovative features in a search engine.
CO5	Inspect and implement a recommender system.

Text Books	
1.	Ricardo Baeza-Yates and Berthier Ribeiro Neto, Modern Information Retrieval: The Concepts and Technology behind Search, Second Edition, ACM Press Books, 2011.
2.	Badal Soni, Suganya Devi K, “Information Retrieval: Models and Concepts”, Wiley, 2018

Reference Books	
1.	Christopher Manning, Prabhakar Raghavan and Hinrich Schutze, “Introduction to Information Retrieval”, Cambridge University Press. 2012.
2.	Stefan Buettcher, Charles L.A. Clarke and Gordon V. Cormack, “Information Retrieval : Implementing and Evaluating Search Engines”, The MIT Press, 2010.

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B.E.	B19CST710 - REAL TIME SYSTEMS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To study issues related to the design and analysis of systems with real-time constraints.
2.	To learn the features of Real time OS.
3.	To study the various Uniprocessor and Multiprocessor scheduling mechanisms.
4.	To learn about various real time communication protocols.
5.	To study the difference between traditional and real time databases.

UNIT - I	INTRODUCTION TO REAL - TIME SYSTEMS	9

Introduction to real time computing - Concepts - Example of real-time applications - Structure of a real time system - Characterization of real time systems and tasks - Hard and Soft timing constraints - Design Challenges - Performance metrics - Prediction of Execution Time: Source code analysis - Micro-architecture level analysis - Cache and pipeline issues- Programming Languages for Real-Time Systems.

UNIT - II	TASK ASSIGNMENT AND SCHEDULING	9

Real time OS - Threads and Tasks - Structure of Microkernel - Time services - Scheduling Mechanisms - Communication and Synchronization - Event Notification and Software interrupt - Uniprocessor scheduling algorithms - Task assignment - Mode changes - Fault tolerant scheduling.

UNIT - III	REAL - TIME COMMUNICATION	9

Network topologies and architecture issues - Protocols - Contention-based - token-based - polled bus - Fault tolerant routing.

UNIT - IV	REAL - TIME DATABASES	9

Transaction priorities and aborts - Concurrency control issues - Scheduling algorithms - Two-phase approach to improve predictability.

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UNIT - V	PROGRAMMING LANGUAGES AND TOOLS	9
Hierarchical decomposition - Run - time error handling - Overloading - Timing specification - Recent trends and developments.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Analyze scheduling problems.
CO2	Apply real time programming environment to tackle practical problems.
CO3	Develop real time systems Communication.
CO4	Interpret the basic multi-task scheduling algorithms.
CO5	Infer the problems using programming tools in real time systems.

Text Books	
1.	Jane W.S. Liu, “Real Time Systems”, Pearson Publication, 2018.
2.	Phillip A. Laplanta, Seppo J. Ovaska, “Real time System Design and Analysis Tools for practitioner”, Wiley, 2013

Reference Books	
1.	Rajib, “Real Time Systems”, Pearson Education, 2009
2.	Albert M. K. Cheng, “Real-Time Systems: Scheduling, Analysis, and Verification”, Wiley, 2002

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B.E.	B19CSE711 - AGENT BASED INTELLIGENT SYSTEMS	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 Agent.
3.	To learn to represent knowledge in solving Agent problems.
4.	To understand the different ways of Planning agents.
5.	To know about the acting in uncertainty and knowledge representation.

UNIT - I	INTRODUCTION	9

Definitions - Foundations - History - Intelligent agents: Nature of environment-Structure of agents problem solving - Searching: uninformed search strategies-Searching with partial information - Heuristics: Local search algorithms - Constraint satisfaction problems: Backtracking search

UNIT - II	KNOWLEDGE REPRESENTATION AND REASONING	9

Logical Agents: Propositional logic - Reasoning patterns in propositional logic - Agent based propositional logic - First order logic: Syntax and semantics-First order inference: Unification - Chaining - Resolution strategies - Knowledge representation: Objects - Actions - Events

UNIT - III	PLANNING AGENTS	9

Planning problem: State space search - Partial order planning - Graphs - Hierarchical network planning - Nondeterministic Domains - Conditional planning - Execution monitoring and replanning - Continuous planning - Multi agent planning

UNIT - IV	AGENTS AND UNCERTAINTY	9

Acting under uncertainty - Probability notation-Bayes rule and use - Probabilistic reasoning: Bayesian Networks-Other approaches - Time and uncertainty: Temporal Models - Simple decisions: Utility theory - Decision network - Complex decisions: Value Iteration - Policy iteration.

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UNIT - V	HIGHER LEVEL AGENTS	9
Knowledge in learning: Explanation based learning - Relevance information - Statistical learning methods: Instance based learning - Neural network - Reinforcement learning: Passive and active communication: Formal grammar - Augmented grammars - Future of AI.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Summarize the agent based problem solving techniques.
CO2	Classify the knowledge representation and reasoning techniques in logic programming.
CO3	Make use of planning agents to solve problems in different domains of knowledge processing.
CO4	Analyze the uncertainty to improve decision making.
CO5	Apply and integrate various artificial intelligence techniques in intelligent system design and development.

Text Books	
1.	Stuart Russell and Peter Norvig, “Artificial Intelligence - A Modern Approach”, Prentice Hall India, 2012.
2.	Elaine Rich, Kevin Knight, Shivashankar B Nair, “Artificial Intelligence”, Tata McGraw Hill, 2010.

Reference Books	
1.	M. Tim Jones, Artificial Intelligence: A Systems Approach, Jones and Bartlett Publisher, 2010
2.	Winston, Patrick Henry, “Artificial Intelligence”, Addison Wesley, 2008.

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B.E.	B19CSE712 - INTELLECTUAL PROPERTY RIGHTS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basic concepts of IPR, Patents and Copyrights.
2.	To Give an idea about registration of IPR in India and abroad.
3.	To learn the different types of Agreement and patent act in India.
4.	To learn the digital innovation, development and patent law with use cases.
5.	To understand enforcement of IPR in real time application.

UNIT - I	INTRODUCTION	9

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad - Genesis and Development - the way from WTO to WIPO -TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations - Important examples of IPR.

UNIT - II	REGISTRATION OF IPRs	10

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad.

UNIT - III	AGREEMENTS AND LEGISLATIONS	10

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT - IV	AGENTS AND UNCERTAINTY	9

Digital Innovations and Developments as Knowledge Assets - IP Laws, Cyber Law and Digital Content Protection - Unfair Competition - Meaning and Relationship between Unfair Competition and IP Laws.

UNIT - V	ENFORCEMENT OF IPRs	7

Infringement of IPRs - Enforcement Measures - Emerging issues - Case Studies.

Total Instructional hours : 45

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Course Outcomes : Students will be able to	
CO1	Outline the basic concepts of IPR, Patents and Copyrights.
CO2	Explain the details about registration of IPR in India and abroad.
CO3	Identify the different types of Agreement and patent act in India.
CO4	Apply the digital innovation, development and patent law to different Applications.
CO5	Summarize the enforcement measures of IPR with use cases.

Text Books	
1.	V. Scople Vinod, “Managing Intellectual Property”, Prentice Hall of India pvt Ltd, 2012.
2.	S.V. Satakar, “Intellectual Property Rights and Copy Rights”, Ess Ess Publications, New Delhi, 2002.

Reference Books	
1.	Deborah E. Bouchoux, “Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets”, Cengage Learning, Third Edition, 2012.
2.	Prabuddha Ganguli, ”Intellectual Property Rights: Unleashing the Knowledge Economy”, McGraw Hill Education, 2011.
3.	Derek Bosworth and Elizabeth Webster, “The Management of Intellectual Property”, Edward Elgar Publishing, 2013.

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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. Introduction to Mission Planning, Instrument Flying & Navigation (GCS) - Applications of fixed-wing UAVs. Pros and Cons of Fixed Wing 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 andthe 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.	Lan 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

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

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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.	"Manufacturing Engineering and Technology", kalpakjian and schmid, pearson, 2010.
2.	Hajra Choudry, "Elements of workshop technology - Vol II", Media promoters, 2002.
3.	Sahay, "Elements of Agricultural Engineering", standard publishers Distributors, Delhi, 2010.
4.	Michael and Ohja, "Principles of Agricultural Engineering", Jain brothers, New Delhi., 2005.

Reference Books	
1.	Gupta. K.N., and Kaushik, J.P., 1998, "Workshop Technology Vol I and II", New Heights, Daryaganj, New Delhi.
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/

BoS Chairman

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 Time stamp.

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 ACQUISITION 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 : Students will 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 Medicine” Press 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

BoS Chairman

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 nano biocomposites.
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 nanostructured materials, nanoparticles - Quantum dots, Nanowires - Ultra thin films - Multi layered materials. 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 synthesis, top-down and functional approaches; Chemical and physical synthesis of nanoparticles - characteristics of nanoparticles; Characterization of nanoscale materials using UV spectroscopy, TEM, SEM, SPM, AFM, STM, SNOM, 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 - using bacteria, fungi, yeast and plants with 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 NANO BIOTECHNOLOGY	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 : Students 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 S D, “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	B19ECO701 - INTRODUCTION TO COMMUNICATION SYSTEMS (Common to all Except ECE)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To introduce the concept of basic Analog and Digital Communication Systems.
2.	To understand the various modulation techniques for Analog and digital communication Systems.
3.	To perform a block-diagram design of the transmitter and receiver for a basic Analog and Digital Communications System.
4.	To identify the performance, in terms of bit error rate, of a Digital Communication System.
5.	To study the wireless channel and Mobile Communication Systems.

UNIT - I	ANALOG COMMUNICATIONS	9

Basic concepts of Linear Modulation and Demodulation - Modulation Index - Power relation in AM wave - double and single sideband-Generation and Detection of Amplitude Modulation - Hilbert transform - analytic signal.

UNIT - II	ANGLE MODULATIONS	9

Frequency Modulation-comparison of frequency modulation and amplitude modulation - narrowband and wideband FM - Bessel functions - Carson's rule-bandwidth-Generation and Demodulation of frequency and phase modulation - Phase-locked loops.

UNIT - III	DIGITAL COMMUNICATIONS	9

Nyquist sampling theorem - Pulse amplitude modulation, Pulse code modulation - quantization noise, delta modulation, DPCM, ADPCM, Multiplexing and Multiple Access Techniques - FDM and FDMA, TDM and TDMA, CDMA.

UNIT - IV	DIGITAL MODULATION TECHNIQUES	9

Binary Phase Shift Keying - Binary Frequency Shift Keying - Pulse Amplitude Modulation (PAM), On - Off Keying OOK. Optimum receiver structures for digital communication - matched filtering, co-relation detection, probability of error.

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UNIT - V	WIRELESS CHANNEL AND MOBILE COMMUNICATION	9
Overview of wireless systems-capacity of wireless channel- Examples of Wireless Communication Systems- Paging system, Cordless telephones systems, Cellular telephone Systems- Cellular concept- Large and small Scale Fading.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Explain the basic concepts of analog communication systems.
CO2	Develop the modulation technique for analog communication.
CO3	Identify and describe different techniques in modern digital communications.
CO4	Explain various digital modulation techniques.
CO5	Analyzes the performance of wireless channels for mobile communication.

Text Books	
1.	Thepdore. S.Rapport, “Wireless Communications: principles and practice”, 2nd Edition, Pearson education, India, 2009.
2.	B.P.Lathi, “Modern Digital and Analog Communication systems”, 4th Edition, Oxford university press, 2010.
3.	S.Haykin, “Communication systems”, 3/e John Wiley, 2007.

Reference Books	
1.	David Tse and Pramod Viswanath, “Fundamentals of wireless communications” Wiley series in Telecommunications, cambridge university press, 2005.
2.	J.G. Proakis, M. Salehi, “Fundamentals of Communication Systems”, Pearson education 2006.
3.	H.P. Hsu, Schaum outline series, “Analog and Digital Communications”, TMH, 2006.
4.	Andrea Goldsmith, “Wireless Communications”, Cambridge University Press, 2005.

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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 ELECTRICVEHICLES	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.	C.K. Chua, Kah Fai Leong, “3D Printing and Rapid Prototyping - Principles and Applications”, World Scientific, 2017.

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Semester - VIII

B.E.	B19CSE801 - SOFTWARE PROJECT MANAGEMENT	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To introduce the Fundamentals of Software Project Management.
2.	To study the importance of project planning.
3.	To highlight different techniques for project scheduling.
4.	To study the concepts of software risk management.
5.	To develop skills to manage the various phases involved in project cost management and people management.

UNIT - I	INTRODUCTION TO SOFTWARE PROJECT MANAGEMENT	9

Importance of software project management - Stages of Project - The Stakeholder of Project - Project Management Framework - Software Tools for Project Management - Microsoft Project 2010 - Cost-benefit evaluation technology - Risk evaluation - Strategic program Management - Stepwise Project Planning.

UNIT - II	PROJECT PLANNING	9

Integration Management: Project Plan Development - Plan Execution Scope Management: Methods for Selecting Projects - Project Charter - Scope Statement - WBS. Stepwise Project Planning: Main Steps in Project Planning Use of Software to Assist in Project Planning Activities

UNIT - III	PROJECT SCHEDULING	9

Time Management: Importance of Project Schedules, Schedules and Activities, Sequencing and Scheduling Activity Project Network Diagrams: Network Planning Models, Duration Estimating and Schedule Development, Critical Path Analysis, Program Evaluation and Review Technique (PERT), Monte Carlo simulation , Resource Allocation, Creation of critical paths, Cost schedules.

UNIT - IV	SOFTWARE RISK MANAGEMENT	9

Perspectives of Risk Management - Risk Definition - Risk Categories - Risk Assessment: Approaches, techniques and good practices - Risk Identification / Analysis / Prioritization - Risk Control (Planning / Resolution / Monitoring) - Risk Retention - Risk Transfer - Failure Mode and Effects Analysis (FMEA) - Operational Risks - Supply Chain Risk Management

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UNIT - V	PROJECT COST MANAGEMENT AND PEOPLE MANAGEMENT	9
Project Cost Management: Importance and Principles of Project Cost Management, Resource Planning - Cost Estimating - Cost Budgeting - Cost Control - Use of Software to assist in Cost Management. Managing people - Organizational behavior - Best methods of staff selection, working in teams, Communications genres, Communication plans, Leadership		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Outline about the project management principles while developing software.
CO2	Demonstrate the knowledge of project planning.
CO3	Analyze the step involved in project scheduling.
CO4	Identify the risks involved in various projects activities.
CO5	Summarize the importance of software project estimation and staff selection.

Text Books	
1.	Pankaj Jalote, “Software Project Management in Practice”, Pearson, 2015.

Reference Books	
1.	Murali Chemuturi, Thomas M. Cagley, “Mastering Software Project Management: Best Practices, Tools and Techniques”, J. Ross Publishing, 2010
2.	Elaine Marmel, “Microsoft Project 2010 Bible”, Wiley; 1st Edition, 2010

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B.E.	B19CSE802 - NETWORK ROUTING AND PROTOCOLS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To learn about the network router architecture.
2.	To describe about the network routing foundations.
3.	To know about routing in IP networks.
4.	To learn about MANET routing.
5.	To understand about next generation routing.

UNIT - I	ROUTER ARCHITECTURE	9

Functions of Router - Types - Elements - Packet Flow - Packet Processing Router Architectures, IP Address Lookup Algorithms- Impact of Addressing on Lookup- Longest Prefix Matching - Naïve algorithms - Binary Tries - Multibit Tries.

UNIT - II	NETWORK ROUTING FOUNDATIONS	9

Networking and Network Routing: An Introduction, Routing algorithms: Shortest path and widest path - Bellman Ford algorithm and distance vector approach - Dijikstra's algorithm - comparison - widest path algorithm - shortest and widest path computation - k-shortest path algorithms, Routing Protocols: Framework and Principles.

UNIT - III	ROUTING IN IP NETWORKS	9

Routing IP Networks - IP Routing - Distance vector routing Protocol family - OSPF and Integrated IS-IS - Packet format - IP traffic Engineering - BGP - Internet Routing Architectures.

UNIT - IV	MANET ROUTING	9

Internet based mobile ad-hoc networking, communication strategies, classification of MANET routing algorithms Destination sequenced Distance Vector (DSDV), Dynamic source Routing (DSR), Ad-hoc on demand Distance Vector (AODV) & Temporarily Ordered Routing algorithm (TORA).

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UNIT - V	NEXT GENERATION ROUTING	9
QOS routing - Adapting shortest path and widest path routing - Routing protocols for QOS routing - MPLS - GMPLS - routing and traffic engineering with MPLS - VoIP routing - Interoperability through IP and PSTN.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Infer the concepts of Network Router Architecture.
CO2	Outline Network routing algorithm foundations and its Framework.
CO3	Classify the abstraction of IP networks using Routing Protocols.
CO4	Utilize the available protocols for MANET Routing.
CO5	Interpret the technical, economic and services of next generation routing.

Text Books	
1.	Medhi, K.Ramasamy, “Network Routing: Algorithms, Protocols and Architectures”, Morgan Kaufmann Publishers, 2017.

Reference Books	
1.	C.Siva Ram Murthy and B.S. Manoj, Adhoc Wireless Networks, Pearson, 2012.
2.	Steen Strub M, Routing in Communication networks, Prentice Hall International, New York, 2005

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B.E.	B19CSE803 – FINANCIAL MANAGEMENT	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To acquire the knowledge of the decision areas in finance.
2.	To learn the various sources of Finance
3.	To describe about capital budgeting and cost of capital.
4.	To discuss on how to construct a robust capital structure and dividend policy
5.	To develop an understanding of tools on Working Capital Management.

UNIT - I	INTRODUCTION TO FINANCIAL MANGEMENT	9

Definition and Scope of Finance Functions - Objectives of Financial Management - Profit Maximization and Wealth Maximization - Time Value of money - Risk and return concepts.

UNIT - II	SOURCES OF FINANCE	9

Long term sources of Finance - Equity Shares – Debentures - Preferred Stock – Features – Merits and Demerits. Short term sources - Bank Sources, Trade Credit, Overdrafts, Commercial Papers, Certificate of Deposits, Money market mutual funds etc

UNIT - III	INVESTMENT DECISIONS	9

Investment Decisions: capital budgeting – Need and Importance – Techniques of Capital Budgeting –– Payback -ARR – NPV – IRR –Profitability Index. Cost of Capital - Cost of Specific Sources of Capital - Equity - Preferred Stock - Debt - Reserves - Concept and measurement of cost of capital - Weighted Average Cost of Capital.

UNIT - IV	FINANCING AND DIVIDEND DECISION	9

Operating Leverage and Financial Leverage - EBIT - EPS analysis. Capital Structure – determinants of Capital structure - Designing an Optimum capital structure . Dividend policy - Aspects of dividend policy - practical consideration - forms of dividend policy - Determinants of Dividend Policy.

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UNIT - V	WORKING CAPITAL DECISION	9
Working Capital Management: Working Capital Management - concepts - importance - Determinants of Working capital. Cash Management: Motives for holding cash – Objectives and Strategies of Cash Management. Receivables Management : Objectives - Credit policies.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Outline the benefits of finance management policies.
CO2	Illustrate various sources of finance and their impacts.
CO3	Demonstrate the strategies involved in investment related decision making.
CO4	Summarize the techniques behind capital structure and dividend policy.
CO5	Explain the concepts of working capital decision system.

Text Books	
1.	M.Y. Khan and P.K.Jain Financial management, Text, Tata McGraw Hill, 8th Ed, 2018.
2.	M. Pandey Financial Management, Vikas Publishing House Pvt. Ltd, 11th Ed, 2015.

Reference Books	
1.	James C. Vanhorne – Fundamentals of Financial Management – PHI Learning, 12th Ed, 2009
2.	Prasanna Chandra, Financial Management, Tata McGraw Hill, 10th Ed, 2019.
3.	Srivatsava, Mishra, Financial Management, Oxford University Press, 2nd Ed., 2011

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B.E.	B19CSE804 - GREEN COMPUTING	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To acquire knowledge to adopt green computing practices to minimize negative impacts on the environment.
2.	To infuse skill in energy saving practices in their use of hardware, examine technology tools that can reduce paper waste and carbon footprint by user.
3.	To understand how to minimize equipment disposal requirements.
4.	To understand the issues related with Green compliance.
5.	To know and analyze various case studies.

UNIT - I	GREEN COMPUTING FUNDAMENTALS	9

Information Technology and Environment - Green Enterprise Characteristics- Green Vision- Green Value-Green IT Opportunity-Environmental Intelligence--Envisioning the Green Future.

UNIT - II	GREEN IT STRATEGIES AND ASSETS	9

Introducing Green IT Strategies-Green IT Drivers-Green IT Business Dimensions-Green IT Metrics and Measurements- Green IT Readiness and CMM-Green Assets-Buildings-Green IT Hardware- Green Data Centers - Networking and Communication Infrastructure- Managing Devices for Central Green Services.

UNIT - III	SOCIO CULTURAL ASPECTS OF GREEN IT	9

Green IT Social Impact- Social stakeholders-Role based view of Green IT-Green User practices-Green IT Ethics and Code Conduct- Privacy and security of green Information - Green IT project - Green Virtual Communities.

UNIT - IV	EMERGENT CARBON ISSUES - TECHNOLOGIES AND FUTURE	9

Future Carbon Landscape - Green ICT and Technology Trends - Nanotechnologies- Quantum Computing- Eco design- New Renewable Energies-Green ICT- Business and Economic Trends.

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UNIT - V	CASE STUDIES	9
The Environmentally Responsible Business Strategies (ERBS) - Case Study Scenarios for Trial Runs - Case Studies - Applying Green IT Strategies and Applications to a Home, Hospital, Packaging Industry and Telecom Sector.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Demonstrate the benefits and policies of energy efficient computing.
CO2	Illustrate and the change in processes and products to make them green safe and economically acceptable.
CO3	Apply the strategies of going Green for energy aware applications.
CO4	Devise energy efficient computing application.
CO5	Outline the ways to minimize equipment disposal requirements.

Text Books	
1.	Bhuvan Unhelkar, “Green IT Strategies and Applications-Using Environmental Intelligence”, CRC Press, June 2016.
2.	Woody Leonhard, Katherrine Murray, “Green Home computing for dummies”, August 2009.

Reference Books	
1.	Wu Chun Feng (editor), “Green computing: Large Scale energy efficiency”, CRC Press, 2012.
2.	Alin Gales, Michael Schaefer, Mike Ebbers, “Green Data Center: steps for the Journey”, Shoff/ IBM rebook, 2011.
3.	Carl speshocky, “Empowering Green Initiatives with IT”, John Wiley & Sons, 2010.

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B.E.	B19CSE805 - DIGITAL FORENSICS	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To understand the basics of digital forensics and Computer crime.
2.	To be well-trained as next-generation computer crime investigators.
3.	To model and detail about the data acquisition and its tools.
4.	To learn about preventing and fighting digital crimes.
5.	To know about digital crime cases and their issues.

UNIT - I	BASICS OF DIGITAL FORENSICS AND COMPUTER CRIME	9

Computer forensics fundamentals, Benefits of forensics, computer forensics evidence and courts, legal concerns and private issues. computer crimes, introduction to internet crimes, hacking and cracking, credit card and ATM frauds.

UNIT - II	COMPUTER FORENSICS AND INVESTIGATION	9

Understanding Computer forensics Investigations - Preparing for Computer Investigation - Procedure for corporate High-Tech investigations, understanding data recovery work station and software, conducting and investigations.

UNIT - III	DATA ACQUISITION AND ITS TOOLS	9

Data acquisition- understanding storage formats and digital evidence, determining the best acquisition method, acquisition tools, validating data acquisitions, performing RAID data acquisitions, remote network acquisition tools, other forensics acquisitions tools.

UNIT - IV	PROCESSING CRIME AND INCIDENT SCENE	9

Processing crimes and incident scenes, securing computer incident or crime, seizing digital evidence at scene, storing digital evidence, obtaining digital hash, reviewing case.

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UNIT - V	FORENSIC CASE STUDIES	9
CFNZ Hotmail case - APCO Surfing issue - Leaking Sensitive information before delivery.		
		Total Instructional hours : 45

Course Outcomes : Students will be able to	
CO1	Outline the basic digital forensics and computer crime for conducting the forensic examination on different digital devices.
CO2	Infer the role of a Computer forensics profession for investigation.
CO3	Summarize the requirements for use of data acquisition and its tools.
CO4	Identify the need of Process crime and Incident scenes for digital evidence.
CO5	Classify the challenges in investigating forensic cases.

Text Books	
1.	Bill Nelson, Amelia Philips, Christopher Steuart, Guide to Computer Forensics and Investigations, Fourth Edition, Cengage Learning, 2016.
2.	Warren G. Kruse II and Jay G. Heiser, "Computer Forensics: Incident Response Essentials", Addison Wesley, 2002.

Reference Books	
1.	Greg Gogolin, Digital Forensics Explained, CRC Press, 2013.
2.	Cory Altheide, Harlan Carvey, Digital Forensics with Open Source Tools, British Library Cataloguing-in-Publication Data, 2011.
3.	Vacca, J, Computer Forensics, Computer Crime Scene Investigation, 2nd Ed., Charles River Media, 2005.

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B.E.	B19CSE806 - FUNDAMENTALS OF NANOSCIENCE	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To learn about the basics of Nanoscience.
2.	To describe about the preparation methods.
3.	To know about Nano materials.
4.	To learn about the preparation environments.
5.	To understand characterization techniques and applications.

UNIT - I	INTRODUCTION	9

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering- Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms- multilayered materials - Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties.

UNIT - II	PREPARATION METHODS	8

Bottom-up Synthesis-Top-down Approach: Precipitation - Mechanical Milling - Colloidal routes - Self-assembly - Vapour phase deposition - MOCVD - Sputtering - Evaporation - Molecular Beam Epitaxy - Atomic Layer Epitaxy - MOMBE.

UNIT - III	NANO MATERIALS	9

Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube - Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT) - methods of synthesis(arc-growth laser ablation CVD routes Plasma CVD) - structure - property Relationships applications - Nano metal oxides - ZnO - TiO2 - MgO - ZrO2 - NiO - nanoalumina - CaO - AgTiO2 - Ferrites - Nano clays functionalization and applications- Quantum wires - Quantum dots - preparation - properties and applications.

UNIT - IV	PREPARATION ENVIRONMENTS	9

Clean rooms: specifications and design - air and water purity - requirements for particular processes - Vibration free environments: Services and facilities required - Working practices - sample cleaning - chemical purification - chemical and biological contamination - Safety issues - flammable and toxic hazards - biohazards.

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UNIT - V	CHARACTERIZATION TECHNIQUES AND APPLICATIONS	11
X-ray diffraction technique - Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging - Surface Analysis techniques- AFM - SPM - STM - SNOM - ESCA - SIMS-Nanoindentation-NanoInfoTech: Information storage- nanocomputer - molecular switch - super chip - nanocrystal - Nanobiotechlogy: nanoprobes in medical diagnostics and biotechnology - Nano medicines- Targetted drug delivery - Bioimaging - Micro Electro Mechanical Systems (MEMS) - Nano Electro Mechanical Systems (NEMS)- Nanosensors - nano crystalline silver for bacterial inhibition- Nanoparticles for sunbarrier products - In Photostat- printing- solar cell- battery.		
Total Instructional hours : 45		

Course Outcomes : Students will be able to	
CO1	Explain the basic concepts of Nano science.
CO2	Show the preparation methods of nano components
CO3	Illustrate the Nano materials and its chemical composition.
CO4	Explain about the preparation environment.
CO5	Outline the characterization techniques and design applications.

Text Books	
1.	Nils O. Petersen, “Foundations for Nanoscience and Nanotechnology”, CRC, 2017
2.	A.S. Edelstein and R.C. Cammearata, eds., “Nanomaterials: Synthesis, Properties and Applications”, Institute of Physics Publishing, Bristol and Philadelphia, 1996.

Reference Books	
1.	Akhlesh Lakhtakia (Editor), “The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulations”. PHI, 2007.
2.	N John Dinardo, “Nanoscale charecterisation of surfaces & Interfaces”, 2nd edition, Weinheim Cambridge, Wiley-VCH, 2000.
3.	G Timp (Editor), “Nanotechnology”, AIP press/Springer, 1999.

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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	8

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	11
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.	Lan 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

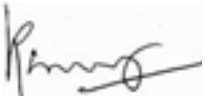
Agricultural Finance: Definition, Importance, Nature and Scope - Agricultural Credit: Meaning, Definition, Need and Classification - Sources of credit - Role of institutional and non - Institutional agencies: Advantages and Disadvantages - Rural indebtedness: consequences of rural indebtedness - History and Development of rural credit in India.

UNIT - II	FARM FINANCIAL ANALYSIS	8

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	11

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, S N., “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	8

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 - Administrative Information Systems - Support Service Technical Information Systems - Medical Transcription, Medical Records Department - Central Sterilization and Supply Department - Pharmacy- Food Services - Laundry Services.

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UNIT - V	QUALITY AND SAFETY ASPECTS IN HOSPITAL	11
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 administration.
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, 4th Edition, 2006.
2.	G.D. Kunders, “Hospitals - Facilities Planning and Management”, TMH, 5th Reprint, New Delhi, 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	8

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	11
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 : Students 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 W W, “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 R M, IL Pepper and CP Gerba, “Environmental Microbiology”, Academic Press. 2000.
6.	Pelczar M J, ECS Chan and N R Kreig, “Microbiology”, 5th Ed., Tata McGraw-Hill, New Delhi, 2002.

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B.E. / B.TECH	B19ECO801 - WIRELESS TECHNOLOGIES (Common to all Except ECE)	T	P	TU	C
		3	0	0	3

Course Objectives	
1.	To provide basic understanding about wired and wireless communication.
2.	To have an exposure to Internet of Things and applications.
3.	To know the basic wireless network security.
4.	To get exposed to antenna systems.
5.	To understand various satellite communication.

UNIT - I	FUNDAMENTALS OF COMMUNICATION	9

Basics of Communication, Spectrum - FCC, Transceiver design and its Components, Wired and wireless communication. Modulation techniques, OSI Layers, TCP/IP Protocols 1G to 5G developments; 3G, 4G and 5G cell architecture.

UNIT - II	INTERNET OF THINGS	8

Introduction, IoT- Architecture, IEEE 802.15.4, M2M and IoT Protocols, SCADA and RFID Protocols, Architecture and Applications - Bluetooth, Zigbee, LORA, 6LOWPAN, Wi-Fi, WIMAX.

UNIT - III	WIRELESS NETWORK SECURITY	9

Cryptography, Integrity, Authentication and Key management, Wireless Threats - Hacking 802.11, Eavesdropping, Jamming, Cyber-crimes and awareness - countermeasures, Wireless Security.

UNIT - IV	ANTENNA SYSTEMS	9

Introduction, Types of Antennas, Radiation Mechanisms and Measurements, Dipole, Monopole, Mobile Phone Antenna, Smart Antennas, RFID antennas, Automotive Antenna, Reconfigurable Antennas, SAR measurements.

UNIT - V	SATELLITE COMMUNICATION	11

Basic principles, Kepler's law, Types of satellites - LEO, MEO and GEO. Launch Vehicles, Satellite Subsystems and Satellite links, Applications - GPS, Mobile communication and TV broadcast, Navigation systems, Modern Navigation systems.

Total Instructional hours : 45

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Course Outcomes : Students will be able to	
CO1	Analyze the wired and wireless communication and networks.
CO2	Develop Internet of Things for various applications.
CO3	Apply security protocols in Wireless Networks.
CO4	Discover various antenna systems for Wireless Technologies.
CO5	Explain the Satellite Communication technologies.

Text Books	
1.	John G Proakis, MasoudSalehi, “Communication Systems Engineering” Prentice Hall, 1994.
2.	Oliver Hersent, David Boswarthick, Omar Elloumi, “The Internet of Things - Key applications and Protocols”, Wiley, 2012.

Reference Books	
1.	Dennis Roddy, “Satellite Communication”, 4th Edition, Tata McGraw-Hill, 2009.
2.	Behrou A. Forouan, “Data Communication and Networking”, 5th Edition, Tata McGraw Hill, 2013.
3.	Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on Approach)”, VPT, 1st Edition, 2014.
4.	AfifOsseiran, Jose F. Monserrat and Patrick Marsch, “5G Mobile and Wireless Communications Technology”, Cambridge University Press, 2016.
5.	Kasun Maduranga Silva Thotahewa (Author), Jean-Michel Redoute (Author), Mehmet Rasit Yuce, “Ultra Wideband Wireless Body Area Networks”, Springer, 2016.
6.	Timothy Pratt and Charles W.Bostain, “Satellite Communications”, John Wiley and Sons, 2nd Edition, 2012.
7.	M. Richharia, “Satellite Systems for Personal Applications”, John Wiley, 2010.
8.	Balanis. A, “Antenna Theory Analysis and Design”, 3rd Edition, John Wiley and sons, New York, 1982.
9.	William Stallings, “Cryptography & Network Security - Principles and Practices”, Pearson Education, 4th Edition, 2006.

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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	8

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	11
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	8

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.

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UNIT - V	LEAN INVOLVEMENT AND CULTURE	11
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

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.

BoS Chairman

B.E.	B19CSP801 - PROJECT WORK PHASE - II	T	P	TU	C
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Course Objectives	
1.	To analyse a problem again to find optimal solution.
2.	To divide the problem in to modules or sub modules to improve functionality.
3.	To build the code for each module and combine to get the final package.
4.	To simulate few section of code and test its performance using modern tools.

COURSE DESCRIPTION

Project work shall be carried out by batch of students (minimum 3 and maximum 4 members per batch) under the supervision of a faculty of this department. The student batch shall meet the supervisor periodically and attend the periodic reviews for evaluating the progress. In some cases, industrial support also considered for the project. In such cases, one supervisor from industry and other supervisor from institute have to monitor the batch of students.

Project work will be carried out in two phases, Phase-I during the seventh semester and Phase-II during the final semester. Phase-II shall be pursued for a minimum of 16 periods per week. In phase-II, three reviews and viva voce at the end of the semester will be conducted. The Project Report prepared according to approved guidelines and duly signed by the supervisor and the Head of the Department shall be submitted to the concerned department at least one week before the viva voce examination.

Course Outcomes : Students will be able to	
CO1	Recommend a sound technical knowledge develop solution for selection project topics.
CO2	Defend problem identification, formulation and solution.
CO3	Design engineering solution to complex problems with systematic approach.
CO4	Take part in discussion with engineers and the community at large in written an oral forms.
CO5	Demonstrate the knowledge, skill and attitudes of a professional engineer.

BoS Chairman