ACADEMIC REGULATIONS
COURSE STRUCTURE
AND
DETAILED SYLLABUS

COMPUTER SCIENCE AND ENGINEERING

B.Tech - Four Year Degree Course

(Applicable for the Batches Admitted from 2019 - 2020)

R-19

(Choice Based Credit System)

NEC

NARASARAOPETA
ENGINEERING COLLEGE
(AUTONOMOUS)

Kotappakonda Road, Yellamanda (P),
Narasaraopet - 522 601, Guntur Dist.,
Andhra Pradesh, INDIA.

R19
Academic Regulations, Course Structure and Syllabus

B. TECH.
Computer Science and Engineering
(4 Year Program)

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Kotappakonda Road, Yellamanda (Post), Narasaraopet – 522601, Guntur District, AP
Approved by AICTE, New Delhi & Permanently affiliated to JNTUK, Kakinada, Code: 47,
Accredited by NBA & NAAC, RTA Approved Pollution test Centre, ISO 9001: 2008 Certified Institution
Phone: 08647-239905 **Website: www.nrtec.in**

NARASARAOPETA ENGINEERING COLLEGE
(AUTONOMOUS)

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

INSTITUTE VISION AND MISSION

VISION:

To emerge as a Centre of excellence in technical education with a blend of effective student centric teaching learning practices as well research for the transformation of lives and community.

MISSION:

M1: Provide the best class infrastructure to explore the field of engineering and research.

M2: Build a passionate and a determined team of faculty with student centric teaching, imbibing experiential and innovative skills

M3: Imbibe lifelong learning skills, entrepreneurial skills and ethical values in students for addressing societal problems.

DEPARTMENT VISION AND MISSION

VISION:

To become a centre of excellence in nurturing the quality Computer Science & Engineering professionals embedded with software knowledge, aptitude for research and ethical values to cater to the needs of industry and society.

MISSION:

The department of Computer Science and Engineering is committed to

M1: Mould the students to become Software Professionals, Researchers and Entrepreneurs by providing advanced laboratories.

M2: Impart high quality professional training to get expertize in modern software tools and technologies to cater to the real time requirements of the industry.

M3: Inculcate team work and lifelong learning among students with a sense of societal and ethical responsibilities.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The graduates of the programme are able to:

PEO1: Apply the knowledge of mathematics, science and engineering fundamentals to identify and solve computer science and engineering problems.

PEO2: Use various software tools and technologies to solve problems related to academia, industry and society.

PEO3: Work with ethical and moral values in the multi-disciplinary teams and can communicate effectively among team members with continuous learning.

PEO4: Pursue higher studies and develop their career in software industry.

PROGRAM OUTCOMES (POs):

PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	**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.
PO4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	**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.
PO7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**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.
PO11	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long 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 OBJECTIVES (PSOs)

PSO1: Apply mathematical and scientific skills in numerous areas of computer science and Engineering to design and develop software based systems.

PSO2: Acquaint module knowledge on emerging trends of modern era in Computer Science and Engineering

PSO3: Promote novel applications that meet the needs of entrepreneur, environmental and social issues.

ACADEMIC REGULATIONS R-19 FOR B.TECH

(Applicable for the students of B.Tech admitted from the academic year 2019-20)

1. PREAMBLE

The rapid transformation in every sphere of life is augmenting the need to prepare the present fast-paced generation to adapt to the changing knowledge & skill requirement on a life-long basis, in the fields of science, engineering, technology and humanities to influence society positively. The future looks up to multi-disciplinary, competent leaders who are Information and Communication Technology ready and driven by strong ethical values.

NEC envisions to nurture knowledge, skills, attitude and values of the aspiring youth to enable them to become global citizens and towards that process, the institution has evolved a flexible integrated academic curriculum.

NEC introduced Outcome Based Education (OBE) and Choice Based Credit System (CBCS), which emphasized on honing the skills and knowledge of the graduates.

NEC is ambitious to develop a new academic regulation, curricular framework and syllabi for its UG programmes. This effort is undertaken to address the present challenges in the educational system and also to be ahead of the curve with respect to innovative practices.

2. PROGRAMS OFFERED BY THE COLLEGE

Narasaraopeta Engineering College (NEC) offers a 4-year (8 semesters) **Bachelor of Technology** (B.Tech.) degree programme, under Choice Based Credit System (CBCS) for the following branches of Engineering.

S. No.	Name of the Program	Program Code
1.	Civil Engineering (CE)	01
2.	Electrical and Electronics Engineering (EEE)	02
3.	Mechanical Engineering (ME)	03
4.	Electronics and Communication Engineering (ECE)	04
5.	Computer Science and Engineering (CSE)	05
6.	Information Technology (IT)	12

3. ELIGIBILITY FOR ADMISSION

The total seats available as per the approved intake are grouped into two categories viz. category A and Category B with a ratio of 70:30 as per the state government guidelines vide G.O No.52.

The admissions for category A and B seats shall be as per the guidelines of Andhra Pradesh State Council for Higher Education (APSCHE) in consonance with government reservation policy.

a. Under Category A: 70% of the seats are filled through EAMCET counselling.
b. Under Category B: 30% seats are filled based on 10+2 merits in compliance with guidelines of APSCHE

Admission eligibility - Under Lateral Entry Scheme

Students with diploma qualification have an option of direct admission into 2nd year B. Tech. (Lateral entry scheme). Under this scheme 10% seats of sanctioned intake will be available in each course as supernumerary seats. Admissions to this three-year B Tech later entry Programme will be through ECET. The maximum period to complete B. Tech. under lateral entry scheme is six consecutive academic years from the date of joining.

Academic Calendar

For all the eight semesters a common academic calendar shall be followed in each semester by having sixteen weeks of instruction, one week for the conduct of practical exams and with three weeks for theory examinations and evaluation. Dates for registration, sessional and end semester examinations shall be notified in the academic calendar of every semester. The schedule for the conduct of all the curricular and co-curricular activities shall be notified in the planner.

4. AWARD OF B.TECH. DEGREE

A student will be declared eligible for the award of the B.Tech. degree if he/she fulfils the following academic regulations:

i) Pursue a course of study for not less than four academic years and not more than eight academic years.
ii) Registers for 160 credits and secures all 160 credits.

Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall **forfeit** their seat in B.Tech. course and their admission stands cancelled.

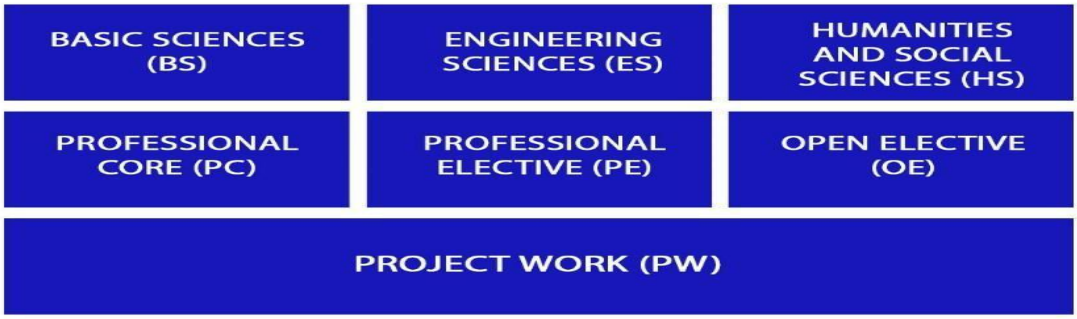
The medium of instruction for the entire undergraduate programme in Engineering and Technology will be in English only.

5. ABOUT PROGRAM RELATED TERMS

i. **Credit:** A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (Lecture/Tutorial) or two hours of practical work/field work per week.
ii. **Academic Year:** Two consecutive (one odd + one even) semesters constitute one academic year.
iii. **Choice Based Credit System (CBCS):** The CBCS provides choice for students to select from the prescribed courses.
iv. Each course is assigned certain number of credits based on following criterion:

	Semester	
	Periods / Week	Credits
Theory (Lecture/Tutorial)	02	02
	03	03
	04	04
Practical	02	01
	03	1.5
	04	02
Project	14	07
MOOCs	-	01

v. Every B. Tech. Programme will have a curriculum consisting of theory, practical, project courses that shall be included in any of the following categories. The typical curriculum structure for UG degree programmes are based on AICTE and University norms and is given below.



5.1 SUBJECT / COURSE CLASSIFICATION

All subjects/ courses offered for the under graduate programme in B.Tech. degree are broadly classified as follows. NEC has followed almost all the guidelines issued by JNTUK/AICTE/UGC

S.No.	Broad Course Classification	Course Group/Category	Course Description	No. of Credits
1	FOUNDATION COURSES	BS – Basic Sciences	Includes Mathematics, Physics and Chemistry Subjects	25
2		ES – Engineering Sciences	Includes fundamental engineering subjects like Engineering Practices, Engineering Graphics, Basics of Electrical / Electronics / Mechanical / Computer Engineering, etc.	24
3		HS – Humanities and Social Sciences	Includes subjects related to Humanities, Social Sciences and Management Courses like English, Professional Ethics and Human Values, Communication skills and Environmental Science and Engineering	12
4	Core Courses	PC – Professional Core	Includes core subjects related to the parent discipline/ department/ branch of Engineering.	48
5	Electives	PE – Professional Electives	Includes elective subjects related to the parent discipline/ department/ branch of Engineering.	18
6		OE – Open Electives	Elective subjects which include inter-disciplinary subjects or subjects in an area outside the parent discipline/ department/ branch of Engineering	18
7	Project Work	PR-Project Work	B.Tech. Project or UG Project or UG Major Project	14
8		Industrial training/ Internship	Industrial training/ Summer Internship	
9		Mini- project	Industrial Oriented Mini-project/ Mini-project	
10	Mandatory Courses (MC)	Mandatory Courses (non-credit)		0
11	MOOCS	PE – Professional Elective	Subjects related to the parent discipline/ department/ branch of Engineering.	1
Total				160

5.2. Induction Program

When new students enter an institution, they come with diverse thoughts, backgrounds and preparations. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose. Its purpose is to make the students feel comfortable in their new environment, open them up, set a healthy daily routine, create bonding in the batch as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

A two-week induction program for first year B.Tech students is to be held in zero semester. Regular classes will start after the induction program.

The objectives of the program are as follows:
1. Assimilation in the ethos and culture of the institution
2. Exposure to a larger vision of life
3. Bonding among students and teachers
4. Learning a creative skill in arts
5. Regular lifestyle and professional discipline
6. Special assistance for needy students for improving proficiency in English and Mathematics

The above objectives will be achieved through the following activities:
1. Physical activity: Yoga, Mild Exercise, Games and sports etc.
2. Creative arts: Painting, Photography, music, dance etc.
3. Literary activity: General reading, writing summaries, debating, enacting a play etc.
4. Human Values: Discussion/Lectures in small groups of students with a faculty member
5. Lectures by eminent people: From industry, entrepreneurs, public life, social activists, alumni
6. Exposure to department/branch, Innovation, Exploring Engineering.

6. DISTRIBUTION AND WEIGHTAGE OF MARKS

The performance of a student in each semester shall be evaluated subject – wise with

a maximum of 100 marks for Theory, 50 marks for Practical Subject / Mini Project and 50 marks for Practical Training / Internship. The Project Work shall be evaluated for 200 marks.

6.1. THEORY

For all theory subjects consisting of 5 units in each subject, the assessment shall be for 40 marks through internal evaluation and 60 marks through external end semester examination of 3 hours duration.

6. 1.a. INTERNAL EVALUATION

The internal evaluation will be based on two cycle tests conducted in each semester. The 40 internal marks will be awarded as sum of 75% of the best cycle and 25% of the least cycle examinations, where each cycle of examination contains

Descriptive test - 20 Marks

Objective test - 10 Marks

Assignment test - 10 Marks

Syllabus is framed for 5 Units. **First descriptive** test question paper contains 3 questions from 50% of the syllabus i.e. 1st, 2nd and half of 3rd unit. **Second descriptive** test in remaining half of 3rd Unit, 4th Unit and 5th Units of each subject in a semester. The student has to answer all the 3 questions (10 marks questions from 1st and 2nd units and 5 marks question from half of the 3rd unit totalling to 25 marks). These 25 marks will be scaled down to 20 marks. The descriptive examination will be conducted in 1½ hour duration.

Each Objective type test 1 question paper (Online examination) contains 20 objective Multiple-choice questions for 10 marks covering the syllabus of 1st ,2nd and half of 3rd unit. The Objective Examination (online) will be conducted for a duration of the 20 minutes on the day of descriptive exam. Objective test 2 shall contains 20 Multiple choice questions for 10 marks covering the syllabus from the remaining half of the 3rd unit, 4th and 5th Units.

Two assignments will be conducted for each cycle. In first cycle first assignment will be from 1st unit for 10 marks. 5 or 6 questions will be given in the classroom at least one week in advance. Student must answer two questions in classroom which are given at random as per the schedule given by exam cell. Second assignment test for 10 marks of first cycle will be conducted from 2nd unit. 5 or 6 questions will be declared in the class room at least one week in advance. Student has to answer two questions in class room which are given at random as per the schedule given by exam cell.

First cycle assignment marks (10 marks) is calculated from the two assignments (1&2) i.e. 75% of best assignment and 25% of the least assignment.

Similarly, for second cycle assignment test 3 for 10 marks will be conducted from remaining half of the 3rd unit (after first mid syllabus) and half of the 4th unit. 5 or 6 questions will be given in the classroom at least one week in advance. Student must answer two questions in classroom which are given at random as per the schedule given by exam cell.

Assignment test 4 will be from remaining half the fourth unit and half of the 5th unit for 10 marks. 5 or 6 questions will be declared in the classroom at least one week in advance. Student has to answer two questions in class room which are given at random as per the schedule given by exam.

Second cycle assignment marks (10 marks) is calculated from the two assignments (3 &4) i.e. 75% of best assignment and 25% of the least assignment

First cycle (Descriptive, objective and assignment) is conducted for 1st ,2nd and half of 3rd Unit and second cycle is remaining half of 3rd unit, 4th & 5 units of each subject in semester.

Final internal semester marks shall be arrived at by considering the marks secured by the student in both the cycle examinations with 75% weightage given to the best cycle exam and 25% to the other.

Final internal marks = 75% of best cycle and 25% of the least cycle.
=(0.75 x best cycle) + (0.25 x least cycle)

If the student is absent for any one internal examination, the final internal semester marks shall be arrived at by considering 75% weightage to the marks secured by the student in the appeared examination and zero to the other.

Final internal marks = 75% of best cycle and 25% of the least cycle.
= (0.75 x best cycle) + (0.25 x 0)

6.1.b. EXTERNAL EVALUATION

End semester examinations will be conducted for 60 marks. The Question paper consists of five questions and each question carries 12 marks from all the five units. Each of the question is from one unit and may contain sub-questions. There will be two questions from each unit and student should answer any one of the two questions. The examination duration is 3 hours

6.2. PRACTICALS

For practical subjects there shall be continuous evaluation during the semester.

6.2.a. INTERNAL EVALUATION

There shall be continuous evaluation during the semester for 20 internal marks.
The internal marks shall be awarded as follows:

i) Day to day performance: Record (4M) +Experiment (4M) + Viva (2M) - 10Marks
ii) Internal Lab Test : 10 Marks

Total =i +ii =10+10 = 20 Marks.

6.2.b. EXTERNAL EVALUATION

For practical subjects there shall be an external examination at the end of the semester for 30 marks in the presence of an external examiner. The examination duration is 3 hours.

6.3. DRAWING SUBJECTS

For the subject having design and / or drawing, (such as Engineering Graphics, Engineering Drawing, etc.,) and estimation, the distribution shall be 40 marks for Internal Evaluation and 60 marks for End Examination.
The 40 internal marks will be evaluated as follows:

Internal Tests : 20 marks. (1½ hour duration)
Day – to – day work: 20 marks (evaluation of charts)

In the internal test, 3 questions will be given to the student and he has to answer all the three questions (2 x10 =20 marks from 1st and 2nd units and 5 marks from half of the 3rd unit totalling 25 marks scaled down to 20 marks)

There shall be two internal tests in a semester. The sum of 75% of the best and 25% of the least of two internal tests shall be considered for the award of internal marks.

The syllabus for the subject "**Machine drawing and CAD Lab**" consists of two major portions:

1. Unit 1, 2 –Conventional drawing pattern.
2. Unit 3 and 4 - CAD lab using drafting packages

The distribution of internal and external marks is 40 and 60 marks respectively.

Internal Evaluation: Max Marks: 40

The total internal evaluation marks are distributed in the following two components:

1. Day-to-day work : 20 Marks (Evaluation of Charts)
2. Descriptive Test : 20 Marks

Cycle–I Examination – Conventional drawing pattern

In Cycle-I examination the 40 marks will be awarded as follows:

Day-to-day evaluation - 20 Marks
Internal Test - 20 Marks

In the Descriptive Test of duration 2 hours, one question for 20 marks will be given to the student.

Cycle–II Examination – Computer lab pattern using any drafting packages for duration of 2 hours.

In Cycle-II examination the 40 marks will be awarded as follows:

Day-to-day evaluation - 20 Marks
Internal Test - 20 Marks

Of two cycle examinations conducted during the semester, sum of 75% of the best and 25% of the least of two cycle examinations shall be considered for the award of internal marks.

End Examination (Total Duration: 4 hours, Max, marks: 60) in the presence of external examiner
Conventional drawing pattern (Duration: 2 Hours, Marks: 30)
Computer lab pattern using any drafting packages (Duration: 2 Hours, Max:30)
(Note: Both Conventional drawing pattern and Computer lab pattern using any drafting packages are compulsory and are to be conducted in separate sessions)

6.4. MANDATORY NON-CREDIT COURSES

A student is required to take up Non-Credit / Mandatory courses (zero credit), viz. Environmental Science, Constitution of India, Community service, Advanced Communication Skills (ACS), Quantitative Aptitude and Reasoning (QAR) etc., as and when the courses are offered. The B.Tech degree shall only be awarded only if a student

gets satisfactory grade in each of the mandatory non-credit courses besides acquiring 160 credits.

A student has to repeat the course if he does not get satisfactory grade in each non- credit course for getting the degree awarded.

Advanced Communication Skills (ACS) & Quantitative Aptitude & Reasoning (QAR) :
There will be two online internal examinations of 40 marks of each and another 20 marks will be awarded based on day to day evaluation. The student has to secure a minimum of 40 marks out of the above mentioned 100 marks to secure satisfactory report.

Community Service:
Community service gives an opportunity to explore the leadership skills, Team work and develop empathy in real world. Students have to spend time in hospitals, temples, at traffic signals, old age homes, orphanage homes at least 24 hours during that semester.

Old age homes: The students will go to old age homes and fulfil the special needs and requirements that are unique to senior citizens. They help the old people by taking them to hospitals.

Hospitals: in hospitals the students help them to maintain hygiene, help the people who cannot understand the medical terms, give directions to the old people who are unable to read the signs, serve them by distributing food.

Traffic clearance: Help the people understand the traffic rules, help the disabled persons, Children and old people to cross the roads.

Temple services: During the festivals the students give the directions to pilgrims, distribute the food and help the old and disabled people to get their darshan in the temple.

6.5 PRACTICAL TRAINING / INTERNSHIP

As a part of curriculum in all branches of Engineering, it is mandatory for all students to undergo summer internship Programme at industries (core or allied) / R & D organization to get practical insight of their subject domain during summer break after the 6th semester. This internship Programme shall be availed by the students in a duration of minimum 2 weeks or maximum of 4 weeks and the assessment shall be carried out by internal experts.

After the completion of internship, the student shall submit a certificate, a technical report and presentation to the concerned departmental committee constituted by the HOD for evaluation. 50 marks shall be awarded for the submission of certificate, technical report, presentation and Viva-Voce examination.
Students are advised to take up Industrial Internship. In case, the student is unable to obtain the internship, they can opt for Practical Training at College.

Assessment for Practical Training:
The practical training gained by student shall be assessed for 50 marks. The time duration for Practical Training shall be 2 to 4 weeks during the inter-semester break. The

training shall be evaluated through continuous assessment. After the completion of Practical Training the student shall submit a report and presentation to the Departmental Committee constituted by HOD for evaluation. A total of 50 marks shall be awarded for day to day performance, submission of report, presentation and Viva-Voce examination.

6.6. MINI PROJECT

Mini Project shall be evaluated for a total of 50 marks. Out of a total of 50 marks, 20 marks shall be awarded for internal evaluation consisting of day-to-day work, reviews, the assessment of the project report and 30 marks will be awarded for the external evaluation. The external evaluation shall be conducted by the committee. The committee consists of an External Examiner, Head of the Department and Supervisor of the Project. The evaluation of mini project work shall be conducted as and when offered.

Mini Project:

Continuous Assessment (Internal Evaluation): 20 Marks

Distribution

Literature Survey	: 04 Marks
Innovativeness of the Project	: 04 Marks
Review 1	: 04 Marks
Review 2	: 04 Marks
Marks Final Presentation	: 04 Marks

6.7. PROJECT WORK

Out of a total of 200 marks for the project work, 80 marks shall be awarded for Internal Evaluation consisting of day-to-day work, reviews, the assessment of the project report and 120 marks are for the external evaluation. The external evaluation shall be conducted by the committee. The committee consists of an External Examiner, Head of the Department and Supervisor of the Project. The evaluation of project work shall be conducted at the end of the IV year II semester.

Continuous Assessment (Internal Evaluation): 80 Marks

Distribution

Innovativeness of the Project	: 05 Marks
Literature Survey	: 05 Marks
Experimentation / Simulation	: 10 Marks
Result Analysis	: 05 Marks
Review 1	: 15 Marks
Review II	: 20 Marks
Final Presentation	: 10 Marks
Project Report	: 10 Marks

6.8. MOOCS:

Meeting with the global requirements, to inculcate the habit of self-learning and in compliance with AICTE/ UGC guidelines, MOOC (Massive Open Online Course) have been introduced, Student has to complete an on-line course to fulfil the academic requirement of B.Tech course. He/she can start doing the course from II Year I semester and submit the MOOCs certificate before the commencement of the end examinations wherever the MOOCs course is offered. The student shall register on-line Course offered by any reputed organization like NPTEL, SWYAM, JNTUK MOOCS, COURSERA, edX, Udacity, etc., approved by Departmental Committee constituted by HOD. Student has to submit the progress of the MOOC's course (such as assignment submission etc.,) to the

mentor or departmental committee. B.Tech. degree shall be awarded only upon submission of MOOC's certificate.

7. PASS MARK CRITERIA

A student shall be deemed to have satisfied the pass mark, if he secures not less than 35% of marks in the end examinations and a minimum of 40% of marks in the sum total of the internal evaluation and end examination taken together as detailed below.

On passing a course of a program, the student shall earn the credits as assigned to that course.

S.No	Category of Subject	Max. Marks	Internal Marks	External Marks	External pass %	External pass mark	Over all pass %	Over all pass mark
1	Theory/ Drawing	100	40	60	35	21	40	40
2	Practical	50	20	30	35	11	40	20
3	Mini Project	50	20	30	35	11	40	20
4	Project work	200	80	120	35	42	40	80
5	Practical Training/ Internship	50	50	-	-	-	40	20
6	MOOCS	Certificate must be submitted before the end semester examinations of that semester in which MOOCS course is offered.						

8. PROMOTION POLICY

8.1. ATTENDANCE REQUIREMENTS

(1) A student shall be eligible to appear for the end examinations if he acquires a minimum of 75% of attendance in aggregate of all the subjects.

(2) Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester for genuine medical reasons shall be approved by a committee duly appointed by the college. A fee stipulated by the college shall be payable towards condonation of shortage of attendance. However, the number of condonations is restricted to **four** for the entire course.

(3) A student who is short of attendance in a semester may seek re-admission into that semester when offered next time within 4 weeks from the date of commencement of class work.

(4) If any candidate fulfils the attendance requirement in the present semester, he shall not be eligible for re-admission into the same semester.

8.2. CREDIT REQUIREMENTS

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned above.

(1) A student shall be promoted from I to II year, if he puts up the minimum attendance requirement in I year II semester, irrespective of credits earned.

(2) A student shall be promoted from II year to III year, only if he fulfils the academic requirement of 40% of the credits up to II year II semester from all the examinations, irrespective of whether the candidate takes the examination or not.

(3) A student shall be promoted from III to IV year, only if he fulfils the academic requirements of 40% of the credits up to III year II semester from all the examinations, irrespective of whether the candidate takes the examination or not.

(4) A candidate, who is not promoted either to III year or IV year due to lack of required credits can seek admission into III / IV year in subsequent years after obtaining the required credits as stipulated above.

(5) A student registers for all 160 credits and earns all 160 credits. Marks obtained in the all the courses shall be considered for the calculation of grade points/division.

(6) The registrations in mandatory courses i.e. CI, ES, MOOCS, CS is compulsory and student should get a satisfactory report.

8.3. COURSE PATTERN

(1) The entire course of study is of FOUR academic years and each year will have TWO Semesters (Total EIGHT Semesters).

(2) A student is eligible to appear for the end examination in a subject, but absent for it or has failed in the end examinations may appear for that subject in supplementary examinations, when conducted next.

(3) When a student is detained due to lack of credits / shortage of attendance, he may be re-admitted in to the same semester / year in which he has been detained.

Re-admission Criteria:

i) A candidate, who is detained in a semester due to lack of attendance has to obtain written permission from the Principal for readmission into the same semester after duly fulfilling the required norms stipulated by the college and by paying the required tuition fee .

ii) A candidate, who is not promoted either to III year or IV year due to lack of required credits can seek admission into III / IV year in subsequent years after obtaining the required credits as stipulated in regulation by paying the required tuition fee.

9. METHOD FOR AWARDING OF GRADE POINTS FOR A SUBJECT:

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Theory/ Drawing / Laboratory / Practical Training / Internship / Mini Project / Project (% of marks in a subject)	Corresponding Grade Points	Letter Grade
91 - 100	10	O (Outstanding)
81 - 90	9	A (Excellent)
71 - 80	8	B (Very Good)
61 - 70	7	C (Good)
51 - 60	6	D (Satisfactory)
40 - 50	5	E (Pass)
<40	0	F (Fail)

A student who has obtained an '**F**' grade in any subject shall be deemed to have '**Failed**' and is required to reappear as a 'supplementary student' in the semester end examination, as and when offered. In such cases, internal marks in those subjects will remain the same as those obtained earlier.

To a student who has not appeared for an examination in any subject, '**AB**' grade will be allocated in that subject, and he is deemed to have '**Failed**'. A student will be required to reappear as a 'supplementary student' in the semester end examination, as and when offered next. In this case also, the internal marks in those subjects will remain the same as those obtained earlier. A Student who involved in malpractice during the examination will be marked as MP in that subject grade.

For mandatory courses, "**Satisfactory**" or "**Unsatisfactory**" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA

10. CRITERIA FOR AWARD OF GRADES/DIVISION

10.1.Calculation of Semester Grade Point Average (SGPA)* for semester

The performance of each student at the end of each semester is indicated in terms of SGPA. The SGPA is calculated by dividing the sum of credit points secured from all subjects registered in a semester by the total no.of credits of that semester.

The SGPA is calculated as given below:

$$SGPA = \frac{\sum(CR \times GP)}{\sum CR} = \frac{\sum(CR \times GP)}{\sum CR}$$

Where CR = Credits of a subject
GP = Grade Points awarded for a subject
*SGPA is calculated for a candidate who passed all the subjects in that semester.

10.2. Calculation of Cumulative Grade Point Average (CGPA) for Entire Program:

The CGPA is a measure of the overall cumulative performance of a student in all semesters considered for a registration. CGPA is the ratio of the total credit points secured by a student in all registered courses in all semesters and the total no.of credits in all semesters.
The CGPA is calculated as given below:

$$CGPA = \frac{\sum(CR \times GP)}{\sum CR} = \frac{\sum(CR \times GP)}{\sum CR}$$

Where CR= Credits of a subject
GP = Grade Points awarded for a subject

- The SGPA and CGPA shall be rounded off to 2 decimal point and reported in the transcripts.
- Equivalent percentage = (CGPA – 0.75) x 10

CGPA is calculated for a candidate who passed all the subjects of all previous and current semester.

10.3 Award of Division:

After satisfying the requirements prescribed for the completion of the program, the student shall be eligible for the award of B.Tech Degree and shall be placed in one of the following classes:

CGPA	Class	From the CGPA secured from 160 credits
≥ 7.75	First Class with Distinction *(with no subject failures)	
≥ 6.75	First Class (with subject failures)	
≥ 5.75 & < 6.75	Second Class	
≥ 4.75 to < 5.75	Pass Class	

***First Class with Distinction:** A candidate who qualifies for the award of the Degree having passed all the courses of study of all the eight semesters (six semesters for lateral entry candidates) at the first attempt, within eight consecutive semesters (six consecutive semesters for lateral entry candidates) after the commencement of his /her study and securing a CGPA of 7.75 and above shall be declared to have passed in First Class with Distinction.

10.4. CONSOLIDATED GRADE MEMO

A Consolidated Grade Memo containing credits and grades obtained by the candidate will be issued after the completion of the four year B.Tech program.

11. REVALUATION

1. Student can submit the application for revaluation, along with the prescribed fee for revaluation of his answer script(s) of theory subject(s) as per the notification issued by the Controller of Examinations.
2. The Controller of Examinations shall arrange for revaluation of such answer script(s).
3. An External evaluator, other than the first evaluator shall revaluate the answer script(s).

12. MINIMUM INSTRUCTION DAYS

The minimum instruction days for each semester shall be **90 working days.**

13. There shall be **no branch transfer** after the completion of admission process.

14. WITHHOLDING OF RESULTS

If the student has not paid the dues, if any, to the college or if any case of indiscipline/malpractice is pending against him, the result of such student will be kept withheld. His degree will be withheld in such cases.

15. TRANSITORY REGULATIONS

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

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

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

15.3 Transfer candidates (from non-autonomous college affiliated to JNTUK)

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

15.4 Transfer candidates (from an autonomous college affiliated to JNTUK)

A student who has secured the required credits up to previous semester as per the regulations of other autonomous institutions shall also be permitted to be transferred to this college.

A student who is transferred from the other autonomous colleges to this college in second year first semester or subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the subjects in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree.

However, exemption will be given in the subjects of the semester(s) of the batch which he had passed earlier and substitute subjects are offered in their place as decided by the Board of studies.

The total number of credits to be secured for the award of the degree will be the sum of the credits up to previous semester as per the regulations of the college from which he has transferred and the credits prescribed for the semester in which a candidate joined after transfer and subsequent semesters under the autonomous stream. The class will be awarded based on the academic performance of a student in the autonomous pattern.

16. Scope

1. The academic regulations should be read as a whole, for the purpose of any interpretation.

2. In case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Academic Council is final.

3. The college may change or amend the academic regulations, course structure or syllabi at any time, and the changes or amendments made shall be applicable to all students with effect from the date notified by the College Authorities.

ACADEMIC REGULATIONS (R-19) FOR B. TECH. (LATERAL ENTRY SCHEME)

(Effective for the students getting admitted into II year from the Academic Year 2020- 21 and onwards)

1. AWARD OF B. TECH. DEGREE

A student will be declared eligible for the award of the B. Tech. Degree if he fulfils the following academic regulations.

(a) Pursue a course of study for not less than three academic years and not more than six academic years counted from the academic year of admission.

(b) The candidate registers for 120 credits and secures all the 120 credits.

CGPA	Class	
≥ 7.75	First Class with Distinction *(with no subject failures)	From the CGPA secured from 120 credits from 2nd year to 4th year
≥ 6.75	First Class (with subject failures)	
≥ 5.75 & < 6.75	Second Class	
≥ 4.75 to < 5.75	Pass Class	

2. The attendance regulations of B.Tech (Regular) shall be applicable to B.Tech (LES), whereas the number of condonations are restricted to 3.

3. PROMOTION RULE:

(a) Attendance requirement is same as regular course.

(b) A lateral entry student will be promoted from II to III year if he puts up the minimum required attendance in II year II semester irrespective of credits earned.

(c) A student shall be promoted from III to IV year only if he fulfils the academic requirements of 40% of the credits up to III Year II semester from all the examinations, whether the candidate takes the examinations or not.

4. TRANSITORY REGULATIONS:

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

4.2 A student who is following JNTUK curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester of second year or at the subsequent semesters shall join with the autonomous batch in the appropriate semester. Such candidates shall be required to pass in all the subjects in the program prescribed by the Board of Studies concerned for that batch of students from that semester onwards to be eligible for the award of degree. However, exemption will be given in the subjects of the semester(s) of the batch of them as decided by the Board of Studies.

The student has to clear all his backlog subjects up to previous semester by appearing for the supplementary examinations conducted by JNTUK for the award of degree.

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

5. All the other regulations as applicable for B. Tech. Four- year degree course (Regular) will be applicable for B. Tech. (Lateral Entry Scheme).

MALPRACTICES RULES
DISCIPLINARY ACTION FOR / IMPROPER CONDUCT INEXAMINATIONS

- The Principal shall refer the cases of Malpractices in Internal Assessment Test and Semester end examinations to a malpractice prevention committee constituted by him for the purpose. Such committee shall follow the approved levels of punishment. The Principal shall take necessary action against the students based on the recommendations of the committee.
- Any action by the candidate trying to get undue advantage in the performance or trying to help another, or derive the same through unfair means is punishable according to the provisions contained hereunder:

	Nature of Malpractices/ Improper conduct	**Punishment**
	If the candidate:	
1(a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination).	Expulsion from the examination hall and cancellation of the performance in that subject only.
1(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book,	Expulsion from the examination hall and cancellation of the performance in that subject and

	programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the college.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practical's and to be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.
4.	Smuggles in the Answer book or additional sheet or takes out or arranges to send out the question paper during the examination or answer book or additional sheet, during or after the examination.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
5.	Uses objectionable, abusive or offensive language in the answer paper or in letters to the examiners or writes to the examiner requesting him to award pass marks.	Cancellation of the performance in that subject.
6.	Refuses to obey the orders of the Chief Superintendent/Assistant – Superintendent /any officer on duty or misbehaves or creates disturbance of any kind in and around the examination hall or organizes a walk out or instigates others to walk out, or threatens the officer-in	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that subject and all other subjects the candidate(s)has (have) already appeared and shall not be permitted to appear for the remaining examinations of the subjects of that semester/year. The candidates also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case is registered against them.

	charge or any person on duty in or outside the examination hall of any injury to his person or to any of his relations whether by words, either spoken or written or by signs or by visible representation, assaults the officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the college campus or engages in any other act which in the opinion of the officer on duty amounts to use of unfair means or misconduct or has the tendency to disrupt the orderly conduct of the examination.	
7.	Leaves the exam hall taking away answer script or intentionally tears of the script or any part thereof inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that subject and all the other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all college examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
8.	Possess any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year. The candidate is also debarred and forfeits the seat.
9.	If student of the college, who is not a candidate for the particular examination or any person not connected with the college indulges in any malpractice or improper	Student of the college expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of

	conduct mentioned in clause 6to 8.	the subjects of that semester/year. The candidate is also debarred and forfeits the seat. Person(s) who do not belong to the college will be handed over to police and, a police case will be registered against them.
10.	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted for the remaining examinations of the subjects of that semester/year.
11.	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that subject and all other subjects the candidate has appeared including practical examinations and project work of that semester/year examinations.
12.	If any malpractice is detected which is not covered in the above clauses 1 to 11 shall be reported to the college for further action to award suitable punishment.	

OTHER MATTERS:

1. Physically challenged candidates who have availed additional examination time and a scribe during their intermediate / EAMCET examinations will be given similar concessions on production of relevant proof / documents.
2. The Principal shall deal in an appropriate manner with any academic problem which is not covered under these rules and regulations, in consultation with the Heads of the departments and subsequently such actions shall be placed before the Academic Council for ratification. Any emergency modification of regulation, approved in the meetings of the Heads of the departments shall be reported to the Academic Council for ratification.

GENERAL:

1. The academic council may, from time to time, revise, amend or change the regulations, schemes of examinations and / or syllabi.
2. Where ever the words ‘’he’’ ‘’him’’ ‘’his’’, occur in the regulations, they include ‘’she’’, ’’her’’, ’’hers’’.
3. The academic regulation should be read as a whole for the purpose of any interpretation.
4. In the case of any doubt or ambiguity in the interpretation of the above rules, the decision of the Principal is final.

R19 COURSE STRUCTURE

I B.TECH - I SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCC1TH01	Communicative English -I	HS	40	60	100	2	-	-	2
2	19BCC1TH03	Linear Algebra & Calculus	BS	40	60	100	3	-	-	3
3	19BCI1TH06	Electronic Devices and Logic Design	ES	40	60	100	3	-	-	3
4	19BCC1TH07	Engineering Chemistry	BS	40	60	100	3	-	-	3
5	19BCC1TH10	C Programming	ES	40	60	100	2	1	-	3
6	19BCC1LB01	English Communication Skills Lab - I	HS	20	30	50	-	-	3	1.5
7	19BCC1LB05	Engineering Chemistry Lab	BS	20	30	50	-	-	3	1.5
8	19BCC1LB07	C Programming Lab	ES	20	30	50	-	-	3	1.5
9	19BCC1MC02	Constitution of INDIA	MC	-	-	-	3	-	-	0
TOTAL										**18.5**

I B.TECH. – II SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCC2TH01	Communicative English -II	HS	40	60	100	2	-	-	2
2	19BCC2TH07	Engineering Physics	BS	40	60	100	2	1	-	3
3	19BCI2TH08	Probability & Statistics	BS	40	60	100	2	1	-	3
4	19BCC2TH09	Engineering Graphics	ES	40	60	100	1	-	4	3
5	19BCI2TH10	Numerical Methods And Vector Calculus	BS	40	60	100	2	1	-	3
6	19BCI2TH12	Python Programming	ES	40	60	100	3	-	-	3
7	19BCC2LB06	Engineering Physics Lab	BS	20	30	50	-	-	3	1.5
8	19BCC2LB07	IT Workshop	ES	20	30	50	-	-	3	1.5
9	19BCI2LB09	Python Programming Lab	ES	20	30	50			3	1.5
10	19BCC2MC02	Environmental Studies	MC	-	-	-	3	-	-	0
TOTAL										**21.5**

II B.TECH. – I SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCC3TH01	Business Management Concept for Engineers	HS	40	60	100	3	-	-	3
2	19BCI3TH02	Front End Web Technologies	ES	40	60	100	3	-	-	3
3	19BCI3TH03	OOPs Through Java	PC	40	60	100	2	1	-	3
4	19BCI3TH04	Mathematical Foundations of Computer Science	BS	40	60	100	3	-	-	3
5	19BCI3TH05	Data Structures	PC	40	60	100	3	-	-	3
6	19BCI3TH06	Computer Organization	PC	40	60	100	3	-	-	3
7	19BCI3LB01	Data Structures Lab	PC	20	30	50	-	-	3	1.5
8	19BCI3LB02	Front End Web Technologies Lab	ES	20	30	50	-	-	3	1.5
9	19BCI3LB03	Java Programming Lab	PC	20	30	50	-	-	3	1.5
10	19BCCMC02	Community Service	MC	-	-	-	-	-		0
TOTAL										**22.5**

II B.TECH. – II SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCI4TH01	Database Management Systems	PC	40	60	100	2	1	-	3
2	19BCI4TH02	Formal Languages and Automata Theory	PC	40	60	100	3	-	-	3
3	19BCS4TH03	Design and Analysis of Algorithms	PC	40	60	100	3	-	-	3
4	19BCS4TH04	Software Engineering	PC	40	60	100	3	-	-	3
5		**Open Elective -I**	OE	40	60	100	3	-	-	3
6	19BCS4LB03	Mobile Applications Development Lab	PC	20	30	50	-	-	3	1.5
7	19BCC4LB01	English Communication Skills Lab - II	HS	20	30	50	-	-	3	1.5
8	19BCI4LB02	Data Base Management Systems Lab	PC	20	30	50	-	-	3	1.5
9	19BCC4MC02	QAR	MC	-	-	-	3	-	-	0
TOTAL										**19.5**

III B.TECH. – I SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCI5TH01	Operating Systems	PC	40	60	100	3	-	-	3
2	19BCS5TH03	Computer Networks	PC	40	60	100	3	-	-	3
3	19BCI5TH02	Compiler Design	PC	40	60	100	3	-	-	3
4	19BCS5TH04	OOAD through UML	PC	40	60	100	3	-	-	3
5	19BCS5TH05	Advanced Java and Web Technologies	PC	40	60	100	3	-	-	3
6	19BCS5TH05 19BCS5TH08 19BCS5TH09 19BCI5TH07	**Professional Elective – I** a. DWDM b. Computer Graphics c. Software Testing Methodology d. Microprocessors and Multicore systems	PE	40	60	100	3	-	-	3
7	19BCS5LB01	OS and UML Lab	PC	20	30	50	-	-	3	1.5
8	19BCS5LB02	Advanced Java and Web Technologies Lab	PC	20	30	50	-	-	3	1.5
9	19BCS5LB03	**PE-I LAB**	HS	20	30	50	-	-	3	1.5
10	19BCS5MP01	Mini Project	PR	20	30	50	-	-	-	1
11	19BCC5MC01	Advanced Communication Skills	MC	-	-	-	3	-	-	0
TOTAL										**23.5**

III B.TECH. – II SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCS6TH02	Artificial Intelligence	PC	40	60	100	3	-	-	3
2	19BCS6TH03	Cryptography and Network Security	PC	40	60	100	3	-	-	3
3	19BCC6TH01	Entrepreneurship and Innovation	HS	40	60	100	2	-	-	2
4		Open Elective – II	OE	40	60	100	3	-	-	3
5	19BCS6PE04 19BCS6PE05 19BCS6PE06 19BCS6PE07	Professional Elective – II a. Big Data Analytics b. Network Programming c. Agile with SCRUM d. Mobile Computing	PE	40	60	100	3	-	-	3
6	19BCS6LB01	Cryptography and Network Security Lab	PC	20	30	50	-	-	3	1.5
7	19BCS6LB02	PE-II LAB	PC	20	30	50	-	-	3	1.5
8	19BCS6LB03	R PROGRAMMING LAB	ES	20	30	50	-	-	3	1.5
9	19BCS6LB04	Artificial Intelligence Lab	HS	20	30	50	-	-	3	1.5
TOTAL										**20**

*** This lab covers experiments related to CNS and of the chosen PE-II**

IV B.TECH. – I SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCS7TH01	Machine Learning	PC	40	60	100	3	-	-	3
2	19BCS7PE02 19BCS7PE03 19BCS7PE04 19BCS7PE05	Professional Elective – III a. Data Science b Cloud Computing c. Digital Forensics d. DevOps	PE	40	60	100	3	-	-	3
3		**Open Elective – III**	OE	40	60	100	3	-	-	3
4		**Open Elective – IV**	OE	40	60	100	3	-	-	3
5	19BCS7PE06 19BCS7PE07 19BCS7PE08 19BCS7PE09	Professional Elective – IV a. Design patterns b. Mobile Adhoc and Sensor Networks c. Human Computer Interaction d. Block Chain Technologies	PE	40	60	100	3	-	-	3
6	19BCS7LB02	Machine Learning Lab	PC	20	30	50	-	-	3	1.5
7	19BIT7LB01	PE-III LAB	PC	20	30	50	-	-	3	1.5
8		Internship/ Practical Training	PR	50	-	50	-	-	-	1
9	19BCS6MOOC	MOOCS	PE	-	-	-	-	-	-	1
10		Skill Lab	PR	20	30	50	-	-	3	1.5
TOTAL										**21.5**

Software Lab-II contains experiments related to PE-III, PE-IV

IV B.TECH. – II SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCS8PE02 19BCS8PE03 19BCI8PE01 19BCS8PE04	Professional Elective – V a. Distributed Systems b. Internet of Things (IoT) c. Deep Learning d. Inter-Networking With TCP/IP	PE	40	60	100	3	-	-	3
2	19BCS8PE05 19BCS8PE06 19BCS8PE07 19BCI8PE08	Professional Elective – VI a. Software Project Management. b. SoA c. Functional Programming d. E-Commerce	PE	40	60	100	3	-	-	3
3	19BCI8PW	Project	PR	60	140	200	-	-	-	7
TOTAL										**13**

Open Elective Course: At any semester, student can choose an open elective course offered by any department provided that he/she has not studied it.

List of open Electives offered by all Departments

OPEN ELECTIVE-I

S.No.	Open Elective-I Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Public Health Engineering	CE	19BCC4OE01	3	0	0	3
2	Geographical Information Systems	CE	19BCC4OE02	3	0	0	3
3	Micro Electro Mechanical System	EEE	19BCC4OE03	3	0	0	3
4	Energy Audit Conservation and Management	EEE	19BCC4OE04	3	0	0	3
5	RPT &3D Printing (Other than ME)	ME	19BCC4OE05	3	0	0	3
6	Operations Research	ME	19BCC4OE06	3	0	0	3
7	Principles of Signals, Systems & Communications (Other than ECE)	ECE	19BCC4OE07	3	0	0	3
8	Medical Electronics	ECE	19BCC4OE08	3	0	0	3
9	DBMS (Other Than CSE)	CSE	19BCC4OE09	3	0	0	3
10	Web Development Using Mean Stack Tech	CSE	19BCC4OE10	3	0	0	3
11	Front End UI and Frame Work	IT	19BCC4OE11	3	0	0	3
12	Front End Web Technologies	IT	19BCC4OE12	3	0	0	3
13	Financial Institutions, Markets and Services	MBA	19BCC4OE13	3	0	0	3
14	Human Resource Practices	MBA	19BCC4OE14	3	0	0	3

OPEN ELECTIVE-II

S.No.	Open Elective-II Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Disaster Management	CE	19BCC5OE01	3	0	0	3
2	Green Building & Sustainability	CE	19BCC5OE02	3	0	0	3
3	Non-Conventional Energy Resources	EEE	19BCC5OE03	3	0	0	3
4	Basics in Electrical and Electronics Engineering (Other than EEE)	EEE	19BCC5OE04	3	0	0	3
5	Work study	ME	19BCC5OE05	3	0	0	3
6	Mechatronics	ME	19BCC5OE06	3	0	0	3
7	Fundamentals of Image Processing (Other than ECE)	ECE	19BCC5OE07	3	0	0	3
8	Consumer Electronics	ECE	19BCC5OE08	3	0	0	3
9	Artificial Intelligence	CSE	19BCC5OE09	3	0	0	3
10	OOPS through JAVA	CSE	19BCC5OE10	3	0	0	3
11	Object Oriented Programming through C++	IT	19BCC5OE11	3	0	0	3
12	Cloud Computing	IT	19BCC5OE12	3	0	0	3
13	Digital Marketing	MBA	19BCC5OE13	3	0	0	3
14	Personal Finance Planning	MBA	19BCC5OE14	3	0	0	3

OPEN ELECTIVE-III

S.No.	Open Elective-III Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Solid and hazardous waste management	CE	19BCC6OE01	3	0	0	3
2	Ground Water Development and Management	CE	19BCC6OE02	3	0	0	3
3	Soft Computing	EEE	19BCC6OE03	3	0	0	3
4	Industrial Electronics	EEE	19BCC6OE04	3	0	0	3
5	Automotive Vehicles	ME	19BCC6OE05	3	0	0	3
6	Nano Technology	ME	19BCC6OE06	3	0	0	3
7	Introduction to Embedded Systems (Other than ECE)	ECE	19BCC6OE07	3	0	0	3
8	Global Positioning System(GPS)	ECE	19BCC6OE08	3	0	0	3
9	Cloud Computing	CSE	19BCC6OE09	3	0	0	3
10	Block Chain Technologies	CSE	19BCC6OE10	3	0	0	3
11	Digital Marketing	IT	19BCC6OE11	3	0	0	3
12	DevOps	IT	19BCC6OE12	3	0	0	3
13	Performance Management	MBA	19BCC6OE13	3	0	0	3
14	Services Marketing	MBA	19BCC6OE14	3	0	0	3

OPEN ELECTIVE-IV

S.No.	Open Elective-IV Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Water shed management	CE	19BCC7OE01	3	0	0	3
2	Modern Construction Material	CE	19BCC7OE02	3	0	0	3
3	Control System	EEE	19BCC7OE03	3	0	0	3
4	Embedded Control of Electric Drives	EEE	19BCC7OE04	3	0	0	3
5	Pneumatics & Hydraulic Automation	ME	19BCC7OE05	3	0	0	3
6	Industrial Robotics	ME	19BCC7OE06	3	0	0	3
7	Introduction to Micro Processors & Micro Controllers(Other than ECE)	ECE	19BCC7OE07	3	0	0	3
8	Automotive Electronics	ECE	19BCC7OE08	3	0	0	3
9	Cyber Security	CSE	19BCC7OE09	3	0	0	3
10	Ethical Hacking	CSE	19BCC7OE10	3	0	0	3
11	Human Computer Interaction	IT	19BCC7OE11	3	0	0	3
12	E-Commerce	IT	19BCC7OE12	3	0	0	3
13	Quality Management	MBA	19BCC7OE13	3	0	0	3
14	Logistics and Supply Chain Management	MBA	19BCC7OE14	3	0	0	3

Distribution of Credits

S.No.	Year/Sem	HS	BS	ES	PC	PE	OE	PRC	TOTAL
1	I-I	3.5	7.5	7.5					**18.5**
2	I-II	2	10.5	9					**21.5**
3	II-I	3	3	4.5	12				**22.5**
4	II-II	1.5			15		3		**19.5**
5	III-I	1.5			18	3		1	**23.5**
6	III-II	3.5		1.5	9	3	3		**20**
7	IV-I				6	7	6	2.5	**21.5**
8	IV-II					6		7	**13**
9	TOTAL(Actual) CREDITS	15	21	22.5	60	19	12	10.5	**160**

S.No.	Course Work-Subject areas	Credits (as per AICTE)	Credits (as per NEC-CSE)
1	Humanities and Social Sciences (HS)	12	15
2	Basic Sciences (BS)	25	21
3	Engineering Sciences (ES)	24	22.5
4	Professional Core (PC)	48	60
5	Professional Elective (PE)	18	19
6	Open Elective (OE)	18	12
7	Project/Practical Training/Internship (PR)	15	10.5
	Total Credits	**160**	**160**

I B.TECH - I SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCC1TH01	Communicative English -I	HS	40	60	100	2	-	-	2
2	19BCC1TH03	Linear Algebra & Calculus	BS	40	60	100	3	-	-	3
3	19BCI1TH06	Electronic Devices and Logic Design	ES	40	60	100	3	-	-	3
4	19BCC1TH07	Engineering Chemistry	BS	40	60	100	3	-	-	3
5	19BCC1TH10	C Programming	ES	40	60	100	2	1	-	3
6	19BCC1LB01	English Communication Skills Lab - I	HS	20	30	50	-	-	3	1.5
7	19BCC1LB05	Engineering Chemistry Lab	BS	20	30	50	-	-	3	1.5
8	19BCC1LB07	C Programming Lab	ES	20	30	50	-	-	3	1.5
9	19BCC1MC02	Constitution of INDIA	MC	-	-	-	3	-	-	0
TOTAL										**18.5**

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	-	-	40	60	100	2
SUBCODE: 19BCC1TH01	**COMMUNICATIVE ENGLISH - I** (Common to All Branches)						

COURSE OBJECTIVES:

- To equip the students with appropriate oral and written communication skills.
- To inculcate the skills of listening, reading and critical thinking.
- To enhance the students' proficiency in reading skills enabling them meet the academic needs of their course.
- To enable the engineering students develop their basic communication skills in English for academic and social purposes.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Infer explicit and implicit meaning of a text, recognize key passages; raise questions and summarize it. [K2]
CO 2: Compose paragraphs, essays as creative writing.[K5]
CO 3: Build grammatically correct sentences using a variety of sentence structures.[K3]
CO 4: Enhance word power and usage of lexicons. [K3]
CO 5: Compile emails, letters, reports, resume and information transfer.[K5]

SYLLABUS

UNIT– I

Akio Morita

a) **Speaking**: Introducing self and others.
b) **Reading**: Skimming for main idea, scanning for specific piece of information.
c) **Writing**: Note – making flowed by paragraph writing, effective opening sentences, introducing the topic, key words, main idea, summarize the main idea.
d) **Grammar and Vocabulary**: Content words and function words, verbs, nouns, adjectives and adverbs. Basic sentence structure and simple question form, framing jargon, technical vocabulary (15 words)

UNIT–II

Dhirubhai Ambani

a) **Speaking**: Discussions on specific topic
b) **Reading**: Identifying the sequence of ideas and recognizing verbal techniques to link the ideas in a paragraph.
c) **Writing**: Paragraph writing, using key words/phrases and organizing points in a coherent manner.
d) **Grammar and Vocabulary**: Linkers, articles and prepositions.

UNIT–III

Louis Braille

a) **Speaking**: Discussions on specific topic
b) **Reading**: Sequencing of ideas and recognizing verbal techniques to link the ideas in a paragraph.

c) **Writing**: Paragraph writing, using key words/phrases and organizing points in a coherent manner.
d) **Grammar and Vocabulary**: Cohesive devices, articles and prepositions

UNIT-IV

Mallika Srinivasan

a) **Speaking:** Role plays, asking for and giving information/directions/instructions
b) **Reading**: Understand and interpret graphic elements used in texts.
c) **Writing**: Information transfer.
d) **Grammar and Vocabulary**: Adjectives, adverbs and antonyms.

UNIT-V

Muhammad Yunus

a) **Speaking**: Oral presentations
b) **Reading:** Reading for comprehension.
c) **Writing**: Essay writing
d) **Grammar and Vocabulary**: Articles, prepositions, tenses, subject verb agreement and technical jargon (15 words)

TEXT BOOKS:

1. **"**Modern Trail Blazers", Orient Black Swan Pvt.Ltd.Publisher, 1ST edition. 2013
2. English All Round -I (Communication skills for Under Graduate Learners)– Orient Black Swan Pvt.Ltd.Publisher, 1st edition,2019

REFERENCE BOOKS:

1. Raymond Murphy, *Murphy's English Grammar,* Cambridge University Press 2004
2. Meenakshi Raman, Sangeeta Sharma, *Technical Communication: English Skills for Engineers*, Oxford University Press, 2009
3. Michael Swan, *Practical English Usage,* Oxford University Press, 1996

WEB REFERENCES:

1. https://app.grammarly.com/
2. https://www.grammarly.com/blog
3. https://www.englishclub.com/
4. https://www.nonstopenglish.com/
5. https://www.fluentu.com/blog/english/
6. https://www.fluentu.com/blog/english/
7. http://freerice.com soon migrating to https://beta.freerice.com/

I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBCODE: 19BCC1TH03	**LINEAR ALGEBRA AND CALCULUS (Common to All Branches)**						

COURSE OBJECTIVES:

- Understanding basic concepts of linear algebra (systems of linear equations, matrix calculus).
- To become proficiency in solving computational problems of linear algebra.
- To acquire knowledge on mean value theorems in calculus.
- Familiarization about the techniques in calculus and multivariate analysis.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to

CO 1: Solve the system of linear equations.[K3]
CO 2: Analyze the applications of matrices in various fields and obtain Eigen values and Eigenvectors.[K4]
CO 3: Relate the results of mean value theorems in calculus to Engineering problems.[K1]
CO 4: Apply the functions of several variables to evaluate the rates of change with respect to time and space variables in engineering.[K3]
CO 5: Compute the area and volume by interlinking them to appropriate double and triple integrals.

SYLLABUS

UNIT I: Linear systems of equations: **(10 hours)**

Rank of a matrix - Echelon form, Normal form, Solution of linear systems, Direct Methods, Gauss elimination, Gauss Jordon and Gauss Seidal Methods. Solutions of linear simultaneous equations: LU decomposition.

Application: Finding the current in a electrical circuit

UNIT II: EIGENVALUES AND EIGENVECTORS **(12 hours)**

Eigenvalues, Eigenvectors, Properties, Cayley - Hamilton Theorem, Quadratic forms, Reduction of quadratic form to canonical form, Rank, Positive definite, negative definite, semi definite, index, signature.

Application: Finding powers and inverse of a square matrix using Cayley Hamilton's Theorem.

UNIT III: MEAN VALUE THEOREMS (6 hours)

Review on limits and continuity, Mean Value theorems (without proofs): Rolle's theorem, Lagrange's theorem, Cauchy's theorem, Taylor's (Generalized mean value) theorem, increasing and decreasing functions, Maxima and minima of function of single variable.

UNIT IV: PARTIAL DIFFERENTION: (8 hours)

Function of two or more variables, Partial derivatives, Total derivatives, change of variables, Jacobian - functional dependence, Taylor's theorem for Two variables. Maxima and Minima of functions of two variables, Lagrange's method of undetermined multipliers.

UNIT V: APPLICATION OF INTEGRATION and MULTIPLE INTEGRALS:

(12 hours)

Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates. Multiple Integrals- double and triple integrals, Change of Variables, Change of order of Integration.

TEXT BOOK :

1. Dr. B.S. Grewal, "*Higher Engineering Mathematics*", 43rd Edition, Khanna Publishers, 2012.

REFERENCES:

1. N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "*Engineering Mathematics*", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
2. Kreyszig E, "*Advanced Engineering Mathematics*", 8th Edition, John Wiley, Singapore, 2001.
3. Greenberg M D, "*Advanced Engineering Mathematics*", 2nd Edition, Pearson Education, Singapore, Indian Print, 2003.
4. Peter V. O'Neil, *"Advanced Engineering Mathematics"*, 7th Edition, Cengage Learning, 2011.
5. Bhavanari Satyanarayana, Pradeep Kumar T.V. & Srinivasulu D, "Linear Algebra and Vector Calculus", Studera Press, New Delhi, 2017.

I B.TECH I-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBCODE: 19BCI1TH06	**ELECTRONIC DEVICES AND LOGIC DESIGN**						

COURSE OBJECTIVES:

- To discuss the characteristics of semiconductor diodes.
- To illustrate the different types of Transistors and their applications.
- To demonstrate the basics of Boolean algebra and reduction techniques.
- To design of combinational circuits.
- To design sequential circuits like registers and counters.

COURSE OUTCOMES:

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

CO1: Apply P-N diodes and Special diodes in electronic circuits.[K3]

CO2: Compare different types of transistors (BJT, FET and MOSFET) with their working principles.[K2]

CO3: Make use of Boolean algebra and K-map and to minimize combinational functions.[K3]

CO4: Develop combinational circuits and sequential circuits.[K3]

CO5: Construct different types of registers and counters.[K3]

SYLLABUS:

UNIT I: Junction Diode Characteristics

Open circuited PN Junction, Forward and Reverse bias, V-I characteristics, Applications of Diode – Switch, Rectifiers (without and with filters), Zener Diode characteristics, Zener as voltage regulator, LED.

UNIT II: Transistors

BJT, Configuration of BJT, Input and Output Characteristics of CB, CE and CC Configuration, JFET, MOSFETs – Construction, Characteristics and Applications, Comparison between BJT and JFET, Comparison between JFET and MOSFET.

UNIT III: Number Systems, Logic Gates and Boolean algebra

Binary, Octal, Decimal and Hexadecimal Number Systems, Conversion of Numbers from one Radix to another Radix, 1's Complement and 2's Complement.

Basic Gates- AND, OR and NOT, Universal Gates- NAND and NOR, EX-OR and EX-NOR Gates, De-Morgan's Laws, Minimization of Logic Functions using Boolean Theorems and Karnaugh map method.

UNIT IV: Combinational and Sequential Logic Circuits

Combinational: Design of Half Adder, Full Adder, Half Subtractor, Full Subtractor, Design of Decoders, Encoders, Multiplexers, Demultiplexers. Sequential:Basic sequential logic circuits: Latch and Flip-Flop, Truth tables and excitation tables of RS, JK, T and D Flip-Flops.

UNIT V: Registers and Counters

Buffer Register, Control Buffer Register, Bidirectional Shift Registers, Universal Shift Registers. Synchronous Counter, Ripple Counter, Ring Counter, Modulus Counter.

TEXT BOOKS:

1. Electronic Devices and Circuits – J. Millman, C.C. Halkias, TMGH, 2nd Edition 1998.

2. Digital Design – M. Morris Mano, Pearson, 3rd Edition, 2009.

REFERENCES:

1. Electronic Devices and Circuits Theory- Robert L. Boylestad and Louis Nashelsky, Pearson Education, 9th Edition, 2008.
2. Fundamentals of Logic Design- Charles H. Roth, Jr, Thomson Learning, 5th Edition, 2005.

I B.TECH I SEMESTERS	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBCODE: 19BCC1TH07	**ENGINEERING CHEMISTRY** (COMMON TO ALL BRANCHES)						

COURSE OBJECTIVES:

- To analyze water for its various parameters and its significance in industrial and domestic allocations.
- To acquire the knowledge on types of polymers, fuels and their applications.
- To provide information on exciting advanced materials available in engineering.
- To apply the electrochemical principles, understand the fundamentals of corrosion and development of different techniques in corrosion control.
- To learn the importance of engineering materials used in daily life and industry.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Analyze the suitable method of water treatment depending on the quality treatment. [K4]

CO 2: Compare different types of polymers, fuels and their importance. [K4]

CO 3: Utilize the advanced materials as engineering materials and apply them in domestic and industrial life. [K3]

CO 4: Distinguish electrical energy sources and importance of corrosion science. [K4]

CO 5: Identify different types of engineering materials and applications in engineering. [K3]

SYLLABUS

UNIT-I: WATER CHEMISTRY

Characteristics of water: Sources, Impurities–Hardness & its units–Industrial water characteristics– Softening of water by external treatment methods (Lime soda process, Zeolite and Ion exchange process)–Numerical problems on lime soda process–Desalination of brackish water (Reverse osmosis and Electrodialysis).

Water analysis techniques: Alkalinity–hardness (Complexo-metric)–Break point chlorination–Free chlorine–DO–BOD and COD.

UNIT-II: POLYMERS AND FUEL CHEMISTRY

Polymers: Introduction to polymers–Chain growth (free radical, ionic)–Step growth polymerization–Coordination polymerization–Copolymerization with specific examples–

Thermoplastics and thermosets–Plastic moulding methods (Compression & Injection moulding)–Rubbers–Natural rubber–Processing–Vulcanization.

Fuels-Types of fuels–Calorific value–Numerical problems based on calorific value–Analysis of coal–Liquid fuels–Refining of petroleum–Cracking of heavy oil–Knocking and anti knocking agents–Octane and cetane values.

UNIT-III: CHEMISTRY OF ADVANCED MATERIALS

Nano materials: Introduction–Sol-gel method & Chemical reduction method of preparation – Characterization by BET method and TEM methods–Carbon nano tubes and fullerenes: Types–Preparation–Properties and Applications.

Liquid crystals: Introduction–Types–Applications.

Composite materials: Introduction–Definition–Types–Applications–Cermets.

UNIT-IV: ELECTROCHEMISTRY AND CORROSION

Electrochemistry: Galvanic cells–Single electrode potential–Reference electrodes–Electrochemical series–Batteries (primary, secondary and fuel cells)–Applications of secondary batteries in E-vehicles.

Corrosion: Causes and effects of corrosion–Theories of corrosion (chemical and electrochemical corrosion)–Factors effecting corrosion–Corrosion control methods–Cathode protection–Sacrificial anodic, Impressed current methods–Surface coatings–Methods of application on metals (Hot dipping, Galvanizing, Tinning, Cladding, Electroplating, Electroless plating)–Organic surface coatings–Paints–Constituents and their functions–Pigment Volume Concentration.

UNIT-V: CHEMISTRY OF ENGINEERING MATERIALS

Lubricants: Introduction–Mechanism of lubrication–Classification of lubricants–Properties and testing of lubricating oils.

Cement & Refractories: Manufacture–Setting and hardening of cement–Failures of cement–Slag cement–Refractory: Introduction–Classification and properties of refractories.

TEXT BOOKS:

1. Shikha Agarwal, "**Engineering Chemistry**", ISBN 1107476410, 2nd Edition, Cambridge University Press, New Delhi, (2019).
2. O.G. Palana, "**Engineering Chemistry**", ISBN 0070146101, Tata McGraw Hill Education Private Limited, New Delhi, (2009).
3. B. Rama Devi, Ch. Venkata Ramana Reddy, Prashantharath, "**Text Book of Engineering Chemistry**", ISBN 9789353500511, Cenage Learning India Pvt. Ltd, (2016).

REFERENCE BOOKS:

1. P.C. Jain and M. Jain "**Engineering Chemistry**", ISBN 8187433175, 15/e, Dhanpat Rai & Sons, Delhi, (2015).
2. B.S Murthy and P. Shankar, "**A Text Book of NanoScience and NanoTechnology"**, University Press (2013).
3. K. Sesha Maheshwaramma and Mridula Chugh, "**Engineering Chemistry"**, Pearson India Edn services, (2016).
4. S.S. Dara, "**A Textbook of Engineering Chemistry"**, ISBN 8121932645, S.Chand Publisher, (2010)

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2. URL: https://www.youtube.com/watch?v=H1Y1oxQ5eUA&t=627s
3. URL: https://www.youtube.com/watch?v=1xWBPZnEJk8
4. URL: https://www.youtube.com/watch?v=p9yPXdT0k48&t=225s
5. URL: https://www.youtube.com/watch?v=xb_xndPe4n0&t=390s

E-BOOKS:

1. "**Engineering Chemistry**" (NPTEL Web-book), by B.L. Tembe, Kamaluddin and M.S. Krishnan.

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	-	40	60	100	3
SUBCODE: 19BCC1TH10	**C PROGRAMMING (Common to CSE & IT)**						

COURSE OBJECTIVE:

- To know the basic problem solving process using Flow Charts and algorithms.
- To understand the basic concepts of control structures in C.
- To learn concepts of arrays, functions, pointers and Dynamic memory allocation in C.
- To use the concepts of structures, unions, files and command line arguments in C.

COURSE OUTCOMES:

After completion of this course, the students would be able to:

CO1. Develop algorithms and flow charts for simple problems [K3].

CO2. Utilize suitable control structures for developing code in C [K3].

CO3. Make use of functions and arrays in developing modular programs [K3].

CO4. Make use of structures and pointers to write well-structured programs [K3].

CO5. Make use of file Operations in C programming for a given application [K3].

SYLLABUS

UNIT I

Introduction to Algorithms and Programming Languages: Algorithm – Key features of Algorithms – Some more Algorithms – Flow Charts – Pseudo code – Programming Languages – Generation of Programming Languages – Structured Programming Language.

Introduction to C: Introduction – Structure of C Program – Writing the first C Program - Compiling and Executing C Programs - Using Comments – Keywords – Identifiers – Basic Data Types in C – Variables – Constants – I/O Statements in C - Operators in C - Programming Examples – Type Conversion and Type Casting.

UNIT II

Decision Control and Looping Statements: Introduction to Decision Control Statements – Conditional Branching Statements – Iterative Statements – Nested Loops – Break and Continue Statement – Goto Statement.

Functions: Introduction – using functions – Function declaration/ prototype – Function Definition – function call – return statement – Passing parameters – Scope of variables – Storage Classes – Recursive functions – Recursion vs Iteration.

UNIT III

Arrays: Introduction – Declaration of Arrays – Accessing elements of the Array – Storing Values in Array – Calculating the length of the Array – Operations on Array — Two Dimensional Arrays –Operations on Two Dimensional Arrays.

Strings: Introduction – Reading Strings – Writing Strings – String Manipulation functions -Array of Strings.

UNIT IV

Pointers: Introduction to Pointers – declaring Pointer Variables – Pointer Expressions and Pointer Arithmetic – Null Pointers – Passing Arguments to Functions using Pointer, Dynamic Memory Allocation.

Structure, Union, and Enumerated Data Types: Introduction – Nested Structures – Arrays of Structures – Structures and Functions – Self-referential Structures – Union – Enumerated Data Types.

UNIT V

Files: Introduction to Files – Using Files in C – Reading Data from Files – Writing Data To Files – Detecting the End-of-file – Error Handling during File Operations – Accepting Command Line Arguments – Functions for Selecting a Record Randomly - Remove – Renaming a File – Creating a Temporary File

TEXT BOOKS:

1. Reema Thareja**, "**Programming in C**"**, First **edition,** OXFORD University Press 2018.

REFERENCE BOOKS

1. REEMA THAREJA, "Introduction to C programming" OXFORD UNIVERSITY PRESS
2. Rachhpal Singh, "Programming in C", kalyani publishers
3. E Balagurusamy, "computing fundamentals & c programming", isbn 978-0-07- 066909-3, Tata McGraw-Hill, Second Reprint, 2008,
4. Ashok N Kamthane, "Programming with ANSI and Turbo C", Pearson Edition Publications, 2002.
5. Dennis Richie and Brian Kernighan, "The C programming Language", 2nd edition.

WEB REFERENCES:

1. http://cprogramminglanguage.net/
2. http://lectures-c.blogspot.com/
3. http://www.coronadoenterprises.com/tutorials/c/c_intro.htm
4. http://vfu.bg/en/e-Learning/Computer-Basics--computer_basics2.pdf

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
SUBCODE: 19BCC1LB01	**ENGLISH COMMUNICATION SKILLS LAB-I (Common to All Branches)**						

COURSE OBJECTIVES:

- To build confidence in the students to communicate effectively in English.
- To strengthen the oral communication skills to enable them to interact with the people in various social situations.
- To enable the learners improve pronunciation through emphasis on word accent, intonation and rhythm

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Improve their basic communication skills to interact with peers and others in various social situations.

CO 2: Speak English with good pronunciation, overcoming mother tongue influence.

CO 3: Take part in various conversations/discourses using formal and informal expressions.

CO 4: Listen and comprehend several accents of English Language.

SYLLABUS

UNIT– I

a. Greeting, Introducing and Taking leave
b. Pure Vowels
c. Listening - TEDx Talks (https://www.ted.com/talks/ashweetha_shetty_how-education-helped-me-rewrite-my-life?language-en#t-623369)
d. Self-Introduction

UNIT–II

a. Giving information and Asking for information
b. Diphthongs
c. Listening -TEDx Talks(https://www.youtube.com/watch?v=Dk20-E0yx_s)
d. Role Play

UNIT–III

a. Inviting, Accepting and Declining Invitations
b. Consonants
c. Listening - TEDx Talks (https://www.youtube.com/watch?v=IgAnj6r1O48)
d. JAM

UNIT-IV

a. Commands, Instructions and Requests
b. Accent and Rhythm
c. Listening -TEDx Talks(https://youtu.be/SKvMxZ284AA)
d. Tables Turned

UNIT-V

a. Suggestions and Opinions
b. Intonation
c. Listening -TEDx Talks(https://youtu.be/ov6pEGXRYZo)
d. Impromptu

TEXT BOOKS:

1. *"Strengthen Your Communication Skills",* Maruthi Publications, 2013.

REFERENCE BOOKS:

1. Meenakshi Raman, Sangeeta Sharma, *Technical Communication: Principles and Practice*, Oxford University Press, 2015
2. J.D.O Conner, *Better English Pronunciation*, Cambridge University Press 1980.
3. T.Balasubramanian, "*A Text Book of English Phonetics for Indian Students"*, Macmillan,1981
4. Penny ur *Grammar Practice Activities,* Cambridge University Press, 2010.
5. Mark Hancock, *Pronunciation in Use,* Oxford University Press 2007.

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
SUBCODE: 19BCC1LB05	**ENGINEERING CHEMISTRY LAB (COMMON TO ALL BRANCHES)**						

COURSE OBJECTIVES:

- To provide the students with a solid foundation in chemistry laboratory required to solve the engineering problems.
- To expose the students in practical aspects of the theoretical concepts.
- To train the students on how to handle the instruments.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Develop and perform analytical chemistry techniques to address the water related problems (hardness, alkalinity, Chlorine, DO). [K3]

CO 2: Explain the functioning of different analytical instruments.[K2]

CO 3: Compare viscosity and surface tension of different oils.[K2]

LIST OF EXPERIMENTS

Introduction to chemistry laboratory–Molarity, Normality, Primary, Secondary standard solutions, Volumetric titrations, Quantitative analysis, Qualitative analysis etc.

1. Estimation of NaOH using standard HCl solution
2. Determination of hardness of water sample by EDTA method
3. Determination of alkalinity of water sample
4. Determination of Dissolved Oxygen content of water sample by Winkler's method
5. Determination of Dissolved Chlorine by Mohr's method
6. Estimation of Fe^{+2} by using $KMnO_4$
7. Preparation of phenol formaldehyde resin/Urea formaldehyde
8. Conductometric titration between strong acid and strong base
9. Determination of viscosity of a liquid by Ostwald's viscometer
10. Determination of surface tension of a liquid by Stalagnometer
11. Determination of moisture content present in given coal sample
12. Determination of acid value of an oil

TEXT BOOKS:

1. N.K Bhasin and Sudha Rani "**Laboratory Manual on Engineering Chemistry**" 3/e, Dhanpat Rai Publishing Company (2007).
2. Mendham J, Denney RC, Barnes JD, Thosmas M and Sivasankar B "**Vogel's Quantitative Chemical Analysis**" 6/e, Pearson publishers (2000).
3. Sudharani, "**Lab manual on Engineering Chemistry**" Dhanpat Rai Publications, Co., New Delhi. (2009).

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
SUBCODE: 19BCC1LB07	**C PROGRAMMING LAB (Common to CSE & IT)**						

COURSE OBJECTIVE:

- The purpose of this course is to introduce to students to the field of language. The students will be able to enhance their analyzing and problem solving skills and use the same for writing programs in C.

COURSE OUTCOMES:

After completion of this C Programming Lab, students would be able to:

CO1: Analyze logical structure of computer programming and different constructs to develop programs in C Language [K4].

CO2: Compare and contrast various data types and operator precedence [K2].

CO3: Analyze the use of conditional and looping statements to solve problems associated with conditions and repetitions [K4].

CO4: Analyze simple data structures, use of pointers and dynamic memory allocation techniques [K4].

CO5: Make use of functions and file I/O operations in developing C Programs [K3].

EXERCISE 1

Construct Flowcharts for the following through Raptor:

i) Develop a calculator to convert time, distance, area, volume and temperature from one unit to another.
ii) Calculate simple and compound interest for various parameters specified by the user.
iii) Calculate the average of n numbers.

EXERCISE 2

a) Write a C Program to calculate the area of triangle using the formula Area $=(s*(s-a)*(s-b)*(s-c))^{1/2}$ where s= (a+b+c)/2.
b) Write a C Program to find the largest of three numbers using ternary operator.
c) Write a C Program to swap two numbers without using a temporary variable.

EXERCISE 3

a) Write a C program to find the roots of a quadratic equation.
b) Write a C program, which takes two integer operands and one operator form the user, performs
the operation and then prints the result. Consider the operators +,-,*, /, % and use Switch
Statement

EXERCISE 4

a) Write a C program to find the sum of individual digits of a positive integer and find the reverse of the given number.
b) Draw a flow chart using Raptor and write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

EXERCISE 5

a) Draw a flow chart using Raptor and write a C Program to print the multiplication table of a given number n up to a given value, where n is entered by the user.
b) Write a C Program to enter a decimal number, and calculate and display the binary equivalent of that number.
c) Write a C Program to check whether the given number is Armstrong number or not.

EXERCISE 6

a) Write a C program to interchange the largest and smallest numbers in the array.
b) Write a C program to input two m x n matrices, check the compatibility and perform addition and multiplication of them.

EXERCISE 7

a) Draw a flow chart using Raptor and write a C Program to find both the largest and smallest number
of an array of integers
b) Write a C Program to find transpose of a matrix.

EXERCISE 8

Draw a flow chart using Raptor and write C programs that use both recursive and non-recursive

Functions for the following

i) To find the factorial of a given integer.
ii) To find the GCD greatest common divisor of two given integers.

EXERCISE 9

a) Draw a flow chart using Raptor and write a C Program for the following To find Fibonacci sequence

b) Write C programs illustrating call by value and call by reference concepts.

EXERCISE 10

Write C Programs for the following string operations without using the built in functions - to concatenate two strings

a) To append a string to another string
b) To compare two strings

EXERCISE 11

Write C Programs for the following string operations without using the built in functions

a) To find whether a given string is palindrome or not

EXERCISE 12

Write a C program that uses functions to perform the following operations:

i. To insert a sub-string in to given main string from a given position.
ii. To delete n Characters from a given position in a given string.
iii. To replace a character of string either from beginning or ending or at a specified location

EXERCISE 13

a) Write a C Program to Implement Taylor series method
b) Write a C Program to Implement Euler's method
c) Write a C Program to Implement Runge Kutta method

EXERCISE 14

a) Draw a flow chart using Raptor and write a C program to implement a linear search.
b) Draw a flow chart using Raptor and write a C program to implement binary search
c) Write a C program to implement sorting of an array of elements.

EXERCISE 15

a) Write C Program to reverse a string using pointers
b) Write a C Program to compare two arrays using pointers
c) Write a C program to swap two numbers using pointers

EXERCISE 16

Examples which explores the use of structures, union and other user defined variables

EXERCISE 17

a) Write a C program which copies one file to another.
b) Write a C program to count the number of characters and number of lines in a file.
c) Write a C Program to merge two files into a third file. The names of the files must be entered using command line arguments.

EXERCISE 18

Virtual Lab: http://cse02-iiith.vlabs.ac.in/ /

Any three programs must be submitted with result from the above link.

*** At the end of the semester the student has to submit a Mini-Project on Computer Programming. The list of Mini-Projects is available in the department.**

TEXT BOOKS:

1. Reema Thareja, " Programming in C", OXFORD .
2. The C programming Language by Dennis Richie and Brian Kernighan 2nd ed..

REFERENCE BOOKS:

1. Dr.E.Balaguruswamy, "Programming in ANSI C", Tata McGraw-Hill Education.
2. Hanly, "Problem Solving and Program Design in C", Koffman, 7th ed, PEARSON.
3. Forouzan, Gilberg, Prasad ,"C Programming, A Problem Solving Approach", CENGAGE.
4. Programming in C, Second Edition by Ashok N.Kamthane, Pearson.

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	-	-	-	MC
SUBCODE: 19BCC1MC02	**CONSTITUTION OF INDIA (MC)**						

COURSE OBJECTIVES:

- To train students in understanding the basic structure of Indian Constitution
- To aware the students about the role of constitution in a democratic society
- To prepare students to live better and happily with other fellow beings through the application of Fundamental Rights in their lives.
- To know about the powers of Union Government and State Government

COURSE OUTCOMES:

CO1: Examine salient features of Indian Constitution and live accordingly in society & interpret the meaning of Fundamental Rights of State Policy. [K

CO2: Discover various aspects of Union Government legislation and live up to the expectations of the rules.

CO3: Critically examine State Government legislation and improve your living standards by following the rules strictly

CO4: Examine powers and functions of local bodies such as Municipalities and Panchayats and, take advantage of available resources for better living

CO5: Analyze the powers and functions of Election Commission and The Union Public Service Commission and decide upon it for safe and secured life.

UNIT-I:

INTRODUCTION TO INDIAN CONSTITUTION & FUNDAMENTAL RIGHTS :

Meaning of the term Indian Constitution –Preamble- Constituent Assembly- Salient Features of Indian Constitution. Fundamental Rights -Fundamental Duties -The Directive Principles of State Policy.

UNIT-II:

UNION GOVERNMENT : Union Government -Union Legislature (Parliament) -Lok Sabha and Rajya Sabha (with Powers and Functions) -Union Executive -President of India (with

Powers and Functions) -Prime Minister of India (with Powers and Functions) -Union Judiciary (Supreme Court) -Jurisdiction of the Supreme Court

UNIT-III:

STATE GOVERNMENT : State Government -State Legislature (Legislative Assembly / Vidhan Sabha, Legislative Council / Vidhan Parishad) -Powers and Functions of the State Legislature -State Executive-Governor of the State (with Powers and Functions) -The Chief Minister of the State (with Powers and Functions) -State Judiciary (High Courts)

UNIT-IV:

LOCAL SELF GOVERNANCE : Powers and functions of Municipalities, Panchyats, ZP's and Co – Operative Societies

UNIT-V:

SOVEREIGN BODIES : Election Commission of India (with Powers and Functions) -The Union Public Service Commission (with Powers and Functions)

TEXT BOOKS:

1. Introduction to constitution of India, Durga Das Basu, Lexis Nexis Publications
2. Constitution of India by PRFESSIONAL BOOK PUBLISHERS
3. The Constitution of India by Arun K Tiru vengadam, Blooms bury publishers.
4. The constitution of India by PM Bakshi, Universal law publishing co
5. The Constitution of India by S.R. Bhansali, Universal law publishing co

I B.TECH. – II SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCC2TH01	Communicative English -II	HS	40	60	100	2	-	-	2
2	19BCC2TH07	Engineering Physics	BS	40	60	100	2	1	-	3
3	19BCI2TH08	Probability & Statistics	BS	40	60	100	2	1	-	3
4	19BCC2TH09	Engineering Graphics	ES	40	60	100	1	-	4	3
5	19BCI2TH10	Numerical Methods And Vector Calculus	BS	40	60	100	2	1	-	3
6	19BCI2TH12	Python Programming	ES	40	60	100	3	-	-	3
7	19BCC2LB06	Engineering Physics Lab	BS	20	30	50	-	-	3	1.5
8	19BCC2LB07	IT Workshop	ES	20	30	50	-	-	3	1.5
9	19BCI2LB09	Python Programming Lab	ES	20	30	50			3	1.5
10	19BCC2MC02	Environmental Studies	MC	-	-	-	3	-	-	0
TOTAL										**21.5**

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	-	-	40	60	100	2
SUBCODE: 19BCC2TH01	**COMMUNICATIVE ENGLISH - II (Common to All Branches)**						

COURSE OBJECTIVES:

- To enable the engineering students develop their basic communication skills in English for academic and social purposes.
- To equip the students with appropriate oral and written communication skills.
- To enhance the skills of listening, reading and critical thinking.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Read and comprehend complex texts and summarize.
CO 2: Compose paragraphs, essays as creative writing.
CO 3: Learn grammatical structures and write grammatically correct sentences
CO 4: Enhance word power and usage of lexicons.
CO 5: Compile emails, letters, reports, resume and information transfer.

UNIT– I

a. **Reading**: Rahul Bajaj
b. **Communication Skills -**Role and significance of communication, Features of Human Communication-
c. **Writing:** Emails and Letters
d. **Vocabulary**: Homonyms, Homophone and Homographs.

UNIT–II

a. **Reading:** Ratan Tata
b. **Communication Skills -**Process of Communication & types of Communication, barriers to communication
c. **Writing:** General Essay
d. **Vocabulary:** Words often confused, Suffixes & Prefixes

UNIT–III

a. **Reading:** Sabeer Bhatia
b. **Communication Skills -**Importance of Listening for effective communication, Interpersonal communication-

c. **Writing:** Note making
d. **Vocabulary:** Synonyms and Antonyms (100)

UNIT-IV

a) **Reading:** Steve Jobs
b) **Communication Skills** -Persuasion techniques
c) **Writing:** Resume
d) **Vocabulary:** One word substitutes (100)

UNIT-V

a. **Reading:** Sudha Murthy
b. **Communication Skills** -Telephone and Cell phone etiquette-
c. **Writing:** Report writing; types, format, style, sample reports
d. **Vocabulary:** Frequently used Idioms (100)

TEXT BOOKS:

1. **"**Modern Trail Blazers" , Orient Black Swan Pvt.Ltd.Publisher, 1ST edition. 2013

2. E Suresh Kumar," *Engineering English",* Orient Black Swan Pvt. Ltd. Publishers.

REFERENCE BOOKS:

1. Raman, Meenakshi and Sangeetha Sharma, "*Technical Communication: Principles and Practice",* Oxford University Press, New Delhi. 2015.
2. Rutherford, Andrea. J *Basic Communication Skills for Technology*. Pearson, New Delhi. 2001
3. Raymong Murphy, "*Murphy's English Grammar",* Cambridge University Press 2004.
4. Sanjay Kumar, Pushpa Latha, "*Language and Communication Skills for Engineerers",* Oxford University Press, 2018.

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	-	40	60	100	3
SUBCODE: 19BCC2TH07	**ENGINEERING PHYSICS (Common to All branches)**						

COURSE OBJECTIVES:

- To impart knowledge in basic concepts of wave optics, fiber optics, properties of solid crystal materials and magnetic materials, acoustics, superconductors.
- To familiarize the applications of materials relevant to engineering field.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Find the experimental evidence of wave nature of light and interference in thin films, Diffraction grating and Polarisation in various fields. [K1]

CO 2: Analyse various types of lasers & optical fibers. [K4]
CO 3: Explain the crystal structures and XRD techniques. [K2]

CO 4: Develop the strategies to apply the concepts of magnetiism in engineering field. [K3]

CO5: Examine the various applications of semiconductors in engineering field. [K4]

SYLLABUS

UNIT– I

Interference & Diffraction: Introduction -Interference in thin films by reflection – Newton's rings, introduction to diffraction – difference between Fresnel's and Fraunhofer diffraction - Fraunhofer diffraction at single slit (qualitative) - Diffraction grating.

Polarization: Introduction – Types of Polarization – Double refraction – Nicol's prism- Quarter wave plate and Half Wave plate

UNIT–II

Lasers: Introduction – Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Population inversion – Ruby laser – Helium Neon laser-Applications.

Fiber Optics: Introduction- Principle of optical fiber - Acceptance angle – cone - Numerical Aperture-Applications.

UNIT–III

Crystallography : Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC,BCC and FCC.

X-Ray Diffraction: Directions and planes in crystals – Miller indices – Separation between successive (h k l) planes – Bragg's law.

UNIT-IV

Electromagnetic Fields: Gauss and stokes theorems (qualitative) – Fundamental laws of electromagnetism – Maxwell's Electromagnetic Equations.

Magnetic materials: Magnetic Susceptibility- Magnetic permeability –Classification of Magnetic materials – Dia, Para, Ferro – Soft and Hard magnetic materials - Applications

UNIT-V

Quantum Mechanics: Introduction –de-Broglie's concept of Matter waves – Physical significance of wave function - Schrodinger Time Independent wave equations – Particle in a one dimensional potential box.

Semiconductor Physics: Origin of energy band formation in solids- classification of materials into conductors, semiconductors and insulators, Intrinsic and Extrinsic semiconductor- Hall Effect.

TEXT BOOKS:

1. A.J. Dekker, "Solid state Physics", ISBN 10: 0333918339 / ISBN 13: 9780333918333, Mc Millan India Ltd, First edition, 2000.
2. M.N. Avadhanulu & P.G. Kshirasagar, "A text book of Engineering Physics", ISBN 81-219-0817-5, S. Chand publications, First Edition, 2011.
3. P. K. Palanisamy, "Engineering Physics", ISBN: 9788183714464, Scitech Publishers, 4th Edition, 2014
4. M.R. Srinivasan, "Engineering Physics", ISBN978-81-224-3636-5, New Age international publishers, 2nd Edition,2014

REFERENCE BOOKS:

1. Charles Kittle, "Introduction to solid state physics" ISBN: 9788126578436, Willey India

2. Pvt.Ltd, 5TH edition, 2012.

3. M.Arumugam, "Applied Physics", ISBN: 81-89638-01-7, Anuradha Agencies, 4th edition,
4. 2013.
5. D.K.Bhattacharya, "Engineering Physics", ISBN: 0198065426, 9780198065425, Oxford
6. University press, 2nd edition, 2010.
7. Sanjay D Jain and Girish G Sahasrabudhe "Engineering Physics", University Press
8. ISBN: 8173716781,1st edition, 2010.
9. B.K.Pandey & S. Chaturvedi "Engineering Physics" ISBN: 8131517616, Cengage
10. Learning, 1st edition, 2012.

WEB REFERENCES:

1. http://link.springer.com/physics
2. http://www.thphys.physics.ox.ac.uk
3. http://www.sciencedirect.com/science
4. http://www.e-booksdirectory.com

E-BOOKS:

1. http://www.peaceone.net/basic/Feynman
2. http://physicsdatabase.com/free-physics-books
3. http://www.damtp.cam.ac.uk/user/tong/statphys/sp.pdf
4. http://www.freebookcentre.net/Physics/Solid-State-Physics-Books.html

I B.TECH II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	-	40	60	100	3
SUBCODE: 19BCI2TH08	**PROBABILITY AND STATISTICS (CSE & IT)**						

COURSE OBJECTIVES:

- To extend and formalize knowledge of the theory of probability and random variables
- To introduce techniques for carrying out probability calculations and identifying probability distributions.
- To explain students with the fundamental concepts of probability and statistics and to develop an understanding of the role of statistics in engineering.

COURSE OUTCOMES:

Upon Successful completion of the course, the students are able to

CO 1: Make use of the knowledge of theory of probability and random variables.

CO 2: Apply discrete and continuous probability distributions to solve various engineering problems.

CO 3: Identify the estimation errors in sampling distributions.

CO 4: Apply the proper test statistics to test the hypothetical data by Tests of Hypothesis.

CO 5: Apply Statistical Quality controlling methods to given data.

UNIT I: PROBABILITY AND DISCRETE DISTRIBUTIONS: **(10 hours)**

Probability, Conditional Probability, Baye's theorem -Random variables- Discrete Random variable-Distribution function- Expectation. Discrete distributions: Binomial, Poisson distributions and their fitting to data.

UNIT-II: CONTINUOUS RANDOM VARIABLES & DISTRIBUTIONS:

(10 hours)

Continuous Random variable-Distribution function- Expectation. Continuous distributions: Normal distributions-data fitting-Normal approximation to Binomial distribution, Uniform, Exponential, Weibull, and Gamma distributions.

UNIT-III: SAMPLING THEORY: (10 hours)

Introduction - Population and samples- Sampling distribution of means (σ known)-Central limit theorem- Sampling distribution of means (σ unknown) - Sampling distribution of variances. Point estimation- Maximum error of estimate - Interval estimation.

UNIT-IV: TESTS OF HYPOTHESIS FOR SMALL SAMPLES: (12 hours)

Introduction –Hypothesis-Null and Alternative Hypothesis- Type I and Type II errors –Level of significance - One tail and two-tail tests- t-test (single mean and differences of means), chi-square test (good ness of fit, Independence of attributes and population variance), F-test, ANOVA for one-way and two-way classified data.

UNIT-V: STATISTICAL QUALITY CONTROL METHODS & INTRODUCTION TO DATA SCIENCE USING PYTHON: (6 hours)

Quality Control, control charts for measurements, control charts for attributes, tolerance limits.

TEXT BOOK:

1. **T. K. V. Iyenger**, Krishna Gandhi, Ranganadhan and M.V.S.S. Prasad Probability and Statistics, S. Chand & Company Ltd, 2015.
2. **S. C. Gupta and V. K. Kapoor,** Fundamentals of Mathematical Statistics, 11/e (Reprint) 2019, Sultan Chand & Sons Publications.

REFERENCES:

1. **Miller and Freund's,** Probability and Statistics for Engineers, 7/e, Pearson, 2008.
2. **Jay I. Devore,** Probability and Statistics for Engineering and the Sciences, 8th Edition, Cengage.
3. **Sheldon M. Ross,** Introduction to probability and statistics Engineers and the Scientists, 4th Edition, Academic Foundation, 2011.

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	1	-	4	40	60	100	3
SUBCODE: 19BCC2TH09	**ENGINEERING GRAPHICS** (COMMON TO CSE & ECE & EEE & IT)						

COURCE OBJECTIVES:

- The students to use drawing instruments and to draw polygons, engineering Curves & engineering scales.
- The students use to make orthographic projections, projections of points, simple lines & projections of the lines inclined to both the lines.
- The students use to draw the projections of the plane inclined to both the plane.
- The students use to draw the projections of solids & development of surfaces.
- The students use to draw conversion of isometric views to orthographic views vice versa and to learn basic drawing commands in auto cad.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Construct the geometrical shapes of regular polygons, Engineering Curves.
CO 2: Develop the orthographic projections, projections of points, and lines inclined to both the planes.
CO 3: Construct the projection of planes inclined to both the planes.
CO 4: Develop the projection of regular solids and surfaces.
CO 5: Interpret the conversion of isometric views to orthographic views vice versa.
.

UNIT– I

THE BASIC CONCEPTS IN ENGINEERING DRAWING: introduction to engineering drawing instruments, lettering and dimensioning practice. Geometrical constructions- Constructing regular polygons by general methods.

CURVES USED IN ENGINEERING PRACTICE: Introduction to **conic** sections, construction of ellipse, parabola, hyperbola by eccentricity method. Construction of ellipse by - Arcs of circles Method, Concentric Circles Method and Oblong Method, & parallelogram methods.

UNIT–II

ORTHOGRAPHIC PROJECTIONS: introduction to type of projections, first angle and third angle projections.

Projection of points: Principles of orthographic projection – Convention – First angle projections, projections of points.

PROJECTIONS OF STRAIGHT LINES:

Projections of straight lines parallel to both the planes, parallel to one plane and inclined to the other plane. Lines inclined to both the planes - Projections of straight lines inclined to both the planes- determination of true lengths, angle of inclination and traces.

UNIT–III

PROJECTIONS OF PLANES: regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

UNIT-IV

PROJECTIONS OF SOLIDS: introduction to projections of solids, types of solids: prisms, pyramids, cones and cylinders –simple positions and the axis inclined to one of the plane.

UNIT-V

Introduction of isometric views, isometric projections & orthographic projections. Conversion of isometric views to orthographic views and orthographic views to isometric views.

INTRODUCTION TO AUTO CAD: practice on draw, edit & modify commands using auto CAD.

TEXT BOOKS:

1. Engineering Drawing by N.D. Butt, Chariot Publications.
2. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers.
3. Engineering Drawing & Graphics by K.Venu gopal, New age international Publishers.

REFERENCE BOOKS:

1. Engineering Graphics for Degree by K.C. John, PHI Publishers.
2. Engineering Drawing by Basant Agarwal & CM. Agarwal, Tata McGraw Hill Publishers.

WEB REFERENCES:

1. https://nptel.ac.in/courses/112103019/17

E-BOOKS:

1. https://www.pdfdrive.com/textbook-of-engineering-drawing-e28918244.html

I B.TECH-II-SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	-	40	60	100	3
SUBCODE: 19BCI2TH10	**NUMERICAL METHODS AND VECTOR CALCULUS** (CSE & IT)						

COURSE OBJECTIVES:

- To elucidate the different numerical methods to solve nonlinear algebraic equations.
- To propagate the use of different numerical techniques for carrying out numerical integration.

COURSE OUTCOMES:

Upon successful completion of the course, the students should be able to

CO 1: Evaluate approximating roots of polynomials and transcendental equations by different algorithms.

CO 2: Apply Newton's forward backward and Lagrange's interpolation for equal and unequal intervals.

CO 3: Apply different algorithms for approximating solutions of ordinary differential equation to its analytical computations.

CO 4: Interpret the physical meaning of different operators as gradient, curl and divergence.

CO 5: Estimate the work done against a field, circulation and flux using vector calculus.

UNIT –I: ITERATION METHODS: **(8 hours)**

Solution of Algebraic and Transcendental Equations: Introduction- Bisection method, Method of false position, Iteration method, Newton-Raphson method (One variable and simultaneous Equations).

UNIT –II: INTERPOLATION: **(10 hours)**

Interpolation: Introduction- Errors in polynomial interpolation – Finite differences- Forward differences- Backward differences –Central differences – Symbolic relations and separation of symbols - Differences of a polynomial-Newton's formulae for interpolation – Interpolation with unequal intervals – Newton's Divided difference formula, Lagrange's interpolation formula.

UNIT –III: NUMERICAL DIFFERENTIATION AND INTEGRATION:

(10 hours)

Numerical Differentiation, Ordinary differential equations-Taylor's series, Euler and modified Euler's methods. Runge-Kutta method of fourth order for solving first and second order equations. Numerical integration- trapezoidal rule, Simpson's 1/3rd and 3/8th rules.

UNIT- IV: VECTOR DIFFERENTIATION: **(10 hours)**

Scalar and vector point functions, vector operator del, del applies to scalar point functions-Gradient, del applied to vector point functions-Divergence and Curl, vector identities.

UNIT- V: VECTOR INTEGRATION: **(10 hours)**

Line integral-circulation-work done, surface integral-flux, Green's theorem in the plane (without proof), Stoke's theorem (without proof), volume integral, Divergence theorem (without proof).

TEXT BOOK :

1. Dr. B.S. Grewal, "*Higher Engineering Mathematics*", 43nd Edition, Khanna Publishers, 2012.

REFERENCES:

1. N.P. Bali, Bhavanari Satyanarayana, Indrani Promod Kelkar, "*Engineering Mathematics*", University Science Press, (An Imprint of Lakshmi Publications Pvt., Ltd) New Delhi, 2012.
2. Kreyszig E, "*Advanced Engineering Mathematics*", 8th Edition, John Wiley, Singapore, 2001.
3. Bhavanari Satyanarayana, Pradeep Kumar T.V. & Srinivasulu D, "Linear Algebra and Vector Calculus", Studera Press, New Delhi, 2017.
4. Curtis F. Gerald, Patrick O. Wheatley, "Applied Numerical Analysis", 7 th edition, Pearson.

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBCODE: 19BCI2TH12	**PYTHON PROGRAMMING** (Common to CSE & IT)						

COURSE OBJECTIVE:

- To teach problem solving through flow charting tool-Raptor.
- To elucidate problem solving through python programming language.
- To introduce function oriented programming paradigm through python.
- To train in development of solutions using modular concepts.

COURSE OUTCOMES:

After successful completion of this course, the students would be able to:

CO 1: Summarize the fundamental concepts of python programming.[K2].

CO 2: Apply the suitable data structures to solve the real time problems.[K3].

CO 3: Interpret object oriented and event driven programming in python.[K2].

CO 4: Apply regular expressions for many different situations.[K3].

SYLLABUS:

UNIT-I

Introduction to python: Python-numbers, strings, variables, operators, expressions, statements, string operations, math function calls, Input/output statements, conditional if, while and for loops,

Functions: user defined functions, parameters to functions, recursive functions, lambda function and turtle graphics.

UNIT-II

Data structures: Lists- basic list operators, replacing, inserting, removing an element; searching and sorting lists; tuples. Dictionaries- dictionary literals, adding and removing keys, accessing and replacing values; traversing dictionaries. Sets, Strings, files and their libraries.

UNIT-III

Event driven programming: Turtle bar chart, event driven programming, key press events, mouse events, timer events.

UNIT-IV

OOP: Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modeling; persistent storage of objects ,inheritance, polymorphism, operator overloading _eq_, _str_, etc); abstract classes; exception handling, try block.

UNIT-V:

Regular expressions: Powerful pattern matching and searching, Power of pattern searching using regex in python, Real time parsing of networking or system data using regex Password, email, url validation using regular expression, Pattern finding programs using regular expression.

TEXT BOOKS:

1. Kenneth Lambert, "Fundamentals of Python: First Programs" , ISBN-13: 978-1337560092,cengage learning publishers, first edition,2012.
2. Allen B. Downey, "think python: how to think like a computer scientist", ISBN-13: 978-1491939369, O'reilly, 2nd edition, 2016.
3. Reema Thareja, "Python Programming using Problem Solving Approach", ISBN-13:978-0-19-948017-3, Oxford University Press, 2017.

REFERENCE BOOKS:

1. Vamsi kurama, "Python programming : A modern approach", ISBN-978-93-325-8752-6,pearson,2018.
2. Mark Lutz , "Learning python", ISBN: 1-56592-464-9,Orielly, 4th edition, 1999 .
3. W.Chun, "Core python programming", ISBN-13: 978-0132269933, pearson, 2nd edition, 2016.

WEB RESOURCES:

1. https://raptor.martincarlisle.com/
2. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
3. https://zhanxw.com/blog/wp-content/uploads/2013/03/BeautifulCode_2.pdf
4. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
5. https://www.cse.msu.edu/~stockman/ITEC/Scratch/BGC2011Scratch-Rev1.pdf
6. https://nostarch.com/scratchplayground
7. http://fusecontent.education.vic.gov.au/9f79537a-66fc-4070-a5ce-e3aa315888a1/scratchreferenceguide14.pdf

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
SUBCODE: 19BCC2LB06	**ENGINEERING PHYSICS LAB** (Common to All branches)						

COURSE OBJECTIVES:

- To impart physical measurement skills and make the students understand coherence between theoretical and practical knowledge.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Understand the principle of physics and interpret them in engineering field and compares the results with theoretical calculations.

CO2: Ability to use modern engineering physics techniques and tools in real time applications in engineering studies.

CO3: The student will be enabled to know about the characteristics and the behavior of materials in a practical manner and gain knowledge and its usage.

LIST OF EXPERIMENTS:

1. Rigidity modulus of material by wire-dynamic method (torsional pendulum)
2. Determination of wavelength of a source-Diffraction Grating-Normal incidence
3. Newton's rings –Radius of Curvature of Plano Convex Lens.
4. Determination of thickness of thin wire- Air wedge method
5. Determination of wavelength of Laser Source-single slit diffraction.
6. Determine the Numerical aperture of an optical fiber.
7. Melde's experiment – Transverse and Longitudinal modes.
8. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
9. Verification of laws of stretched string by using Sonometer.
10. Calculate the energy loss in a given ferromagnetic material by plotting B-H Curve.
11. Energy Band gap of a Semiconductor p - n junction.
12. Characteristics of Thermistor – temperature coefficient

TEXT BOOKS:

1. Engineering Physics Lab Manual by Dr.Y. Aparna & Dr.K.Venkateswarao (V.G.S.Book links).
2. Physics Practical Manual, Lorven Publications
3. S. Balasubramanian , M.N. Srinivasan " A Text book of Practical Physics"- S Chand Publishers, 2017.

WEB REFERENCES:

1. https://www.youtube.com/watch?v=NDsSPtL9dyQ
2. https://www.youtube.com/watch?v=9agoJRCnu4w
3. https://www.youtube.com/watch?v=bv-lLJreyCU
3. http://vlab.amrita.edu/index.php

I B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
SUBCODE: 19BCC2LB07	**IT WORKSHOP** (Common to CSE & IT)						

COURSE OBJECTIVES:

- Enabling the student to understand basic hardware and software tools through practical exposure.

COURSE OUTCOME:

After completion of this course, the student should be able to

CO1: Demonstrate the need of PC hardware components, applications and software [K2].

CO2: Explain the knowledge of networks, internet and World Wide Web, Search engines, Netiquette [K2].

CO3: Experiment with the installation and use of different software like Windows XP, Linux [K3]

CO4: Identify and fix the defective PC and software related issues [K3].

CO5: Make use of various options in Microsoft word, Excel and Power point [K3].

PC Hardware:

Identification of basic peripherals, assembling a PC, installation of system software like MS Windows, device drivers, Trouble shooting Hardware and Software, some tips and tricks.

Internet & World Wide Web:

Different ways of hooking the PC on to the internet from home and workplace and effectively use the internet, web browsers, email, newsgroups and discussion forums. Awareness of cyber hygiene protecting the personal computer from getting infected with the viruses, worms and other cyber-attacks.

Productivity tools: Crafting professional word documents; excel spread sheets, power point presentations and personal websites using the Microsoft suite of office tools.

PC Hardware

Task 1: Identification of the peripherals of a computer. To prepare a report containing the block diagram of the CPU along with the configuration of each peripheral and its functions. Description of various I/O Devices.

Task 2: A Practice on disassembling the components of a PC and assembling them to back to working condition.

Task 3: Examples of Operating Systems- DOS, MS Windows, and Installation of MS windows on a PC

Task 4: Introduction to Memory and Storage Devices, I/O Port, Device Drivers, Assemblers, Compilers, Interpreters, Linkers, Loaders.

Task 5: Hardware Troubleshooting Demonstration: Identification of a problem and fixing a defective PC(improper assembly) or defective peripherals.

Software Troubleshooting Demonstration: Identification of problem and fixing the PC for any software issues.

Internet & Networking Infrastructure

Task 6: Demonstrating Importance of Networking, Transmission Media, Networking Devices- Gateway, Routers, Hub, Bridge, NIC, Bluetooth technology, Wireless Technology, Modem, DSL, and Dialup Connection.

Orientation & Connectivity Boot Camp and Web Browsing: Students are trained to configure the network settings to connect to the Internet. They are trained to demonstrate the same through web browsing (including all tool bar options) and email access.

Task 7: Search Engines & Netiquette:
Students are enabled to use search engines for simple search, academic search and any other context based search (Bing, Google etc).Students are acquainted to the principles of micro-blogging, wiki, collaboration using social networks, participating in online technology forums.
Task 8: Cyber Hygiene (Demonstration) : Awareness of various threats on the internet. Importance of Security patch updates and Anti-Virus solution Ethical Hacking, Firewalls, Multi-factors authentication techniques including Smart card Biometrics and also practiced

WORD

Task 9: MS Word Orientation: Accessing, overview of toolbars, saving files, Using help and resources, rulers, formatting, Drop Cap, Applying Text effects, Using Character Spacing, OLE in Word, using templates, Borders and Colors, Inserting Header and Footer, Using Date and Time option, security features in word, converting documents while saving.
Task 10 : Creating Project : Abstract Features to be covered:-Formatting Styles, Inserting Table, Bullets and Numbering, Changing Text Direction, Cell alignment, footnote, Hyperlink, Symbols, Spell Check, Track Changes, Images from files and clipart, Drawing toolbar and Word Art, Formatting Images, Textboxes and Paragraphs.
Task 10A: Create a document using Google Docs, Create a Survey Form using Google Forms, Create a document using Google Docs with voice typing, Translate Document from one language to another language.

EXCEL

Task 11: Using spread sheet features of EXCEL including the macros, formulae, pivot tables, graphical representations.
Creating Scheduler - Features to be covered:-Gridlines, Format Cells, Summation, auto fill, Formatting Text.
LOOKUP/VLOOKUP
Task 12: Performance Analysis: Features to be covered:-Split cells, freeze panes, group and outline, Sorting, Boolean and Logical operators, Conditional Formatting.

POWER POINT

Task 13: Students will be working on basic power point utilities and tools which help them create basic power point presentation. Topic covered during this week includes:- PPT Orientation, Slide Layouts, Inserting Text, Word Art, Formatting Text, Bullets and Numbering, Auto Shapes, Lines and Arrows, Hyperlinks, Inserting –Images, Clip Art, Tables and Charts in PowerPoint.

Task 14: Focusing on the power and potential of Microsoft power point Help them learn best practices in designing and preparing power point presentation. Topic covered during this week includes:- Master Layouts (slide, template and notes), Types of views (basic, presentation, slide slotter, notes etc), Inserting – Background , textures, Design Templates, Hidden slides, OLE in PPT.

Task 14A: Create a Power point Presentation with audio recording and video recording, Create an animation video using Plotogon Tool.

TEXT BOOKS:

Faculty to consolidate the workshop manuals using the following references.

1. Anita Goel , Computer Fundamentals, Pearson
2. Scott. Mueller QUE , Scott Mueller's Upgrading and Repairing PCs, 18/e, Pearson, 2008

REFERENCE BOOKS:

1. Dr.N.B.Venkateswarlu, Essential Computer and IT Fundamentals for Engineering and Science Students.
2. G Praveen Babu, M V Narayana, "Information Technology Workshop", BS Publications, 3e
   Vikas Gupta, "Comdex Information Technology", Dreamtech.

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
SUBCODE: 19BCI2LB09	**PYTHON PROGRAMMING LAB** (Common to CSE & IT)						

COURSE OBJECTIVE:

- To introduce programming through Visual programming tool - Scratch
- To teach problem solving through Flow charting tool - Raptor
- To elucidate problem solving through python programming language
- To introduce function-oriented programming paradigm through python
- To train in development of solutions using modular concepts
- To teach practical Pythonic solution patterns

COURSE OUTCOMES:

After successful completion of this course, the students would be able to:

CO1: Develop interactive visual programs using Scratch.[K3].
CO2: Develop Python programs for numerical and text based problems. [K3].
CO3: Develop graphics and event based programming using Python. [K3].
CO4: Develop Python programs on object oriented programming and regular expressions. [K3].

LABORATORY EXPERIMENTS

Design a script in Scratch to make a sprite to draw geometrical shapes such as Circle, Triangle, Square, Pentagon.

1. Design a script in Scratch to make a sprite to ask the user to enter two different numbers and an arithmetic operator and then calculate and display the result.
2. Design a Memory Game in Scratch which allows the user to identify positions of similar objects in a 3 x 3 matrix.
3. Design a Python script to convert a Binary number to Decimal number and verify if it is a Perfect number.
4. Design a Python script to determine if a given string is a Palindrome using recursion
5. Design a Python script to sort numbers specified in a text file using lists.
6. Design a Python script to determine the difference in date for given two dates in YYYY:MM:DD format 0 <= YYYY <= 9999, 1 <= MM <= 12, 1 <= DD <= 31 following the leap year rules.
7. Design a Python Script to determine the Square Root of a given number without using inbuilt functions in Python.
8. Design a Python Script to determine the time difference between two given times in HH:MM:SS format. 0 <= HH <= 23, 0 <= MM <= 59, 0 <= SS <= 59
9. Design a Python Script to find the value of Sine, Cosine, Log, PI, e*g* of a given number using infinite series of the function.
10. Design a Python Script to convert a given number to words
11. Design a Python Script to convert a given number to roman number.
12. Design a Python Script to generate the frequency count of words in a text file.
13. Design a Python Script to print a spiral pattern for a 2 dimensional matrix.

14. Design a Python Script to implement Gaussian Elimination method.
15. Design a Python script to generate statistical reportsMinimum, Maximum, Count, Average, Sum etc) on public datasets.
16. Design a Python script using the Turtle graphics library to construct a turtle bar chart representing the grades obtained by N students read from a file categorising them into distinction, first class, second class, third class and failed.
17. Write a Python program to match a string that contains only upper and lowercase letters, numbers, and underscores.
18. Write a Python program to convert a date of yyyy-mm-dd format to dd-mm-yyyy format.
19. Write a Python program to replace all occurrences of space, comma, or dot with a colon.
20. Write a Python program to check that a string contains only a certain set of characters in this case a-z, A-Z and 0-9
21. Write a Python program to find the occurrence and position of the substrings within a string.
22. Design a Python script on oop's concepts: Class variables and instance variable
    i) Robot ii) ATM Machine
23. Virtual Lab: http://ps-iiith.vlabs.ac.in/

Any three programs must be submitted with result from the above link.

TEXT BOOKS:

1. Kenneth Lambert, "Fundamentals of Python: First Programs" , ISBN-13: 978-1337560092,cengage learning publishers, first edition,2012.
2. Allen B. Downey, "think python: how to think like a computer scientist", ISBN-13: 978-1491939369, O'reilly, 2nd edition, 2016.
3. Reema Thareja, "Python Programming using Problem Solving Approach", ISBN-13:978-0-19-948017-3, Oxford University Press, 2017.

REFERENCE BOOKS:

1. Vamsi kurama, "Python programming : A modern approach", ISBN-978-93-325-8752-6,pearson,2018.
2. Mark Lutz , "Learning python", ISBN: 1-56592-464-9,Orielly, 4th edition, 1999 .
3. W.Chun, "Core python programming", ISBN-13: 978-0132269933, pearson, 2nd edition, 2016.

WEB RESOURCES:

1. https://raptor.martincarlisle.com/
2. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
3. https://zhanxw.com/blog/wp-content/uploads/2013/03/BeautifulCode_2.pdf
4. http://www.ict.ru.ac.za/Resources/cspw/thinkcspy3/thinkcspy3.pdf
5. https://www.cse.msu.edu/~stockman/ITEC/Scratch/BGC2011Scratch-Rev1.pdf
6. https://nostarch.com/scratchplayground
7. http://fusecontent.education.vic.gov.au/9f79537a-66fc-4070-a5ce-e3aa315888a1/scratchreferenceguide14.pdf

I B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	-	-	40+40+20		100	MC(0)
SUBCODE: 19BCC2MC02	**ENVIRONMENTAL STUDIES (Common to all Branches)**						

COURSE OBJECTIVES:

- To make the students aware about the environment and it's inter–disciplinary, to familiarize the concept of ecosystem and their importance, basic understanding of the ecosystem and its diversity.
- Overall understanding of the natural resources.
- To bring the awareness among students about the importance of biodiversity and the need for its conservation.
- To make the students understand the adverse effects of environmental pollution, its causes and measures to control it.
- Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities. Awareness on the social issues, environmental legislation and global treaties understanding the environmental policies and regulations.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Explain the concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web.

CO 2: Analyze the natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources.

CO 3: Explain the biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity.

CO 4: Distinguish various attributes of the pollution, their impacts and measures to reduce or control the pollution along with waste management practices.

CO 5: Define Environmental policy, legislation, environmental assessment and the stages involved in EIA Environmental audit.

UNIT – I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Need for Public Awareness. Institutions and people in Environment.

Ecosystems:

Definitions and concepts – Characteristics of ecosystem – Structural and functional features – Producers, consumers and decomposers and food webs – Types of ecosystems – Forests, grassland, desert, crop land, pond, lake, river and marine ecosystems – Energy flow in the ecosystem – Ecological pyramids – Ecological successions.

UNIT – II

Natural Resources: Water resources–Use and over utilization of surface and natural resourced ground water–Floods, drought, conflicts over water, dams–benefits and problems on tribal population & Environment.

Forest resources: Use and over–exploitation, deforestation.

Mineral resources: Use and exploitation, tribal & environmental effects of extracting and using mineral resources.

Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer–pesticide problems, water logging, salinity–concept of sustainable agricultural methods.

Energy Resources: Renewable (wind energy, tidal energy) and non renewable energy resources (Fossil fuels, coal).

UNIT – III

Biodiversity: Definition: genetic, species and ecosystem diversity- classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity

Conservation of biodiversity: Threats to biodiversity: habitat loss, man wildlife conflicts - Endangered and endemic species of India – Conservation of biodiversity: In-Situ conservation and Ex- situ conservation.

UNIT – IV

Environmental Pollution and Control Technologies: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, and nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies, Good Agricultural Practices – Drip irrigation, soil erosion and desertification

Solid Waste Management: Sources, Classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products, Biomedical, Hazardous and e – waste management.

UNIT – V

Environmental Policy, Legislation and Environmental Management: Environmental ethics: Issues and possible solutions. Environmental Protection Act, Legal aspects -Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. Impact Assessment and its significance - various stages of EIA, preparation of EMP and EIS, Environmental audit, Ecotourism.

Visit to some local Polluted Site: Study of an industrially Polluted area.

TEXT BOOKS:

1. AnubhaKaushik& C. P. Kaushik, Environmental Studies, New Age International (P) Ltd., New Delhi. Fourth edition, 2014
2. P. N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani,Environmental Studies, Pearson Education, Chennai.ISBN 978-93-325-2052-3,Second edition-2014.

REFERENCE BOOKS:

1. Deekshita Dave & P. Udaya Bhaskar, Text Book of Environmental Studies Cengage Learning.
2. Shaashi Chawla, a Textbook of Environmental Studies, TMH, New Delhi.
3. Benny Joseph Environmental Studies, Tata McGraw Hill Co, New Delhi.
4. Dr.K.V.S.G. Murali Krishna, Environmental Studies VGS Publishers, Vijayawada, First Edition 2016.
5. Bharucha, E. Text book of Environmental Studies, First edition, Universities Press (India) Pvt., Ltd., Hyderabad, 2005.

WEB REFERENCES:

1. URL:https://www.youtube.com/watch?v=7G3eXI_DPn8
2. URL: https://www.eolss.net/sample-chapters/C09/E6-70-05-01.pdf
3. URL: https://www.youtube.com/watch?v=QuRL6NbyvEQ
4. URL: https://google/ Introduction to Environmental Studies 5JM1G2
5. URL:http://www.teacherspayteachers.com/Product/Food-Chains-Trophic-Levels-and-Ecological- Pyramids-PowerPoint Click the above
6. URL:http://iadc-dredging.com/en/371/environment/ecosystem-services/ this webinar will focus on the concept of ecosystem services
7. URL: http://mocomi.com/ presents: What is Air Pollution? Air pollution is the introduction of foreign products into the atmosphere.
8. URL: https://en.wikipedia.org/wiki/green_impact_assessment

E-BOOKS:

1. https://faculty.psau.edu.sa/.../doc-5-pdf-d78456fce3bebc84d9320fa2f9cf9e2a-original
2. https://www.researchgate.net/.../273775623_Introduction_to_Environmental_Sciences

II B.TECH. – I SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCC3TH01	Business Management Concept for Engineers	HS	40	60	100	3	-	-	3
2	19BCI3TH02	Front End Web Technologies	ES	40	60	100	3	-	-	3
3	19BCI3TH03	OOPs Through Java	PC	40	60	100	2	1	-	3
4	19BCI3TH04	Mathematical Foundations of Computer Science	BS	40	60	100	3	-	-	3
5	19BCI3TH05	Data Structures	PC	40	60	100	3	-	-	3
6	19BCI3TH06	Computer Organization	PC	40	60	100	3	-	-	3
7	19BCI3LB01	Data Structures Lab	PC	20	30	50	-	-	3	1.5
8	19BCI3LB02	Front End Web Technologies Lab	ES	20	30	50	-	-	3	1.5
9	19BCI3LB03	Java Programming Lab	PC	20	30	50	-	-	3	1.5
10	19BCCMC02	Community Service	MC	-	-	-	-	-		0
TOTAL										**22.5**

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
SUBCODE: 19BCC3TH01	**BUSINESS MANAGEMENT CONCEPTS FOR ENGINEERS**						

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Summarize fundamentals of Managerial economics for decision making. [K2)]

CO2: Apply concepts of Financial Accounting and BEP for business decisions. [K3].

CO3: Evaluate fundamental concepts and principles of management [K5].

CO4: Discuss functional areas of management like HR, marketing and finance [K6].

CO5: Apply project management techniques for project planning and evaluation [K3].

UNIT-I: INTRODUCTION TO MANAGERIAL ECONOMICS

Definitions, - Nature And Scope- Relation With Other Subjects- Demand Definition- Determinants- Law of Demand and Its Exceptions- Concept of Elasticity of Demand- Cost Concepts- CVP Analysis (With Simple Problems), Significance- Limitations.

UNIT-II: MARKET STRUCTURES AND FINANCIAL ACCOUNTING

Introduction to Markets – Features of various markets-Perfect competition, Monopoly and Oligopoly. Definition – Importance, limitations and basic books of financial accounting, Preparation of basic books of accounting: journal, ledger and trail balance.

UNIT-III: INTRODUCTION TO MANAGEMENT

Concept, Nature, Importance- Functions of Management- Henry Fayols Principles of Management- F.W.Taylors Scientific Management- Douglas Mc Gregors Theory X and Y.

UNIT-IV: FUNCTIONAL AREAS OF MANAGEMENT

Concept of HRM, Functions of HR Manager- Marketing Management- Functions of Marketing Manager- Production Management-Functions of Production Management – Financial Management and functions of Financial Management.

UNIT-V: PROJECT MANAGEMENT: (PERT/CPM)

Development of Network – Difference between PERT and CPM- Problems on Critical Path- Problems on PERT Analysis.

TEXT BOOKS

1. Dr. N. APPARAO Dr. P. Vijay Kumar: "Managerial economics and financial analysis" Cengage publication's, New Delhi-2011.
2. Dr. A. R. Aryasri- Managerial Economics and Financial Analysis, TMH2011.
3. V. Maheswari: Managerial Economies, Sultan Chand.
4. Suma Damodaran: Managerial Economics, Oxford 2011.
5. Koontz & Weihrich: Essentials of Management" TMH 2011.

REFERENCES:

1. Managerial economics theory & applications, DM Mithani, Himalaya Publishing House, 2013. **Unit-1, 2**
2. Accounting For Managers, G. Prasad, Jaibharath Publishers, 2016. - **Unit-3**
3. Dr. P. Vijaya Kumar & Dr. N. Appa Rao," Management Science" cengage. Delhi, 2012. **Unit-4, 5**
4. Project Planning & Control with PERT & CPM, BC Punmia & KK Khandelwal, Lakshmi Publications, New Delhi, 4th Edition – 2016. **-Unit-6**

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBCODE: 19BCI3TH02	**FRONT END WEB TECHNOLOGIES** (Common to CSE & IT)						

COURSE OBJECTIVE:

- This course is designed to introduce students with no programming experience to the programming languages and techniques associated with the World Wide Web. The course will introduce web-based media-rich programming tools for creating interactive web pages.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1: Interpret a webpage and identify its elements and attributes.[K2].

CO2: Build webpages using HTML5 [K3].

CO3: Make use of Cascading Style Sheets on webpages [K3].

CO4: Make use of Java Script to write Interactive webpages [K3].

CO5: Build dynamic webpages with JQuery [K3].

CO6: Make use of JQuery UI to develop dynamic webpages [K3].

SYLLABUS:

UNIT I:

HTML5: Fundamentals of HTML, working with text, organizing text in HTML, working with Links and URLs, creating tables, working with Images, Colors and Canvas, working with Forms, interactive elements, working with Multimedia.

UNIT II:

Cascading Style Sheets: Overview of CSS3, backgrounds and color gradients in CSS, fonts and text styles, creating boxes and columns using CSS. Displaying, positioning and floating an element, list styles, table layouts, pseudo-classes and pseudo-elements. Effects, frames and controls in CSS, Implementing the advanced features of HTML5.

UNIT - III

Introduction to JavaScript: General syntactic characteristics, primitives, operations, expressions and Control Statements. **Objects in JavaScript**: Object creation and modification, Arrays, Functions. **Dynamic HTML with JavaScript**: Positioning elements, moving elements, element visibility, changing colors and fonts, dynamic content. **Regular**

Expressions in JavaScript: Pattern matching using regular expressions. **Working with Events**: onload, onclick, onsubmit, onmouseover, onmouseout, onkeydown, onkeyup and onkeypress.

UNIT - IV

JQuery API:

Introduction: What jQuery can Do, Who Develops jQuery? Obtaining jQuery, Installing jQuery, programming conventions, markup and CSS conventions, JavaScript conventions. **Selecting and Filtering Elements**: Using the selectors API, filtering a selection, working within the context of a selection, working with an element's relatives, slicing a selection, adding to a selection. **Events**: The various event wrapper methods, attaching other events, attaching persistent event handlers, removing event Handlers, creating custom events.

UNIT - V

JQuery UI: HTML5 Drag and Drop: Implementing Drag and Drop, Implementing Drag-and-Drop File Uploads, **Sortable**: Making a List Sortable, Customizing Sortable, Saving the State of Sorted Lists, **Selectable, Accordion**: Building an Accordion UI, Changing the Default Pane, Changing the Accordion Event, Setting the Header Elements, **Date picker**: Implementing a Date picker, Localizing the Date picker, **Dialogue**: Implementing a Dialog, Styling a Dialog, Making a Modal Dialog, Auto-Opening the Dialog, Controlling Dynamic Interaction, Animating the Dialog, Working with Dialog Events.

TEXT BOOKS:

1. Kogent Learning solutions Inc., "HTML 5 Black book", Dreamtech.,2011, (Unit I,II,III).
2. Uttam K Roy, "Web Technologies",Oxford,2010 (Unit IV).
3. Richard York , Web Development with JQuery, Wiley publications, 2/e ,2015(Unit V)

REFERENCE BOOKS:

1. Robert W Sebesta, "Programming the World Wide Web", 7ed, Pearson, 2012
2. Paul S Wang, Sanda S Katila, "An Introduction to Web Design, Programming", Cengage, 2003.

ADDITIONAL RESOURCES:

1. https://www.w3schools.com/
2. nptel.ac.in/courses/106105084/13
3. https://www.coursera.org
4. Learning Management System.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	-	40	60	100	3
SUBCODE: 19BCI3TH03	**OOPS THROUGH JAVA** (Common to CSE & IT)						

COURSE OBJECTIVE:

- The course provides fundamentals of object-oriented programming in Java and development of user interface.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1: Interpret the syntax and semantics of java programming language and OOPs concepts [K2].

CO2: Make use of different predefined classes and packages to develop programmes using OOPs concepts [K3].

CO3: Apply exception handling and multithreading on java programs [K3].

CO4: Develop Java Programmes using collection frame work & I/O [K3].

CO5: Make use of Applets, AWT and event-handling to develop GUI [K3].

SYLLABUS

UNIT-I

Oriented Languages (Classes, Objects, Abstraction, Encapsulation, Inheritance, Polymorphism), Procedural languages Vs. OOP. The History and Evolution of Java, Java Buzzwords, java program structure.

Data Types, Variables, and Arrays: The primitive types, variables, type conversion and casting, Automatic Type Promotion in Expressions, Arrays, Operators, Control statements.

Introducing Classes : Class fundamentals, Declaring the objects, Assigning Object Reference Variables, Introducing Methods, Constructors, The this keyword, Garbage Collection, the finalize() Method.

UNIT-II

A Closer Look at Methods and Classes: Overloading Methods, Using objects as Parameters, Returning Objects, Understanding static , Nested and Inner Classes.

Inheritance: Inheritance Basics and types of inheritance, Using super, Method Overriding, Dynamic Method Dispatch, Using Abstract Classes, using final with Inheritance, The Object class.

Packages and Interfaces: Packages, Access Protection, Importing Packages, Interfaces, Default Interface Methods, Use static Methods in an Interface.

UNIT-III

String Handling: String class, StringBuffer class, StringBuilder Class,

Exception Handling: Fundamentals, Exception types, Uncaught Exceptions, Using try and catch, Multiple catch Clauses, Nested try Statements, throw, throws, finally, Java's Built-in Exceptions, Creating Your Own Exception Subclasses.

Multithreaded Programming : The Java Threaded Model, The Main Thread , Creating a Thread, Creating Multiple Threads, Using isAlive() and join(), Thread Priorities, Synchronization, Inter Thread Communication, Suspending, Resuming, Stopping Threads.

UNIT-IV

Collections Framework in Java- Introduction to Java collections, Overview of Java collection frame work, Commonly used Collection classes- ArrayList,LinkedList, HashSet, Hash table, HashMap, TreeSet,TreeMap , StringTokenizer.

Input/Output: reading and writing data - Byte Stream, Console, Character Stream, Buffered Byte Stream, Buffered Character Stream; java.io package.

UNIT-V

The Applet Class: Applet Basics, Applet Architecture, An Applet Skeleton, Simple Applet Display Methods, Requesting Repainting, The HTML APPLET Tag, Passing Parameters to Applets.

Event Handling: Two Event Handling Mechanisms, The Delegation Event Model, Event Classes, The KeyEvent Class, Sources of Events, Event Listener Interfaces, Using The Delegation Event Model, Adapter Classes , Inner Classes.

Introducing the AWT: java.awt package, Components and Containers, Button, Label, Checkbox, Radio buttons, List boxes, Choice boxes, Text field and Text area, container classes, Layouts, Menu, Scroll bar.

TEXT BOOKS:

1. Herbert Schildt, "The Complete Reference Java", 8/e, , TMH, 2011 (UNITS : I, IV, V)
2. Sachin Malhotra, Saurabh Choudhary, "Programming in JAVA", 2/e, , Oxford, 2014, (UNITS: I, II & III)

REFERENCE BOOKS:

1. JAVA Programming, K. Rajkumar,1/e, Pearson,2013.
2. Core JAVA, Black Book, Nageswara Rao, Wiley, 1/e, Dream Tech, 2012.

ADDITIONAL RESOURCES:

https://www.tutorialspoint.com/java/index.html

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
SUBCODE: 19BCI3TH04	**MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE** (CSE & IT)						

COURSE OBJECTIVE:

- The course provides with the basic mathematical implication for computer science, applications of mathematics in computer science.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO 1: Apply the logical statements, connectivity among the statements and forms different types of normal forms. [K3]

CO 2: Analyze the theory of Inference for statement calculus. [K4]

CO 3: Classify the types of graphs and trees to formulate computational problems.[K4]

CO 4: Apply DNF and CNF on Boolean algebraic functions to simplify the digital (logic) circuits. [K3]

CO 5: Solve mathematical problems with recurrence relations using different methods. [K3]

SYLLABUS

UNIT – I: Mathematical Logic: **(10 hours)**

Statements and Notations, Connectives - Negation, Conjunction, Disjunction, Statement Formulas and Truth tables, Conditional Statements, Bi Conditional Statements, Well-formed Formulas, Tautologies, Equivalence of Formulas, Duality Law, Tautological Implications, Functionally Complete Sets of Connectives, Other Connectives; Normal Forms - Disjunctive Normal Forms, Conjunctive Normal Forms, Principal Disjunctive Normal Forms, Principal Conjunctive Normal Forms, Ordering and Uniqueness of Normal Forms.

UNIT – II: The Theory Of Inference For The Statement Calculus: **(10 hours)**

Validity Using Truth Tables, Consistency of Premises and Indirect method of proof.

Predicate calculus: Predicates, Statement Function, Variables and Quantifiers, Free and Bound Variables, Inference Theory of Predicate Calculus, Exercises.

Mathematical Induction: Principle of Mathematical Induction, Exercises.

UNIT – III: GRAPH THEORY: **(12 hours)**

Definitions, finite and infinite graphs, incidence and degree, isolated pendant vertices, isomorphism, sub graphs, walk, path and circuit, connected and disconnected graphs, components, Euler graphs, Euler graph theorem, operations on graphs, decomposition of Euler graphs into circuits, arbitrarily traceable Euler graphs, Hamiltonian paths and circuits,

number of edge disjoint Hamiltonian circuits in complete graph with odd number of vertices, travelling salesman problem.

Trees: Some properties of trees, pendant vertices, distance and centers, rooted and binary trees, spanning trees, fundamental circuit, shortest spanning trees, Kruskal's algorithm

UNIT – IV: RECURRENCE RELATION: (8 hours)

Recurrence Relations, Formation of Recurrence Relations, Solving linear homogeneous recurrence Relations by substitution method, generating functions and The Method of Characteristic Roots. Solving Inhomogeneous Recurrence Relations.

UNIT – V: BOOLEAN ALGEBRAS & COMBINATORICS: (8 hours)

Boolean Algebras: Boolean Algebras, Boolean Polynomials, Disjunctive and Conjunctive Normal forms, Switching Circuits and Applications.

Combinatorics: Basic Counting Principles, Permutations and Combinations: Permutations, Combinations, Restricted Combinations, Pigeonhole Principle and its Application.

TEXT BOOKS:

1. Tremblay & Manohar, “Discrete Mathematical Structures with Applications to Computer Science”, TMH.
2. Bhavanari Satyanarayana and Kunchan Syam Prasad “Discrete Mathematics”, PHI, India, ISBN: 978-81-203-4948-3.
3. Bhavanari Satyanarayana, T. V. Pradeep, Sk. Mohiddin Shaw, “Mathematical Foundation for Computer Science”, B.S Publications, Hyd: 2016, ISBN: 978-93-83635-81-8.

REFERENCE BOOKS:

1. Rosen, “Discrete Mathematics and its Applications with combinatorics and graph theory”, 7th ed, , TMH
2. Purna Chandra Biswal, “Discrete Mathematics and Graph theory”, 3rd rd, PHI.
3. Joe L. Mott, Abraham Kandel, Theodore P. Baker, “Discrete Mathematics for Computer Scientists and Mathematicians”, 2nd Edition, PHI.

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106106094
2. nptel.ac.in/courses/106108054 (Graph Theory)

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	-	40	60	100	3
SUBCODE: 19BCI3TH05	**DATA STRUCTURES (Common to CSE & IT)**						

COURSE OBJECTIVE:

- Comprehensive knowledge of data structures and exposure to algorithmic complexities, recursive algorithms, searching, sorting and hashing techniques
- Applying Stack and Queue techniques for logical operations
- Understand Linked-list representation models in various types of applications
- Implementation of tree in various forms, orientation on graphs, representation of graphs, graph traversals, spanning trees Graphs

COURSE OUTCOMES:

After the completion of this course the student should be able to:
CO1 : Apply Searching, Sorting and Hashing techniques to solve problems [K3].
CO2 : Analyze basic data structures such as Stacks, Queues and Linked List [K4].
CO3 : Solve problems involving Advanced concepts of Trees [K3].
CO4 : Analyze variety of Graph data structures that are used in various applications [K4].

SYLLABUS:

UNIT – I

Introduction to Data Structures and Algorithms: Basic Terminology – Variables, Data Types, Data Structures, Abstract Data Types (ADTs)(p.g.no.20-21). Algorithms, Time and Space Complexity (worst-case, average-case, best-case). (p.g.no 21-27).

UNIT-II

Searching and Sorting : Introduction to Searching, Linear Search, Binary Search.(p.g.no:318-319).Introduction to Sorting, Bubble sort, Selection sort, Insertion sort ,Merge sort, Heap sort, Quick sort. (p.g.no:292-301).

UNIT – III

Hashing: Introduction, Hash Tables, Hash Functions, Different Hash Functions, Collisions. (pg.no.:356-361). **Linked Lists:** Introduction, Singly linked list, Doubly linked list, Circular linked list (p.g.no. 52-65).

UNIT - IV

Stacks: Definition, Stack ADT, Applications, Implementation (p.g.no 100-105).**Queues:** Definition, Queue ADT, Exceptions, Applications, Implementation. (p.g.no 123-124). **Trees:** Introduction, Binary Trees, Traversing a Binary Tree. (pg.no.:139-143). Binary Search Trees, operations on Binary Search Trees (insertions and deletions), AVL Trees (pg.no.:178-193).

UNIT - V

Priority Queues and Heaps: Introduction ,ADT, Applications ,Implementations, Binary Heaps-Inserting a new element in a Binary Heap, Deleting an element from a Binary Heap.(pg.no.:216-223)

Graphs: Introduction, Graph Terminology, Directed Graphs, Representations of Graphs, Adjacency Matrix Representation, (Adjacency List Representation), Graph Traversal algorithms.(pg.no:247-255).

TEXT BOOKS:

1. Data Structures and Algorithmic Thinking with Python Narasimha Karumanchi ,IIT Bombay,
   CareerMonk Publications, First Edition, 2018.

2. Data Structures and Algorithms in Python, Michael T. Goodrich,Second Edition,2013.

REFERENCE BOOKS:

1. Python Data Structures and Algorithms, Benjamin Baka , Kindle Edition.
2. Hands-On Data Structures and Algorithms with Python, Dr. Basant Agarwal and Benjamin Baa, 2nd Edition.

ADDITIONAL RESOURCES:

1. https://www.youtube.com/watch?v=YWnBbNj_G-U
2. https://www.youtube.com/watch?v=RBxS6niE6q4

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBCODE: 19BCI3TH06	**COMPUTER ORGANIZATION (Common to CSE & IT)**						

COURSE OBJECTIVE:

- Comprehensive knowledge of computer system including the analysis and design of components of the system.
- Describes different parameters of a memory system, organization and mapping of various types of memories.
- Illustrates algorithms for basic arithmetic operations using binary representation.
- Describes the means of interaction of devices with CPU, their characteristics and operating modes.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO 1: Interpret the computer system from user's perspective and can explain how Arithmetic Logic Unit works [K2].

CO 2: Explain of basic components of the system and illustrate data paths and control flow for sequencing in CPUs [K2].

CO 3: Interpret the Micro operations and Microprogramming for design of control unit of CPU. [K2]

CO 4: Develop Main Memory Interfacing Circuit and can apply various cache memory mapping techniques.

CO 5: Apply algorithms to perform arithmetic operations on binary representation of fixed point data **[**K3].

CO 6: Interpret various I/O interface devices [K2].

SYLLABUS:

UNIT - I

Introduction: Types of Computers, Functional units of Basic Computer (Block diagram of Micro Computer).

Register Transfer and Micro-operations: Register Transfer language, Register Transfer, Bus and memory transfers - Three-State Bus Buffers, Memory Transfer; Arithmetic micro operations, Binary Adder, Binary Adder _Subtractor, Binary Incrementer, Arithmetic Circuit; Logical micro operations- List of Logic Microoperations, Hardware Implementation, Some Applications; Shift micro operations-Hardware Implementation, Arithmetic logic shift unit.

UNIT - II

Basic Computer Organization and Design: Instruction codes – Stored Program Organization, Indirect Address, Computer Registers – Common Bus Systems, Computer instructions – Instruction Set Completeness, Timing and control, Instruction cycle – Fetch and Decode, Determine the Type of Instruction, Register Reference Instructions, Memory – Reference Instructions – AND to AC, ADD to AC, LDA :Load to AC,STA: Store AC, BUN: Branch Unconditionally, BSA: Branch and Save Return Address, ISZ: Increment and Skip if Zero, Control Flow Chart, Input – Output Instructions and Interrupt – Input – Output Configuration, Input-Output Instructions.

UNIT - III

Central Processing Unit: Instruction formats – Three Address Instructions, Two Address Instructions, One Address Instructions, Zero Address Instructions, RISC Instructions, Addressing modes – Numerical Example, Data Transfer and manipulation – Data Transfer Instructions, Data Manipulation Instructions, Arithmetic Instructions, Logical and Bit Manipulation Instructions, Shift Instructions, Program control – Status Bit Conditions, Conditional Branch Instructions, Subroutine Call and Return, Program Interrupt, Types of Interrupts, Reduced Instruction Set Computer – CISC Characteristics, RISC Characteristics.

Micro Programmed Control Unit: Control memory, Address sequencing – Conditional Branching, Mapping of Instructions, Subroutines, Micro program example – Computer Configuration, Microinstruction Format, Symbolic Microinstructions, The Fetch Routine, Symbolic Microprogram, Design of control unit – Microprogram Sequencer.

UNIT - IV

The Memory System: Memory Hierarchy, Main memory - RAM and ROM Chips, Memory Address Maps, Memory Connection to CPU, Auxiliary memory – Magnetic Disks, Magnetic Tape, Associative Memory – Hardware Organization, Match Logic, Cache Memory – Associative Mapping, Direct Mapping, Set- Associative Mapping, Writing into Cache.

Computer Arithmetic: Addition and subtraction – Addition and Subtraction with Signed Magnitude Data, Hardware Implementation, Hardware Algorithm, Addition and Subtraction with Signed 2's Complement Data, Multiplication Algorithms –Booth Multiplication Algorithm

UNIT – V

Input-Output Organization: Peripheral Devices – ASCII Alphanumeric Characters, Input Output Interface – I/O Bus and Interface Modules, I/O vs Memory Bus, Isolated vs Memory Mapped I/O, Example of I/O Interface, Asynchronous data transfer – Strobe Control, Handshaking, Asynchronous Serial Transfer, Modes of Transfer – Example of Programmed I/O, Interrupt Initiated I/O, Priority Interrupts – Daisy Chaining Priority, Parallel Priority

Interrupt, Priority Encoder, Interrupt Cycle, Direct memory Access – DMA Controller, DMA Transfer.

TEXT BOOKS:

1. M. Morris Mano, "Computer System Architecture", Third Edition, Pearson.2008

REFERENCE BOOKS:

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, "Computer Organization", McGraw Hill, 5/e, 2002.

2. William Stallings, "Computer Organization and Architecture", Pearson 6/e, 2006.

3. Structured Computer Organization, Andrew S. Tanenbaum, Pearson, 4/e, 2005.

4. Sivarama P. Dandamudi, "Fundamentals of Computer Organization and Design", Springer, 2006

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106106092

2. nptel.ac.in/courses/106103068

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
SUBCODE: 19BCI3LB01	**DATA STRUCTURES LAB (Common to CSE & IT)**						

COURSE OBJECTIVES:

- To teach efficient storage mechanisms of data for an easy access
- To design and implementation of various basic and advanced data structures.
- To introduce various techniques for representation of the data in the real world.
- To understanding about writing algorithms and step by step approach in solving problems with the help of fundamental data structures

COURSE OUTCOMES:

After the completion of this course the student should be able to

CO 1: Analyze algorithms, Searching, Sorting and hashingTechniques [K4].

CO 2: Make use of elementary data structures such as stacks, Queues and linked list to develop their applications.

CO 3: Examine different tree traversal techniqes.

CO 4: Experiment with different graph traversal techniques.

LABORATORY EXPERIMENTS

WEEK - 1

a) Write a recursive Python program which computes the nth Fibonacci number, for appropriate values of n.

b) Write recursive Python programs for the following
   i) Factorial of a given number
   ii) GCD Computation
   iii) Towers of Hanoi

WEEK - 2

a) Write a Python program that use both recursive and non-recursive functions to perform linear search.

b) Write a Python program that use both recursive and non-recursive functions to perform binary search.

WEEK - 3

a) Write a Python program to implement Bubble sort.

b) Write a Python program to implement Insertion sort.

c) Write a Python program to implement Selection sort.

WEEK - 4

a) Write a Python program to implement Quick sort.
b) Write a Python program to implement Merge sort.
c) Write a Python program to implement Heap sort.

WEEK - 5

a) Write a Python program to implement Stack operations using arrays
b) Write a Python program to implement Queue operation using arrays.

WEEK – 6

a) Write a Python program to convert infix expression into postfix expression using Stack.

WEEK - 7

a) Write a Python program to implement Stack operation using Linked list.
b) Write a Python program to implement Queue operations using Linked lists.

WEEK - 8

Write a Python program to implement the following operations on a singly linked using functions

i) Insertion
ii) Deletion
iii) Displaying
iv) Reversing

WEEK - 9

a) Write a Python program to store a polynomial expression in memory using linked list
b) Write a Python program to representation the given sparse matrix using arrays.

WEEK - 10

a) Write a Python program to implement following Operations on a Binary Tree
i) Create
ii) In-order traversal
iii) Pre-order traversal
iv) Post-order traversal
b) Write a Python program to implement following Operations a Binary Search Tree
i) Create
ii) Insert
iii) Delete

WEEK - 11

a) Write a Python program to compute the shortest path of a graph using Dijkstra's algorithm
b) Write a Python program to find the minimum spanning tree using Warshall's Algorithm.

WEEK - 12

Virtual Lab: http://cse01-iiith.vlabs.ac.in/
Any three programs must be submitted with result from the above link.

II B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
SUBCODE: 19BCI3LB02	**FRONT END WEB TECHNOLOGIES LAB (Common to CSE & IT)**						

COURSE OBJECTIVES:

- This course provide students with theoretical and practical skills in the design and development of web pages using HTML5,CSS, JS and jQery.

COURSE OUTCOMES:

After Completion of this course, students would be able to:

CO 1: Develop static html pages [K3].

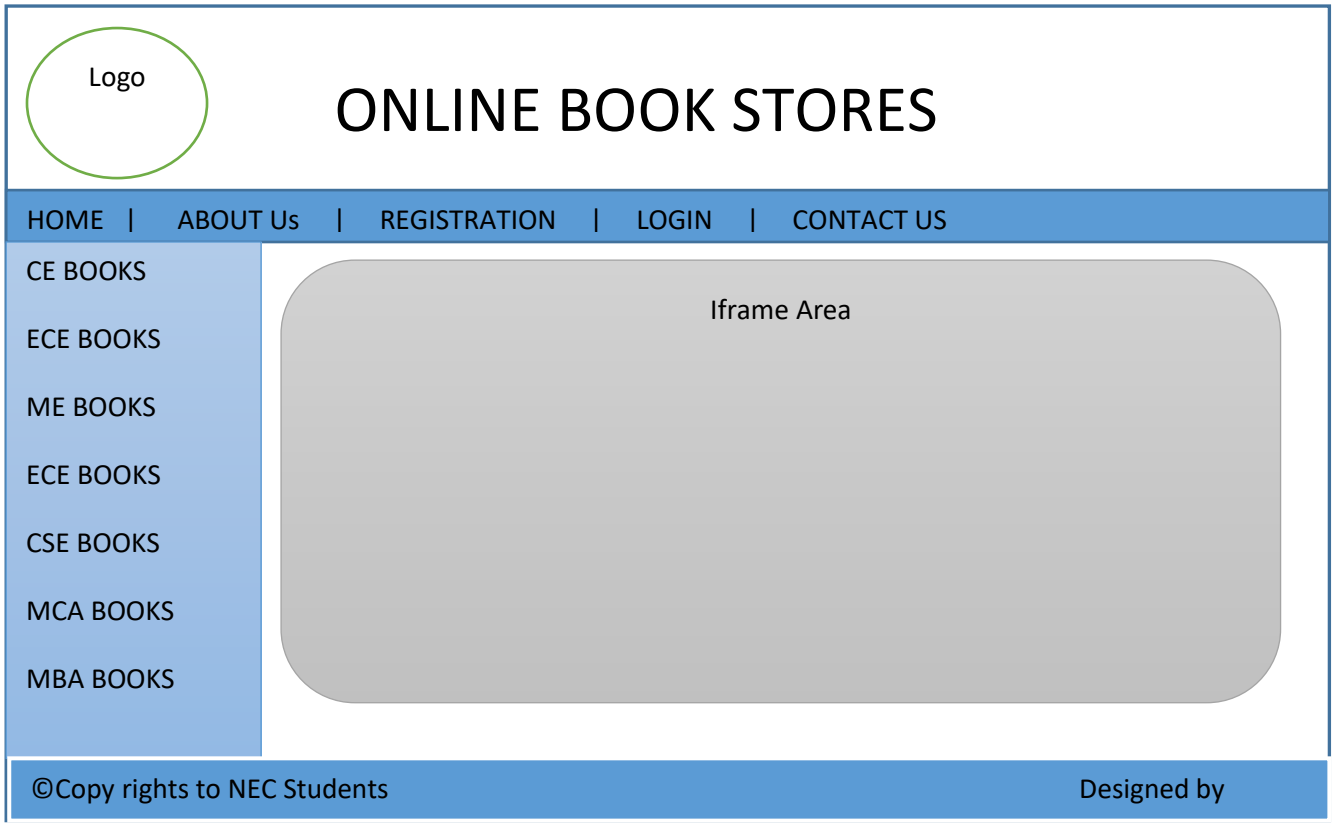
CO 2: Develop Interactive Web Pages with different styles and client side validations[K3].

CO 3: Make use of JQuery programming to develop Web pages [K3].

CO 4: Apply JQuery UI to HTML pages [K3].

LIST OF PROGRAMS:

Lab 1: Create the following web



1. Welcome.html
   It explain about website
   (Hint: Heading the website (Preferable H1, Describe website) it includes minimum two paragraphs)
2. Aboutus.html
   (Hint: About owner of website)
3. Contactus.html
4. List.html
   (Hint: Mention List of courses)

Lab 2:

a. Create web pages for each course. Example cse.html (Hint: It contains Heading and List of subjects in tabular form)
   Example

SNo	Title Book	Author	Publisher	Price	Image
--	--	--	--	--	--

b. Create Registration and Login forms
   Registration Form: It contains Student Name, Roll Number, Password, Gender, Email ID, Phone
   Number, opted course and languages known.
   Login Form: It contains roll number as User ID, password, submit button and cancel button.

Lab 3: Apply CSS 3 on web-pages created on Lab 1 and Lab2.
Make use of the selectors like class, id, html elements, pseudo classes and elements

Lab 4:

a. Apply validation on Registration and Login forms.
b. In contactus.html web-page add Google maps.

Lab 5:

a. Design HTML5 web page by embedding Audio, Video elements.
b. Write HTML5 and JavaScript code to draw Arc, Circle, Rectangle and Triangle using Canvas.

Lab 6: Bootstrap Concepts on Grid System, Menus

Lab 7: Create index.html page and design it as shown in above screen (Hint: Use Bootstrap Grid System, Horizontal and vertical menus, footer, table etc.)

Lab 8: Write a jQuery code to make draggable Rectangle

Lab 9: Write jQuery code to demonstrate the usage of important options disabled, delay, distance and clone in the drag function of jQuery UI.

Lab 10: Write jQuery code to demonstrate three options addClass, disable and tolerance in the drop function of jQuery UI.

Lab 11: Write jQuery code to demonstrates the use of two options delay and distance of selectable() method.

Lab 12: Write jQuery code to demonstrate Accordion and Date Picker.

II B.TECH ISEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
SUBCODE: 19BCI3LB03	**JAVA PROGRAMMING LAB**						

COURSE OBJECTIVE:

- The course provides user interface and application development program implementation using core java principles.

COURSE OUTCOMES:

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

CO1 : Develop java programs by using OOP concepts [K3].
CO2 : Make use of interfaces, threads, applets in developinging JAVA programmes [K3].
CO3 : Make use of exception handling and collections in Java Programming[K3].
CO4 : Develop java components [K3].

LIST OF PROGRAMS:

1. Write a JAVA program to display default value of all primitive data types of JAVA.
2. Write a JAVA program to display the Fibonacci sequence
3. Write a JAVA program give example for command line arguments.
4. Write a JAVA program to sort given list of numbers.
5. Write a JAVA program to search for an element in a given list of elements (linear search).
6. Write a JAVA program to search for an element in a given list of elements using binary search mechanism.
7. Write a JAVA program to determine multiplication of two matrices.
8. Write a JAVA program to sort an array of strings
9. Write a JAVA program to check whether given string is palindrome or not.
10. Write a JAVA program to give the example for ‘this’ operator. And also use the ‘this’ keyword as return statement.
11. Write a JAVA program to demonstrate static variables, methods, and blocks.
12. Write a JAVA program using StringTokenizer class, which reads a line of integers and then displays each integer and the sum of all integers.
13. Write a JAVA program to give the example for ‘super’ keyword.
14. Write a JAVA program that illustrates simple inheritance.
15. Write a JAVA program to maintain Student Grading Database using multilevel inheritance. Student is Super class, which contains roll no, name, address. Marks derived from Student class, which contains subject names and respective marks. Result is derived from Marks class, which contains total, grade.
16. Write a JAVA program demonstrating the difference between method overloading and method overriding.
17. Write a JAVA program demonstrating the difference between method overloading and constructor overloading.
18. Write a JAVA program that describes exception handling mechanism.
19. Write a JAVA program for example of try and catch block. In this check whether the given array size is negative or not.
20. Write a JAVA program for creation of user defined exception.

21. Write a JAVA program to illustrate creation of threads using runnable interface (start method start each of the newly created thread. Inside the run method there is sleep() for suspend the thread for 500 milliseconds).
22. Write a JAVA program to create a class MyThread in this class a constructor, call the base class constructor, using super and starts the thread. The run method of the class starts after this. It can be observed that both main thread and created child thread are executed concurrently.
23. Write a JAVA program illustrating multiple inheritance using interfaces.
24. Write a JAVA program to create a package named pl, and implement this package in Ex class.
25. Write a JAVA program to create a package named mypack and import it in Circle class.
26. Write a JAVA program to create an abstract class named Shape, that contains an empty method named numberOfSides ().Provide three classes named Trapezoid, Triangle and Hexagon, such that each one of the classes contains only the method numberOfSides (), that contains the number of sides in the given geometrical figure.
27. Write a JAVA program that describes the life cycle of an applet.
28. Write a JAVA program to create a border layout control.
29. Write a JAVA program to create a grid layout control.
30. Write a JAVA program to create a simple calculator.
31. Write a JAVA program that displays the x and y position of the cursor movement using Mouse.
32. Write a JAVA program that displays number of characters, lines and words in a text file.
33. Write a JAVA program that allows user to draw lines, rectangles and ovals.
34. Write a Java Program to Implement HashMap API.
35. Write a Java Program to Implement HashSet API.
36. Write a Java Program to Implement ArrayList API.
37. Write a Java Program to Implement TreeSet API.
38. Write a Java Program to Implement TreeMap API.
39. Virtual Lab: http://ps-iiith.vlabs.ac.in/

Any three programs must be submitted with result from the above link.

II B.TECH. – II SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCI4TH01	Database Management Systems	PC	40	60	100	2	1	-	3
2	19BCI4TH02	Formal Languages and Automata Theory	PC	40	60	100	3	-	-	3
3	19BCS4TH03	Design and Analysis of Algorithms	PC	40	60	100	3	-	-	3
4	19BCS4TH04	Software Engineering	PC	40	60	100	3	-	-	3
5		Open Elective -I	OE	40	60	100	3	-	-	3
6	19BCS4LB03	Mobile Applications Development Lab	PC	20	30	50	-	-	3	1.5
7	19BCC4LB01	English Communication Skills Lab - II	HS	20	30	50	-	-	3	1.5
8	19BCI4LB02	Data Base Management Systems Lab	PC	20	30	50	-	-	3	1.5
9	19BCC4MC02	QAR	MC	-	-	-	3	-	-	0
TOTAL										**19.5**

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	1	-	40	60	100	3
SUBCODE: 19BCI4TH01	**DATABASE MANAGEMENT SYSTEMS (Common to CSE & IT)**						

COURSE OBJECTIVE:

- Provides students with theoretical knowledge and practical skills in the design, use of databases and database management systems in information technology applications

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Interpret the fundamentals of DBMS [K2].
CO2 : Analyze DB design methodology and normalization process [K4].
CO3 : Develop Queries in RDBMS [K3].
CO4 : Compare and Contrast various transaction and concurrency management techniques [K2].
CO5 : Analyze various file organizations and indexing techniques [K4].

SYLLABUS:

UNIT - I

Introduction: Database system, Characteristics - Database vs. File System; Database Users - Actors on Scene, Workers behind the scene; Advantages of Data base systems, and Database applications. Brief introduction of different Data Models Hierarchical, Network and Relational; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system Environment, Centralized and Client Server architecture for the database.

UNIT - II

Entity Relationship Model: Introduction, Representation of entities, attributes, entity set, relationship, relationship set, Key constraints - Key constraints for Ternary Relationships, participation constraints, class hierarchies, Aggregation; sub classes, super class, inheritance, specialization, generalization using ER Diagrams.
Relational Model: Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values - Comparisons Using Null Values, Logical Connectives AND, OR, and NOT, Impact on SQL Constructs, Disallowing Null Values; Integrity constraints in SQL - Domain constraints, Entity constraints, Referential integrity constraints, Assertions.

UNIT - III

Basic SQL: Form of a basic SQL Query, Examples of Basic SQL Queries, Expressions and Strings in the SELECT Command, Simple Database schema, data types, table definitions, different DML operations, basic SQL querying using where clause, arithmetic & logical operations, SQL functions - Date and Time, Numeric, String conversion.
SQL : Creating tables with relationship, implementation of key and integrity constraints, nested queries, correlated Nested Queries, set-Comparison Operators, sub queries, grouping,

aggregate operators, ordering, implementation of different types of joins, view - updatable and non-updatable; relational set operations, SQL constructs that grant access or revoke access from user or user groups.

UNIT - IV

Schema Refinement (Normalization): Problems Caused by Redundancy, Decompositions, Problems Related to Decomposition, Functional dependency, Properties of Functional dependency, Normal forms based on functional dependency - 1NF, 2NF and 3NF, concept of surrogate key, Boyce-Codd normal formBCNF, 4NF; Properties of Decompositions - Lossless join decomposition and dependency preserving decomposition.

UNIT - V

Transaction Management and Concurrency Control: Transaction - Single-User versus Multiuser Systems; Transactions, Database Items, Read and Write Operations, Transaction States and Additional Operations, The System Log, Commit Point of a Transaction, properties of transactions, Characterizing Schedules Based on Serializability ; Lock based Concurrency Control ; Concurrency Control Based on Timestamp Ordering .

Indexing Files:, Files of Unordered Records (Heap Files), Files of Ordered Records (Sorted Files), Types of Single-Level Ordered Indexes - Primary Indexes, Clustering Indexes, Secondary Indexes; Multilevel Indexes, Dynamic Multilevel Indexes Using B+Trees.

TEXT BOOKS:

1. Raghuram Krishnan, Johannes Gehrke , “Database Management Systems”, TMH, 3/e, , 2003.
2. Ramez Elmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, PEA, 6/e, 2010,

REFERENCE BOOKS:

1. Silberschatz, Korth, “Database System Concepts”. TMH, 5/e, 2006.
2. C J Date, “Introduction to Database Systems”, PEA, 8/e, 2006.
3. NarainGehani, “The Database book principles & practice using Oracle/MySql”, University Press, 2006.

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106106093
2. nptel.ac.in/courses/106104135

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBCODE: 19BCI4TH02	**FORMAL LANGUAGES AND AUTOMATA THEORY (Common to CSE & IT)**						

COURSE OBJECTIVE:

- Introduce concepts in automata theory and theory of computation.
- Identify different formal language classes and their relationships.
- Design grammars and recognizers for different formal languages.
- Prove or disprove theorems in automata theory using its properties.
- Determine the decidability and intractability of computational problems.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1: Interpret the core concepts relating to the theory of computation, formal languages, Regular Expressions[K2].

CO2: Analyze the functioning of Finite-State Machines, Pushdown Automata and Turing Machines to solve problems [K4].

CO3: Build grammars and Normal forms for given grammars for different language classes and able to prove and disprove theorems establishing key properties of formal languages and automata[K3].

CO4: Identify formal language classes and their membership properties[K2].

SYLLABUS:

UNIT - I

Fundamentals of Automata: Computation, Finite State Machine, Examples Finite State Automata, Components of Finite State Automata, Elements of Finite State System, Mathematical representation of Finite State Machine,Automata in Real World - Advantages of FSM, Disadvantages of FSM, Applications of FSM.

Formal Language Theory: Symbols, Alphabets and Strings, Operations on Strings, Formal Languages, Operations on Languages.

Formal Languages / Grammar Hierarchy: Formal Grammar, Generative Grammars, Types of Generative Grammar, Formal Languages, Regular Language, Context-Free Language, Context- Sensitive Language, Recursive Language, Recursively Enumerable Language, Relationship between Grammars and Languages.

UNIT – II

Finite Automata: Introduction, Deterministic Finite Automata, Design of DFAs, Non Deterministic Finite Automata, Design of NFAs, Non-Deterministic Automata with ϵ-moves, Design of NFA- ϵ s, Advantages of Non-Deterministic Finite automata, NFA Versus DFA. **Equivalent Automata:** Equivalent Finite-State Automata, Equivalence of NFA/NFA- ε and DFA, Equivalence of NFA - ϵ to NFA.

Transducers: Introduction, Moore Machine, Design of a Moore Machine, Mealy Machine Design of a Mealy Machine; Difference between Moore and Mealy Machines, Properties / Equivalence of Moore and Mealy Machines.

UNIT - III

Minimization/ Optimization of DFA: Optimum DFA, Minimal DFA, 2DFA, DFA vs. 2DFA. **Regular Expressions and Languages:** Regular Languages,

Regular Expressions, Components of Regular Expression, Languages Associated with Regular Expression, Properties of Regular Expressions, Uses of Regular Expressions.

Finite Automata and Regular Expressions: Properties of Regular Sets or Regular Languages, Arden's Theorem, Equivalence of Finite Automata and Regular Expressions, Cycle of Constructions, Equivalence of DFA and Regular Expressions, Equivalence of NFA And Regular Expressions.

UNIT – IV

Context-Free Grammars and Context-Free Languages: Types of Grammar, Ambiguous and Unambiguous Grammars, Relation between Regular Grammar and Finite Automata**.**

Simplification of Context - Free Grammar: Simplification of Context-Free Grammars, Elimination of ϵ - Productions, Elimination of Unit Productions, Normal Forms for Context Free Grammars, Chomsky Normal Form, Greibach Normal Form, Chomsky Vs. Greibach Normal Form, Application of Context-Free Grammars.

Push Down Automata: Definition, Model, Graphical notation, and Instantaneous descriptions, Acceptance of context free languages, Acceptance by final state and acceptance by empty Stack.

UNIT - V

Turing Machine: Introduction, Components of Turing Machine, Description of a Turing Machine, Observations on TM, Elements of TM, Instantaneous description of TM, Moves of a TM, Language accepted by a TM, Role of TM's, Design of TM's, Undecidable Problem, P and NP Classes of Languages.

TEXT BOOKS:

1. Nasir S.F.B, P.K. Srimani, "A Text Book on Automata Theory", 1/e, Foundation
Publications Cambridge University Press, 2014. (UNITS: I, II, III, IV,V).

2. John E. Hopcroft, Rajeev Motwani and Jeffrey D. Ullman, "Introduction to Automata
Theory, Languages and computation", 3/e, PEA, 2009. (UNIT-IV)

REFERENCE BOOKS:

1. Shamalendu Kandar, "Introduction to Automata Theory, Formal Languages and
Computation", 1/e, Pearson, 2013.
2. Michel Sipser, "Introduction to Theory of Computation", 2/e, , CENGAGE, 2007.

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106104028
2. nptel.ac.in/courses/106104148

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBCODE: 19BCS4TH03	**DESIGN AND ANALYSIS OF ALGORITHMS (Common to CSE & IT)**						

COURSE OBJECTIVES:

- To analyze the asymptotic performance of algorithms.
- To write rigorous correctness proofs for algorithms.
- To demonstrate a familiarity with major algorithms and data structures.
- To apply important algorithmic design paradigms and methods of analysis.
- To synthesize efficient algorithms in common engineering design situations.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Apply asymptotic notations to measure the performance of algorithms [K3]
CO 2: Apply divide-and-conquer paradigm when an algorithmic design situation calls for it [K3].
CO 3: Identify all feasible solutions to get optimal solutions using greedy method [K3].
CO 4: Apply dynamic-programming approach, to solve real world problems [K3].
CO 5: Apply fundamental graph traversal techniques to solve various applications using Backtracking [K3].
CO 6: Analyse least cost and FIFO branch and bound paradigms [K4].

SYLLABUS:

UNIT-I

Introduction: Algorithm Specification, Performance Analysis -Space complexity, Time complexity, Asymptotic Notations (Big-oh notation, Omega notation, Theta notation).

UNIT-II

Divide and Conquer: General method, Binary search, Merge sort, Quick sort, Strassen's matrix multiplication.

UNIT-III

Greedy method: General method, Knapsack problem, Job sequencing with deadlines, Minimum cost spanning trees, Single source shortest paths.

UNIT-IV

Dynamic Programming: The General method, All pairs shortest path problem, Optimal binary search trees, 0/1 knapsack, Reliability design, The Travelling sales person problem, Matrix-chain multiplication.

UNIT-V

Backtracking: The General method, N-Queen problem, Sum of subsets, Graph coloring, Hamiltonian cycles.

Branch and Bound: The method, 0/1 knapsack problem, Travelling sales person problem.

TEXT BOOK:

1. Fundamentals of Computer Algorithms, Second Edition – Ellis Horowitz, Sartaj Sahni and rdSanguthevar Rajasekaran, Universities Press.

REFERENCE BOOKS:

1. S. Sridhar, Oxford, Design and Analysis of Algorithms, First Edition –.
2. T.H.Cormen, C.E.Leiserson, R.L.Rivest and C.Stein , Introduction to Algorithms, second edition, , PHI Pvt.Ltd.
3. Parag Himanshu Dave, Himanshu Bhalchandra Dave , Design and Analysis of Algorithms, Second Edition –, Pearson Education.
4. Alfred V. Aho, John E. Hopcroft, Jeffrey D. Ullman , Design and Analysis of Computer Algorithms –, Pearson Education.
5. Anany Levitin , Introduction to the Design and Analysis of Algorithms, Third Edition –, Pearson Education.

ONLINE REFERENCES:

1. http://www.personal.kent.edu/~rmuhamma/Algorithms/algorithm.html
2. https://www.coursera.org/learn/algorithms-divide-conquer
3. http://nptel.ac.in/courses/106101060/
4. https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-046j-design-and-analysis-of-algorithms-spring-2015/index.html

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
SUBCODE: 19BCS4TH04	**SOFTWARE ENGINEERING**						

COURSE OBJECTIVE:

- The student will have a broad understanding of the discipline of software engineering and its application to the development of and management of software systems.

COURSE OUTCOMES:

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

CO1 : Compare and contrast basic software engineering methods and practices. [K2].
CO2 : Analyze the project management essentials [K4].
CO3 : Analyze the software process models. [K4].
CO4 : Outline the importance of software testing and quality control approaches [K2].

SYLLABUS:

UNIT - I

Introduction to Software Engineering: Software-Software classification, Engineering Discipline; Software Crisis, Software Engineering definition, Evolution of Software Engineering Methodologies - exploratory, structured, data structure, object oriented, component based development; Software Engineering Challenges- problem understanding, quality and product, cycle time and cost, reliability, change and maintenance, usability and reusability, repeatability and process maturity, estimation and planning.

Software Processes: Software Process- software process model, elements of software process, characteristics of software process; Phased development life cycle- phased life cycle activity; Software Development Process Models- classical waterfall model, iterative waterfall, prototyping, incremental, spiral, agile process, RUP process model.

UNIT - II

Requirements Engineering: Software Requirements- business, user, system, functional and nonfunctional; Requirements engineering Process, Requirements elicitation-fact finding techniques; Requirements Analysis, Structured Analysis - data flow diagram, data dictionary,

Structured analysis, pros and cons of structured analysis; Prototyping Analysis- throwaway, evolutionary; Requirements Specification- characteristics, components, structure, requirement specification methods; Requirements Validation- review, inspection, test case generation, reading, prototyping; Requirements Management.

UNIT - III

Software Design: Software Design Process, Characteristics of Good Software Design, Design Principles- abstraction, information hiding, functional decomposition, design strategies, modularity; Modular Design- coupling, cohesion; Design Methodologies- function oriented design, object oriented design; Structured Design- structure chart, structure vs flow chart; Structured Design Methodology- review and refine data flow diagram, identify boundaries between input process and output segments, apply design principles modularization criteria.

UNIT - IV

Implementation: Coding Principles- information hiding, structure programming, max cohesion and min coupling, code reusability, kiss, simplicity extensibility , code verification, code documentation; Coding Process- traditional coding process, test driven development.

Software Testing: Testing Fundamentals- errors, faults, failures, cost of defects, testing process, role of software testers; Test Planning- create a test plan, design test cases, test stubs and test drivers, test case execution, test summary report, defect tracking and statistics; Black Box Testing- equivalence class partitioning, boundary value analysis, cause effect graphing, error guessing; White Box Testing- control flow based, path, data flow based, mutation; Levels of Testing- unit, integration, system, acceptance.

UNIT - V

Project Planning and Estimation: Project Planning activities, Software Metrics and measurements, Project Size Estimation - lines of code, functional point analysis; Effort Estimation Techniques- COCOMO cost models, analytical estimation.

Software Quality: software quality concept, Software Quality Factors, Verification & Validation, Software Quality Assurance- SQA activities, SQA plan; Capability Maturity Model (CMM) - SEI-CMM vs ISO standard.

TEXT BOOKS:

1. Ugrasen Suman, “Software Engineering, concepts and practices”, Cengage learning, 1/e, 2015.

REFERENCE BOOKS:

1. W S Jawadekar, “Software Engineering principles and practice”, TMH, 2006
2. Sommerville, “Software Engineering”, 8/e, , Pearson.
3. Roger S. Pressman, “Software Engineering”, 7/e, TMH

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106101061

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	**-**	**3**	**20**	**30**	**50**	**1.5**
SUBCODE: 19BCS4LB03	**MOBILE APPLICATION DEVELOPMET LAB**						

COURSE OBJECTIVES:

- To enlighten the student with knowledge base in Android Applications Development.

COURSE OUTCOMES:

On successful completion of this course, the students will be able to:

CO1 : Demonstrate various components of Android Framework.[K2].
CO2 : Develop user Interfaces for the Android Application.[K3].
CO3 : Develop Android Applications using Android API and Services.[K3].
CO4 : Develop Android Applications which access data from Internet.[K3].

LIST OF EXPERIMENTS

1. Create Hello World Android App using **Android Studio** and explain each step in detail.
2. Create an Activity that receive name form the user and displays **Hello Name** to the user using Android Studio.
3. Create an Activity that demonstrates the Life Cycle of an Activity.
4. Create an Android Application which receives URL form the user and open appropriate page in the system browser with the help of Implicit Intents using Android Studio.
5. Create an Android App which receives name form the user and displays welcome name in Second Activity.
6. Create Login Screen Application which shows Home screen if Login success otherwise displays error message using Android Studio.
7. Write an Android application program that demonstrate the use of

a. RelativeLayout.
b. LinearLayout.
c. GridLayout.
d. TableLayout.

8. Write an Android application program that demonstrates the use ImageView.
9. Write an Android application program that demonstrates the use of ListView and ArrayAdapter.
10. Write an Android application program that demonstrates how to create Custom ListView and Custom Adapters.
11. Write an Android application program that demonstrates the use of SQLite Database and Cursor.
12. Write an Android application program that demonstrates the use AsyncTask.
13. Write an Android application program that demonstrates Notifications.
14. Write an Android application program that demonstrates Shared Preferences.
15. Write an Android application program that connect to the internet, gets JSON data and displays the result in UI by parsing JSON data.

ONLINE REFERENCES:

1. https://developer.android.com/index.html
2. http://nptel.ac.in/courses/106106147/10
3. https://www.edx.org/course/introduction-mobile-application-hkustx-comp107x-2
4. https://www.coursera.org/specializations/android-app-development

II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
SUBCODE: 19BCC4LB01	**ENGLISH COMMUNICATION SKILLS LAB-II (Common to All Branches)**						

COURSE OBJECTIVES:

- To train the students to use language effectively in various professional interactions like Group Discussions, Public Speaking, Presentations and Interviews.
- To make the students understand the importance of body language.
- To provide exposure to students to soft skills like Goal Setting, Assertiveness, Time Management, Positive Attitude and Stress Management
- To expose the students to variety of a self-instructional, learner friendly, electronic media and stimulate intellectual faculties/resources

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Know the importance of Non-verbal communication and interpret nonverbal symbols.
CO 2: Make formal presentations using strategies.
CO 3: Participate in Group Discussions using analytical and problem solving skills effectively.
CO 4: Face job interviews confidently for employability.

UNIT– I

Body Language

UNIT–II

Presentation Skills

UNIT–III

Group Discussions

UNIT-IV

Interviews and Telephonic Interviews

UNIT-V

Debates

TEXT BOOKS:

1. *"Strengthen Your Communication Skills",* Maruthi Publications, 2013.

REFERENCE BOOKS:

1. "*Personality Development and Soft Skills"*, Oxford University Press, New Delhi.
2. M Ashraf Rizvi, "*Effective Technical Communication skills"*, McGraw-Hill, 2005.
3. Barun K Mitra, "*Personality Development and Soft Skills",* Oxford University Press, 2011.
4. Konar N, "*Communication Skills for Professionals",* PHI Learning Private Limited, 2011.

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II B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
SUBCODE: 19BCI4LB02	**DATABASE MANAGEMENT SYSTEMS LAB (Common to CSE & IT)**						

COURSE OUTCOMES:

After Completion of this course student must be able to

CO1 : Apply SQL commands like DDL,DML,DCL to perform different Database operations [K3].
CO2 : Develop PL/SQL block statements, control statements and cursors [K3].
CO3 : Develop PL/SQL programs using functions and procedures [K3].
CO4 : Develop PL/SQL programs using packages and Triggers [K3].

PROGRAMS LIST:

1. Creation, altering and droping of tables and inserting rows into a table (use constraints while creating tables) examples using SELECT command.
2. Queries using Conversion functions (to_char, to_number and to_date), string functions (Concatenation, lpad, rpad, ltrim, rtrim, lower, upper, initcap, length, substr and instr), date functions (Sysdate, next_day, add_months, last_day, months_between, least, greatest, trunc, round, to_char, to_date).

3. Queries using Aggregate functions (COUNT, SUM, AVG, MAX and MIN), GROUP BY, HAVING and Creation and dropping of Views.
4. Queries (along with sub Queries) using ANY, ALL, IN, EXISTS, NOTEXISTS, UNION, INTERSET, Constraints.
   Example:- Select the roll number and name of the student who secured fourth rank in the class.

5. i)Creation of simple PL/SQL program which includes declaration section, executable section and exception –Handling section (Ex. Student marks can be selected from the table and printed for those who secured first class and an exception can be raised if no records were found)
   ii)Insert data into student table and use COMMIT, ROLLBACK and SAVEPOINT in PL/SQL block.

6. Develop a program that includes the features NESTED IF, CASE and CASE expression. The program can be extended using the NULLIF and COALESCE functions.
7. Program development using WHILE LOOPS, numeric FOR LOOPS, nested loops using ERROR Handling, BUILT –IN Exceptions, USE defined Exceptions, RAISE-APPLICATION ERROR.
8. Programs development using creation of procedures, passing parameters IN and OUT of PROCEDURES.

9. Program development using creation of stored functions, invoke functions in SQL Statements and write complex functions.
10. Program development using creation of package specification, package bodies, private objects, package variables and cursors and calling stored packages.
11. Develop programs using features parameters in a CURSOR, FOR UPDATE CURSOR, WHERE CURRENT of clause and CURSOR variables.
12. Develop Programs using BEFORE and AFTER Triggers, Row and Statement Triggers and INSTEAD OF Triggers

TEXT BOOKS:

1. SCOTT URMAN, "ORACLE DATA BASE LOG PL/SQL Programming", Tata Mc-Graw Hill.

REFERENCES:

1. Benjamin Rosenzweig, Elena Silvestrova "ORACLE PL/SQL by example", Pearson Education 3/e
2. Dr.P.S. Deshpande, "SQL & PL/SQL for Oracle 10g", Black Book
3. Pranab kumar Das Gupta, P Radha Krishna, "Data Base Management System, Oracle SQL and PL/SQL" , PHI

II B.Tech II -SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	--	--	--	0
SUBCODE: 19BCC4MC02	**QUANTITATIVE APTITUDE AND REASONING**						

COURSE OBJECTIVES:

- To train students in analyzing real life scenarios considering all factors
- To educate the students on principles of mathematical problems and problem solving methods
- To train students for campus placements
- To make students adept in applying appropriate logic and shortcuts to solve the problems in the least possible time.

COURSE OUTCOMES:

After thorough learning of Quantitative Aptitude and Reasoning, a student:

CO 1: Will be able to prepare well for clearing Quantitative Aptitude and Reasoning tests for campus placements

CO 2: Will be able to critically evaluate various real life situations by resorting to Analysis of key issues and factors.

CO 3: Will be able to demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.

SYLLABUS FOR QUANTITATIVE APTITUDE

UNIT I: Simple equations, Ratio, Proportion, and Variation

1. **Simple equations**
   a. Definition of Linear Equations
   b. Formation of simple equations
   c. Problems on Ages, Fractions and Digits
   d. Indeterminate system of equations
   e. Special cases in indeterminate system of equations
2. **Ratio and proportion**
   a) Definition of Ratio
   b) Properties of Ratios
   c) Comparison of Ratios
   d) Problems on Ratios
   e) Compound Ratio

f) Problems on Proportion, Mean proportional and Continued Proportion

3. Variation

a) Direct variation
b) Inverse variation
c) Joint variation
d) Problems on Variations

UNIT II: Percentages, Partnership.

1. Percentages

a) Introduction
b) Converting a percentage into decimals
c) Converting a Decimal into a percentage
d) Percentage equivalent of fractions
e) Problems on percentages

2. Partnership

a) Introduction
b) Relation between capitals, Period of investments and Shares

Unit III: Profit And Loss

a) Problems on Profit and Loss percentage
b) Relation between Cost Price and Selling price
c) Discount and Marked Price
d) Two different articles sold at same Cost Price
e) Two different articles sold at same Selling Price
f) Gain% / Loss% on Selling Price

SYLLABUS FOR REASONING

UNIT III: Deductions & Connectives

1. Deductions

a) Finding the conclusions using Venn diagram method
b) Finding the conclusions using syllogism method

2. Connectives

a) Definition of a simple statement
b) Definition of compound statement
c) Finding the Implications for compound statements
d) Finding the Negations for compound statements

UNIT IV: Analytical Reasoning puzzles

a) Problems on Linear arrangement
b) Problems on Circular arrangement
c) Problems on Double line-up
d) Problems on Selections
e) Problems on Comparisons

UNIT IV: Clocks, Calendars & Blood relations

1. **Clocks**
   a) Finding the angle when the time is given
   b) Finding the time when the angle is known
   c) Relation between Angle, Minutes and Hours
   d) Exceptional cases in clocks
2. **Calendars**
   a) Definition of a Leap Year
   b) Finding the number of Odd days
   c) Framing the year code for centuries
   d) Finding the day of any random calendar date
3. **Blood relations**
   a) Defining the various relations among the members of a family
   b) Solving Blood Relation puzzles
   c) Solving the problems on Blood Relations using symbols and notations

TEXT BOOKS:

1. GL Barrons, Mc Graw Hills, Thorpe's verbal reasoning, LSAT Materials

2. R S Agarwal, S.Chand , 'A modern approach to Logical reasoning'

3. R S Agarwal, S Chand, 'Quantitative Aptitude'

4. Quantitative Aptitude - G. L BARRONS

5. Quantitative Aptitude - Abhijit Guha Mc Graw Hills

REFERENCES:

1. www.careerbless.com/aptitude/qa/home.php
2. www.affairscloud.com/quantitative-aptitude-questions
3. www.careerafter.com/rs-aggarwal-quantitative-aptitude-pdf/
4. www.amazon.in/Quantitative-Aptitude-Competitive-Examinations.../8121924987
5. www.indiabix.com
6. www.practiceaptitudetests.com/numerical-reasoning-tests

III B.TECH. – I SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCI5TH01	Operating Systems	PC	40	60	100	3	-	-	3
2	19BCS5TH03	Computer Networks	PC	40	60	100	3	-	-	3
3	19BCI5TH02	Compiler Design	PC	40	60	100	3	-	-	3
4	19BCS5TH04	OOAD through UML	PC	40	60	100	3	-	-	3
5	19BCS5TH05	Advanced Java and Web Technologies	PC	40	60	100	3	-	-	3
6	19BCS5TH05 19BCS5TH08 19BCS5TH09 19BCI5TH07	**Professional Elective – I** a. DWDM b. Computer Graphics c. Software Testing Methodology d. Microprocessors and Multicore systems	PE	40	60	100	3	-	-	3
7	19BCS5LB01	OS and UML Lab	PC	20	30	50	-	-	3	1.5
8	19BCS5LB02	Advanced Java and Web Technologies Lab	PC	20	30	50	-	-	3	1.5
9	19BCS5LB03	**PE-I LAB**	HS	20	30	50	-	-	3	1.5
10	19BCS5MP01	Mini Project	PR	20	30	50	-	-	-	1
11	19BCC5MC01	Advanced Communication Skills	MC	-	-	-	3	-	-	0
TOTAL										**23.5**

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCI5TH01	**OPERATING SYSTEMS**						

COURSE OBJECTIVES:

- To gain knowledge about the Operating Systems concepts such as process, main memory management, secondary memory management, Deadlocks, CPU and disk scheduling etc.,

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO 1: Classify various operating system functionalities and generations. [K2]
CO 2: Interpret process management and exemplify the process synchronization techniques. [K2]
CO 3: Apply various process scheduling algorithms. [K3]
CO 4: Distinguish various memory management techniques and apply various deadlock techniques. [K4]
CO 5: Compare and contrast various disk scheduling algorithms and can interpret the file system implementations. [K2]

SYLLABUS:

UNIT - I

Computer System and Operating System Overview: Overview of Operating System - What operating systems do, User view, System view, defining operating systems; Operating Systems functions- Process Management, Memory Management, Storage Management, File-System Management, Mass-Storage Management, Caching, Protection and security; Distributed systems, Special purpose systems, Real-Time Embedded Systems, Multimedia Systems, Handheld Systems, Operating Systems Structures, Simple Structure, Layered Approach, Micro Kernels, Modules; Systems Calls- Process control, File management, Device management, Information maintenance, Communication; Operating systems generation.

UNIT - II

Process Management: Process, Process States, Process Control Block, Process Scheduling- Scheduling Queues, Schedulers; Operations- Process Creation, Process termination; Inter process communication- Shared-Memory Systems, Message-Passing Systems, Naming, Synchronization, Buffering; Multi Thread programming models- Many to one, One to one, Many to Many model;

Process Scheduling Criteria- CPU scheduler, Preemptive scheduling, Dispatcher, Scheduling Criteria; CPU Scheduling Algorithms- First Come First Serve, Shortest job first, Priority Scheduling, Round robin scheduling.

UNIT - III

Concurrency: Process Synchronization, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware. Semaphores- Usage, Implementation, Deadlock and Starvation; Classic Problems of Synchronization- Bounded buffer problem, Readers writers' problem, Dining-Philosophers problem; Monitors- Usage, Dining-Philosophers solution using monitors.

Memory Management: Swapping, Contiguous Memory Allocation- Memory Allocation, Fragmentation; Paging- Basic Method, Hardware Method, Protection, shared pages; Structure of the Page table- Hierarchical Paging, Hashed Page Tables. Segmentation- Basic Method, hardware.

UNIT - IV

Virtual Memory Management: Virtual Memory. Demand Paging- Basic concept, copy on write; Page-Replacement Algorithms- Basic page replacement, FIFO page replacement, optimal page replacement, LRU page replacement, LFU page replacement; Thrashing- Cause of Thrashing, Working set model, Page fault frequency

Principles of Deadlock: Deadlock System Model. Deadlock Characterization- Necessary Conditions, Resource allocation graph; Deadlock Prevention- Mutual exclusion, Hold and wait, No preemption, Circular wait; Deadlock Detection and Avoidance- Resource allocation Graph algorithm, Banker's algorithm, Single instance of each resource type, several instances of each resource type; Recovery Form Deadlock- Process termination, Resource preemption

UNIT - V

File System: The Concept of a File- file attributes, file operations, file types, file structures; Access Methods- sequential access, direct access, other access methods; Directory Structure- single level directory, two level directories, tree structured directory, general graph directory; File Sharing- multiple users, remote file systems; Protection- types of access, access control.

Implementing File System: File System Structure. File System Implementation- overview, partitions and mounting, virtual file systems; Allocation Methods- contiguous allocation, linked allocation, indexed allocation; Free-Space Management- linked list, grouping, counting. **Disk Scheduling**- FCFS scheduling, SSTF scheduling, SCAN scheduling, C-SCAN scheduling, LOOK scheduling.

TEXT BOOKS:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "Operating System Concepts", John Wiley, 7/e, 2016.

REFERENCE BOOKS:

1. William Stallings, "Operating Systems – Internal and Design Principles", Pearson Education, 6/E, 2005.
2. D.M.Dhamdhere, "Operating Systems – A Concept based Approach" –, TMH, 2/e, 2005.
3. Crowley, "Operating System a Design Approach", TMH, 1/e, 2005.
4. Andrew S Tanenbaum , "Modern Operating Systems", PHI, 3/e, 2013.

WEB REFERENCES:

1. nptel.ac.in/courses/106108101
2. nptel.ac.in/courses/106106144

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
CODE:19BCS5TH03	COMPUTER NETWORKS						

COURSE OBJECTIVES:

- To provide knowledge on the fundamental concepts of the Computer Networks and problem solving techniques on Networks.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Summarize basic concepts of Data Communication and Networking. [K2]
CO 2: Compare and Contrast OSI and TCP/IP reference models. [K2]
CO 3: Interpret data link layer services and multiple access protocols. [K2]
CO 4: Analyse different routing protocols. [K4]
CO 5: Illustrate the essential principles of different transport layer protocols. [K2]
CO 6: Summarize various application layer protocols. [K2]

SYLLABUS:

UNIT – I

Introduction: OSI Overview, TCP/IP and Other Network Models, Examples of Networks: Novell Networks, Arpanet, Internet, Network Topologies: WAN, LAN, MAN.

UNIT – II

Data Link Layer: Design Issues- Framing, Services Provided to Network Layer, Flow Control, Error Control, Error Detection and Correction-CRC, Checksum-Idea, One's Complement, Hamming code. **IEEE Standards:** 802.3, 802.11.

UNIT – III

Elementary Data Link Layer Protocols: Simplex Protocol, Simplex Stop and Wait, Simplex Protocol for Noisy Channel.
Sliding Window Protocol: One Bit, Go Back N, Selective Repeat-Stop And Wait Protocol, Examples Of Data Link Protocols- HDLC, PPP.
Medium Access Control Sub Layer: Chanel Allocation Problem, ALOHA, Carrier Sense Multiple Access (CSMA), CSMA With Collision Detection, CSMA with Collision Avoidance,

UNIT – IV

Network Layer: Network Layer Design Issues- Store And Forward Packet Switching, Service Provided to Transport Layer, Connection Oriented and Connection Less Service, Comparison of Virtual Circuit and Datagram Subnets.
Routing Algorithms: Optimality Principle, Shortest Path Routing, Flooding, Hierarchical Routing, Broad Cast, Multi Cast, Distance Vector Routing, Link State Routing.
Network Layer in Internet: IP Protocol, IP Address, IPv4 frame format.

UNIT –V

Transport Layer: The Transport Services- Services Provided to the Upper Layer, Transport Service Primitives, Elements of Transport Protocol-Addressing, Connection Establishment, Connection Release.

The Internet Transport Protocols: TCP and UDP.

Application Layer: DNS (Domain Naming System)-DNS Namespace, Name Servers, Electronic Mail- Architecture And Services, Message Format-MIME, Sending and Receiving E-mail, Message Transfer- SMTP.

The World Wide Web- Architecture Overview, URL, HTTP.

TEXT BOOKS:

1. Andrew S Tanenbaum, "Computer Networks, Pearson Education/PHI, 4th Edition.
2. Behrouz A.Forouzan, "Data Communications and Networks", TMH, Third Edition,

REFERENCE BOOKS:

1. S.Keshav, "An Engineering Approach to Computer Networks", Pearson Education 2nd Edition,
2. W.A. Shay, Thomson, "Understanding Communications and Networks", 3rd Edition.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc18_cs38.
2. https://in.udacity.com/course/computer-networking--ud436.
3. https://www.class-central.com/subject/computer-networking.
4. https://www.youtube.com/watch?v=3DZLItfbqtQ&list=PL32DBC269EF768F74.

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
CODE:19BCI5TH02	COMPILER DESIGN						

COURSE OBJECTIVES:

- Understand the process involved in a Compiler.
- Create an overall view of various types of translators, linkers, loaders, and phases of a compiler.
- Understand the Syntax Analysis, Various types of Parsers, like the Top-Down approach, and the Bottom- Up approach parsers.
- Gives a view of Intermediate Code Generation, Type Checking,
  Understand the role of Symbol Table and its organization.
- Describe Code Generation, Machine Independent Code Optimization and Instruction Scheduling.

COURSE OUTCOMES:

After successful completion of this course, students will be able to:

CO 1: Summarize different phases and passes of a compiler. [K2]
CO 2: Compare and Contrast various Top-Down and Bottom-Up Parsing techniques. [K2]
CO 3: Interpret different types of Intermediate Code representations. .[K2]
CO 4: Illustrate the effective usage of register allocation and various Code-generation techniques. .[K2]
CO 5: Apply different code-optimization techniques to optimize the target code. .[K3]

SYLLABUS:

UNIT–I

Overview of Language Processing: Pre-processor, compiler, assembler, interpreter, linker & loader and phases of a compiler.
Lexical Analysis: Role of the lexical analysis, lexical analysis vs. parsing, token, patterns and lexemes, lexical errors. Regular expressions: Regular definitions for the language constructs, strings, sequences, transition diagram for recognition of tokens, reserved words and identifiers with examples.

UNIT–II

Syntax Analysis: Discussion on CFG, LMD, RMD, ambiguity, parse tree, role of the parser, Classification of Parsing Techniques: Brute Force approach, left recursion, left factoring. Top-down parsing: FIRST and FOLLOW, LL (1) grammars, non-recursive predictive parsing and error recovery in predictive parsing.

UNIT–III

Types of Bottom-Up Approaches: Introduction to bottom-up parser, Why LR Parsers?, model of an LR parsers, operator precedence parser, shift- reduce parser, difference between LR and LL Parsers, Construction of SLR Table. More Powerful LR parsers: Construction of CLR (1),

LALR parsing table, dangling ELSE ambiguity, and error recovery in LR parsing and comparison of all bottom-up approaches with all top-down approaches.

UNIT–IV

Semantic analysis: SDT schemes, evaluation of semantic rules, intermediate codes, three address codes - quadruples, triples, abstract syntax trees, types and declarations, type checking.

Symbol Table: Use and need of symbol tables, runtime environment storage organization, stack allocation, access to non-local data, heap management.

UNIT–V

Code Generation: Issues, target machine, basic blocks and flow graphs, simple code generator, peep-hole optimization

Machine Independent Code Optimization: Semantic preserving transformations, global common sub expression elimination, copy propagation, dead code elimination, constant folding, strength reduction, loop optimization, instruction scheduling and inter procedural optimization.

TEXT BOOKS:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, “Compilers – Principles, Techniques & Tools”, Pearson, Second edition, 2007.
2. K. Muneeswaran, “Compiler Design”, Oxford University Press, 2013.

REFERENCE BOOKS:

1. Keith D. Cooper, & Linda Torczon, “Engineering a Compiler”, Morgan Kaufman publications, Second edition, 2011.
2. V. Raghavan, “Principles of Compiler Design”, TMH, Second edition, 2011.
3. Kenneth C. Louden, “Compiler Construction - Principles and Practice”, Cengage Learning publications, First edition,1997.
4. Yunlin Su, Song Y. Yan, “Implementations of Compiler - A new approach to Compilers including the Algebraic Methods”, Springer publications, 2011.

WEB REFERENCES:

1. http://www.diku.dk/hjemmesider/ansatte/torbenm/Basics/
2. http://nptel.ac.in/courses/106108052/1
3. https://www.geeksforgeeks.org/compiler-design-tutorials/
4. https://link.springer.com/article/10.1007/s10766-005-3590-6

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
CODE:19BCS5TH04	OOAD THROUGH UML						

COURSE OBJECTIVES:

- Importance of modeling in Software Development Life Cycle.
- Different diagrams and relationships.
- Unified application for a system.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Illustrate the conceptual model of UML in software development life cycle. [K2]
CO 2: Apply Common Modeling Techniques of Structural Modeling. [K3]
CO 3: Analyze and model the behavioral concepts of a system and Apply Unified Modeling Language (UML) towards analysis and design. [K4]
CO 4: Apply advance behavioural modelling concepts for analysing and designing of Object oriented Systems. [K3]
CO 5: Apply the concepts of architectural design for deploying the code for software. [K3]

SYLLABUS:

UNIT- I

Introduction to UML: Importance of Modeling, Principles of Modeling, Object Oriented Modeling, Conceptual Model of the UML, Architecture, Software Development Life Cycle.
Basic Structural Modeling : Classes-Terms and Concepts, Common Modeling Techniques-Modeling the Vocabulary of a system, Modeling the Distribution of Responsibilities in a System, Modeling the Non-Software things, Modeling the Primitive Types, **Relationships**-Terms and Concepts, Common Modeling Techniques-Modeling Simple Dependencies, Modeling Single Inheritance, Modeling Structural Relationships, common Mechanisms-Modeling New Building Blocks, Modeling Comments, Modeling New Semantics, Modeling New Properties, and **Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling Different Views of a System, Modeling Different Levels of Abstractions, Modeling Complex Views.

UNIT- II

Advanced Structural Modeling : Advanced Classes- Terms and Concepts, Modeling the Semantics of a Class, Advanced relationships- Terms and Concepts, Common Modeling Techniques-Modeling the advanced web of relationships, **Interfaces, Types and Roles** - Terms and Concepts, Modeling the Seams in a System, Modeling static and dynamic types, **Packages**- Terms and Concepts, Common Modeling Techniques-Modeling Group of elements, Modeling Architectural Views.
Class & Object Diagrams : Class Diagrams-Terms and Concepts, Common Modeling Techniques-Modeling Simple Collaborations, Modeling Logical Database Schema, Forward

and Reverse Engineering, **Object Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling Object Structures, Forward and Reverse Engineering.

UNIT- III

Basic Behavioral Modeling : Interactions- Terms and Concepts, Common Modeling Techniques-Modeling a Flow of Control, **Interaction Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling a Flows of Control by Time Ordering, Modeling a Flows of Control by Organization, Forward and Reverse Engineering. **Use cases**- Terms and Concepts, Common Modeling Techniques-Modeling the Behavior of an Element, **Use case Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling the Context of a System, Modeling the Requirements of a System, Forward and Reverse Engineering, **Activity Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling a Workflow, Modeling an Operation, Forward and Reverse Engineering.

UNIT- IV

Advanced Behavioral Modeling : Events and Signals-Terms and Concepts, Common Modeling Techniques-Modeling a Family of Signals, Modeling Exceptions, State Machines-Terms and Concepts, Common Modeling Techniques-Modeling Lifetime of an object, **Processes and Threads**-Terms and Concepts, Common Modeling Techniques-Modeling Multiple Flows of Control, Modeling Inter Process Communication, **Time and Space**-Terms and Concepts, Common Modeling Techniques- Modeling Timing Constraints, Modeling the Distribution of Objects, Modeling Objects that Migrate, **State Chart Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling Reactive Objects, Forward and Reverse Engineering.

UNIT- V

Architectural Modeling : **Component**-Terms and Concepts, Common Modeling Techniques- Modeling Executables and libraries, Modeling Tables, Files and Documents, Modeling an API, Modeling Source Code, **Deployment**- Terms and Concepts, Common Modeling Techniques- Modeling Processors and Devices, Modeling the Distribution of Components, **Component Diagrams**- Terms and Concepts, Common Modeling Techniques-Modeling Executable Release, Modeling a Physical Database, Modeling Adaptable Systems, Forward and Reverse Engineering and **Deployment Diagrams**- Terms and Concepts, Common Modeling Techniques- Modeling an Embedded System, Modeling a Client/Server System, Modeling a Fully Distributed System, Forward and Reverse Engineering. **Case Study:** The Unified Student Database application.

TEXT BOOKS:

1. Grady Booch, James Rumbaugh, Ivar Jacobson, “The Unified Modeling Language User Guide”, Pearson Education.

REFERENCE BOOKS:

1. Meilir Page-Jones, “Fundamentals of Object Oriented Design in UML”, Pearson Education.
2. Pascal Roques, “Modeling Software Systems Using UML2”, WILEY Dreamtech India Pvt. Ltd.

3. Atul Kahate, “Object Oriented Analysis & Design”, The McGraw-Hill Companies.
4. Mark Priestley, “Practical Object-Oriented Design with UML”,TATA McGrawHill
5. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, “UML 2 Toolkit”, WILEY-Dreamtech India Pvt. Ltd.

WEB REFERENCES:

1. https://www.uml-diagrams.org/uml-object-oriented-concepts.html
2. https://www.lucidchart.com/blog/uml-diagram-templates
3. https://www.smartdraw.com/uml-diagram/
4. https://www.ibm.com/developerworks/rational/library/769.html

III B. TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
CODE:19BCS5TH05	ADVANCED JAVA AND WEB TECHNOLOGIES						

COURSE OBJECTIVES:

- To gain the knowledge of Server-side programming languages and techniques associated with the World Wide Web.
- To make the students get acquainted the skill for developing web apps.
- Understand how to use web-based media-rich programming tools for creating dynamic web pages.

COURSE OUTCOMES:

After the successful completion of this course, the students will be able to:

CO 1: Interpret Servlet Life Cycle and web servers. [K2]
CO 2: Illustrate JSP Life cycle. [K2]
CO 3: Apply Session Management for JSP applications. [K3]
CO 4: Illustrate the usage of JDBC in JSP applications. [K2]
CO 5: Make use of PHP for the development of web-based applications. [K3]
CO 6: Utilize JDBC in PHP web-based applications. [K3]

SYLLABUS:

UNIT-I

Web Servers and Servlets: Tomcat web server, introducing java Servlet, Introducing the servlet API, Lifecycle of a Servlet, Working with Initialization Parameters, Describing the HttpServlet Request & HttpServletResponse interfaces, Cookies, Session Tracking, Security Issues.

UNIT-II

Introduction to JSP: The Problem with Servlet. The Anatomy of a JSP Page, JSP Processing. JSP Application Design with MVC. JSP Application Development: Generating Dynamic Content: directive elements, what is template text, action elements. Using Scripting Elements, Implicit JSP Objects. Conditional Processing: Displaying Values Using an Expression to Set an Attribute, Declaring Variables and Methods.

UNIT-III

JSP: Error Handling and Debugging, Implicit JSP Objects, Sharing Data between JSP pages, Requests, and Users Passing Control and Data between Pages: passing the control between

the pages, passing the data between JSP pages passing the data between JSP pages using session object, Memory Usage Considerations.

UNIT-IV

JDBC: Introduction, Database Programming Using JDBC: How JDBC Works, JDBC Architecture, JDBC Driver Types, Accessing Database From JSP page: Use of Prepared Statement, ResultSet.

UNIT-V

PHP: Introduction to PHP, Creating PHP script, Running PHP script. Working with variables and constants, Data types, Operators. Controlling program flow, Working with Arrays, Built-in functions in PHP, user-defined functions in PHP, recursive, variable, and callback functions. User and Database Interface: Database programming, Working with forms, validating a form, Working with Databases such as MySQL.

TEXT BOOKS:

1. A.A. Puntambekar , “Web Technologies” , Technical Publications, Pune.
2. “Web Technologies Black Book” , Kognent Learning Solutions Inc Sol. DreamTech Press

REFERENCES BOOKS:

1. Wang Thomson, “An Introduction to Web Design and Programming”.
2. Wang, Katila, “An Introduction to Web Design + Programming”, CENGAGE.
3. Web Technologies A Developer’s Perspective, N.P.Gopalan, Akhilandeswari, PHI.

WEB REFERENCES:

1. https://www.coursera.org/learn/html-css-javascript-for-web-developers.
2. https://www.coursera.org/learn/web-applications-php.
3. https://www.udemy.com/javawebtut/.
4. https://www.coursera.org/learn/desenvolvimento-agil-com-java-avancado/lecture/LUXm0/criando-java-servlets.

III B. TECH I SEMESTER (PE-I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCI5TH06	**DATA WAREHOUSING AND DATA MINING**						

COURSE OBJECTIVES:

- Identify the scope and necessity of Data Mining & Warehousing for the society.
- Describe the design of Data Warehousing so that it can be able to solve the root problems.
- Categorize and carefully differentiate between situations for applying different data mining techniques: mining frequent patterns, association, correlation, classification, prediction, and cluster analysis.
- Evaluate the performance of different data mining algorithms.
- To develop further interest in research and design of new Data Mining Techniques.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Interpret the data mining terminology and types of data to be mined. [K2]
CO 2: Outline the need and importance of pre-processing techniques and apply them.[K2]
CO 3: Interpret data warehousing concepts and operations. [K2]
CO 4: Compare and contrast different dominant Data Mining Algorithms for Classification and Clustering and apply them. [K4]
CO 5: Analyze the performance of Association Rules. [K4]

SYLLABUS

UNIT– I

Introduction to data mining: -What Is Data Mining, -Motivating Challenges, -The Origins of Data Mining, -Data Mining Tasks, -Types of Data: Attributes and Measurement, Types of Data Sets, -Data Quality: Measurement and Data Collection Issues, Issues Related to Applications.

UNIT–II

Data:- Data Preprocessing: Aggregation, Sampling, Dimensionality Reduction, Feature Subset Selection, Feature Creation, Discretization and Binarization, Variable Transformation, -Measures of similarity and dissimilarity: Basics, Similarity and Dissimilarity between Simple Attributes, Dissimilarities between Data Objects, Similarities between Data Objects, Examples of Proximity Measures.

Exploring data: -The Iris Data set, -Summary Statistics: Frequencies and the Mode, Percentiles, Measures of Location: Mean and Median, Measures of Spread: Range and Variance, Multivariate Summary Statistics, Other Ways to Summarize the Data.

UNIT–III

Data Warehouse and OLAP Technology for Data Mining: -What is a Data Warehouse, -A Multidimensional Data Model: From tables to data cubes, Stars, snowflake, and fact constellations(schemas for multidimensional databases), Examples for defining star, snowflake, and fact constellation schemas, Measures(their categorization and computation),

Introducing concept hierarchies, OLAP operations in the multidimensional data model, A starnet query model for querying multidimensional databases, -Data Warehouse Architecture: Steps for the design and construction of data warehouses, A three-tier data warehouse architecture, OLAP server architectures: ROLAP vs. MOLAP vs. HOLAP, SQL extensions to support OLAP operations, Data Warehouse implementation: Efficient computation of data cubes, Indexing OLAP data, Efficient processing of OLAP queries, Metadata repository, Data warehouse back-end tools and utilities, -Further development of data cube technology: Discovery-driven exploration of data cubes, Complex aggregation at multiple granularities (Multifeature cubes), -From data warehousing to data mining: Data warehouse usage, From online analytical processing to online analytical mining.

UNIT-IV

Classification: Basic Concepts, Decision Trees, and Model Evaluation: -Preliminaries, -General Approach to Solving a Classification Problem, Decision Tree Induction: How a Decision Tree Works, How to Build a Decision Tree, Methods for Expressing Attribute Test Conditions, Measures for Selecting the Best Split, Algorithm for Decision Tree Induction, -Model Overfitting: Overfitting Due to Presence of Noise, Overfitting Due to Lack of Representative Samples, Evaluating the Performance of a Classifier: Holdout Method, Random Subsampling, Cross Validation, Bootstrap.
Classification: alternative techniques: -Bayesian classifier: Bayes Theorem, Using Bayes theorem for classification, Naïve Bayesian classifier.

UNIT-V

Association Analysis: Basic Concepts and Algorithms: -Problem Definition, -Frequent Itemset Generation: The Apriori principle, Frequent Itemset Generation in the Apriori Algorithm, Candidate Generation and Pruning, Support Counting, -Rule Generation: Confidence-Based Pruning, -Compact Representation of Frequent Itemsets: Maximal Frequent Itemsets, Closed Frequent Itemsets, -FP-Growth algorithms: FP-Tree Representation, Frequent Itemset Generation in FP-Growth Algorithm.
Cluster Analysis: Basic Concepts and Algorithms: -Overview: What is Cluster Analysis? Different Types of Clustering, Different Types of Clusters, -K-means: The Basic K-means Algorithm, K-means Additional Issues, Bisecting K-means, K-means and Different Types of Clusters, Strengths and Weaknesses, -Agglomerative Hierarchical Clustering: Basic Agglomerative Hierarchical Clustering Algorithm, Specific Techniques, -DBSCAN: Traditional Density (center based approach), The DBSCAN algorithm, Strengths and Weaknesses**.**

TEXT BOOKS:

1. Pang-Ning tan, Michael Steinbach, Vipin kumar, “Introduction to Data Minin”, Addision-Wesley.
2. Jiawei Han, Micheline Kamber, “Data Mining, Concepts and Techniques”, Elsevier, 2/e, 2006.

REFERENCE BOOKS:

1. Margaret H Dunham, “Data Mining: Introductory and Advanced Topics”, Pearson, 2008.
2. GK Gupta, “Introduction to Data Mining with Case Studies”, Prentice Hall.

3. Jarke, Lenzerini, Vassiliou, Vassiliadis, “Fundamentals of data warehouses”, 2/e, Springer.
4. Soman, Diwakar, Ajay, “Data Mining Theory and Practice", PHI, 2006.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc18_cs14
2. www.oracle.com/Data/Warehousing
3. www.databaseanswers.org/data_warehousing.html
4. https://www.wileyindia.com/data-warehousing-data-mining.html

III B.TECH I SEMESTER (PE-I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS5TH08	**COMPUTER GRAPHICS**						

COURSE OBJECTIVES:

- Provide foundation in graphics applications programming
- Introduce fundamental concepts and theory of computer graphics
- Give basics of application programming interface (API) implementation based on graphics pipeline approach

COURSE OUTCOMES:

At the end of this course student will be able to:

CO 1: Summarize graphics applications, architectures, and open GL program structure. [k2]
CO 2: Apply basic transformations on objects. [k3]
CO 3: Apply line and polygon clipping algorithms. [k3]
CO 4: Identify different projections. [k3]
CO 5: Design interactive programs using openGL. [k6]

SYLLABUS:

UNIT- I

Introduction: Applications of computer graphics; A graphics system; Images: Physical and synthetic; Imaging systems; the synthetic camera model; the programmer‟s interface; Graphics architectures. Graphics Programming: The Sierpinski gasket; Programming two- dimensional applications. The OpenGL API; Primitives and attributes; Color; Viewing; Control functions; The Gasket program.

UNIT- II

Input and Interaction: Interaction; Input devices; Clients and servers; Display lists; Display lists and modeling; Programming event-driven input; Menus; Picking; Animating interactive programs; Logic operations..

UNIT- III

Geometric Objects and Transformations: Scalars, points, and vectors; Three-dimensional primitives; Coordinate systems and frames; Modeling a colored cube; Affine transformations; Rotation, translation and scaling. Transformations in homogeneous coordinates; Concatenation of transformations; OpenGL transformation matrices.

UNIT- IV

Viewing: Classical and computer viewing; Viewing with a computer; Positioning of the camera; Simple projections; Projections in OpenGL; Parallel-projection matrices; Perspectiveprojection matrices.

UNIT- V

Implementation: Basic implementation strategies; Clipping; Cohen-Sutherland Line-segment clipping; Polygon clipping; Clipping of other primitives; Clipping in three dimensions; Rasterization; Bresenham‟s algorithm; Polygon rasterization.

TEXT BOOKS:

1. Interactive Computer Graphics A Top-Down Approach with OpenGL, Edward Angel, 5th Edition, Pearson, 2009.

2. Computer Graphics through OpenGL: From Theory to Experiments, Sumantha Guha, Chapman and Hall/CRC, 2011 (For OpenGL and related examples).

REFERENCE BOOKS:

1. Computer Graphics with OpenGL, Hearn & Baker, 3rd Edition, Pearson 2004.

2. Computer Graphics Using OpenGL, F.S. Hill, Jr, and M. Kelley, Jr., 3rd Edition, Pearson/PHI, 2009.

WEB REFERENCES:

1. https://nptel.ac.in/courses/106/103/106103224/
2. http://www.svecw.edu.in/Docs%5CCSECGLNotes2013.pdf
3. https://www.ncertbooks.guru/computer-graphics-notes/

III B.TECH I SEMESTER (PE-I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS5TH09	**SOFTWARE TESTING METHODOLOGY**						

COURSE OBJECTIVES:

- To study fundamental concepts in software testing, including software testing objectives, process, criteria, strategies, and methods.
- To discuss various software testing issues and solutions in software unit test; integration, regression, and system testing

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1: Outline the software testing terminology. [K2]
CO 2: Compare and contrast various behavioural testing methodologies. [K2]
CO 3: Summarize various dynamic testing techniques. [K2]
CO 4: Summarize the importance of validation activities. [K2]
CO 5: Interpret software testing and quality management. [K2]

SYLLABUS:

UNIT - I

Software Testing: Introduction, Evolution, Myths & Facts, Goals, Psychology, Definition, Model for testing, Effective Vs Exhaustive Software Testing, Software Failure Case Studies.
Software Testing Terminology and Methodology: Software Testing Terminology, Software Testing Life Cycle.

UNIT - II

Verification and Validation: Verification & Validation Activities, Verification, Verification of Requirements, High level and low level designs, How to verify and validate code.
Dynamic Testing I: Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table based testing, Cause-Effect Graphing based testing, Error guessing

UNIT - III

Dynamic Testing II: White-Box Testing: need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing, mutation testing
Static Testing: inspections, Structured Walkthroughs, Technical reviews

UNIT - IV

Validation activities: Unit testing, Integration Testing,. Function testing, system testing, acceptance testing

UNIT - V

Efficient Test Suite Management: Test case design, why does a test suite grow, minimizing the test suite and its benefits, test suite prioritization, Types of test case prioritization, prioritization techniques, measuring the effectiveness of a prioritized test suite

Software Quality Management: Software Quality metrics, SQA models

TEXT BOOKS:

1. Naresh Chauhan, “Software Testing, Principles and Practices”, Oxford
2. Aditya P Mathur, “Foundations of Software testing”, 2ed, Pearson
3. Yogesh Singh, “Software Testing”, CAMBRIDGE

REFERENCE BOOKS:

1. Baris Beizer, “Software testing techniques”, International Thomson computer press, second edition.
2. M G Limaye, “Software Testing, Principles, techniques and Tools”, TMH
3. Willian E Perry, “Effective Methods for Software testing”, 3ed, Wiley

ONLINE REFERENCES:

1. https://www.youtube.com/watch?v=IhA-EUEjyW0
2. https://www.youtube.com/watch?v=goaZTAzsLMk
3. https://freevideolectures.com/Course/3655/Software-Testing
4. https://www.youtube.com/watch?v=ASzlf-av4v4
5. http://srsstesting.com/

III B.TECH I SEMESTER (PE-I)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
CODE:19BCI5TH07	MICROPROCESSORS AND MULTICORE SYSTEMS						

COURSE OBJECTIVES:

- Learn how the hardware and software components of a microprocessor-based system
- Work together to implement system-level features.
- Learn both hardware and software aspects of integrating digital devices into microprocessor-based systems.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Interpret various building blocks of 8086 microprocessor. [K2]

CO 2: Make use of various instructions and assembler directives to develop programs on the target microprocessor. [K3]

CO 3: Make use of String instruction, various types of procedures and macros to develop programs on the target microprocessor. [K3]

CO 4: Analyze various types of interrupts and interrupt applications of 8086. [K4]

CO 5: Analyze the various basic building blocks of 8086, 80286, 80486 and Pentium Microprocessors. [K4]

SYLLABUS:

UNIT-I

Overview of microcomputer structure and operation-memory, input/output, central processing unit, address, data bus, control bus, hardware, software and firm ware, microprocessor evolution and types- microprocessor evolution, dedicated controllers, bit-slice processors and general processors, the 8086 microprocessor family-overview , 8086 internal architecture-the execution unit, the BIU, introduction to programming the 8086-programming languages, how the 8086 accesses immediate and register data, accessing data in memory.

8086 family assembly language programming: Program development steps- defining the problem, representing program operations, finding the right instruction.

UNIT-II

Implementing standard program structures in 8086 assembly language:

Simple sequence programs-finding the average of two numbers, converting two ASCII codes to packed BCD, jumps, flags and conditional jumps, if-then, if-then-else and multiple if-then-else programs, while-do programs, repeat-until programs, instruction timing and delay loops.

UNIT-III

Strings, procedures and macros:

The 8086 string instructions-introduction and operation, writing and using procedures-introduction, the 8086 CALL and RET instructions, writing and using assembler macros-macros and procedures compared, defining and calling a macro without parameters, passing parameters to macros.

8086 instruction descriptions and assembler directives:
Instruction descriptions, AAA, AAD, AAM, AAS, AND, CALL, CMO, DEC, HLT, assembler directives, ASSUME,DB, DD, DQ, DT, DW, END, ENDS, EVEN, EXTRN, GLOBAL, GROUP, LABEL, PROC.

UNIT-IV

8086 interrupts and interrupt applications:
8086 interrupts and interrupt responses-overview, an 8086 interrupt response example-Type 0, 8086 interrupt types, hardware interrupt applications- simple interrupt data input, using interrupt for counting and timing, 8259A priority interrupt controller- overview and system connections, 8259A system connections and cascading, initializing an 8259A, software interrupt applications.

UNIT-V

CPU: Architecture of Intel 80286 CPU- 80286 architecture, signals and system connections, 80286 real address mode operation, 80286 protected mode operation, 80286 new and enhanced instructions, 80486-Microprocessor, The Pentium Processor

TEXT BOOKS:

1. Microprocessors and Interfacing, Douglas V Hall, Revised Second Edition, Tata McGraw-Hill Publishing company limited, New Delhi.

REFERENCE BOOKS:

1. The Intel Microprocessors, Architecture, programming and interfacing, 8Edition, Barry Bray, Pearson.

WEB REFERENCES:

1. https://www.youtube.com/watch?v=xmJHxlKmyFY
2. https://www.youtube.com/watch?v=EbZdGsSkCNc
3. https://www.docsity.com/en/microprocessor-programming-8086-interrupts-and-interrupt-applications/30789/

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
CODE:19BCS5LB01	OS & UML LAB						

COURSE OBJECTIVES:

- To enlighten the student with knowledge base in Operating Systems and Compiler Design Applications.
- To learn importance of modelling in Software Development Life Cycle.
- To know about different diagrams and relationships.
- To develop a unified application for a system.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Apply various scheduling, page replacement and Deadlock avoidance algorithms for effective utilization of the CPU. [K3]
CO 2: Demonstrate various Memory Management Techniques. [K2]
CO 3: Build use case diagrams that specify requirements for a software system. [K3]
CO 4: Develop class diagrams that demonstrate design model of a software system. [K3]
CO 5: Make use of interaction diagrams to model the dynamic aspects of a software System. [K3]
CO 6: Develop various applications using unified modelling language. [K3]

LIST OF EXPERIMENTS

1. Simulate the following CPU scheduling algorithms.
   a) Round Robin b) SJF c) FCFS d) Priority
2. Simulate all file allocation strategies.
   a) Sequential b) Indexed c) Linked.
3. Simulate Bankers Algorithm for Dead Lock Avoidance and Prevention
4. Simulate all page replacement algorithms
   a) FIFO b) LRU c) LFU
5. Learning the usage of Rational Rose Software and different tools that are helpful to implement UML.
6. Create UML for Library Management system
7. Create UML for ATM system
8. Create UML for Online Railway Reservation system.
9. Create UML for Banking System.
10. Create UML for Student Information System.

REFERENCE BOOKS:

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7th Edition, John Wiley.

WEB REFERENCES:

1. https://www.udemy.com/uml-fundamentals/
2. https://www.youtube.com/watch?v=OkC7HKtiZC0&list=PLGLfVvz_LVvQ5G-LdJ8RLqe-ndo7QITYc
3. https://www.youtube.com/watch?v=RRXe1omEGWQ&list=PLD4EF3E3AD055F3C7

III B. TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
CODE:19BCS5LB02	ADVANCED JAVA AND WEB TECHNOLOGIES LAB						

COURSE OBJECTIVES:

- Gain the knowledge of Server side programming languages and techniques associated with the World Wide Web.
- Understand how to use Server side scripting for creating dynamic web pages.

COURSE OUTCOMES:

After the successful completion of this course, the students will be able to:

CO 1: Experiment with the installation of Web Servers. [K3]
CO 2: Make use of servlets in dynamic web pages. [K3]
CO 3: Develop web applications using JSP for effective data management. [K3]
CO 4: Construct the web based applications in PHP using effective data base access with rich client interaction. [K3]

LIST OF EXPERIMENTS

1. Install TOMCAT webserver and Apache- MySQL.
2. Write a servlet program which receives data from HTML forms and respond it.
3. Create one Servlet to retrieve "ServletContext Initialization Parameters " which you have given in the web.xml file.
4. Write a servlet program to authenticate four users using cookies.
5. Write a servlet that, on entry of a *student rollno*, displays the full details of that students details(Using student table with rollno,Name,Address,date of birth, course fields).
6. Write JSP program to register a student using registration form using student table.
7. Write JSP program for authenticating user by his password using login form. Create suitable tables.
8. Create table to store the details of book(book name, price, author, publisher) and extract data from table and display all books using JSP and JDBC.
9. Write PHP programs that uses arrays and functions in PHP.
10. Write example PHP program for creating login form and validate users.
11. Write example PHP program for to display all students in cse using student table.
12. Create tables in database which contains the details of book .Extract data from tables and display them using PHP.

WEB REFERENCES:

1. https://www.coursera.org/learn/html-css-javascript-for-web-developers
2. https://www.coursera.org/learn/web-applications-php
3. https://www.udemy.com/javawebtut/
4. https://www.coursera.org/learn/desenvolvimento-agil-com-java-avancado/lecture/LUXm0/criando-java-servlets.

III B. TECH I SEMESTER (PE-I LAB)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	3	20	30	50	1.5
Code: 19BCS5LB03	**DATA MINING LAB**						

COURSE OBJECTIVES:

- Exposure to real life data sets for analysis and prediction.
- Practical exposure on implementation of well-known data mining tasks.
- Learning performance evaluation of data mining algorithms in a supervised and an unsupervised setting.
- Handling a small data mining project for a given practical domain.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Apply data preprocessing techniques on the given data.[K3]
CO 2: Construct classification model for the given data.[k3]
CO 3: Identify Association Rules for the given data.[K3]
CO 4: Apply the clustering techniques on the given data.[K3]

LIST OF EXPERIMENTS

1. Demonstration of preprocessing on dataset student.arff
2. Demonstration of preprocessing on dataset labor.arff
3. Demonstration of Association rule process on dataset contactlenses.arff using apriori algorithm
4. Demonstration of Association rule process on dataset test.arff using apriori algorithm
5. Demonstration of classification rule process on dataset student.arff using j48 algorithm
6. Demonstration of classification rule process on dataset employee.arff using j48 algorithm
7. Demonstration of classification rule process on dataset employee.arff using id3 algorithm
8. Demonstration of classification rule process on dataset employee.arff using naïve bayes algorithm
9. Demonstration of clustering rule process on dataset iris.arff using simple k-means
10. Demonstration of clustering rule process on dataset student.arff using simple k-means

ONLINE REFERENCES:

1. https://weka.waikato.ac.nz/dataminingwithweka/preview
2. https://www.class-central.com/tag/weka

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	0	20	30	50	1
CODE:19BCS5MP01	MINI PROJECT						

COURSE OBJECTIVES:

- To offer students a glimpse into real world problems and challenges that need IT based solutions.
- To enable students to create very precise specifications of the IT solution to be designed.
- To enable students to use concepts of IT in creating a solution for a problem
- To improve the team building, communication and management skills of the students.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

CO 1: Apply practical knowledge gained within the chosen area of technology for project Development. [K3]

CO 2: Evaluate, analyze, formulate and handle programming projects with a comprehensive and systematic approach. [K5]

CO 3: Take part in as an individual or in a team in development of technical projects. [K4]

CO 4: Develop effective communication skills for presentation of project related activities.[K3]

The student will do Mini Project during Second year summer holidays and It will be evaluated at the end of III B.Tech first semester as per academic regulation. The main intention of Mini Project is to make student enable to apply the knowledge and skills learned out of courses studied and any other technology whatever he/she is interested to solve problem. The Mini Project may be beyond the scope of curriculum of courses taken or may be based on the courses but thrust should be on

- Learning additional skills
- Development of ability to define and design the problem and lead to its accomplishment with proper planning.
- Learn the behavioral science by working in a group

1. Batch Formation:

For the purpose of project work, II CSE students are divided into 3 groups namely A,B,C as per their total marks obtained up to II Year I Sem in descending order .Now from group A first student (say A1), from group B last student (say B1), from group C last student (say C1) are formed as one batch. This procedure is adopted for batch formation.

2. Guide Allotment:

Once batches are formed, Students can select their guide from list of faculty available depending on the domain of their project and interest. After guide accepted the project then abstract will be submitted to the coordinator and Head of Department.

3. Internal Evaluation of the Mini project

PRC will organize project seminar and final execution of the project. Out of 25 internal marks, 15 marks for execution of the project and 10 marks for project Presentation.

4. External Evaluation of Mini Project :

For external viva the evaluation committee consists of external examiner, guide & HOD. This viva is conducted for 50 marks.

III B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	0	0	0	0
CODE:19BCC5MC01	ADVANCED COMMUNICATION SKILLS						

COURSE OBJECTIVES:

- To train the students to use language effectively in professional situations like group discussions, public speaking, presentations and interviews.
- To make the students understand the importance of body language.
- To provide exposure to students to soft skills like Goal Setting, Assertiveness, Time Management, Positive Attitude and Stress Management
- To expose the students to SWOT Analysis, Interpersonal Skills, Intra Personal Skills, Leadership Qualities and Emotional Intelligence.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Compile emails, letters, reports and resume. **(Create-6)**
CO 2: Develop presentation Skills and make formal presentations using strategies. **(Apply 3)**
CO 3: Analyse problem solving skills effectively to participate in Group Discussions (**Analyze-4)**
CO 4: Build interview skills for employability. **(Apply -3)**

UNIT– I

Resume Writing, Email & Letter Writing

UNIT–II

Non Verbal Communication skills

UNIT–III

Personal Introduction & JAM

UNIT-IV

Group Discussion

UNIT-V

Interview skills

REFERENCE BOOKS:

1. Rajendra Pal, J S KorlahaHi, *Essentials of Business Communication*, Sultan Chand & Sons

2. Andrea J. Rutherford, *Basic Communication Skills for Technology*, Pearson Education Asia
3. V. Prasad, *Advanced Communication Skills*, Atma Ram Publications
4. Sanjay Kumar, Pushp Lata, *Communication Skills*, Oxford University Press
5. Meenakshi Raman, Sangeeta Sharma, *Fundamentals of Technical Communication*, Oxford University Press

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III B.TECH. – II SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCS6TH02	Artificial Intelligence	PC	40	60	100	3	-	-	3
2	19BCS6TH03	Cryptography and Network Security	PC	40	60	100	3	-	-	3
3	19BCC6TH01	Entrepreneurship and Innovation	HS	40	60	100	2	-	-	2
4		Open Elective – II	OE	40	60	100	3	-	-	3
5	19BCS6PE04 19BCS6PE05 19BCS6PE06 19BCS6PE07	Professional Elective – II a. Big Data Analytics b. Network Programming c. Agile with SCRUM d. Mobile Computing	PE	40	60	100	3	-	-	3
6	19BCS6LB01	Cryptography and Network Security Lab	PC	20	30	50	-	-	3	1.5
7	19BCS6LB02	PE-II LAB	PC	20	30	50	-	-	3	1.5
8	19BCS6LB03	R PROGRAMMING LAB	ES	20	30	50	-	-	3	1.5
9	19BCS6LB04	Artificial Intelligence Lab	HS	20	30	50	-	-	3	1.5
TOTAL										**20**

*** This lab covers experiments related to CNS and of the chosen PE-II**

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS6TH02	**ARTIFICIAL INTELLIGENCE**						

COURSE OBJECTIVES:

- Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic and learning.
- The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO1 : Summarize the characteristics of AI that make it useful to real-world problems. [K2]
CO2 : Analyse different search techniques and predicate logic in artificial Intelligence. [K4]
CO3 : Interpret knowledge representation and symbolic reasoning using different rules. [K2]
CO4 : Apply the basic knowledge on learning and reinforcement learning. [K3]
CO5 : Make use of the power of AI in Natural language processing as an advanced application of AI. [K3]

SYLLABUS

UNIT - I

Introduction to AI, Problems, Problem Spaces and Search: Defining the Problem as a State space Search, Production Systems, Problem Characteristics, Production system characteristics, Issues in the Design of Search Programs.

UNIT - II

Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis. **Knowledge Representation Using Predicate Logic:** Representing Simple Facts in logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution.

UNIT - III

Representing Knowledge Using Rules: Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning, Matching, Control Knowledge.
Weak slot-and-filler structures: Semantic Nets, Frames, **Strong slot-and-filler structures**: Conceptual dependency, Scripts

UNIT - IV

Learning: Rote learning, learning by taking advice, learning in problem solving,
Reinforcement Learning: Markov Decision Problem, Q-Learning, Q-Learning Algorithm, temporal difference Algorithm

UNIT – V

Natural Language Processing: Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural language Processing, Spell Checking, **Parallel and Distributed AI:** Parallelism in Reasoning Systems, Distributed Reasoning Systems

TEXT BOOKS:

1. Elaine Rich & Kevin Knight, "Artificial Intelligence", Tata McGraw Hill Edition, 3rd Edition, Reprint 2008.
2. Carl Townsend, "Introduction to TURBO PROLOG", BPB Publications. 2011
3. Tom M Mitchell, "Machine Learning", McGraw-Hill Science/Engineering/Math, 1997.

REFERENCE BOOKS:

1. Patrick Henry Winston, 'Artificial Intelligence', Pearson Education, 2003
2. Russel and Norvig, 'Artificial Intelligence', Pearson Education, PHI, 2003

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc21_cs21/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs22/preview
3. https://onlinecourses.nptel.ac.in/noc21_cs23/preview
4. https://onlinecourses.nptel.ac.in/noc21_cs24/preview

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS6TH03	**CRYPTOGRAPHY & NETWORK SECURITY**						

COURSE OBJECTIVES:

- The main objective of this course is to teach students to understand and how to address various software security problems in a secure and controlled environment.
- During this course the students will gain knowledge in various kinds of software security problems, and techniques that could be used to protect the software from security threats.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1 : Summarize the fundamentals of Cryptography. [K2]

CO2 : Analyze how security is achieved, and attacks can be countered by using symmetric/asymmetric algorithms. [K4]

CO3 : Apply Number Theoretic concepts in developing cryptographic algorithms to counter attacks. [K3]

CO4 : Interpret the role of hash functions and Digital Signatures in Information Security.[K2]

CO5 : Compare different network security designs using available secure solutions. [k2]

CO6 : Illustrate the use of encryption techniques to secure data in transit across data networks. [K2]

SYLLABUS:

UNIT-I

Introduction: Security Attacks-Passive Attacks, Active Attacks, Security Services-Authentication, Access control, Confidentiality, Integrity, Availability service, Nonrepudiation, Security Mechanisms- Specific Security Mechanisms, Pervasive Security Mechanisms, model for Network Security, Basics of Cryptography - Symmetric Cipher Model, Substitution Techniques- Caesar Cipher, Monoalphabetic Ciphers, Playfair Cipher, Hill Cipher, polyalphabetic Ciphers, One-Time pad. Transposition Techniques-rail fence, Block and Stream Ciphers.

UNIT-II

Symmetric Key Cryptography: Fiestel Cipher Structure, Block Cipher Design Principles-Design Criteria, Number of Rounds, Design of Function F, Data Encryption Standard (DES), Strength of DES, Triple DES, International Data Encryption algorithm(IDEA), AES-Structure, Transformation functions, Key Expansion, Block Cipher Modes of Operation-ECB, **CBC**, OFB,CFB,CTR Modes.

UNIT-III

Number Theory: Prime and Relatively Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorems-Proof and Examples, Euler's Totient Function, Primitive root and Discrete Logarithms.

Public Key Cryptography: Principles of Public key Cryptosystems-Public-Key Cryptosystems, Applications for Public-Key Cryptosystems, Requirements for Public-Key Cryptography, Public-Key Cryptanalysis, RSA Algorithm: Description of the Algorithm, The Security of RSA, Diffie-Hellman Key Exchange Algorithm, Elgamal encryption & decryption,

UNIT-IV

Cryptographic Hash Functions: Message Authentication Requirements and Functions-Message Encryption, Message Authentication Code, Hash Function, Message Authentication Codes (MAC)-Requirements, Hash Functions-Requirements, Applications of MAC and hash functions, Secure Hash Algorithm (SHA-512), HMAC.

Digital Signatures: Digital Signature Schemes, Authentication Protocols- Mutual Authentication, One-Way Authentication, Digital Signature Standards-The DSS Approach, The digital Signature Algorithm.

UNIT-V

Authentication Applications: Kerberos: Motivation, Version 4, X.509 Directory Authentication service, E-Mail, PGP, S/MIME.

Web Security: Web Security Considerations, Secure Sockets Layer- SSL Architecture, SSL Record Protocol, Change Cipher Spec Protocol, Alert Protocol, Handshake Protocol, Transport Layer Security, Secure Electronic Transactions (SET), Firewalls.

TEXTBOOKS:

1. William Stallings, "Cryptography and Network Security: Principles and Practice", Pearson Education, 6th Edition, 2011.
2. Chwan Hwa Wu, J.David Irwin, "Introduction to Computer Networks & Cyber Security", CRC Press, 2013.

REFERENCE BOOKS:

1. Eric Maiwald, "Fundamentals of Network Security", Dreamtech press.
2. Withman , Thomson, "Principles of Information Security".
3. Buchmann, Springer, "Introduction to Cryptography".
4. Bruce Schneier, Johnwiley&Sons, "Applied Cryptography", 2nd Edition.
5. Benard Menezes, "Network Security Essentials and Cryptography", Cengage Learning,2011.
6. Behrouz A.Fourouzan and Debdeep Mukhopadhyay, "Cryptography and Network, 2nd Edition", McGraw-Hill, 2010.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc18_cs07/preview
2. https://www.coursera.org/learn/cryptography
3. https://www.coursera.org/specializations/computer-network-security
4. https://www.youtube.com/watch?v=Q-HugPvA7GQ&list=PL71FE85723FD414D7

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	2	0	0	40	60	100	2
Code: 19BCC6TH01	**ENTREPRENEURSHIP & INNOVATION**						

COURSE OBJECTIVES:

- Creating awareness among the students about the significance of entrepreneurship and its social relevance.
- Imparting knowledge to the students on institutional support available to start a business venture
- To understand the significance of entrepreneurial training in the development of new and existing entrepreneurs

COURSE OUTCOME

CO1 : : Outline the concepts of Entrepreneurship.[K2]
CO2 : : Create the awareness on creativity and innovation.[K6]
CO3 : : Adopt the Entrepreneurship Development programs[K6]
CO4 : : Evaluate the project planning and feasibility studies.[K5]
CO5 : : Analyze the concept of small and micro enterprises.[K4]

SYLLABUS:

UNIT –I

ENTREPRENEUR AND ENTREPRENEURSHIP

Entrepreneur – Definitions, concept of entrepreneur, characteristics of entrepreneur, types of entrepreneurs, concept of entrepreneurship, characteristics of entrepreneurship, role of entrepreneurship in economic development, ethics and social responsibilities of an entrepreneur, Financial institutional support to entrepreneurs(IDBI,SISI,DIC,NIESBUD, Commercial banks etc.,

UNIT-II

CREATIVITY AND INNOVATION IN ENTREPRENEURSHIP

Meaning and concept of creativity - Nature and characteristics of creativity -Creativity Process- Factors affecting creativity - Meaning and Importance Innovation - Process - Distinguish the Creativity and Innovation.

UNIT –III

ENTREPRENEURSHIP DEVELOPMENT PROGRAMMES

Designing Appropriate Training Programme to inculcate Entrepreneurial Spirit -Training for Entrepreneurs, Entrepreneurship Development Programme (EDP) – Need and objectives of

EDP's -Phases and evolution on EDP's existing and new Entrepreneurs.

UNIT –IV

PROJECT PLANNING AND FEASIBILITY STUDIES

Meaning of a project, Project identification – Sources of new Ideas, Methods of generating ideas, Project selection**,** - Project Feasibility Study -Project evaluation and Techniques (PBP, ARR, NPV, IRR & PI).

UNIT –V

SMALL AND MICRO ENTERPRISES

Importance, definitions, MSME's Development Act 2006 – policies and their support to MSMEs - Growth of Firm and growth strategies, Factors inducing growth – sickness in small business and remedies.

TEXT BOOKS:

1. Arya Kumar , "Entrepreneurship", Pearson, Publishing House, New Delhi, 2012.
2. VSP Rao, Kuratko, "Entrepreneurship', Cengage Learning, New Delhi,2012
3. ShoimoMaital, DVR Seshadri, "Innovation Management", Response Books 2007

REFERENCE BOOKS:

1. B.Janakiram, M Rizwana , "Entrepreneurship Development", Excel Books, ND, 2011
2. P.C.Shejwalkar , "Entrepreneurship Development", Everest Publishing House, ND, 2011
3. Vinnie Jauhari& Sudhanshu Bhushan, "Innovation Management". Oxford University Press, 2014.

WEB REFERENCES:

1. https://www.sciencedirect.com/science/article/abs/pii/S0362331900000604
2. https://www.emerald.com/insight/content/doi/10.1108/ET-02-2013-0018/full/html
3. https://openpress.usask.ca/entrepreneurshipandinnovationtoolkit/chapter/chapter-9-innovation-and-entrepreneurship/

III B.TECH II SEMESTER (PE – II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS6PE04	**BIG DATA ANALYTICS**						

COURSE OBJECTIVES:

- Introducing Java concepts required for developing map reduce programs.
- Optimize business decisions and create competitive advantage with Big Data analytics.
- Derive business benefit from unstructured data.
- Imparting the architectural concepts of Hadoop and introducing map reduce paradigm.
- To introduce programming tools PIG & HIVE in Hadoop echo system.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Interpret the architectural elements of big data and Hadoop framework. [K2]
CO 2: Analyse various big data applications using map reduce programming module. [K4]
CO 3: Analyse Spark capabilities such as distributed datasets, in-memory caching, and the interactive shell. [K4]
CO 4: Summarize Spark's powerful built-in libraries, including Spark SQL, Spark Streaming. [K2]
CO 5: Analyze Hadoop data with PIG and Hive. Interpret the applications and architecture of Mobile Computing and multiplexing techniques. [K4]

SYLLABUS:

UNIT– I

Starting Hadoop: -Google File System, -The building blocks of Hadoop: Namenode, Datanode, Secondary Namenode, JobTracker, TaskTracker. -Setting up SSH for a Hadoop cluster: Define a common account, Verify SSH installation, Generate SSH key pair, Distribute public key and validate logins. - Running Hadoop: Local (standalone) mode, Pseudo-distributed mode, Fully distributed mode.

UNIT–II

MapReduce: -A Weather Dataset: Data Format, -Analyzing the Data with Hadoop: Map and Reduce, Java MapReduce: A test run, The old and the new Java MapReduce APIs.
Basic programs of Hadoop MapReduce: Driver code, Mapper code, Reducer code, RecordReader, Combiner, Partitioner.

UNIT–III

Programming with RDDs: What Is Apache Spark, RDD Basics, Creating RDDs, RDD Operations, Passing Functions to Spark, Common Transformations and Actions, Persistence (Caching).

UNIT-IV

Pig: Hadoop Programming Made Easier: -Admiring the Pig Architecture, -Going with the Pig Latin Application Flow, -Working through the ABCs of Pig Latin: Uncovering Pig Latin structures, Looking at Pig data types and syntax. -Evaluating Local and Distributed Modes of Running Pig Scripts, -Checking out the Pig Script Interfaces, -Scripting with Pig Latin

UNIT-V

Applying Structure to Hadoop Data with Hive: -Saying Hello to Hive, -Seeing How the Hive is Put Together, -Getting Started with Apache Hive, -Examining the Hive Clients: The Hive CLI client, The web browser as Hive client, SQuirreL as Hive client with the JDBC Driver. -Working with Hive Data Types, -Creating and Managing Databases and Tables: Managing Hive databases, Creating and managing tables with Hive. -Seeing How the Hive Data Manipulation Language Works: LOAD DATA examples, INSERT examples, Create Table As Select (CTAS) examples. Querying and Analyzing Data: Joining tables with Hive, Improving your Hive queries with indexes, Windowing in HiveQL, Other key HiveQL features.

TEXT BOOKS:

1. Tom White, “Hadoop: The Definitive Guide” 3rd Edition, O’Reilly Media.
2. Matei Zaharia, Holden Karau, Andi Konwinski, Patric Wendell, Learning Spark, O’Reilly Media,2015.
3. by Chuck Lam, “Hadoop in Action” MANNING Publ.
4. Dirk deRoos, Paul C.Zikopoulos, Roman B.Melnyk,Bruce Brown, Rafael Coss, “Hadoop for Dummies”

REFERENCE BOOKS:

1. Alex Holmes, “Hadoop in Practice”, MANNING Publ.
2. Srinath Perera, “Hadoop MapReduce Cookbook”, Thilina Gunarathne

WEB REFERENCES:

1. https://www.edx.org/learn/big-data
2. https://www.edureka.co/big-data-and-hadoop

III B.TECH II SEMESTER (PE – II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS6PE05	**NETWORK PROGRAMMING**						

COURSE OBJECTIVES:

- Demonstrate mastery of main protocols comprising the Internet.
- Develop skills in network programming techniques.
- Implement network services that communicate through the Internet.
- Apply the client server model in networking applications.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO 1: Summarize the characteristics of Networking and OSI Reference model. [K2]

CO 2: Illustrate TCP and UDP sockets. [K2]

CO 3: Develop knowledge of client server programing. [K3]

CO 4: Apply the basic knowledge socket programming. [K3]

CO 5: Interpret power of UDP sockets in network programming. [K2]

SYLLABUS:

UNIT - I

Introduction to Network Programming: 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

UNIT - II

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 - III

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 Serverhost.

UNIT - IV

I/O Multiplexing and socket options: I/O Models, select function, Batch input, shutdown function, poll function, TCP Echo server, getsockopt and setsockopt functions.

UNIT – V

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.

TEXT BOOKS:

1. W.Richard Stevens, “UNIX Network Programming, Vol. I”, Sockets API, 2nd Edition. – PearsonEdn. Asia.
2. W.Richard Stevens, “UNIX Network Programming”, 1st Edition, –PHI.

REFERENCE BOOKS:

1. T CHAN , “UNIX Systems Programming using C++”, PHI.
2. Graham GLASS, King abls, “UNIX for Programmers and Users”, 3rd Edition, Pearson Education
3. M. J. ROCHKIND, “Advanced UNIX Programming” 2nd Edition, Pearson Education

WEB REFERENCES:

1. https://www.youtube.com/watch?v=FGdiSJakIS4
2. https://www.youtube.com/watch?v=BqBKEXLqdvI
3. https://www.studytonight.com/network-programming-in-python/introduction-to-network-programming.
4. https://www.geeksforgeeks.org/tag/c-network-programming/

III B.TECH II SEMESTER (PE – II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS6PE06	AGILE WITH SCRUM						

COURSE OBJECTIVES:

- To understand this fundamentals of Agile.
- To build a Agile Scrum Frame work
- To apply the concept of Agile Frame Work into the Industry

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Outline the concepts of Agile. [K2]
CO 2: Analyze the requirements, specifications to design Agile Scrum Framework. [K4]
CO 3: Summarize the benefits of different tools of Agile Testing. [K2]
CO 4: Illustrate the Agile practices with respective principles to design and development. [K2]
CO 5: Apply the Agile scenarios in terms of industry trends. [K3]

SYLLABUS:

UNIT-I

Fundamentals of Agile: The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools (6)

UNIT-II

Agile Scrum Framework: Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management . (8)

UNIT-III

Agile Testing: The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester. (8)

UNIT-IV

Agile Software Design and Development: Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control. (10)

UNIT-V

Industry Trends Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile projects on Cloud, Balancing Agility with Discipline, Agile rapid development technologies. (4)

TEXT BOOKS:

1. Ken Schawber, Mike Beedle , "Agile Software Development with Scrum", Pearson
2. Agile Software Development, Principles, Patterns and Practices By Robert C. Martin Publisher: Prentice Hall

REFERENCE BOOKS:

1. Lisa Crispin, Janet Gregory, "Agile Testing: A Practical Guide for Testers and Agile Teams", Addison Wesley
2. Alistair Cockburn, "Agile Software Development: The Cooperative Game", Addison Wesley
3. Mike Cohn, "User Stories Applied: For Agile Software".

WEB REFERENCES:

1. https://www.youtube.com/watch?v=ZLrJVksmVfs
2. https://ocw.mit.edu/courses/comparative-media-studies-writing/cms-611j-creating-video-games-fall-2014/lecture-videos/lecture-5-agile-software-development/
3. https://freevideolectures.com/course/3679/pmi-acp/8
4. https://www.youtube.com/watch?v=5E4O4NQCb68

III B.TECH II SEMESTER (PE-II)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS6PE07	**MOBILE COMPUTING**						

COURSE OBJECTIVES:

- To make the student understand the concept of mobile computing paradigm, its applications and limitations.
- To understand the typical mobile networking infrastructure through GSM
- To understand the issues and solutions of various layers of mobile networks, namely MAC layer, Network Layer & Transport Layer
- To understand the ad hoc networks and related concepts.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Interpret the applications and architecture of Mobile Computing and multiplexing Techniques. [K2]
CO 2: Analyze the Mobile IP issues. [K4]
CO 3: Analyze the various Mobile TCP Variants. [K4]
CO 4: Analyze the various routing protocols in MANET. [K4]

SYLLABUS:

UNIT–I

Mobile Computing: Architecture of Mobile Computing, Mobile Computing Applications, Limitations of Mobile Computing
GSM: Services, System Architecture, Radio Interfaces, Protocols, Localization& Calling, Handover, Security, New Data Services, GPRS.

UNIT–II

(Wireless) Medium Access Control (MAC): Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals), SDMA, FDMA, TDMA, CDMA.

UNIT–III

Mobile Network Layer: Mobile IP- Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunnelling and encapsulation, optimizations, Dynamic Host Configuration Protocol (DHCP).

UNIT-IV

Mobile Transport Layer : Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

UNIT-V

Mobile Ad hoc Networks (MANETs): Introduction, Characteristics, Applications & Challenges of a MANET, Routing - Proactive, Reactive and Hybrid Routing Algorithms (DSR, AODV, DSDV, OLSR & ZRP).

TEXT BOOKS:

1. Jochen Schiller, "Mobile Communications", Addison-Wesley, 2nd edition, 2004.
2. Rajkamal, "Mobile computing" Second Edition ,Oxford University Press

REFERENCE BOOKS:

1. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002, ISBN 0471419028.
2. Adelstein, Frank, Gupta, Sandeep KS, Richard III, Golden ,Schwiebert, Loren, "Fundamentals of Mobile and Pervasive Computing", ISBN: 0071412379, McGraw-
Hill Professional, 2005.
3. Hansmann, Merk, Nicklous, Stober, "Principles of Mobile Computing", Springer, second edition, 2003.
4. MartynMallick, "Mobile and Wireless Design Essentials", Wiley DreamTech, 2003

WEB REFERENCES:

1. URL: https://www.youtube.com/watch?v=ohhdNRtDpCY

E-BOOKS:

1. https://www3.nd.edu/~cpoellab/teaching/cse40814/Lecture1-Handouts.pdf

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	-	-	2	20	30	50	1.5
Code: 19BCS6LB01	CRYPTOGRAPHY AND NETWORK SECURITY LAB						

COURSE OBJECTIVES:

- Learn to implement the algorithms DES, RSA, MD5,SHA-1
- Learn to use network security tools like GnuPG, KF sensor, Net Strumbler

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Analyse security concepts and type of attacks and network security algorithms. [K4]
CO2: Apply symmetric and asymmetric key cryptography technique to encrypt and decrypt text. [K4]
CO3: Apply Cryptography Hash Function for message authentication and to solve other applications. [K3]

List of Programs

1. Write a program that contains a string (char pointer) with a value 'Hello World'. The program should AND or and XOR each character in this string with 127 and display the result
2. Implement the Caesar Cipher substitution technique.
3. Implement the Playfair Cipher substitution technique.
4. Implement the Hill Cipher substitution technique.
5. Implement the Vigenere Cipher substitution technique.
6. Implement the Rail fence (row & Column Transformation) Transposition Technique.
7. Implement Data Encryption Standard (DES) Symmetric Encryption Algorithm.
8. Implement RSA Public Key Encryption Algorithm
9. Implement Diffie- Hellman Key Exchange Public Key Encryption Algorithm

ADDITIONAL PROGRAMS

- use network security tools like GnuPG, KF sensor, Net Strumbler

TEXT BOOKS

1. William Stallings "Cryptography and Network Security Principles and Practice", 6th Edition, Pearson Publications.

WEB REFERENCES

1. http://kgr.ac.in/beta/wp-content/uploads/2018/09/NS-CRYPTO-LAB-Final.pdf
2. https://www.vvitengineering.com/lab/odd/CS6711-Security-Lab-Manual.pdf
3. https://btech.mit.asia/files/btech/departments/cse/Labmanuals/cns-manual-no-source-code.pdf

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
Code: 19BCS6LB02	**BIG DATA ANALYTICS LAB**						

COURSE OBJECTIVES:

- Introducing Java concepts required for developing map reduce programs.
- Optimize business decisions and create competitive advantage with Big Data analytics.
- Derive business benefit from unstructured data.
- Imparting the architectural concepts of Hadoop and introducing map reduce paradigm.
- To introduce programming tools PIG & HIVE in Hadoop echo system.

COURSE OUTCOMES:

After successful completion of the course, student will be able to:

CO 1: Experiment with installation of Hadoop and develop applications using MapReduce framework. [K3]
CO 2: Experiment with installation of Spark and develop applications. [K3]
CO 3: Analyze Hadoop data with PIG. [K4]
CO 4: Develop NoSQL structures like Hive for processing and aggregating logs in the database. [K3]

LIST OF EXPERIMENTS

1. (i) Perform setting up and Installing Hadoop in its three operating modes: Standalone, Pseudo distributed, and fully distributed mode.
   (ii) Use web based tools to monitor your Hadoop setup.
2. Implement the following file management tasks in Hadoop:
   - Adding files and directories
   - Retrieving files
   - Deleting files

   Hint: A typical Hadoop workflow creates data files (such as log files) elsewhere and copies them into HDFS using one of the above command line utilities.
3. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
4. Write a Map Reduce program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis with MapReduce, since it is semi structured and record-oriented.
5. (i) Perform setting up and Installing SPARK.
   (ii)Use web based tools to monitor your SPARK setup.
6. Run a basic Word Count Map Reduce program using SPARK.
7. Write a SPARK program that mines weather data. Weather sensors collecting data every hour at many locations across the globe gather a large volume of log data, which is a good candidate for analysis, since it is semi structured and record-oriented.
8. Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.
9. Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes

WEB REFERENCES:

1. http://hadoop.apache.org/
2. https://cwiki.apache.org/confluence/display/Hive/Home
3. http://pig.apache.org/docs/r0.7.0/tutorial.html

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
Code: 19BCS6LB03	**R PROGRAMMING LAB**						

COURSE OBJECTIVES:

- To make the student to get a clear understanding of the core concepts of R like import data in various formats for statistical computing, data manipulation, business analytics etc.
- To implement various functions, data structures.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Apply the all basic operators on various data types.[K3]
CO 2: Develop programs using Conditional Statements and various types of loops.[K3]
CO 3: Develop programs using Matrices, Lists and Frames.[K3]
CO 4: Develop programs using Functions, Math functions and Statistical functions in R.[K3]
CO 5: Analyze the real word datasets presented in different formats using R libraries to perform exploratory data analysis and visualization.[K3]

LIST OF EXPERIMENTS

EXERCISE 1:

a) Write a program to illustrate basic Arithmetic in R
b) Write a program to illustrate Variable assignment in R
c) Write a program to illustrate data types in R

EXERCISE 2:

a) Write a program to illustrate if-else-else if in R
b) Write a Program to illustrate While and For loops in R
c) Write a program to illustrate Logical & and Logical | operators in R.

EXERCISE 3:

a) Write a program to illustrate creating and naming a vector in R
b) Write a program to illustrate create a matrix and naming matrix in R
c) Write a program to illustrate Add column and Add a Row in Matrix in R
d) Write a program to illustrate Selection of elements in Matrixes in R
e) Write a program to illustrate Performing Arithmetic of Matrices

EXERCISE 4:

a) How to Create a Matrix in R
b) Print dimension of the matrix with dim()
c) Construct a matrix with 5 rows that contain the numbers 1 up to 10 and byrow = FALSE
d) Print dimension of the matrix with dim()
e) Add a Column to a Matrix with the cbind()
f) Slice a Matrix
g) Write a program to illustrate Compare Matrices and Compare vectors

EXERCISE 5:

a) Write a program to illustrate Factors in R
b) Case study of why you need use a Factor in R
c) Write a program to illustrate Ordered Factors in R

EXERCISE 6:

a) How to Create a Data Frame
b) Slice Data Frame
c) Append a Column to Data Frame
d) Select a Column of a Data Frame
e) Subset a Data Frame
f) Write a program to illustrate Data Frame Selection of elements in a Data frame
g) Write a program to illustrate Sorting a Data frame
h) Merge Data Frames in R: Full and Partial Match

EXERCISE 7:

a) Write a program to illustrate List ? Why would you need a List
b) Write a program to illustrate Adding more elements into a List

EXERCISE 8:

a) Write a program to illustrate Function inside function in R
b) Write a program to illustrate some built in Mathematical Functions.
c) Write a program to calculate mean, mode, SD, variance.

EXERCISE 9:

Cleaning data in R:

a) Characteristics of Clean Data and Messy Data
b) Load Data into R with readxl
c) View the Data with tidyr::glimpse()
d) Looking to Data Types
e) Comparing to read.csv()
f) Combining Datasets
g) Clean Up Column Names with magrittr Magic!
h) The Pipe Operation

EXERCISE 10:

Data visualization in R:

a) Histogram
b) Bar / Line Chart
c) Box plot
d) Scatter plot
e) Heat Map
f) Mosaic Map
g) Map Visualization
h) 3D Graphs
i) Correlogram
j) Write a program to illustrate Customizing and Saving to Graphs in R.

TEXT BOOKS:

1. Robert I. Kabacoff, R in Action-Data analysis and graphics with R, 2e, Manning Publications
2. David Dietrich, Barry Heller, and Beibei Yang, Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services, John Wiley & Sons, Inc.

REFERENCE BOOKS:

1. Garrett Grolemund, Hands-On Programming with R, Orielly. 2. Paul Teetor, R Cookbook, O'Reilly

WEB REFERENCES:

1. https://rpubs.com/
2. https://b-ok.asia/ireader/2604048
3. https://d1b10bmlvqabco.cloudfront.net/attach/ighbo26t3ua52t/igp9099yy4v10/igz7vp4w5su9/OReilly_HandsOn_Programming_with_R_2014.pdf
4. https://www.guru99.com/r-matrix-tutorial.html
5. https://www.guru99.com/r-data-frames.html
6. https://www.guru99.com/r-sort-data-frame.html
7. https://www.guru99.com/r-dplyr-tutorial.html
8. https://www.guru99.com/r-merge-data-frames.html
9. https://www.guru99.com/r-functions-programming.html
10. https://www.dataquest.io/blog/load-clean-data-r-tidyverse/
11. https://www.analyticsvidhya.com/blog/2015/07/guide-data-visualization-r/

III B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
Code: 19BCS6LB04	**ARTIFICIAL INTELLIGENCE LAB**						

COURSE OBJECTIVES:

- To make the student to get a clear understanding of the core concepts of preprocessing techniques, classification and regression techniques using python.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Apply various preprocessing Techniques on the given data.[K3]
CO 2: Construct regression models for a given data.[K3]
CO 3: Build classification models for a given data.[K3]

LIST OF EXPERIMENTS

1. Apply Binarization data pre-processing technique on sample data.
2. Apply Mean Removal data pre-processing technique on sample data.
3. Apply Min and Max scaling on sample data.
4. Apply normalization data pre-processing technique on real estate data.
5. How to encode the labels and show the performance of encoded labels.
6. Using Pandas perform the following
   a. Handling.
   b. Slicing.
   c. Extracting statistics from Time Series Data.
7. Use the sklearn package and implement classification.
8. Using python program build a Linear Regression.
9. Laboratory Equipment/Software/Tools Required

Open source scripting language, Python IDLE, Anaconda

TEXT BOOKS:

1. Aurélien Géron, “Handson machine learning with scikit learn and tensorflow”

IV B.TECH. – I SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCS7TH01	Machine Learning	PC	40	60	100	3	-	-	3
2	19BCS7PE02 19BCS7PE03 19BCS7PE04 19BCS7PE05	Professional Elective – III a. Data Science b Cloud Computing c. Digital Forensics d. DevOps	PE	40	60	100	3	-	-	3
3		Open Elective – III	OE	40	60	100	3	-	-	3
4		Open Elective – IV	OE	40	60	100	3	-	-	3
5	19BCS7PE06 19BCS7PE07 19BCS7PE08 19BCS7PE09	Professional Elective – IV a. Design patterns b. Mobile Adhoc and Sensor Networks c. Human Computer Interaction d. Block Chain Technologies	PE	40	60	100	3	-	-	3
6	19BCS7LB02	Machine Learning Lab	PC	20	30	50	-	-	3	1.5
7	19BIT7LB01	PE-III LAB	PC	20	30	50	-	-	3	1.5
8		Internship/ Practical Training	PR	50	-	50	-	-	-	1
9	19BCS6MOOC	MOOCS	PE	-	-	-	-	-	-	1
10		Skill Lab	PR	20	30	50	-	-	3	1.5
TOTAL										**21.5**

IV B. TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS7TH01	**MACHINE LEARNING**						

COURSE OBJECTIVES:

- To understand how machine learning algorithms are evaluated.
- To be Familiar with a set of well-known supervised, unsupervised and semi-supervised learning algorithms.
- To be able to implement some basic machine learning algorithms.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Summarize the characteristics of Machine Learning that make it useful to real-world Problems. [K2]
CO 2: Outline the need and importance of pre-processing techniques and apply them. [K2]
CO 3: Evaluate and compare the performance of different unsupervised algorithms for typical learning problems and apply them. [K5]
CO 4: Analyze the performance of Association Rules. [K4]
CO 5: Evaluate and compare the performance of different supervised algorithms for typical learning problems and apply them. [K5]

SYLLABUS

UNIT– I

Supervised Learning: Learning a Class from Examples, Vapnik Chervonenkis (VC) Dimension, Probably Approximately Correct (PAC) Learning, Noise, Learning Multiple Classes, Regression, Model Selection and Generalization, Dimensions of a Supervised Machine Learning Algorithm Bayesian Decision Theory: Classification, Losses and Risks, Discriminant Functions, Utility Theory, Association Rules

UNIT–II

Parametric Methods: Maximum Likelihood Estimation, Evaluating an Estimator: Bias and Variance, The Bayes' Estimator, Parametric Classification, Regression, Tuning Model Complexity: Bias/Variance Dilemma, Model Selection Procedures

UNIT–III

Dimensionality Reduction: Subset Selection, Principal Components Analysis, Factor Analysis, Multidimensional Scaling, Linear Discriminant Analysis Association learning: Basics of Association, Apriori Algorithm, Eclat Algorithm, FP Growth Algorithm with examples, SCADA application with FP Growth Algorithm

UNIT-IV

Unsupervised Learning: Expectation Maximization, Self-Organizing Maps(SOM),learning Process in SOM, Algorithm: SOM, Adaptive Resonance Theory. Clustering: k-Means Clustering, Expectation-Maximization Algorithm, Supervised Learning after Clustering,

Fuzzy Clustering, Document Clustering example, Hierarchical Clustering, Choosing the Number of Clusters

UNIT-V

Decision Trees: Univariate Trees, Pruning, Rule Extraction from Trees, Learning Rules from Data. Random Forest: basic Principle, Decision Tree vs random Forest, Random Forest Algorithm with Example

TEXT BOOKS:

1. Ethem Alpaydin, "Introduction to Machine Learning", The MIT Press, 2010
2. Artificial Intelligence and Machine Learning, by Vinod Chandra PHI Learning.
3. Aurélien Géron, "Handson machine learning with scikit learn and tensorflow" O'REILLY

REFERENCE BOOKS:

1. Stephen Marsland, "Machine Learning an Algorithmic Perspective", CRC Press, 2009.

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc21_cs22/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs23/preview
3. https://onlinecourses.nptel.ac.in/noc21_cs24/preview
4. https://onlinecourses.nptel.ac.in/noc21_cs51/preview

IV B.TECH I SEMESTER (PE-III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS7PE02	**DATA SCIENCE**						

COURSE OBJECTIVE:

- This course provides a comprehensive knowledge of data science and analytics techniques using Python. With this students will learn the essential concepts of Python programming and gain deep knowledge in data analytics and data visualization.

COURSE OUTCOMES:

After completion of this course, the students will be able to:
CO 1: Apply principles of NumPy and Pandas to the analysis of data. [K3]
CO 2: Make use of various file formats in loading and storage of data. [K3]
CO 3: Identify and apply the need and importance of pre-processing techniques [K3].
CO 4: Analyze the results and present them in a pictorial format [K2].
CO 5: Apply Data aggregation commands and filling missing value methods [K3]

SYLLABUS:

UNIT-I

What is Data science?, The Data science process, A data scientist role in this process, NumPy Basics:The NumPy ndarray: A Multidimensional Array Object(Creating ndarrays ,Data Types for ndarrays,Operations between Arrays and Scalars, Basic Indexing and Slicing, Boolean Indexing, FancyIndexing), Data Processing Using Arrays(Expressing Conditional Logic as Array Operations ,Methods for Boolean Arrays , Sorting , Unique)

UNIT-II

Getting Started with pandas: Introduction to pandas, Library Architecture, Features, Applications, Data Structures(Series, DataFrame, Index Objects), Essential Functionality(Reindexing, Dropping entries from an axis, Indexing, selection, and filtering), Sorting and ranking, Summarizing and Computing Descriptive Statistics(Unique Values, Value Counts), Handling Missing Data.

UNIT-III

Data Loading, Storage, and File Formats : Reading and Writing Data in Text Format(Reading Text Files in Pieces, Writing Data Out to Text Format, Manually Working with Delimited Formats, JSON Data, XML and HTML: Web Scraping), Binary Data Formats(Using HDF5 Format, Reading Microsoft Excel Files),Interacting with HTML and Web APIs, Interacting with Databases(Storing and Loading Data in MongoDB).

UNIT-IV

Data Wrangling: Clean, Transform, Merge, Reshape:Combining and Merging Data Sets(Database-style DataFrame Merges, Merging on Index, Concatenating Along an Axis,

Combining Data with Overlap), Reshaping and Pivoting(Reshaping with Hierarchical Indexing, Pivoting "long" to "wide" Format), Data Transformation(Removing Duplicates, Transforming Data Using a Function or Mapping, Replacing Values, Renaming Axis Indexes, Discretization and Binning, Detecting and Filtering Outliers)
Plotting and Visualization: A Brief matplotlib API Primer (Figures and Subplots,Colors, Markers, and Line Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File), Plotting Functions in pandas (Line Plots, Bar Plots, Histograms and Density Plots, Scatter Plots)

UNIT-V

Data Aggregation and Group Operations: GroupBy Mechanics(Iterating Over Groups, Selecting a Column or Subset of Columns, Grouping with Dicts and Series, Grouping with Functions, Grouping by Index Levels) Data Aggregation(Column-wise and Multiple Function Application, Returning Aggregated Data in "unindexed" Form), Group-wise Operations and Transformations(Apply: General split-apply-combine, Quantile and Bucket Analysis, Example: Filling Missing Values with Group-specific Values, Example: Random Sampling and Permutation, Example: Group Weighted Average and Correlation, Example: Group-wise Linear Regression)

TEXT BOOKS:

1. Wes McKinney, "Python for Data Analysis", O'REILLY, ISBN: 978-1-449-31979-3, 1st edition, October 2012.

REFERENCE BOOKS:

1. Rachel Schutt & O'neil, "Doing Data Science", O'REILLY, ISBN:978-1-449-35865-5, 1st edition, October 2013.
2. Joel Grus, "Data Science from Scratch", O'REILLY, 1st edition, April 2015

WEB REFERENCES:

1. https://www.greatlearning.in/
2. https://onlinecourses.nptel.ac.in/noc20_cs62/
3. https://nptel.ac.in/noc/courses/noc20/SEM2/noc2

IV B.TECH I SEMESTER (PE-III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS7PE03	**CLOUD COMPUTING**						

COURSE OBJECTIVES:

- To gain knowledge about virtualization and Virtual Machines
- To familiarize Cloud Computing and its services

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Interpret various types of Virtualization.[K2]

CO2: Outline the Cloud Computing Architectures and Models.[K2]

CO3:Analyze the Cloud Infrastructure Management and Migration and Disaster Management in Cloud.[K4]

CO4: Analyze AWS and MS Azure services.[K4]

UNIT-I:

Overview of Cloud Computing: Essentials of Cloud Computing, History of Cloud Computing, Business and Information, Benefits of Cloud Computing, Limitations of Cloud Computing, Characteristics of Cloud Computing, How to Develop Cloud Infrastructure, Vendors of Cloud Computing.

UNIT-II:

Introduction to virtualization and virtual machine: Types of virtualization: Server virtualization, Application/ desktop virtualization, client virtualization, storage virtualization, Network virtualization service / application infrastructure virtualization, virtual machines & virtualization middleware.

Cloud Computing Architecture: Grid Framework Overview, Grid Architecture, Cloud Computing Architecture, Key Design Aspects of Cloud Architecture, Cloud Services, and Cloud Applications, Similarities and Differences Between Grid and Cloud Computing, Cloud and Dynamic Infrastructure.

UNIT-III: Models of Cloud Computing: Cloud Service Models, Cloud Computing Sub Service Models, Cloud Deployment Models, Alternative Deployment Models, Cloud Stack, Cloud Storage.

UNIT-IV:

Cloud Infrastructure Management and Migration: Administrating Clouds, Cloud Management Products, Processes in Cloud Service Management, Cloud Providers and Traditional IT Service Providers, How to Access the Cloud, Migrating to Clouds.

Disaster Recovery: Disaster Recovery Planning, Disasters in the Cloud, Disaster Management

UNIT-V:

What is Microsoft Azure?, Types of Azure Clouds, Azure key Concepts, Azure Domains (Components), Traditional vs. Azure Cloud Model, Applications of Azure, Advantages of Azure, Disadvantages of Azure. What is AWS?, History of AWS,Important AWS Services , Amazon Web Services Cloud Platform: Compute & Networking , Storage & Content Delivery Network, Database, Analytics, Application Services, Deployment and Management ,Applications of AWS ,services, Companies using AWS, Advantages of AWS, Disadvantages of AWS, Comparison between Azure and AWS.

TEXT BOOKS:

1. Cloud Computing –Shailendra Singh Oxford University Press.

REFERENCE BOOKS:

1. Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide David S. Linthicum Addison-Wesley Professional.
2. Distributed & Cloud Computing From Parallel Processing to the Internet of Things by Kai Hwang. Geoffrey C. Fox. Jack J. Dongarra

WEB REFERENCES:

1. http://nptel.ac.in/courses/106106129/21
2. https://freevideolectures.com/course/3649/cloud-computing
3. https://www.youtube.com/watch?v=Eg4AAGCE7X4&list=PL2UlrhJ_JwyA5IlOCdEWlNArFke4jgtlg

IV B.TECH I SEMESTER (PE-III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	30	70	100	3
SUBCODE: 19BCS7PE04	**DIGITAL FORENSICS**						

The course is designed to enable the student to understand underlying principles and many of the techniques associated with the digital forensic practices and cybercrime investigate attacks, handling evidences. Student can have a sneak review of Computer Forensics, Network Forensics, and Mobile Forensics.

COURSE OBJECTIVES:

- Familiarize the student about digital and computer forensics.
- Enable the student to learn analysis of crime scene.
- Manage and present evidences
- Demonstrate investigation process with case study.

COURSE OUTCOMES:

After completion of this course, the student will be able to
CO1: Summarize basics of digital forensics. [K2]
CO2: Analyse the capture, duplication, and preservation of digital evidence [K4]
CO3: Analyse the digital evidence to find the digital artefacts. [K4]
CO4: Analyse the legal aspects of the digital forensics. [K4]

SYLLABUS:

UNIT - I

Introduction

Introduction of Cybercrime:- Types, The Internet spawns crime, Worms versus viruses, Computer's roles in crimes, Introduction to digital forensics, Introduction to Incident - Incident Response Methodology.

UNIT - II

Initial Response and Forensic Duplication

Initial Response & Volatile Data Collection from Windows system - Initial Response & Volatile Data Collection from Unix system - Forensic Duplication:- Forensic Duplicates as Admissible Evidence, Forensic Duplication Tool Requirements, Creating a Forensic. Duplicate/Qualified Forensic Duplicate of a Hard Drive.

UNIT - III

Preserving and Recovering Digital Evidence

File Systems:- FAT, NTFS - Forensic Analysis of File Systems
Storage Fundamentals:- Storage Layer, Hard Drives
Evidence Handling:- Types of Evidence, Challenges in evidence handling, Overview of evidence handling procedure.

UNIT - IV

Network Forensics

Intrusion detection; Different Attacks in network, analysis Collecting Network Based Evidence - Investigating Routers - Network Protocols - Email Tracing- Internet Fraud.

UNIT – V

System Investigation

Data Analysis Techniques - Investigating Live Systems (Windows & UNIX) Investigating Hacker Tools - Ethical Issues – Cybercrime.

Cyber Laws and Global and Indian Contexts

Constitutional law, Criminal law, Civil law, Administrative regulations, Local laws, State laws, Federal laws.

TEXT BOOKS

1. Digital Forensic: The Fascinating World of Digital Evidences, Neelakshi Jain, D.R Kalbande, Wiley Books
2. Digital Forensics and Incident Response: A practical guide to deploying digital forensic techniques in response to cyber security incidents : Gerard Jhansen, Packt Publishers

REFERENCE BOOKS

1. Learn Computer Forensics: A beginner's guide to searching, analyzing, and securing digital evidence by William Oettinger , Pckt Publishers
2. Cyber Forensics by Dejey and Murugan, Oxford University Press

IV B.TECH I SEMESTER (PE-III)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS7PE05	**DevOps**						

COURSE OBJECTIVES:

- DevOps improves collaboration and productivity by automating infrastructure and workflows and continuously measuring applications performance

COURSE OUTCOMES:

At the end of the course, student will be able to
CO 1: Demonstrate the phases of software development life cycle. [K2]
CO 2: Outline the basic Fundamentals of DevOps. [K2]
CO 3: Adopt the DevOps technology into the project. [K6]
CO 4: Evaluate the CI/CD concepts and metrics to track CI/CD practices. [K5]
CO 5: Summarize the importance of DevOps maturity models. [K2]

SYLLABUS:

UNIT- I

Phases of Software Development life cycle. Values and principles of agile software development.

UNIT- II

Fundamentals of DevOps: Architecture, Deployments, Orchestration, Need, Instance of Applications, DevOps delivery pipeline, DevOps eco system.

UNIT- III

DevOps adoption in projects: Technology aspects, Agiling capabilities, Tool stack implementation, People aspect, processes

UNIT- IV

CI/CD: Introduction to Continuous Integration, Continuous Delivery and Deployment, Benefits
of CI/CD, Metrics to track CICD practices

UNIT- V

Devops Maturity Model: Key factors of DevOps maturity model, stages of Devops maturity Model, DevOps maturity Assessment.

TEXT BOOKS:

1. Gene Kim , John Willis , Patrick Debois, “The DevOPS Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations” Jez Humb,O’Reilly Publications
2. Mike Loukides, “What is Devops? Infrastructure as code” O’Reilly publications.

3. Jez Humble and David Farley, “Continuous Delivery: Reliable Software Releases Through Build, Test, and Deployment Automation”,
4. Dave Harrison, Knox Lively, “Achieving DevOps: A Novel About Delivering the Best of Agile, DevOps, and Microservices.
5. Joakim Verona , Packt, “Practical Devops”

REFERENCE BOOKS:

1. Mandi Walls, “Building a DevOps Culture”, O’Reilly publications
2. Viktor Farcic, “The DevOps 2.0 Toolkit: Automating the Continuous Deployment Pipeline With Containerized Micro services”

WEB REFERENCES:

1. https://www.youtube.com/watch?v=hQcFE0RD0cQ

2. https://www.youtube.com/watch?v=YSkDtQ2RA_c

3. https://www.svrtechnologies.video/courses/devops-training-free/lectures/10955807

4. https://www.youtube.com/watch?v=MOZMw5_fBFA

IV B.TECH I SEMESTER (PE-IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS7PE06	**DESIGN PATTERNS**						

COURSE OBJECTIVE:

- Demonstration of patterns related to object oriented design.
- Describe the design patterns that are common in software applications.
- Analyze a software development problem and express it.
- Design a module structure to solve a problem, and evaluate alternatives.
- Implement a module so that it executes efficiently and correctly.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1 Construct a design consisting of a collection of modules. [K4]
CO2 Exploit well-known design patterns. [K4]
CO3 Distinguish between different categories of design patterns. [K4]
CO4 Apply common design patterns to incremental/iterative development. [K3]
CO5 Identify appropriate patterns for design of given problem. [K3]

SYLLABUS:

UNIT-I

INTRODUCTION TO UML AND PATTERNS: Class Diagram, Collaboration Diagram, Statechart Diagram, Deployment Diagram, Patterns Description, A Brief History of Patterns, The Software Life Cycle-Business Case, Define Requirements Specification, Develop High-Level Essential Use Cases, Object-Oriented Analysis, Object-Oriented Design.

UNIT-II

FUNDAMENTALS AND CREATION OF PATTERNS: Delegation, Interface, Abstract Superclass, Interface and Abstract Class, Immutable, Marker Interface, Proxy, Factory Method, Abstract Factory, Singleton.

UNIT-III

STRUCTURAL PATTERNS: Adapter, Iterator, Bridge, Façade, Flyweight, Dynamic Linkage, Virtual Proxy, Decorator, Cache Management.

UNIT-IV

BEHAVIORAL PATTERNS: Chain of Responsibility, Command, Little Language, Snapshot, Observer, Null Object, Strategy, Template Method, Visitor.

UNIT-V

CONCURRENCY PATTERNS: Single Threaded Execution, Guarded Suspension, Balking, Scheduler, Read/Write Lock, Producer-Consumer, Two-Phase Termination, Asynchronous Processing, Future.

TEXT BOOKS:

1. Mark Grand, “Pattern’s in JAVA Vol-I”, Wiley, DreamTech.

REFERENCE BOOKS:

1. Erich Gamma, “Design Patterns”, Pearson Education.
2. Mark Grand, “Pattern’s in JAVA Vol-II”, Wiley DreamTech.
3. Mark Grand, “JAVA Enterprise Design Patterns Vol-III”, Wiley DreamTech.
4. Eric Freeman-Oreilly-spd, “Head First Design Patterns”.

WEB REFERENCES:

1. https://refactoring.guru/design-patterns
2. https://sourcemaking.com/design_patterns
3. https://www.geeksforgeeks.org/software-design-patterns/
4. https://www.amazon.in/design-patterns-object-oriented-addison-wesley-professional/dp/0201633612

IV B.TECH I SEMESTER (PE-IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS7PE07	**MOBILE ADHOC & SENSOR NETWORKS**						

COURSE OBJECTIVES:

- To make the student understand the concepts of MOBILE AD HOC NETWORKS (MANET) as well as Wireless Sensor Networks (WSN), their characteristics, novel applications, and technical challenges.
- To understand the issues and solutions of various layers of MANETs, namely MAC layer, Network Layer &
- Transport Layer in MANETs and WSN.
- To understand the platforms and protocols used in MANETs and WSN.

COURSE OUTCOMES:

CO 1: Analyse the routing protocols in MANET. [K4]
CO 2: Interpret the TCP over Ad-hoc Networks. [K2]
CO 3: Interpret the data transmission and data acquisition in WSN. [K2]
CO 4: Design and Develop the various heterogeneous architectures. [K6]

SYLLABUS:

UNIT- I

Introduction to Ad Hoc Networks: Characteristics of MANETs, applications of MANETs, and challenges of MANETs.
Routing in Adhoc Networks: Introduction, Topology based versus Position based approaches, Topology based routing Protocols and Position based routing Protocols

UNIT- II

TCP over Ad Hoc: TCP protocol overview, TCP and MANETs and Solutions for TCP over Ad hoc

UNIT- III

Basics of Wireless Sensors and applications: Sensing and Communication Range, Design Issues, Energy consumption, Clustering of Sensors. Applications of Sensor Networks.

UNIT- IV

Data Retrieval in Sensor Networks: MAC layer, Routing layer, High-level application layer support

UNIT- V

Integrating MANETs, WLANs, and Cellular Network: Introduction, Ingredients of a Heterogeneous Architecture, Protocol stack, Comparison of the Integrated Architectures

TEXTBOOK:

1. Carlos Cordeiro and Dharma P. Agrawal, "Ad hoc and Sensor Networks - Theory and Applications", World Scientific Publications, March 2006, ISBN 981-256-681- 3.
1. Feng Zhao, Leonidas Guibas, "Wireless Sensor Networks: An Information Processing Approach", Elsevier Science ISBN: 978-1-55860-914-3, (Morgan Kauffman)

WEB REFERENCES:

1. https://scholar.google.co.in/scholar?q=MOBILE+ADHOC+%26+SENSOR+NETWORKS&hl=en&as_sdt=0&as_vis=1&oi=scholart
2. https://link.springer.com/book/10.1007/978-3-540-77024-4
3. https://en.wikipedia.org/wiki/Wireless_ad_hoc_network

IV B.TECH I SEMESTER (PE-IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS7PE08	**HUMAN COMPUTER INTERACTION**						

COURSE OBJECTIVES:

- The main objective is to get student to think constructively and analytically about how to design and evaluate interactive technologies.

COURSE OUTCOMES:

CO 1: Outline knowledge about user interface design. [K2]
CO 2: Summarize the importance of Graphical User Interface. [K2]
CO 3: Apply the strategies used in design process. [K3]
CO 4: Summarize the importance of screen designing. [K2]
CO 5: 5.Apply the various operations of Windows. [K3]

SYLLABUS

UNIT – I

Introduction: Importance of user Interface – definition, importance of good design. Benefits of good design. A brief history of Screen design.

UNIT – II

The graphical user interface – popularity of graphics, the concept of direct manipulation, graphical system, Characteristics, Web user – Interface popularity, characteristics- Principles of user interface.

UNIT – III

Design process – Human interaction with computers, importance of human characteristics human consideration, Human interaction speeds.

UNIT – IV

Screen Designing : Design goals – Screen planning and purpose, organizing screen elements, ordering of screen data and content – screen navigation and flow – Visually pleasing composition – amount of information – focus and emphasis – presentation information simply and meaningfully – information retrieval on web – statistical graphics.

UNIT – V

Windows – New and Navigation schemes selection of window, selection of devices based and screen based controls.
Components – text and messages, Icons and increases – Multimedia, colors, uses problems, choosing colors.

TEXT BOOKS:

1. Alan Dix, Janet Finlay, Goryd, Abowd, Russell Beal, "Human Computer Interaction", PEA, 3/e, 2004.
2. Wilbert O Galitz, "The Essential guide to user interface design", Wiley Dream tech, 2/e.

REFERENCE BOOKS:

1. Dan R.Olsan, "Human Computer", Interaction Cengage ,2010.
2. Ben Shneidermann , "Designing the user interface", 4/e, PEA.
3. Soren Lauesen, "User Interface Design", PEA.
4. Prece, Rogers, Sharps, "Interaction Design", Wiley.

WEB REFERENCES:

1. https://scholar.google.co.in/scholar?q=human+computer+interaction&hl=en&as_sdt=0&as_vis=1&oi=scholar

2. https://www.interaction-design.org/literature/topics/human-computer-interaction

3. https://en.wikipedia.org/wiki/Human%E2%80%93computer_interaction

4. https://www.tutorialspoint.com/human_computer_interface/human_computer_interface_introduction.htm

IV B.TECH I SEMESTER (PE-IV)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS7PE09	**BLOCKCHAIN TECHNOLOGIES**						

COURSE OBJECTIVES:

- Introduces the fundamental concepts and functionalities of Blockchain.
- Provide conceptual understanding of methods in securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.

COURSE OUTCOMES:

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

CO 1: Summarize the fundamentals of Blockchain. [K2]
CO 2: Analyze the working of Blockchain. [K4]
CO 3: Interpret how business can be easily made with Blockchain. [K2]
CO 4: Summarize how Block Chain can be integrated with various current technologies. [K2]
CO 5: Get familiarity about the Blockchain strength in providing solutions. [K3]
CO 6: Investigate and understand the Problems with Blockchain. [K4]

SYLLABUS:

UNIT- I

Grasping Blockchain Fundamentals:

Tracing Blockchain's Origin, The shortcomings of current transaction systems, The emergence of bitcoin, The birth of blockchain, Revolutionizing the Traditional Business Network, Exploring a blockchain application, Recognizing the key business benefits, Building trust with blockchain.

UNIT- II

Taking a Look at How Blockchain Works:

Why It's Called "Blockchain", What Makes a Blockchain Suitable for Business?, Shared ledger, Permissions, Consensus, Smart contracts ,Identifying Participants and Their Roles.

UNIT- III

Propelling Business with Blockchains:

Recognizing Types of Market Friction, Information frictions, Interaction frictions, Innovation frictions, Moving Closer to Friction-Free Business Networks, Reducing information friction, Easing interaction friction, Easing innovation friction, Transforming Ecosystems through Increased Visibility.

UNIT- IV

Blockchain in Action: Use Cases:

Financial Services, Commercial financing, Trade finance, Cross-border transactions, Insurance, Government, Supply Chain Management, Healthcare, Electronic medical records Healthcare payments preauthorization.

UNIT- V

Hyper ledger, a Linux Foundation Project:

Hyperledger Vision, Hyperledger Fabric, How Can IBM Help Developers Innovate With Blockchain? Offering an easily accessible cloud and development platform, Individualized attention and industry Expertise.

UNIT- VI

Problems with Blockchain:

Security and Safeguards, Protection from attackers, Hacks on exchanges, What is stopping adoption?, Scalability problems , Network attacks to destroy bitcoin , Case Study: Failed currencies & blockchain

TEXT BOOKS:

1. Manav Gupta, John Wiley & Sons, Inc.111 River St, Hoboken, “Blockchain For Dummies®”, IBM Limited Edition, NJ 07030-5774.

REFERENCES:

1. Swan, Melanie, “Blockchain: Blueprint for a new economy”. "O'Reilly Media, Inc.", 2015.
2. Gupta, M, "Blockchain For Dummies." (2017).

WEB REFERENCES:

1. https://hackernoon.com/best-resources-for-learning-blockchain-development-in-2019-ffcd5639739a
2. https://www.investopedia.com/articles/personal-finance/091316/top-3-books-learn-about-blockchain.asp
3. https://analyticsindiamag.com/top-10-free-resources-to-learn-blockchain/
4. https://www.onlinecoursereport.com/online-courses-in-bitcoin-and-blockchain-technology/

IV B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
Code: 19BCS7LB02	**MACHINE LEARNING LAB**						

COURSE OBJECTIVES:

- To make the student to get a clear understanding of the core concepts of python like import data in various formats for statistical computing, data manipulation, business analytics, machine learning algorithms and data visualization etc.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 4: Analyse exploratory data analysis. [K4]

CO 5: Analyze the real word datasets presented in different formats using python libraries to Perform exploratory data analysis.[K4]

CO 6: Apply the machine learning algorithms on various real time data sets. [K3]

CO 7: Analyze the data by using visualization tools or libraries. [K4]

LIST OF EXPERIMENTS

1. Perform Basic Visualizations (bar chart, scatter plot, boxplot,histogram etc) for all the columns(numerical data only) on the specified dataset and draw the inferences for the visualizations in excel.
2. Build a prediction model for simple linear regression and do the necessary transformations for input variables for getting better R^2 value for the model prepared.
3. Build a prediction model for multiple linear regression and do the necessary transformations for input variables for getting better R^2 value for the model prepared.
4. Build a prediction model to perform logistic regression.
5. Build a model to generate association rules by using apriori algorithm on the Movies data sets
   i. Try different values of support and confidence. Observe the change in number of rules for different support,confidence values
   ii. Change the minimum length in apriori algorithm Visulize the obtained rules using different plots
6. Perform clustering using k-means clustering algorithm.
7. Perform Principle Component Analysis and then perform clustering.
8. Prepare a Classification model using decision tree Classifier.
9. Prepare a Classification model using Navie Bayes Classifier

TEXT BOOKS:

1. Aurélien Géron, “Handson machine learning with scikit learn and tensorflow”

WEB REFERENCES:

1. https://onlinecourses.nptel.ac.in/noc21_cs22/preview
2. https://onlinecourses.nptel.ac.in/noc21_cs23/preview
3. https://onlinecourses.nptel.ac.in/noc21_cs24/preview
4. https://onlinecourses.nptel.ac.in/noc21_cs51/preview

IV B.TECH I SEMESTER (PE-III LAB)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	3	20	30	50	1.5
CODE: 19BIT7LB01	DATA SCIENCE LAB						

COURSE OBJECTIVES:

- The Data Science Lab focuses on applying machine learning, data mining, and network analysis to real-world problems in society and industry.

COURSE OUTCOMES:

After the completion of this course the student should be able to

CO 1: Develop programs using python. [K3]
CO 2: Develop programs using NumPy. [K3]
CO 3: Develop programs using Pandas. [K3]

LIST OF EXPERIMENTS

1. The student has to experiment the given below programs:
   a) To convert list of tuples into list of strings in python
   b) To remove duplicate lists in tuples using comprehensions.
   c) Write a python program to create and display all combinations of letters, selecting each letter from a different key in a dictionary.
2. Experiments in NumPy
   a) create a 2X3 array using NumPy
   b) createa 2X3 array in an array of 8 with random numbers
   c) Create a list and convert into array using NumPy command
   d) Find out shape and type of an array
3. a) Operations between Arrays and Scalars
   b) Crete a 3d array, copy array to another array(old_array) using copy command, restore old_array
   c) Boolean Indexing:
      create an array with names 'Bob', 'Joe', 'Will', 'Bob', 'Will', 'Joe', 'Joe'
      create a Boolean array by comparing names with ‘Bob’
      create a random array of size (7,3), assume that each row belongs one person and display the rows corresponding to ‘Bob’
      (Hint: use Boolean indexing)
   d) Fancy Indexing
      Create an array like: array
      ([[0., 0., 0., 0.],
      [1., 1., 1., 1.],
      [2., 2., 2., 2.],
      [3., 3., 3., 3.],
      [4., 4., 4., 4.],
      [5., 5., 5., 5.],
      [6., 6., 6., 6.],
      [7., 7., 7., 7.]])

      Display rows as given below using fancy +veindexing array
      ([[4., 4., 4., 4.],

[3., 3., 3., 3.],
[0., 0., 0., 0.],
[6., 6., 6., 6.]])

Display rows as given below using fancy -ve indexing array
([[5., 5., 5., 5.],
[3., 3., 3., 3.],
[1., 1., 1., 1.]])

e) do an experiment Expressing Conditional Logic as Array Operations?
f) Generate 5X4 Matrix and do some Mathematical and Statistical operations on that data.
g) Do an experiment on sort, unique and setlogic
h) LINEAR ALGEBRA MATRIX MULTIPLICATION Transpose inverse Experiments using pandas

4. Series using pandas
   a) Load the car data into frame without headers using pandas
   b) display top 5 rows
   c) display last 10 rows
   d) save the file into various formats (csv,excel, pdf,JSON, sql)
   e) display data types of each column
5. Perform different operations in dataframe using pandas
   a)dropping b)concatenating values
6. Filtering data from csv file using pandas By using single condition filtering
7. Draw a barplot graph in pandas using group by filter condition and also plot graph with series and data frame.

WEB REFERENCES:

1. https://www.greatlearning.in/
2. https://onlinecourses.nptel.ac.in/noc20_cs62/
3. https://nptel.ac.in/noc/courses/noc20/SEM2/noc2

IV B.TECH I SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	0	0	0	0	0	0	1
Code: 19BCS6MOOC	**MASSIVE OPEN ONLINE COURSES (MOOCs)**						

COURSE OBJECTIVES:

- The majority of MOOCs require that the learner be self-directed and proactive in the learning process. In addition to engaging in the course material, they provide learners with an opportunity to develop or expand their personal learning networks (PLN). Learner success is enhanced by learner actions before, during, and after the MOOC.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO1: Identify suitable course required for their carrier. [K3]

CO2: Adapt effectively for changing conditions. [K5]

CO3: Develop and refine oral communication skills. [K3]

CO4: Take part in lifelong learning. [K3]

EVALUATION OF MOOC's COURSE

Student has to complete an on-line course to fulfil the academic requirement of B.Tech course. The on-line Course should be offered by any reputed organization like NPTEL, COURSERA, edX, Udacity, SWAYAM etc., approved by Departmental Committee constituted by HOD. . Student has to submit the progress of the MOOC's course (such as assignment submission etc.,) to the departmental committee. The B.Tech degree shall be awarded only upon submission of MOOC's certificate. If a student fails to submit in that semester, he/she has to submit the certificate in the subsequent semesters for getting the degree awarded.

IV B.TECH. – II SEMESTER

S.No	Subject Code	SUBJECT	Cat. Code	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	L	T	P	CREDITS
1	19BCS8PE02 19BCS8PE03 19BCI8PE01 19BCS8PE04	Professional Elective – V b. Distributed Systems b. Internet of Things (IoT) c. Deep Learning d. Inter-Networking With TCP/IP	PE	40	60	100	3	-	-	3
2	19BCS8PE05 19BCS8PE06 19BCS8PE07 19BCI8PE08	Professional Elective – VI a. Software Project Management. b. SoA c. Functional Programming d. E-Commerce	PE	40	60	100	3	-	-	3
3	19BCI8PW	Project	PR	60	140	200	-	-	-	7
TOTAL										**13**

Open Elective Course: At any semester, student can choose an open elective course offered by any department provided that he/she has not studied it.

IV B.TECH II SEMESTER (PE-V)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS8PE02	**DISTRIBUTED SYSTEMS**						

COURSE OBJECTIVES:

- The aim of this subject is to study, learn, and understand the main concepts of distributed systems
- To learn Hardware and software features that supports these systems.

COURSE OUTCOMES:

After successful completion of the course, students will be able to:

CO 1. Outline the benefits of distributed systems. [K2]
CO 2. Interpret synchronization techniques in distributed systems. [K2]
CO 3. Summarize process scheduling techniques, threads and fault tolerance in distributed environments. Analyze various distributed deadlock detection and prevention techniques. [K4]
CO 4. Interpret distributed file system implementations and shared memory**.** [K2]
CO 5. Relationship of distributed system functions in MACH. [K4]

SYLLABUS:

UNIT–I

Introduction to Distributed systems: Goals of distributed system, hardware and software concepts, design issues. Communication in Distributed systems: Layered protocols, ATM networks, the Client - Server model, remote procedure call and group communication.

UNIT–II

Synchronization in Distributed systems: Clock synchronization, Mutual exclusion, E-tech algorithms, the Bully algorithm, a ring algorithm, atomic transactions.

UNIT-III

Processes: Processes and Processors in distributed systems: Threads, system models, Processor allocation, Scheduling in distributed system, Fault tolerance and real time distributed systems.
Deadlocks: deadlock in distributed systems, Distributed deadlock prevention, and distributed dead lock detection.

UNIT-IV

Distributed file systems: Distributed file systems design, distributed file system implementation, trends in distributed file systems. Distributed shared memory : What is shared memory, consistency models, page based distributed shared memory, shared variable distributed shared memory, object based DSM.

UNIT-V

Case study MACH: Introduction to MACH, process management in MACH, memory management in MACH, communication in MACH, UNIX emulation in MACH.

TEXT BOOKS:

2. Andrew. S. Tanenbaum, "Distributed Operating System", PHI
3. Stallings, "Operating Systems Internal and Design Principles", Pearson Education / PHI, Fifth Edition–2005.

REFERENCE BOOKS:

1. Abraham Silberchatz, Peter B. Galvin, Greg Gagne, "Operating System Principles", - 7th Edition, John Wiley.
2. Andrew S Tanenbaum, "Modern Operating Systems", 2nd edition Pearson/PHI.

WEB REFERENCES:

1. http://www.cs.colostate.edu/~cs551dl/externalLinks.php
2. http://www.personal.kent.edu/~rmuhamma/OpSystems/os.html
3. https://www.sanfoundry.com/operating-system-questions-answers-distributed-operating-system/
4. https://link.springer.com/journal/446
5. https://www.ukessays.com/.../the-distributed-operating-system-info...
6. https://www.youtube.com/watch?v=sK9MC5GREXg

IV B.TECH II SEMESTER (PE-V)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS8PE03	**INTERNET OF THINGS (IoT)**						

COURSE OBJECTIVES:

- To understand this fundamentals of Internet of Things.
- To build a small low cost embedded system using Arduino / Raspberry Pi or equivalent boards.
- To apply the concept of Internet of Things in the real world scenario

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Outline the concepts of Internet of Things. [K2]
CO 2: Analyze the requirements, specifications to design IoT applications. [K4]
CO 3: Analyze domain specific applications using Arduino and Raspberry pi. [K4]
CO 4: Interpret cloud storage models and communication APIs for IoT. [K2]

SYLLABUS:

UNIT - I

FUNDAMENTALS OF IoT INTRODUCTION: Characteristics-Physical design - Protocols – Logical design – Enabling technologies– IoT Levels and Deployment Templates – M2M, IoT vs M2M.

UNIT - II

IoT DESIGN METHODOLOGY: Purpose & Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specification, IoT Level Specification, Functional View Specification, Operational View specification, Device & Component Integration and Application Development.

UNIT - III

PROTOTYPING EMBEDDED DEVICE WITH ARDUINO: Sensors, Actuators, Embedded Computing Basics- Micro Controllers, System on Chips, Choosing your Platform, Arduino – Developing on the Arduino.
PROTOTYPING EMBEDDED DEVICE WITH RASPBERRY PI: Raspberry PI – Introduction, cases and Extension Boards, Developing on the Raspberry PI.

UNIT – IV

IOT Physical Servers & Cloud Offerings: Introduction to Cloud Storage Models & Communication APIs – WAMP – AutoBahn for IoT, Xively Cloud for IoT.

UNIT – V

DOMAIN SPECIFIC APPLICATIONS OF IoT: Home Automation, Agriculture Applications, Smart City applications.

TEXT BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015.
2. Adrian McEwen & Hakim Cassimally, “Designing the Internet of Things”, Wiley Publications – 2014.

REFERENCE BOOKS:

1. Marco Schwartz, “Internet of Things with the Arduino Yun”, Packt Publishing, 2014.
2. Manoel Carlos Ramon, “Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers”, Apress, 2014.
3. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice".
4. Vijay Madisetti and ArshdeepBahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014.
5. Charalampos Doukas “Building Internet of Things with the Arduino”.
6. Francis daCosta, “Rethinking the Internet of Things: A ScalableApproach to Connecting Everything”, 1st Edition, Apress Publications, 2013.
7. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, “From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence”, 1stEdition, Academic Press, 2014.

WEB REFERENCES:

1. https://www.youtube.com/watch?v=G4-CtKkrOmc
2. http://www.cse.wustl.edu/~jain/cse570-13/m_18iot.htm
3. https://www.youtube.com/watch?v=9ZUFYyXhQm8
4. https://www.udemy.com/introduction-to-iot-using-raspberry-pi-2/

IV B.TECH II SEMESTER (PE-V)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCI8PE01	**DEEP LEARNING**						

COURSE OBJECTIVES:

- To present the mathematical, statistical and computational challenges of building neural Networks
- To study the concepts of deep learning
- To introduce dimensionality reduction techniques
- To enable the students to know deep learning techniques to support real-time applications
- To examine the case studies of deep learning techniques

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Summarize the characteristics of Machine Learning and Deep Learning that make it useful to real-world Problems. [K2]
CO 2: Realign high dimensional data using reduction techniques. [K3]
CO 3: Analyze optimization and generalization in deep learning. [K4]
CO 4: Implement various deep learning models. [K3]

SYLLABUS:

UNIT– I

Machine Learning Basics Learning

Algorithms, Capacity, Over fitting and Under fitting, Hyper parameters and Validation Sets, Estimators, Bias and Variance, Maximum Likelihood, Estimation Bayesian Statistics. Supervised Learning Algorithms, Unsupervised Learning Algorithms, Stochastic Gradient Descent, Building a Machine Learning Algorithm, Challenges Motivating Deep Learning.

UNIT–II

Deep Feedforward Networks

Example: Learning XOR, Gradient-Based Learning, Hidden Units, Architecture Design, Back-Propagation and Other Differentiation Algorithms

Regularization for Deep Learning

parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multitask Learning.

UNIT-III

Optimization for Training Deep Models

How Learning Differs from Pure Optimization, Challenges in Neural Network Optimization, Basic Algorithms, Parameter Initialization Strategies, Algorithms with Adaptive Learning Rates, Approximate Second-Order Methods, Optimization Strategies and Meta-Algorithms.

UNIT-IV

Convolutional Networks

The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Efficient Convolution Algorithms, Random or Unsupervised Features, The Neuroscientific Basis for Convolutional Networks.

UNIT–V

Sequence Modeling:

Recurrent and Recursive Nets Unfolding Computational Graphs, Recurrent Neural Networks, Bidirectional RNNs, Deep Recurrent Networks, Recursive Neural Networks, The Challenge of Long-Term Dependencies, Optimization for Long-Term Dependencies, Explicit Memory.

TEXT BOOKS:

1. Goodfellow, I., Bengio, Y., Courville, A., & Bengio, Y. "Deep Learning,Vol.1. Cambridge", MIT press.
2. François Duval , "Deep Learning: Deep Learning for Beginners. Practical Guide with Python and Tensorflow", Data Sciences Publishing.

REFERENCE BOOKS:

1. Sebastian Raschka, Vahid Mirjalili, "Python Machine Learning: Machine. Learning and Deep Learning with Python", scikit-learn and TensorFlow, 2nd Edition, Packt Publishing.

WEB REFERENCES:

1. https://buomsoo-kim.github.io/learning/2020/03/25/Data-science-study-materials.md/
2. https://www.kaggle.com/getting-started/37999
3. https://drive.google.com/file/d/1DXdl4iPzYy7GEFRUROUv8cZRSxgUmu1E/view?usp=drivesdk
4. https://mega.nz/folder/NmQRlaBa#0FKTDkkHYBmkSmcEu0kGoQ

IV B.TECH II SEMESTER (PE-V)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS8PE04	**INTER-NETWORKING WITH TCP/IP**						

COURSE OBJECTIVES:

- Understand the architecture of the Internet protocols as a layered model.
- Describe the functions implemented by each protocol, the design of the protocol and the characteristics of typical implementations.
- Analyze the relationships and dependencies between the protocols.

COURSE OUTCOMES:

At the end of this course student will be able to:

CO 1: Analyze the architecture, design, and behaviours of the internet and of the TCP/IP suite of protocols. [K4]

CO 2: Analyze the concepts and techniques that have been used to design and implement the TCP/IP Internet technology. [K4]

CO 3: Analyze the issues that are driving the development of new protocols to broaden and enhance the operation of the Internet. [K4]

SYLLABUS:

UNIT- I

INTRODUCTION: Introduction to internetworking, Overview of OSI Model TCP/IP protocol suite, Basics of switching technologies and switches, Comparisons of different models, Gateways.

UNIT- II

INTERNET PROTOCOL: Purpose of Internet Protocol, Internet datagram, Options, Checksum, ARP and RARP, Routing Methods: Routing Table and Routing module, ICMP, IGMP. **IP Addresses:** Introduction, Address Classification, A sample internet with classful addressing, Subnetting, Supernetting, Classless addressing, Security at the IP Layer, IPSec, IPv4 and IPv6 packet formats.

UNIT- III

ROUTING PROTOCOLS: UNICAST ROUTING PROTOCOLS Interior and Exterior routing, RIP, OSPF, BGP,

Multicasting: Introduction, Multicast Routing, Multicast Routing Protocols, Multicast Trees, DVMRP, MOSPF,CBT,PIM, MBONE.

UNIT- IV

TRANSPORT CONTROL PROTOCOL: TCP: TCP operation, Segment, Sliding window, Silly window, Options, TCP state machine, Karn's Algorithm, Congestion control- Leaky bucket and Token bucket algorithms. **UDP:** User Datagram, UDP operations, Checksum calculation.

UNIT- V

TCP/IP OVER ATM NETWORKS: ISDN and B-ISDN, ATM reference model, ATM Switch, Interconnection Network, Virtual circuit in ATM, Paths, Circuits and identifiers, ATM cell transport and adaptation layers, packet type and multiplexing, IP Address binding in an ATM Network, Logical Subnet Concept and Connection Management.

TEXT BOOKS:

1. Comer, "Internetworking with TCP/IP", Vol. 1, PHI Pub.
2. Behrouz A. Forouzan, "TCP/IP Protocol suite", TMH Pub.

REFERENCE BOOKS:

1. James F. Kurose, Keith W. Ross, "Computer Networking", Pearson Education.
2. Wright and Stevens, "TCP/IP Illustrated", Vol.2, Pearson Education.
3. Kenneth C. Mansfield Jr. James L. Antonakes, "An Introduction to Computer Networks", PHI.

WEB REFERENCES:

1.https://lecturenotes.in/m/19004-internetworking-with-tcpip

2.https://dl.acm.org/doi/book/10.5555/2531597

3.https://examsdaily.in/tcp-ip-study-materials-pdf-download

IV B.TECH II SEMESTER (PE-VI)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS8PE05	**SOFTWARE PROJECT MANAGEMENT**						

COURSE OBJECTIVES:

- To study about the concepts of object-oriented software engineering.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Illustrate the conventional software Management and economics [K2].
CO 2: Outline the software life cycle phases and artifacts [K2].
CO 3: Illustrate the various workflows, check points and iterative process planning [K2].
CO 4: Analyze the project organizations, responsibilities and control [K4].

UNIT – I:

Conventional Software Management: The waterfall model, conventional software Management performance.
Evolution of Software Economics: Software Economics, pragmatic software cost estimation.
Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT – II:

Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.
Artifacts of the process: The artifact sets, Management artifacts, Engineering artifacts, programmatic artifacts.
Model based software architectures: A Management perspective and technical perspective.

UNIT – III:

Work Flows of the process: Software process workflows, Iteration workflows.
Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.
Iterative Process Planning: Work breakdown structures, planning guidelines, cost and schedule estimating, Iteration planning process, Pragmatic planning.

UNIT – IV:

Project Organizations and Responsibilities: Line-of-Business Organizations, Project Organizations, evolution of Organizations.
Process Automation: Automation Building blocks, The Project Environment.

UNIT – V: Project Control and Process instrumentation: The seven core Metrics, Management indicators, quality indicators, life cycle expectations, pragmatic Software Metrics, Metrics automation.
Tailoring the Process: Process discriminants.

TEXT BOOK:

1. Software Project Management, Walker Royce: Pearson Education, 2005.

REFERENCES:

1. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
2. Software Project Management, Joel Henry, Pearson Education.
3. Software Project Management in practice, Pankaj Jalote, Pearson

Web References:

1.URL: https://www.youtube.com/watch?v=eOTcPOvT-H4
2.URL: https://www.youtube.com/watch?v=IdBSLvoP6uY
2.URL: https://www.youtube.com/watch?v=SkQzQCAWf8M

E-Books:

1. http://www.cs.ox.ac.uk/people/michael.wooldridge/teaching/soft-eng/lect05.pdf
2. http://www.mbaexamnotes.com/software-project-management.html

IV B.TECH II SEMESTER (PE-VI)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS8PE06	**SERVICE ORIENTED ARCHITECTURE**						

COURSE OBJECTIVES:

- Understand the concepts of Service Oriented Architecture along with the evolution of SOA
- Be aware of the key issues facing many organizations, especially dealing with integration among systems and providing architectural abstractions to them
- Integrate SOA technologies with Web Services paradigms.
- Know related technologies and implementation basics of SOA

COURSE OUTCOMES:

After the completion of this course student will be able to

CO 1: Summarize primary concepts of SOA. [K2]

CO 2: Identify the integration of SOA technological points with Web Services. [K3]

CO 3: Implement of SOA in development cycle of Web Services. [K3]

SYLLABUS:

UNIT - I

Introducing SOA: Fundamental SOA, Characteristics of contemporary SOA, Misperception about SOA, Tangible benefits of SOA.

UNIT - II

The Evolution of SOA: An SOA timeline, Continuing evolution of SOA, Roots of SOA.

UNIT - III

Web Services and Primitive SOA: Web Services framework, Services (Web services: Definition, Architecture and standards), Service descriptions with WSDL, Messaging with SOAP, UDDI.

UNIT - IV

Web Services and Contemporary SOA (I: Activity Management and Composition): Message exchange patterns, Coordination, Atomic transactions, Business activities, Orchestration, Choreography.

UNIT – V

Web Services and Contemporary SOA (II: Advanced Messaging, Metadata, and Security): Addressing, Reliable messaging, Correlation, Polices

TEXT BOOK:

1. Thomas Erl, “Service Oriented Architecture: Concepts, Technology, and Design”, Pearson education.

REFERENCES:

1. Mark D Hansen, “SOA using Java Web Services”, Prentice Hall Publication.
2. Michael Rosen & et el., “Applied SOA”, Wiley Publication.
3. Roshen, “ SOA based Enterprise Integration”, TMH Publication.
4. Muninder Singh & Michael Huhns, “Service Oriented Computing”. Wiley Publication.
5. B. V. Kumar, Prakash Narayan & Tony Ng, “Implementing SOA Using Java EE”.

WEB REFERENCES:

1. https://studentsfocus.com/it6801-soa-notes-service-oriented-architecture-lecture-handwritten-notes-cse-7th-sem-anna-university/
2. https://lecturenotes.in/subject/493/service-oriented-architecture
3. http://www.sasurieengg.com/e-course-material/CSE/IV-Year%20IT%20Sem%207%209/IV%20%20IT%20SOA.pdf

IV B.TECH II SEMESTER (PE-VI)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCS8PE07	**FUNCTIONAL PROGRAMMING**						

COURSE OBJECTIVE:

- Able to understand various features and their implementation of functional programming.

COURSE OUTCOMES:

After completion of this course, the students would be able to:
CO1. Compare and contrast features of functional programming and procedural programming [K2]
CO2. Analyze various properties of functional programming [K4]
CO3. Solve problems related to type and inferencing [K2]
CO4. Interpret programs in Haskel [K2]
CO5. Analyze graph reduction methods [K4]

SYLLABUS:

UNIT-I

Introduction to functional programming features: Expressions and function definitions. Recursive formulation of programming problems. Types-monomorphic, universally polymorphic and conditional polymorphic (type variables ranging over type classes). Naive type inferencing. Lazy evaluation, its significance and consequences. Referential transparency and its significance. Abstractions supported by functional languages - Higher order functions, data abstraction through algebraic data types. Pattern matching. The Haskell program development environment.

UNIT-II

Programming with Lists, Trees and Graphs: Generic functions over these data structures and their properties. List comprehensions. Examples of applications coded using these data structures.

Reasoning about functional programs: Proving properties of functional programs through structural induction and rewrites.

UNIT-III

Lambda Calculus: Historical background. Relevance to functional programming. Syntax and reductions. Church Rosser theorem. Expressibility-Church numerals, Booleans, algebraic datatypes. Computational completeness.

UNIT-IV

Type inferencing: The typed lambda calculus. Type rules, type checking and type inferencing. Type rules of the Hindley-Milner type system. Introducing polymorphism through the let construct. The Hindley-Milner type inferencing algorithm.

UNIT-V

Type classes and their implementation: Translation of conditional polymorphic functions to universally polymorphic functions through type dictionaries. The Haskell organization of numeric types into classes. Ambiguous types and their resolution.

Monads and IO: IO and referential transparency. Values and computations. Modelling side-effects through monads. Examples of monads. IO as a form of state monad. IO in Haskell

TEXT BOOKS:

1. R.Bird, “Introduction to Functional Programming using Haskell”. Prentice Hall Europe, 1998.
2. Bryan O'Sullivan, Don Stewart, and John Goerzen, “Real World Haskell”, O'Reilly Media, November 2008

REFERENCE BOOKS:

1. S.Peyton Jones, “The Implementation of Functional Programming languages”, Prentice Hall, New York, 1987.
2. Henk Barendregt. Eds. S. Abramsky, D. Gabbay, T.S.L. Maibaum, “Lambda Calculus with Types”, From Handbook of Logic in Computer Science, Oxford University Press.
3. H.P. Barendregt. “The lambda calculus, its syntax and semantics”, Elsevier Science Publishers B.V. Amsterdam, 1984.

WEB REFERENCES:

1. https://www.cse.iitk.ac.in/users/ppk/teaching/cs653/notes/single-page.lhs.pdf
2. https://alexott.net/en/fp/books/#:~:text=To%20study%20functional%20programming%20%26%20Haskell,!%3A%20A%20Guide%20for%20Beginners.
3. https://www.freetechbooks.com/functional-programming-f34.html
4. https://www.freebookcentre.net/ComputerScience-Books-Download/Functional-Programming-Lecture-notes-(PDF-72P).html

IV B.TECH II SEMESTER (PE-VI)	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCI8PE08	**E - COMMERCE**						

COURSE OBJECTIVES:

- To introduce the fundamental principles of e-business, e-commerce, and the role of management.
- To introduce the application of tools and services to the development of small-scale e-commerce applications

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:

CO 1: Interpret the E-commerce applications and Process Model. [K2]
CO 2: Compare and contrast various electronic Payment Systems. [K3]
CO 3: Interpret the Intra Organizational Commerce. [K2]
CO 4: Outline the corporate digital library and marketing research. [K2]
CO 5: Analyze resource discovery and information filtering. [K4]

SYLLABUS:

UNIT – I

Electronic Commerce-Framework, anatomy of E-Commerce applications, E-Commerce Consumer applications, E-Commerce organization applications.

UNIT – II

Consumer Oriented Electronic commerce - Mercantile Process models.
Electronic payment systems - Digital Token-Based, Smart Cards, Credit Cards, Risks in Electronic Payment systems.

UNIT – III

Intra Organizational Commerce - work Flow, Automation Customization and internal Commerce, Supply chain Management.

UNIT – IV

Corporate Digital Library - Document Library, digital Document types, corporate Data Warehouses.
Advertising and Marketing - Information based marketing, Advertising on Internet, on-line marketing process, market research.

UNIT – V

Consumer Search and Resource Discovery - Information search and Retrieval, Commerce Catalogues, Information Filtering. Digital Video and electronic Commerce

TEXT BOOKS :

1. Kalakata, Whinston, “Frontiers of electronic commerce”, Pearson.

REFERENCE BOOKS :

1. Hendry Chan, Raymond Lee, Tharam Dillon, Ellizabeth Chang, John Wiley, "E-Commerce fundamentals and applications"
2. S.Jaiswal – Galgotia, "E-Commerce".
3. Efrain Turbon, Jae Lee, David King, H.Michael Chang, "E-Commerce".
4. Gary P.Schneider, "Electronic Commerce", Thomson.
5. E-Commerce – Business, Technology, Society, Kenneth C.Taudon, Carol Guyerico Traver.

WEB REFERENCES:

1. https://www.slideshare.net/kamalgulati7/full-notes-on-ecommerce-study-material-for-ecommerce
2. http://www.vssut.ac.in/lecture_notes/lecture1428551057.pdf
3. https://www.geektonight.com/e-commerce-notes/

IV B.TECH II SEMESTER	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	60	140	200	7
Code: 19BCI8PW	**MAJOR PROJECT**						

COURSE OBJECTIVES:

- To offer students a glimpse into real world problems and challenges that need IT based solutions.
- To enable students to create very precise specifications of the IT solution to be designed.
- To enable students to use concepts of IT in creating a solution for a problem
- To improve the team building, communication and management skills of the students.

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:
CO1: Acquire practical knowledge within the chosen area of technology for project development.
CO2: Identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach.
CO3: Contribute as an individual or in a team in development of technical projects.
CO4: Develop effective communication skills for presentation of project related activities.

1. BATCH FORMATION:

The same batch of Mini Project – II will continue for the Main Project also. If any student wants to change the batch he/she can request project review committee (PRC). If possible project review committee can take required action.

2. GUIDE ALLOTMENT:

If any guide who was allotted for Mini Project-II is not available, the batch can select a new guide with the consent of HOD.

3. I MID SEMINAR:

Generally I Mid seminar is conducted after completing the literature survey. For this I Mid seminar the evaluation committee consists of guide, coordinator and HOD .This seminar is conducted for 40 marks. Out of 40 marks ,20 marks are awarded by guide based on the performance ,work and attendance of the student and 20 marks are awarded by the coordinator based on presentation ,work quality, analysis etc. during this seminar the students are supposed to deliver the proposed work and work completed so far.

4. II MID SEMINAR:

Like I Mid seminar, for II Mid seminar the evaluation committee consists of guide, coordinator & HOD. This seminar is conducted for 40 marks. Out of 40 marks, 20 marks are awarded by guide based on the performance, work and attendance of the student. The remaining 20 marks are awarded by the coordinator based on presentation, work quality and result discussions. In this seminar the students are supposed to deliver the complete project work with final results.

5. EXTERNAL SEMINAR & VIVA VOCE:

For external viva the evaluation committee consists of university nominated external examiner, guide & HOD. This viva is conducted for 120 marks.

List of open Electives offered by Department

OPEN ELECTIVE-I

S.No.	Open Elective-I Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	DBMS (Other Than CSE)	CSE	19BCC4OE09	3	0	0	3
2	Web Development Using Mean Stack Tech.	CSE	19BCC4OE10	3	0	0	3

OPEN ELECTIVE-II

S.No.	Open Elective-I Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Artificial Intelligence	CSE	19BCC5OE09	3	0	0	3
2	OOPS through JAVA	CSE	19BCC5OE10	3	0	0	3

OPEN ELECTIVE-III

S.No.	Open Elective-I Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
1	Cloud Computing	CSE	19BCC6OE09	3	0	0	3
2	Block Chain Technologies	CSE	19BCC6OE10	3	0	0	3

OPEN ELECTIVE-IV

S.No.	Open Elective-I Subject Title	Department Offering the Subject	Sub Code	No.of periods per week			No.of Credits
				L	T	P	C
11	Cyber Security	CSE	19BCC7OE09	3	0	0	3
12	Ethical Hacking	CSE	19BCC7OE10	3	0	0	3

OPEN ELECTIVE-I

OPEN ELECTIVE I	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
Code: 19BCC4OE09	DATABASE MANAGEMENT SYSTEMS (OTHER THAN CSE)						

COURSE OBJECTIVE:

Provides students with theoretical knowledge and practical skills in the design, use of databases and database management systems in information technology applications

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO 1: Classify various Data models, Architectures and their implications
CO 2: Analyze DB design methodology and normalization process
CO 3: Interpret how queries are being processed and executed in RDBMS
CO 4: Compare the various transaction and concurrency management techniques

UNIT- I: INTRODUCTION

Database system, Characteristics - Database vs. File System, Database Users -Actors on Scene, Workers behind the scene; Advantages of Data base systems, and Database applications, Brief introduction of different Data Models - Hierarchical, Network and Relational; Concepts of Schema, Instance and data independence; Three tier schema architecture for data independence; Database system structure, Centralized and Client Server architecture for the database.

UNIT- II: ENTITY RELATIONSHIP MODEL

Introduction, Representation of entities, attributes, entity set, relationship, relationship set, Key constraints - Key constraints for Ternary Relationships, participation constraints, class hierarchies, Aggregation; sub classes, super class, inheritance, specialization, generalization using ER Diagrams.

RELATIONAL MODEL

Introduction to relational model, concepts of domain, attribute, tuple, relation, importance of null values - Comparisons Using Null Values, Logical Connectives AND, OR, and NOT, Impact on SQL Constructs, Disallowing Null Values; Integrity constraints in SQL - Domain constraints, Entity constraints, Referential integrity constraints, Assertions.

UNIT- III: SQL

Form of a basic SQL Query, Examples of Basic SQL Queries, Expressions and Strings in the SELECT Command, Simple Database schema, data types, table definitions, different DML operations, basic SQL querying using where clause, arithmetic and logical operations, SQL functions - Date and Time, Numeric, String conversion; Creating tables with relationship, implementation of key and integrity constraints, nested queries, correlated Nested Queries, set- Comparison Operators, sub queries, grouping, aggregate operators, ordering, implementation of different types of joins, view - updatable and non-updatable;

relational set operations, SQL constructs that grant access or revoke access from user or user groups.

UNIT- IV: SCHEMA REFINEMENT (NORMALIZATION)

Problems Caused by Redundancy [Null Values], Decompositions, Problems Related to Decomposition, Functional dependency, Properties of Functional dependency, Normal forms based on functional dependency - 1NF, 2NF and 3NF.

Transaction Management: Transaction - Single-User versus Multiuser Systems; Transactions, Database Items, Read and Write Operations, and DBMS Buffers.

UNIT- V: CONCURRENCY CONTROL

Why Concurrency Control Is Needed, Why Recovery Is Needed, Transaction States and Additional Operations, The System Log, Commit Point of a Transaction, properties of transactions, Characterizing Schedules Based on Serializability - Serial, Non serial, Two-Phase Locking Techniques for Concurrency Control - Types of Locks and System Lock Tables, Guaranteeing Serializability by Two-Phase Locking, Dealing with Deadlock and Starvation.

Introduction to Indexing:

Types of Single- Level Ordered Indexes - Primary Indexes, Clustering Indexes, Secondary Indexes.

TEXT BOOKS:

1. Database Management Systems - Raghuram Krishnan, Johannes Gehrke, TMH, Third Edition, 2003.
2. Fundamentals of Database Systems - Ramez Elmasri, Shamkant B. Navathe, PEA, Sixth Edition, 2010.

REFERENCE BOOKS:

1. Database System Concepts - Silberschatz, Korth, TMH, Fifth Edition, 2006.
2. Introduction to Database Systems - C J Date, PEA, Eighth Edition, 2006.

ADDITIONAL RESOURCES:

1. nptel.ac.in/courses/106106093
2. nptel.ac.in/courses/10610413

OPEN ELECTIVE I	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	-	-	40	60	100	3
Code: 19BCC4OE10	WEB DEVELOPMENT USING MEAN STACK TECH						

COURSE OBJECTIVE:

- This course is designed to introduce students to learn how to design both the front and back end of web applications. The course will introduce web-based media-rich programming tools for creating interactive web pages.

COURSE OUTCOMES:

After completion of this course, the students would be able to
CO1: Apply Angular8 to develop web applications. [K3]
CO2: Make use of Forms and Services. [K3]
CO3: Utilize Node.js to create Server Side Applications. [K3]
CO4: Make use of Express to deploy web applications. [K3]
CO5: Experiment with NoSQL using MongoDB. [K3]

Unit-I: **Angular8:** Introduction, Installation, Creating First Angular8 Application, Architecture, Angular Components and Templates, Data Binding, Directives, Pipes, Services and Dependency Injection.
Unit-II: **Angular8:** Reactive Programming, Http Client Programming, Angular Material, Routing and Navigation, Forms, Form Validation, CLI Commands.
Unit-III: Node.js: Introduction, Git Basic commands, Node.js Process Model, Node.js Console, Node.js Basics, Node.js Modules, Local Modules, Export Module, Node Package Manager, Node.js Web Server.
Unit-IV: Node.js contd. & Express.js: Node.js File System, Debugging Node.js, Node Inspector, Node.js EventEmitter, Frameworks for Node.js. **Express.js:** Express.js Web App, Serving Static Resources.
Unit-V: MongoDB: Access MongoDB in Node.js, Connecting MongoDB, Insert Documents, Update/Delete Documents, Query Database, Mangoose.

TEXT BOOKS:

1. Node.js, MongoDB and Angular Web Development by Brad Dayley, Brendan Dayley- 2nd Edition – Addison –Wesley
2. Getting MEAN with Mango, Express, Angular and Node by Simon Holmes, Clive Harber-2nd Edition - Manning Publications.
3. MEAN Cookbook by Nicholas McClay - Packt

REFERENCES BOOKS:

1. Node.js: Web Development for Beginners by Joseph Conner
2. Mean Stack Developer by Camila Cooper

ADDITIONAL RESOURCES:

1. https://www.edx.org/course/introduction-to-mongodb-using-the-mean-stack
2. https://www.simplilearn.com/full-stack-web-developer-mean-stack-certification-training
3. https://www.tutorialsteacher.com/nodejs/expressjs-web-application

OPEN ELECTIVE-II

OPEN ELECTIVE II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code : 19BCC5OE09	ARTIFICIAL INTELLIGENCE						

COURSE OBJECTIVE:

The objectives of this course are

- Develop a basic understanding of the building blocks of AI as presented in terms of intelligent agents: Search, Knowledge representation, inference, logic and learning.
- The knowledge of artificial intelligence plays a considerable role in some applications students develop for courses in the program.

COURSE OUTCOMES:

After completion of this course, the students would be able to

CO 1: Summarize the characteristics of AI that make it useful to real-world problems.
CO 2: Analyse different search techniques and predicate logic in artificial Intelligence.
CO 3: Interpret knowledge representation and symbolic reasoning using different rules.
CO 4: Apply the basic knowledge on learning .
CO 5: Make use of the power of AI in Natural language processing as an advanced application of AI.

SYLLABUS

UNIT - I

Introduction to AI, Problems, Problem Spaces and Search: Defining the Problem as a State space Search, Production Systems, Problem Characteristics, Production system characteristics, Issues in the Design of Search Programs.

UNIT - II

Heuristic Search Techniques: Generate-and-test, Hill Climbing, Best-First Search, Problem Reduction, Constraint Satisfaction, Means-Ends Analysis. **Knowledge Representation Using Predicate Logic:** Representing Simple Facts in logic, Representing Instance and Isa Relationships, Computable Functions and Predicates, Resolution.

UNIT - III

Representing Knowledge Using Rules: Procedural versus Declarative Knowledge, Logic Programming, Forward versus Backward Reasoning, Matching, Control Knowledge.

UNIT - IV

Weak slot-and-filler structures: Semantic Nets, Frames, **Strong slot-and-filler structures**: Conceptual dependency, Scripts

Learning: Rote learning, learning by taking advice, learning in problem solving,

UNIT - V

Natural Language Processing: Syntactic Processing, Semantic Analysis, Discourse and Pragmatic Processing, Statistical Natural language Processing, Spell Checking, **Parallel and Distributed AI:** Parallelism in Reasoning Systems, Distributed Reasoning Systems

TEXT BOOKS:

1. Elaine Rich & Kevin Knight, 'Artificial Intelligence', 3nd Edition, (Tata McGraw Hill Edition) Reprint 2008
2. Carl Townsend, 'Introduction to TURBO PROLOG', BPB Publications. 2011
3. Tom M Mitchell "Machine Learning "(McGraw-Hill Science/Engineering/Math; (March 1, 1997))

REFERENCE BOOKS:

3. Patrick Henry Winston, 'Artificial Intelligence', Pearson Education, 2003
4. Russel and Norvig, 'Artificial Intelligence', Pearson Education, PHI, 2003

OPEN ELECTIVE II	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code : 19BCC5OE10	OOPS THROUGH JAVA (OTHER THAN CSE AND ECE)						

COURSE OBJECTIVE:

The course provides fundamentals of object-oriented programming in Java and development of user interface.

COURSE OUTCOMES:

After successful completion of this course, the student will be able to:

CO1: Summarize the basic concepts of Object Oriented Programming.
CO2: Illustrate various programming paradigms of Object Oriented Programing.
CO3: Analyze inheritance, packages and Exception handling concepts.
CO4: Apply multi-threading concepts and Applets.
CO5: Apply Event Handling and AWT concepts in various UI Applications.

SYLLABUS:

UNIT - I

Introduction to OOP: Introduction, Need of Object Oriented Programming, Principles of Object-Oriented Languages(Classes, Objects, Abstraction, Encapsulation, Inheritance, Polymorphism), Procedural languages Vs. OOP, Applications of OOP, History of JAVA, Java Virtual Machine, Java Features(Platform Independence, Object-Oriented, Both Java compiled and interpreted, Robust, Security, Multithreaded, other features), and Program structures, Installation of JDK1.8(Getting started with JDK, JDK Installation notes, Exploring the JDK).

UNIT - II

Programming Constructs: Variables, Primitive Data types, Identifiers (Naming Conventions, Keywords), Literals, Operators (Binary, Unary and ternary), Expressions, Precedence rules and Associativity, Primitive Type Conversion and Casting, Flow of control (Branching, Conditional, loops).

Classes and Objects: classes, Objects, Creating Objects, Methods (method types, method overloading), constructors (Parameterized Constructors, Constructor overloading), Cleaning up unused objects (Garbage collector, Finalization), Static keyword (static variables, methods, blocks), this keyword, Arrays, Recursion, Command line arguments and String handling.

UNIT - III

Inheritance: Types of Inheritance, Deriving classes using extends keyword, Method overriding, super keyword, final keyword, Abstract class.

Interfaces, Packages and Enumeration: Interface (Variables in interface, Extending interface), Interface vs. Abstract classes, Packages (Creating packages, using Packages,

Access protection), Understanding CLASSPATH, java.lang package (Object class, String class), enumeration.
Exceptions: Introduction, Exception handling techniques (try...catch, throw, throws, finally block), user defined exception.

UNIT - IV

Multi-Threading: java.lang.Thread, Thread life cycle, main Thread, Creation of new threads (by inheriting Thread class, Implementing the Runnable interface), Thread priority, Multithreading using isAlive () and join (), Synchronization (Synchronizing Methods, Statements), Suspending and Resuming threads, Communication between Threads.
Applets: Applet class, Applet structure, An Example Applet Program, Applet Life Cycle (init (), start (), stop (), destroy ()), paint (), update () and repaint (), passing parameters to the Applet.

UNIT - V

Event Handling: Introduction, Event Delegation Model, java.awt.event Description, Sources of Events, Event Listeners, Adapter classes, Inner classes.
Abstract Window Toolkit: Why AWT?, java.awt package, Components and Containers, Button, Label, Checkbox, Radio buttons, List boxes, Choice boxes, Text field and Text area, container classes, Layouts, Menu, Scroll bar.

TEXT BOOK:

1. The Complete Reference Java, 8ed, Herbert Schildt, TMH.

REFERENCE BOOKS:

1.JAVA Programming, K. Rajkumar, Pearson.
2.Core JAVA, Black Book, Nageswara Rao, Wiley, Dream Tech.

ONLINE REFERENCES:

1. https://www.coursera.org/learn/object-oriented-java
2. https://www.youtube.com/watch?v=3u1fu6f8Hto
3. https://www.edx.org/course/object-oriented-programming-in-java

OPEN ELECTIVE-III

OPEN ELECTIVE III	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	03
Code : 19BCC6OE09	CLOUD COMPUTING						

COURSE OBJECTIVES:

- To gain knowledge about virtualization and Virtual Machines
- To familiarize Cloud Computing and its services

COURSE OUTCOMES:

After successful completion of this course, the students will be able to:
CO1: Interpret various types of Virtualization.
CO2: Outline the Cloud Computing Architectures and Models.
CO3: Analyze the Cloud Infrastructure Management and Migration and Disaster Management in Cloud
CO4: Analyze AWS and MS Azure services.

SYLLABUS

UNIT-I:

Overview of Cloud Computing: Essentials of Cloud Computing, History of Cloud Computing, Business and Information, Benefits of Cloud Computing, Limitations of Cloud Computing, Characteristics of Cloud Computing, How to Develop Cloud Infrastructure, Vendors of Cloud Computing.

UNIT-II:

Introduction to virtualization and virtual machine: Types of virtualization: Server virtualization, Application/ desktop virtualization, client virtualization, storage virtualization, Network virtualization service / application infrastructure virtualization, virtual machines & virtualization middleware.
Cloud Computing Architecture: Grid Framework Overview, Grid Architecture, Cloud Computing Architecture, Key Design Aspects of Cloud Architecture, Cloud Services, and Cloud Applications, Similarities and Differences Between Grid and Cloud Computing, Cloud and Dynamic Infrastructure.

UNIT-III:

Models of Cloud Computing: Cloud Service Models, Cloud Computing Sub Service Models, Cloud Deployment Models, Alternative Deployment Models, Cloud Stack, Cloud Storage.

UNIT-IV:

Cloud Infrastructure Management and Migration: Administrating Clouds, Cloud Management

Products, Processes in Cloud Service Management, Cloud Providers and Traditional IT Service Providers, How to Access the Cloud, Migrating to Clouds.
Disaster Recovery: Disaster Recovery Planning, Disasters in the Cloud, Disaster Management

UNIT-V:

What is Microsoft Azure?, Types of Azure Clouds, Azure key Concepts, Azure Domains (Components), Traditional vs. Azure Cloud Model, Applications of Azure, Advantages of Azure, Disadvantages of Azure. What is AWS?, History of AWS,Important AWS Services , Amazon Web Services Cloud Platform: Compute & Networking , Storage & Content Delivery Network, Database, Analytics, Application Services, Deployment and Management ,Applications of AWS ,services, Companies using AWS, Advantages of AWS, Disadvantages of AWS, Comparison between Azure and AWS.

TEXT BOOKS:

1. Cloud Computing –Shailendra Singh Oxford University Press.

REFERENCE BOOKS:

1. Cloud Computing and SOA Convergence in Your Enterprise: A Step-by-Step Guide David S. Linthicum Addison-Wesley Professional.
2. Distributed & Cloud Computing From Parallel Processing to the Internet of Things by Kai Hwang. Geoffrey C. Fox. Jack J. Dongarra

ONLINE REFERENCES:

1. http://nptel.ac.in/courses/106106129/21
2. https://freevideolectures.com/course/3649/cloud-computing
3. https://www.youtube.com/watch?v=Eg4AAGCE7X4&list=PL2UlrhJ_JwyA5IlOCdEWlNArFke4jgtlg

OPEN ELECTIVE III	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	03
Code : 19BCC6OE10	BLOCKCHAIN TECHNOLOGIES						

COURSE OBJECTIVES:

- Introduces the fundamental concepts and functionalities of Blockchain.
- Provide conceptual understanding of methods in securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable.

COURSE OUTCOMES:

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

CO 1 : Summarize the fundamentals of Blockchain.
CO 2 : Analyze the working of Blockchain.
CO 3 : Interpret how business can be easily made with Blockchain.
CO 4 : Summarize how Block Chain can be integrated with various current technologies.
CO 5 : Get familiarity about the Blockchain strength in providing solutions.
CO 6 : Investigate and understand the Problems with Blockchain.

SYLLABUS:

UNIT I:

Grasping Blockchain Fundamentals:
Tracing Blockchain's Origin, The shortcomings of current transaction systems, The emergence of bitcoin, The birth of blockchain, Revolutionizing the Traditional Business Network, Exploring a blockchain application, Recognizing the key business benefits, Building trust with blockchain.

UNIT II:

Taking a Look at How Blockchain Works:
Why It's Called "Blockchain", What Makes a Blockchain Suitable for Business?, Shared ledger, Permissions, Consensus, Smart contracts ,Identifying Participants and Their Roles.

UNIT III: .

Propelling Business with Blockchains:
Recognizing Types of Market Friction, Information frictions, Interaction frictions, Innovation frictions, Moving Closer to Friction-Free Business Networks, Reducing information friction, Easing interaction friction, Easing innovation friction, Transforming Ecosystems through Increased Visibility.

UNIT IV:

Blockchain in Action: Use Cases:
Financial Services, Commercial financing, Trade finance, Cross-border transactions, Insurance, Government, Supply Chain Management, Healthcare, Electronic medical records Healthcare payments preauthorization.

UNIT V

Hyperledger, a Linux Foundation Project:
Hyperledger Vision, Hyperledger Fabric, How Can IBM Help Developers Innovate With Blockchain? Offering an easily accessible cloud and development platform, Individualized attention and industry
Expertise.

UNIT VI:

Problems with Blockchain:
Security and Safeguards, Protection from attackers, Hacks on exchanges, What is stopping adoption?, Scalability problems , Network attacks to destroy bitcoin , Case Study: Failed currencies & blockchain

TEXT BOOK:

1. Blockchain For Dummies®, IBM Limited Edition, Manav Gupta, John Wiley & Sons, Inc.111 River St, Hoboken, NJ 07030-5774

REFERENCES:

1. Swan, Melanie. Blockchain: Blueprint for a new economy. "O'Reilly Media, Inc.", 2015.
2. Gupta, M. "Blockchain For Dummies." (2017).

OPEN ELECTIVE-IV

OPEN ELECTIVE IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	4	0	0	40	60	100	3
Code: 19BCC7OE09	**CYBER SECURITY**						

COURSE OBJECTIVES:

- The Cyber security Course will provide the students with foundational Cyber Security principles, Security architecture, risk management, attacks, incidents, and emerging IT and IS technologies.
- Students will gain insight into the importance of Cyber Security and the integral role of Cyber Security professionals.

COURSE OUTCOMES:

C01. Cyber Security architecture principles
C02. Identifying System and application security threats and vulnerabilities
C03. Identifying different classes of attacks
C04. Cyber Security incidents to apply appropriate response
C05. Describing risk management processes and practices
C06. Evaluation of decision making outcomes of Cyber Security scenarios

SYLLABUS

UNIT- I

Introduction to Cybercrime:
Introduction, Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? , Classifications of Cybercrimes, Cybercrime: The Legal Perspectives, Cybercrimes: An Indian Perspective, Cybercrime and the Indian ITA 2000, A Global Perspective on Cybercrimes, Cybercrime Era: Survival Mantra for the Netizens.
Cyber offenses: How Criminals Plan Them –Introduction, How Criminals Plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector Cloud Computing.

UNIT –II

Cybercrime Mobile and Wireless Devices:
Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

UNIT –III

Tools and Methods Used in Cybercrime:
Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Trojan Horses and Backdoors, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer Overflow, Attacks on Wireless Networks, Phishing and Identity Theft:Introduction, Phishing, IdentityTheft(IDTheft)

UNIT –IV

Cybercrimes and Cyber security:
Why Do We Need Cyber laws: The Indian Context, The Indian IT Act, Challenges to Indian Law and Cybercrime Scenario in India, Consequences of Not Addressing the Weakness in Information Technology Act, Digital Signatures and the Indian IT Act, Information Security Planning and Governance, Information Security Policy Standards, Practices, The information Security Blueprint, Security education, Training and awareness program, Continuing Strategies.

UNIT –V

Understanding Computer Forensics:
Introduction, Historical Background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber forensics and Digital Evidence, Forensics Analysis of E-Mail, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Computer Forensics Investigation, Computer Forensics and Steganography, Relevance of the OSI 7 Layer Model to Computer Forensics, Forensics and Social Networking Sites: The Security/Privacy Threats, Computer Forensics from Compliance Perspective, Challenges in Computer Forensics, Special Tools and Techniques, Forensics Auditing, Antiforensics.

TEXT BOOKS:

1.Cyber Security: Understanding Cyber Crimes, Computer Forensics and LegalPerspectives, Nina Godbole, SunitBelapure, Wiley.
2.Principles of Information Security, MichealE.Whitman and Herbert J.Mattord, Cengage Learning.

REFERENCE BOOK:

1. Information Security, Mark Rhodes, Ousley, MGH.

OPEN ELECTIVE IV	L	T	P	INTERNAL MARKS	EXTERNAL MARKS	TOTAL MARKS	CREDITS
	3	0	0	40	60	100	3
Code: 19BCC7OE10	**ETHICAL HACKING**						

COURSE OBJECTIVES:

- To develop ability to quantitatively assess and measure threats to information assets
- Evaluate where information networks are most vulnerable and perform penetration tests into secure networks for evaluation purposes
- Critique security plans designed at protecting data assets against attacks from the Internet and investigate and mitigate data risk

COURSE OUTCOMES:

After completion of this course, the students would be able to:

CO1: Classify the elements of information security and its challenges and role of security and penetration testing [K2]
CO2: Analyze different attacks and hacking methods [K4]
CO3: Exemplify different techniques in hacking [K2]
CO4: Apply Ethical hacking techniques and Ethical Hacking Laws [K3]

SYLLABUS:

UNIT - I:

ETHICAL HACKINFG: Types of Data Stolen, Elements of Information Security, Authenticity and Non-Repudiation, Security Challenges, Effects of Hacking, Types of Hackers, Ethical Hacker, Hacktivism - Role of Security and Penetration Tester, Penetration Testing Methodology, Networking & Computer Attacks – Malicious Software (Malware), Protection Against Malware, Intruder Attacks on Networks and Computers, Addressing Physical Security – Key Loggers and Back Doors.

UNIT - II:

FOOT PRINTING AND SOCIAL ENGINEERING: Web Tools for Foot Printing, Conducting Competitive Intelligence, Google Hacking, Scanning, Enumeration, Trojans & Backdoors, Virus & Worms, Proxy & Packet Filtering, Denial of Service, Sniffer, Social Engineering – shoulder surfing, Dumpster Diving, Piggybacking.

UNIT - III:

DATA SECURITY & FIREWALLS: Physical Security – Attacks and Protection, A study on various attacks – Input validation attacks – SQL injection attacks – Buffer overflow attacks - Privacy attacks, Attacks and Measures, Wireless Hacking, Windows Hacking, Linux Hacking.

UNIT - IV:

NETWORK PROTECTION SYSTEM & HACKING WEB SERVERS: Routers, Firewall & Honeypots, IDS & IPS, Web Filtering, Vulnerability, Penetration Testing, Session Hijacking, Web Server, SQL Injection, Cross Site Scripting, Exploit Writing, Buffer Overflow, Reverse Engineering, Email Hacking, Incident Handling & Response, Bluetooth Hacking, Mobiles Phone Hacking.

UNIT - V:

ETHICAL HACKING LAWS AND TESTS : An introduction to the particular legal, professional and ethical issues likely to face the domain of ethical hacking, ethical responsibilities, professional integrity and making appropriate use of the tools and techniques associated with ethical hacking – Social Engineering, Host Reconnaissance, Session Hijacking, Hacking - Web Server, Database, Password Cracking, Network and Wireless, Trojan, Backdoor, UNIX, LINUX, Microsoft, NOVEL Server, Buffer Overflow, Denial of Service Attack, Methodical Penetration Testing.

TEXT BOOKS:

1. Michael T. Simpson, Kent Backman, James E. "Corley, Hands-On Ethical Hacking and Network Defense", Second Edition, CENGAGE Learning, 2010.
2. Kenneth C.Brancik, "Insider Computer Fraud", Auerbach Publications Taylor & Francis, Group 2008.
3. Ankit Fadia, "Ethical Hacking", Second Edition Macmillan India Ltd, 2006.

REFERENCE BOOKS:

1. Steven DeFino, Barry Kaufman, Nick Valenteen, "Official Certified Ethical Hacker Review Guide", CENGAGE Learning, 2009-11-01.
2. Patrick Engebretson, "The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy", Syngress Basics Series –Elsevier, August 4, 2011.Whitaker & Newman, "Penetration Testing and Network Defence", Cisco Press, Indianapolis, IN, 2006.