AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

(Approved by AICTE | Accredited by NAAC | Affiliated to JNTUA)

Gudur, Nellore Dist - 524101, A.P (India)

OUTCOME BASED EDUCATION

WITH

CHOICE BASED CREDIT SYSTEM

BACHELOR OF TECHNOLOGY

ACADEMIC REGULATIONS

UNDER AUTONOMOUS STATUS

DEPARTMENT OF

COMPUTER SCIENCE & ENGINEERING

B.Tech Regular Four Year Degree Programme

(For the batches admitted from the academic year 2016 - 2017)

B.Tech (Lateral Entry Admission)

(For the batches admitted from the academic year 2017 - 2018)

FAILURE TO READ AND UNDERSTAND THE REGULATIONS

IS NOT AN EXCUSE

One best book is equal to hundred good friends, but one good friend is equal to a library.

All of us do not have equal talent, but all of us have an equal opportunity to develop our talents

“This is the way to success”

Dr.A.P.J.Abdul Kalam

VISION AND MISSION OF THE INSTITUTE

VISION

To make Audisankara College of Engineering & Technology a centre for academic excellence where 21st century innovative minds manage with novel ideas & spreadout new technologies relevant to the social needs with increased employment opportunities and changed lifestyle.

MISSION

To provide the students with technological direction and support, acclaimed in latest cutting edge technologies with a blend of academic concepts and practical nuances in hot areas of engineering and technology so that they develop all the resourcefulness, competence and confidence to takeon the technological challenges of tomorrow.

PRELIMINARY DEFINITIONS AND NOMENCLATURES

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

Academic Autonomy: It's a privilege conferred to an institute by UGC following meticulous evaluation process to manage its academic programmes independently for promoting excellence.

Academic Year: An academic year consists of two semesters each lasting 21 weeks i.e., (one odd + one even). It is the period necessary to complete an actual course of study within a year.

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

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

Backlog Course: A course is considered to be a backlog course if the student has not cleared and due to which obtained a failure grade (F) in that course.

Basic Sciences: Basic sciences are Mathematics, Physics, Chemistry, English etc., They provide the basic knowledge of all Engineering sciences.

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

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

Branch: It's specialization in an Engineering discipline like Electronics & Communication Engineering, Computer Science & Engineering, Electical & Electronics Engineering, Mechanical Engineering, Civil Engineering etc.

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

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

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

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

Continuous Internal Examination: It's an examination that evaluates a student's progress throughout the prescribed course.

Course: A course is a unit of teaching that typically lasts one academic term. Courses explore the practice of teaching from both applied and theoretical perspective.

Course Outcomes: Learning outcomes are statements that describe significant and essential learning that learners have achieved, and can reliably demonstrate at the end of a course or program.

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

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

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

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

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

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

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

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

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

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

ASCET: AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY, Gudur, Nellore Dist, Andhra Pradesh.

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

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

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

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

Program: Bachelor of Technology (B.Tech) degree program / PG degree program: Master of Technology (M.Tech)/ Master of Business Administration (MBA) / Master of Computer Applications (MCA).

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

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

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

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

Regulations: The regulations, common to all B.Tech programs offered by Institute are designated as "ASCET Regulations R-16" and are binding on all the stakeholders.

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

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

S/he: A written representation of 'he or she' used as a neutral alternative to indicate someone of either sex.

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

JNTUA: Means the Jawaharlal Nehru Technological University Anantapur, Ananthapuramu.

FOREWORD

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

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

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

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

PRINCIPAL

AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY
(AUTONOMOUS)
Gudur, Nellore Dist - 524101, A.P (India)

ACADEMIC REGULATIONS
B.Tech. Regular Four Year Degree Programme
(For the batches admitted from the academic year 2016 - 17)
&
B.Tech. (Lateral Entry Scheme)
(For the batches admitted from the academic year 2017 - 18)

For pursuing four year undergraduate Bachelor Degree programme of study in Engineering (B.Tech) offered by **AUDISANKARA COLLEGE OF ENGINEERING & TECHNOLOGY** under Autonomous status and herein after referred to as ASCET.

1.0 CHOICE BASED CREDIT SYSTEM

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

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

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

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

The CBCS permits students to:

- Choose electives from a wide range of elective courses offered by the departments.
- Undergo additional courses of interest.
- Adopt an interdisciplinary approach in learning.
- Make the best use of expertise of the available faculty.

2.0 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.

2.1 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.

- Under category A: 70% of the seats are filled through EAMCET counseling.
- Under category B: 30% seats are filled based on 10+2 merits in compliance with guidelines of APSCHE.

2.2 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.

3.0. DURATION OF PROGRAMME

The course duration for the award of the Degree in **Bachelor of Technology** will be four academic years, with two semesters in each year. However if a student is unable to complete the course within 4 years, he/ she can do so by giving more attempts but within 8 consecutive academic years from the date of admission.

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.

4.0.MEDIUM OF INSTRCTION

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

5.0 BRANCHES OF STUDY

- Civil Engineering (CE)
- Electrical & Electronics Engineering (EEE)
- Mechanical Engineering (ME)
- Electronics & Communication Engineering (ECE)
- Computer Science & Engineering (CSE)

6.0 TYPES OF COURSES

6.1 Foundation / Skill Course

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

6.2 Core Course

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

6.3 Elective Course

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

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

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

There are four professional elective groups; students can choose not more than two courses from each group. Overall, students can opt for four professional elective courses which suit their project work in consultation with the faculty advisor/mentor. Nevertheless, one course from each of the two open electives has to be selected.

7.0 SEMESTER STRUCTURE

Each academic year is divided into two semesters, TWO being Main Semesters (one odd + one even). Main Semesters are for regular class work. However, the following cases are exempted:

7.1 Students admitted on transfer from JNTUA affiliated institutes, Universities and other institutes in the subjects in which they are required to earn credits so as to be on par with regular students as prescribed by concerned 'Board of Studies'.

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

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

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

Table 1: Academic Calendar

FIRST SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation and Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Semester Break and Supplementary Examinations			2 weeks
SECOND SEMESTER (21 weeks)	I Spell Instruction Period	8 weeks	19 weeks
	I Mid Examinations	1 week	
	II Spell Instruction Period	8 weeks	
	II Mid Examinations	1 week	
	Preparation & Practical Examinations	1 week	
	Semester End Examinations		2 weeks
Summer Vacation and Supplementary Examinations			8 weeks

8.0 REGISTRATION

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

8.2 INABSENTIA registration will not be permitted under any circumstance.

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

9.0 UNIQUE COURSE IDENTIFICATION CODE

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

S. No	Branch	Code
1	Civil Engineering	01
2	Electrical & Electronics Engineering	02
3	Mechanical Engineering	03
4	Electronics & Communication Engineering	04
5	Computer Science & Engineering	05

10.0 CURRICULUM AND COURSE STRUCTURE

The curriculum shall comprise Foundation/ Skill Courses, Core Courses, Elective Courses, Open Electives, Laboratory Courses, Technical Seminar, Term Paper, Communication Skills Practice, Soft Skills Practice, Professional Society Activities, Mini Project, Internship and Major Project and Comprehensive Viva-Voce. The list of elective courses may include subjects from allied disciplines also.

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

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

10.1Credit distribution for courses offered is shown in Table 3.

Table 3: Credit distribution

S. No	Course	Hours	Credits
1	Theory Course (Core/Foundation/Elective)	3	3
2	Theory Course (Core/Foundation/Elective)	2+2	3
3	MOOC Courses	-	3
4	Laboratory Courses/Drawing Courses	3	2
5	Technical Seminar	3	1
6	Term Paper	3	2
7	Mini Project	3	2
8	Internship	3	2
9	Major Project And Comprehensive Viva-Voce	8	12
10	Communication Skills Practice	3	1
11	Soft Skills Practice	3	1
12	Quantitative Aptitude	3	1
13	Technical Aptitude	3	1
14	Professional Society Activities	3	1
15	Full Semester Internship	-	21
16	Audit Course	-	-

10.2 Course Structure

Every program of study shall be designed to have 42 theory courses and 21 laboratory courses. Every course of the B.Tech program will be placed in one of the eight categories with minimum credits as listed in Table 4. In addition, a student has to carry out a mini project, project work and comprehensive examination.

Table 4: Category Wise Distribution of Credits

S. No	Category	Subject Area and % of Credits	Average No. of Credits
1	Humanities and Social Sciences (HS), including Management.	HS (05% to 10%)	**13**
2	Basic Sciences (BS) including Mathematics, Physics and Chemistry.	BS (10% to 15%)	**22**
3	Engineering Sciences (ES), including Workshop, Drawing, Basics of Electrical / Electronics / Mechanical / Computer Engineering.	ES (10% to 15%)	**18**
4	Professional Subjects - Core (PC), relevant to the chosen specialization/branch.	PC (40% to 50%)	**99**
5	Professional Subjects - Electives (PE), relevant to the chosen specialization/branch.	PE (10% to 15%)	**15**
6	Open Subjects - Electives (OE), from other technical and/or emerging subject areas.	OE (01% to 5%)	**03**
7	Project Work and Comprehensive Viva-Voce, Mini Project and Internship	10% to 15%	**16**
8	Technical Seminar, Term Paper, Quantitative Aptitude, Technical Aptitude and Professional Society Activities	CRT	**10**
		TOTAL	**196**

10.3 Semester-wise course break-up

Following are the TWO models of course structure out of which any student shall choose or will be allotted with one model based on their academic performance.

i. Full Semester Internship (FSI) Model and

ii. Non Full Semester Internship (NFSI) Model.

10.4 Four year regular program (FSI Model):

In the FSI Model, selected/eligible students shall undergo Full Semester Internship in B.Tech 7^{th} Semester. In the Non FSI Model, the remaining students shall carry out the course work and project work as specified in the course structure. A student who secures a minimum CGPA of 7.5 upto 4^{th}

Semester with no backlogs and maintains the CGPA of 7.5 till 6th Semester shall be eligible to opt for FSI

10.5 For Four year regular program (FSI Model):

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
1st Semester	5 Foundation	3	21
2nd Semester	5 Foundation	3	21
3rd Semester	1 Foundation + 5 Core	3+CSP+PSA+Audit Course	24+1+1=26
4th Semester	1 Foundation + 5 Core	3+TS+SSP+PSA	24+1+1+1=27
5th Semester	6 Core	3+TP+QA+PSA	24+2+1+1=28
6th Semester	5 Core + 1 Elective	3+Mini Project +TA+PSA	24+2+1+1=28
7th Semester	3 Core + 1 Elective + 1 Open Elective	3+Internship+PSA	21+2+1=24
8th Semester	Full Semester Internship (FSI)		21
Total	39	21+TP+TS+Internship+ Mini Project+ CSP+ SSP+ QA+TA+PSA+FSI	196

10.6 For Four year regular programme (Non FSI Model)

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
1st Semester	5 Foundation	3	21
2nd Semester	5 Foundation	3	21
3rd Semester	1 Foundation + 5 Core	3+CSP+PSA+Audit Course	24+1+1=26
4th Semester	1 Foundation + 5 Core	3+TS+SSP+PSA	24+1+1+1=27
5th Semester	6 Core	3+TP+QA+PSA	24+2+1+1=28
6th Semester	5 Core + 1 Elective	3+Mini Project +TA+PSA	24+2+1+1=28
7th Semester	3 Core + 1 Elective + 1 Open Elective	3+Internship+PSA	21+2+1=24
8th Semester	3 Electives	Major Project +Viva	9+12=21
Total	42	21+TP+TS+Internship+Mini Project + CSP + SSP + QA+TA + PSA+Major Project	196

10.7 For Three year lateral entry program (FSI Model):

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
3rd Semester	1 Foundation + 5 Core	3+CSP+PSA+Audit Course	24+1+1=26
4th Semester	1 Foundation + 5 Core	3+TS+SSP+PSA	24+1+1+1=27
5th Semester	6 Core	3+TP+QA+PSA	24+2+1+1=28
6th Semester	5 Core + 1 Elective	3+Mini Project +TA+PSA	24+2+1+1=28
7th Semester	3 Core + 1 Elective + 1 Open Elective	3+Internship+PSA	21+2+1=24
8th Semester	Full Semester Internship (FSI)		21
Total	29	15+TP+TS+Internship+Mini Project+ CSP+ SSP +QA +TA +PSA + FSI	154

10.8 For Three year lateral entry program (Non FSI Model)

Year/Sem	No. of Theory Courses	No. of Lab Courses	Total Credits
3rd Semester	1 Foundation + 5 Core	3+CSP+PSA	24+1+1=26
4th Semester	1 Foundation + 5 Core	3+TS+SS+PSA	24+1+1+1=27
5th Semester	6 Core	3+TP+QA+PSA+Audit Course	24+2+1+1=28
6th Semester	5 Core + 1 Elective	3+Mini Project +TA+PSA	24+2+1+1=28
7th Semester	3 Core + 1 Elective + 1 Open Elective	3+Internship+PSA	21+2+1=24
8th Semester	3 Electives	Major Project +Viva	9+12=21
Total	32	15+TP+TS+Internship+Mini Project+ CSP +SSP + QA + TA +PSA + Major Project	154

Note: PSA - Professional Society Activities
CSP - Communication Skills Practice
SSP – Soft Skills Practice
TS – Technical Seminar
TP – Term Paper
QA – Quantitative Aptitude
TA - Technical Aptitude

10.9 Course-wise break-up for Four year Regular program (FSI Model):

Total Theory Courses - 39 (36 Foundation and Core + 2 Professional Electives + 1 Open Elective)	39 @ 3credits each	117
Laboratory Courses – 21	21 @ 2 credits each	42
Term Paper with self study report	1@ 2 credit	02
Mini Project with self study report	1 @ 2credits	02
Internship	1 @ 2credits	02
Technical Seminar	1 @ 1credit	01
Communication Skills Practice	1 @ 1credit	01
Soft Skills Practice	1 @ 1credit	01
Quantitative Aptitude	1 @ 1credit	01
Technical Aptitude	1 @ 1credit	01
Professional Society Activities	5 @ 1credit each	05
Full Semester Internship	1 @ 21credit	21
	TOTAL CREDITS	**196**

10.10 Course-wise break-up for Four year Regular program(Non FSI Model)

Total Theory Courses - 42 (36 Foundation and Core + 5 Professional Electives + 1 Open Elective)	42 @ 3credits each	126
Laboratory Courses – 21	21 @ 2 credits each	42
Term Paper with self study report	1@ 2 credit	02
Mini Project with self study report	1 @ 2credits	02
Internship	1 @ 2credits	02
Technical Seminar	1 @ 1credit	01
Communication Skills Practice	1 @ 1credit	01
Soft Skills Practice	1 @ 1credit	01
Quantitative Aptitude	1 @ 1credit	01
Technical Aptitude	1 @ 1credit	01
Professional Society Activities	5 @ 1credit each	05
Major Project and Comprehensive Viva-Voce	1 @ 12credits	12
TOTAL CREDITS		**196**

10.11Course-wise break-up for three year lateral entry program(FSI Model)

Total Theory Courses - 29 (26 Foundation and Core + 2 Professional Electives + 1 Open Elective)	29 @ 3credits each	87
Laboratory Courses – 15	15 @ 2 credits each	30
Term Paper with self study report	1@ 2 credit	02
Mini Project with self study report	1 @ 2credits	02
Internship	1 @ 2credits	02
Technical Seminar	1 @ 1credit	01
Communication Skills Practice	1 @ 1credit	01
Soft Skills Practice	1 @ 1credit	01
Quantitative Aptitude	1 @ 1credit	01
Technical Aptitude	1 @ 1credit	01
Professional Society Activities	5 @ 1credit each	05
Full Semester Internship	1 @ 21credit	21
	TOTAL CREDITS	**154**

10.12 Course-wise break-up for three year lateral entry program (Non FSI Model):

Total Theory Courses - 32 (26 Foundation and Core + 5 Professional Electives + 1 Open Elective)	32 @ 3credits each	96
Laboratory Courses – 15	15 @ 2 credits each	30
Term Paper with self study report	1@ 2 credit	02
Mini Project with self study report	1 @ 2credits	02
Internship	1 @ 2credits	02
Technical Seminar	1 @ 1credit	01
Communication Skills Practice	1 @ 1credit	01
Soft Skills Practice	1 @ 1credit	01
Quantitative Aptitude	1 @ 1credit	01
Technical Aptitude	1 @ 1credit	01
Professional Society Activities	5 @ 1credit each	05
Major Project and Comprehensive Viva-Voce	1 @ 12credits	12
TOTAL CREDITS		**154**

11.0 DIVISION OF MARKS FOR INTERNAL AND EXTERNAL ASSESSMENT

Name of the Course	Continuous Internal Assessment (CIA)	Semester End Examination (SEE)
Theory	40	60
Laboratory	25	50
Technical Seminar	100	-
Term Paper	-	50
Mini Project	25	50
Internship	25	50
Communication Skills Practice	25	25
Soft Skills Practice	-	25
Quantitative Aptitude	-	50
Technical Aptitude	-	50
Professional Society Activities	-	-
Major Project and Comprehensive Viva-Voce	40	160

12.0 EVALUATION METHODOLOGY

The performance of a student in each semester shall be evaluated through Continuous Internal Assessment (CIA) and / or an Semester End Examination (SEE) conducted semester wise.

12.1 Theory Course

The performance of a student in every theory course shall be evaluated for total of 100 marks each, of which the relative weightage for Continuous Internal Assessment and Semester End Examination shall be 40 marks and 60 marks respectively.

12.2 Practical Course

The performance of a student in every practical course shall be evaluated for total of 75 marks each, of which the relative weightage for Continuous Internal Assessment and Semester End Examination shall be 25 marks and 50 marks respectively.

12.3 Internal Evaluation for Theory Course

The total internal weightage for theory courses is 40 marks with the following distribution.

- 30 marks for Mid-Term Examination
- 10 marks for Assignment Test

While the first mid-term examination shall be conducted on the 50% of the syllabus (Unit-I & Unit-II), the second mid-term examination shall be conducted on the remaining 50% of the syllabus (Unit III & Unit-IV).

10 marks are allocated for assignment test (as specified by the subject teacher concerned). The first assignment should be conducted after completion of Unit-I for 5 marks and the second assignment should be conducted after completion of Unit-III for 5 marks. The final Assignment Test marks will be the addition of these two.

Two midterm examinations each for **30 marks** with the duration of 90 minutes each will be conducted for every theory course in a semester. The midterm examination marks shall be awarded giving a weightage of 80% in the midterm examination in which the student scores better performance and 20% in the remaining midterm examination.

The final mid-term marks obtain by the addition of these two (80% + 20%).

Example: If a student scores 23 marks and 24 marks in the first and second mid-term examinations respectively,

then Weighted Average Marks = 24 x 0.8 + 23 x 0.2 = 23.8,

rounded to 24 Marks.

Note: The marks of any fraction shall be rounded off to the next higher mark.

12.4 Pattern of the midterm examination question paper is as follows

- A total of two Sections (Section-I & Section-II)
- Section-I contains five two marks questions. Two questions from each unit and a student has to be answered all five questions ($5 \times 2 = 10$ Marks)
- Section-II contains four questions are to be designed taking two questions from each unit and a student has to be answered three questions. ($3 \times 10 = 30$ Marks)
- Then its converted to 30 marks.

Pattern of the Assignment Test is as follows

- Five assignment questions are given in advance, out of which two questions given by the concerned teacher has to be answered during the assignment test
- Sum of Assignment Tests marks is considered.

Note: A student who is absent for any Mid-Term Examination/ Assignment Test, for any reason whatsoever, shall be deemed to have scored zero marks in that Mid-Term Examination/ Assignment Test and no make-up test shall be conducted.

12.5 Internal Evaluation for Practical Course

For practical subjects there shall be a Continuous Internal Evaluation during the semester for 25 internal marks. Out of the 25 marks for internal evaluation, day-to-day assessment in the laboratory shall be evaluated for 10 marks and internal practical examination shall be evaluated for 15 marks conducted by the laboratory teacher concerned.

12.6 Internal Evaluation for Design/ Drawing Courses

For the subject having design and/or drawing, (such as engineering graphics, engineering drawing, machine drawing, production drawing and building drawing) the internal marks distribution shall be 10 marks for day-to-day performance and 20 marks for Mid-Term Examinations.

12.7 Internal Evaluation for Technical Seminar

There shall be a Technical seminar presentation in 4th Semester. A Technical Seminar shall have two components, one chosen by the student from the course work as an extension and approved by the faculty supervisor. The other component is suggested by the supervisor and can be a reproduction of the concept in any standard research paper or an extension of concept from earlier course work. A hard copy of the information on seminar topic in the form of a report is to be submitted for evaluation along with presentation. The presentation of the seminar topics shall be made before a committee consisting of Head of the department, seminar supervisor and a senior faculty member. Each Technical Seminar shall be evaluated for 100 marks. Technical Seminar component-I for 50 marks and component-II for 50 marks making total 100 marks. (**Distribution of marks for 50:** 10 marks for report, 10 marks for subject content, 20 marks for presentation and 10 marks for queries).

12.8 Internal Evaluation for Communication Skills Practice

For communicational skills practice subject, there shall be a Continuous Internal Assessment during the semester for 25 internal marks. Out of the 25 marks for internal evaluation, day-today assessment in the laboratory shall be evaluated for 10 marks and internal practical examination shall be evaluated for 15 marks conducted by the laboratory teacher concerned.

12.9 Mini Project

The Mini Project shall be carried out during 6th Semester along with other lab courses by having regular weekly slots. Students will take mini project batch-wise and the batches will be divided as per the guidelines issued. The topic of mini project should be so selected that the students are enabled to complete the work in the stipulated time with the available resources in the respective laboratories. The scope of mini project could be handling part of the consultancy work, maintenance of the existing equipment, development of new experiment setup or can be a prelude to the main project with specific outcome.

Mini Project report will be evaluated for 75 marks. 25 marks for internal evaluation and 50 marks for external evaluation.

Assessment will be done by the supervisor/guide for 25 marks based on the work and presentation/ execution of the mini project.

The remaining 50 marks is based on report, presentation, execution and viva-voce. Evaluation is done by a committee comprising the mini project supervisor, Head of the Department and external examiner appointed by the Principal from the panel of experts recommended by Chairman, BOS in consultation with Head of the Department.

12.10 Internal Evaluation for Internship

Internship course is 25 marks for continuous internal assessment and will be evaluated based on day-to-day assessment by concern industry.

12.11 Internal Evaluation for Major Project Work: 8th Semester

The major project shall be carried out during the 8th Semester in the **Non FSI Model** and shall be evaluated for 200 marks out of which 60 marks for internal evaluation and 140 marks for semester end evaluation. Major project will be taken up batch wise and batches will be divided as per the guidelines. The object of major project is to enable the student to extend further the investigative study takenup as the project in Mini project under the guidance of the supervisor/ guide from the department.

The assignment normally includes:

- Preparing an action plan for conducting the investigation including the team work.
- In depth study of the topic assigned.
- Review and finalization of the approach to the problem relating to the assigned topic.
- Final development of product/process, testing, results, conclusions and further direction.
- Preparing a paper for conference presentation/ publication in journal, if possible.
- Preparing a dissertation in the standard format for being evaluated by the department.
- Final presentation of the work done before the Project Review Committee (PRC).

Major Project is allocated 60 internal marks. Out of 60, 30 marks are allocated for the supervisor/guide and head of the department to be evaluated based on two seminars given by each student on the topic of the project. The other 30 marks shall be evaluated on the basis of his presentation on the work done on his project by the Departmental Committee comprising of Head of the Department, respective supervisor/ guide and two senior faculty of the department appointed by the Principal.

12.12 External Evaluation for Theory Course - Semester End Examination

The Semester End Examination in each theory subject shall be conducted for 3 hours duration at the end of the semester for 60 marks.

Pattern of the Semester End Examination question paper is as follows:

- A total of two Sections (Section-I & Section-II)
- Section-I contains six two mark questions. One question from each unit and a student has to be answered all the six questions compulsory ($6 \times 2 = 12$ Marks)
- Section-II contains eight questions are to be designed taking two questions from each unit (Unit Wise - Either or type) of the total four units. ($4 \times 12 = 48$ Marks)

A student has to secure not less than a minimum of 40% of marks (24 marks) exclusively at the Semester End Examinations in each of the theory subjects in which the candidate had appeared. However, the candidate shall have to secure a minimum of 40% of marks (40 marks) in both external and internal components put together to become eligible for passing in the subject.

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

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

12.13 External Evaluation for Practical Course

Out of 50 marks **35** marks are allocated for experiment (procedure for conducting the experiment carries 15 marks & readings, calculation and

result-20) and **10** marks for viva-voce examination with **5** marks for the record.

Each Semester External Lab Examination shall be evaluated by an Internal Examiner along with an External Examiner appointed by the Principal.

A candidate shall be declared to have passed in individual lab course if he secures a minimum of 50% aggregate marks (38 marks) (Internal & Semester External Examination marks put together), subject to a minimum of 50% marks (25 marks) in the semester external examination.

12.14 External Evaluation for Communication Skills Practice

25 marks to be conducted after 10 weeks of training to assess the training outcomes. Semester End Evaluation shall be done for 25 marks by the skilled soft Skill Trainer nominated by the Principal.

A candidate shall be declared to have passed in individual lab course if he secures a minimum of 50% aggregate marks (25 marks) (Internal & Semester External Examination marks put together), subject to a minimum of 50% marks (13 marks) in the semester external examination.

12.15 External Evaluation for Soft Skills Practice

25 marks to be conducted after 10 weeks of training to assess the training outcomes. Semester End Evaluation shall be done for 25 marks by the skilled soft Skill Trainer nominated by the Principal.

A candidate shall be declared to have passed in individual lab course if he secures a minimum of 50% marks (13 marks) in the semester external examination.

12.16 External Evaluation for Quantitative Aptitude

The external examination will be conducted for 50 Marks with 1 credit, examination type is Multiple Choice Question (MCQ) – Offline/Online.

12.17 External Evaluation for Technical Aptitude

The external examination will be conducted for 50 Marks with 1 credit, examination type is Multiple Choice Question (MCQ) – Offline/Online.

12.18 External Evaluation for Term Paper

The Term Paper is a self study report and shall be carried out either during 5th Semester along with other lab courses. Every student will take up this

term paper individually and submit a report. The scope of the term paper could be an exhaustive literature review choosing any engineering concept with reference to standard research papers or an extension of the concept of earlier course work in consultation with the term paper supervisor. The term paper reports submitted by the individual students during the 5th Semester shall be evaluated for a total of 50 marks for external evaluation, it shall be conducted by two Examiners, one of them being term paper supervisor as internal examiner and an external examiner nominated by the Principal from the panel of experts recommended by HOD.

12.19 External Evaluation for Major Project

The major project shall be carried out during the 8th Semester in the **Non FSI Model** and shall be evaluated for 200 marks. The Semester End Examination for major project work done during 8th Semester and for 140 marks shall be conducted by a Project Review Committee (PRC). The committee comprises of an External Examiner appointed by the Principal, Head of the Department and Project Guide/Supervisor. The evaluation of project work shall be conducted at the end of the 8th Semester. The above committee evaluates the project work report with weightages of 50% of the marks (50 marks) awarded by external examiner, 20% of marks (20 marks) awarded by HOD & 30% of the marks (30 marks) by Project Guide/ Supervisor respectively for a total of 100 marks. Of the 40 marks for Presentation & Viva-Voce examination, HOD evaluates for 10 marks and external examiner for 30 marks. The evaluation of 140 marks is distributed as given below:

Distribution of Project Work Marks

Sl. No.	Criterion	Marks
1	Report	100
2	Presentation & Viva – Voce	40

A candidate shall be declared to have passed in major project if he secures a minimum of 50% aggregate marks (100 marks) (Internal & Semester External Examination marks put together), subject to a minimum of 50% marks (70 marks) in the major project end examination.

12.20 Massive Open Online Courses (MOOCs)

Meeting with the global requirements, to inculcate the habit of self learning and incompliance with UGC guidelines, MOOC (Massive Open Online

Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers

Regulations for MOOCs

- The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.
- Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.
- A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.
- The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.
- Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.
- There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses.
- Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.

12.21 Internship

There shall be 60 hours duration to complete summer internship during summer vacations. The total internal weightage for internship course is 25 marks and will be evaluated based on day-to-day assessment by concern industry.

The external examination shall be evaluated by the two senior faculties (i.e one faculty act as external examiner and other one as internal examiner) for 50 marks based on the his/her report and presentation.

12.22 Full Semester Internship (FSI)

Full Semester Internship (FSI) programme carries 21 credits. During the FSI, student has to spend one full semester in an identified industry /firm / organization and has to carry out the internship as per the stipulated guidelines of that industry / firm / organization and the institute.

Following are the evaluation guidelines

- Profile and abstract –Student has to submit the industry profile and abstract of the project within four weeks from date of commencement of internship through mail or post.

  Weightage: 10%.

- Seminar 1 -at 9^{th} week from date of commencement of internship weightage: 10%
- Seminar 2 -Pre-submission at 17^{th} week from date of commencement of internship– Weightage: 10%
- Internship Diary, weightage: 15 %
- Project Report, weightage: 15%
- Viva-voce & Final Presentation, weightage: 40%

The internship shall be evaluated for 200 marks out of which 60 marks for internal evaluation and 140 marks for external evaluation.

The external evaluation based on the report submitted and viva-voce exam for 140 marks by a committee comprising the HOD, Project supervisor and external examiner (Industry/ Academia).A minimum of 60% of maximum marks shall be obtained to earn the corresponding credits.

FSI shall be open to all the branches in the VII semester. The selection procedure is:

- Choice of the students
- CGPA (> 7.5) upto IV semester with no current arrears and maintains the CGPA of 7.5 till VI Semester

13.0 GRADING PROCEDURE

Grades will be awarded to indicate the performance of students in each theory subject, laboratory / practicals, Technical Seminar, Term Paper, Mini Project, Communication Skills Practice, Soft Skills Practice, Quantitative Aptitude, Technical Aptitude and Major Project. Based on the percentage of marks obtained (Continuous Internal Evaluation plus Semester End Examination, both taken together) as specified in item 11 above, a corresponding letter grade shall be given.

13.1 As a measure of the performance of a student, a 10-point absolute grading system using the following letter grades (as per UGC/AICTE guidelines) and corresponding percentage of marks shall be followed

% of Marks Secured in a Subject/Course (Class Intervals)	Letter Grade (UGC Guidelines)	Grade Points
Greater than or equal to 90%	S (Superior)	10
80 and less than 90%	A (Excellent)	9
70 and less than 80%	B (Very Good)	8
60 and less than 70%	C (Good)	7
50 and less than 60%	D (Average)	6
40 and less than 50%	E (Pass)	5
Below 40%	F (FAIL)	0
Absent	AB	0

13.2 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

13.3 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.

13.4 A letter grade does not indicate any specific percentage of marks secured by the student, but it indicates only the range of percentage of marks.

13.5 A student earns grade point (GP) in each subject/ course, on the basis of the letter grade secured in that subject/ course. The corresponding 'credit points' (CP) are computed by multiplying the grade point with credits for that particular subject/ course.

Credit points (CP) = grade point (GP) x credits …. For a course

13.6 A student passes the subject/ course only when GP 5 ('E' grade or above)

13.7 A student obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered.

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.

13.8 Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i. The Semester Grade Point Average (SGPA) is the ratio of sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student, i.e.,

$$SGPA = \sum(C_i \times G_i) / \sum C_i$$

where, C_i is the number of credits of the i^{th} subject and G_i is the grade point scored by the student in the i^{th} course.

ii. The Cumulative Grade Point Average (CGPA) will be computed in the same manner taking into account all the courses undergone by a student over all the semesters of a program, i.e.,

$$CGPA = \sum(C_i \times S_i) / \sum C_i$$

where "S_i" is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

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

iv. While computing the SGPA the subjects in which the student is awarded Zero grade points will also be included.

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

Letter Grade: It is an index of the performance of students in a said course. Grades are denoted by letters S, A, B, C, D, E and F.

Example: Computation of SGPA and CGPA

Illustration for SGPA

Course	Credit	Grade Letter	Grade Point	Credit Point
Course-I	3	S	10	3x10=30
Course-II	3	A	9	3x9=27
Course-III	3	B	8	3x8=24
Course-IV	3	D	6	3x6=18
Course-V	2	B	8	2x8=16
Course-VI	1	C	7	1x7=7
	15			122

Thus, SGPA $= \frac{122}{15} = 8.13$

Illustration for CGPA

1st Semester	2nd Semester	3rd Semester	4th Semester
Credit: 21 SGPA: 8.13	Credit: 21 SGPA: 6.9	Credit: 26 SGPA: 7.3	Credit: 27 SGPA: 6.8
5th Semester	**6th Semester**	**7th Semester**	**8th Semester**
Credit: 28 SGPA: 8.2	Credit: 28 SGPA: 7.4	Credit: 24 SGPA: 7.2	Credit: 21 SGPA: 7.8

Thus, CGPA

$$\frac{(21\times 8.13)+(21\times 6.9)\times(26\times 7.3)+(27\times 6.8)+(28\times 8.2)(28\times 7.2)(24\times 7.2)(21\times 7.8)}{196}$$

$=7.432$

14.0 AWARD OF CLASS

14.1 After a student has satisfied the requirement prescribed for the completion of the program and is eligible for the award of B.Tech. Degree he/she shall be placed in one of the following four classes:

CGPA ≥ 7.5	CGPA ≥ 6.5 and < 7.5	CGPA ≥ 5.0 and < 6.5	CGPA ≥ 4.0 and < 5.0	CGPA < 4.0
First Class with Distinction	**First Class**	**Second Class**	**Pass Class**	**Fail**

A student with final CGPA is < 4.00 will not be eligible for the Award of the Degree.

15.0 CONDUCT OF SEMESTER END EXAMINATIONS AND EVALUATION

15.1 Semester end examination shall be conducted by the Controller of Examinations (CoE) by inviting Question Papers from the External Examiners

15.2 Question papers may be moderated for the coverage of syllabus, pattern of questions by a Semester End Examination Committee chaired by CoE and senior subject expert before the commencement of semester end examinations. Internal Examiner shall prepare a detailed scheme of valuation.

15.3 The answer papers of semester end examination should be evaluated by the first examiner immediately after the completion of exam and the award sheet should be submitted to CoE in a sealed cover before the same papers are kept for second evaluation by external examiner.

15.4 In case of difference is more than 15% of marks, the answer paper shall be re-evaluated by a third examiner appointed by the Examination Committee and the marks awarded by third examiner is compared with first and second evaluation marks and higher marks of minimum difference pair will be considered as final marks.

15.5 CoE shall invite required number of external examiners to evaluate all the end-semester answer scripts on a prescribed date(s). Practical laboratory exams are conducted involving external examiners.

15.6 Examinations Control Committee shall consolidate the marks awarded by both the examiners and award grades.

16.0 SUPPLEMENTARY EXAMINATIONS

Apart from the regular End Examinations the institute may also schedule and conduct supplementary examinations for all subjects for the benefit of students with backlogs. Such students writing supplementary examinations as supplementary candidates may have to write more than one examination per day.

17.0 ATTENDANCE REQUIREMENTS AND DETENTION POLICY

17.1 A candidate shall putin a minimum required attendance of 75 % in that semester. Otherwise, s/he shall be declared detained and has to repeat semester.

17.2 For cases of medical issues, deficiency of attendance in a semester to the extent of 10% may be condoned by the College Academic Committee (CAC) on the recommendation of Head of the department if their attendance is between 75% and 65% in a semester, subjected to submission of medical certificates, medical case file and other needful documents to the concerned departments. The condonation is permitted maximum of two times during the entire course of study.

17.3 A prescribed fee shall be payable towards condonation of shortage of attendance.

17.4 A student shall not be promoted to the next semester unless he/she satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, he/she shall not be eligible for readmission into the same class.

17.5 Any student against whom any disciplinary action by the institute is pending shall not be permitted to attend any SEE in that semester.

18.0 PROMOTION POLICIES

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no. 17.

18.1 In four year B.Tech program, a student shall be promoted from 2nd year to 3rd year only if s/he fulfills the academic requirements and earning of minimum 50% of credits upto 2nd year.

18.2 In four year B.Tech program, a student shall be promoted from 3rd year to 4th year only if s/he fulfills the academic requirements and earning of minimum 50% credits upto 3rd year.

18.3 A student shall register for all the 196 credits and earn all the 196 credits. Marks obtained in all the 196 credits shall be considered for the award of the Grade.

18.4 In three year lateral entry B.Tech program, a student shall be promoted from 3rd year to 4th year only if s/he fulfills the academic requirements and earning of minimum 50% credits upto 3rd year.

18.5 In three year lateral entry, a student shall register for all the 154 credits and earn all the 154 credits. Marks obtained in all the 154 credits shall be considered for the award of the Grade.

19.0 GRADUATION REQUIREMENTS

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

19.1 Student shall register and acquire minimum attendance in all courses and secure 196 credits for regular program and 154 credits for lateral entry program.

19.2 A student of a regular program, who fails to earn 196 credits within eight consecutive academic years from the year of his/her admission with a minimum CGPA of 4.0, shall forfeit his/her degree and his/her admission stands cancelled.

19.3 A student of a lateral entry program who fails to earn 154 credits within six consecutive academic years from the year of his/her admission with a minimum CGPA of 4.0, shall forfeit his/her degree and his/her admission stands cancelled.

20.0 REVALUATION

A student, who seeks the re-evaluation of the answer script, is directed to apply for the photocopy of his/her semester examination answer paper(s) in the theory course(s), within 5 working days from the declaration of results in the prescribed format with prescribed fee to the Controller of Examinations through the Head of the department. On receiving the photocopy, the student can consult with a competent member of faculty and seek the opinion for revaluation. Based on the recommendations, the student can register for the revaluation with prescribed fee. The Controller of Examinations shall arrange for the revaluation and declare the results. Revaluation is not permitted to the courses other than theory courses.

21.0 TEMPORARY BREAK OF STUDY FROM THE PROGRAMME

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

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

21.3 The total period for completion of the program reckoned from the commencement of the semester to which the candidate was first admitted shall not exceed the maximum period specified in clause 19.0. The maximum period includes the break period.

22.0 TERMINATION FROM THE PROGRAMME

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

22.1 The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.

22.2 A student shall not be permitted to study any semester more than three times during the entire Program of study.

22.3 The student fails to satisfy the norms of discipline specified by the institute from time to time.

23.0 WITH-HOLDING OF RESULTS

If the candidate has any dues not paid to the institute or if any case of indiscipline or malpractice is pending against him/her, the result of the candidate shall be withheld and he/she will not be allowed / promoted into the next higher semester. The issue of awarding degree is liable to be withheld in such cases.

24.0 STUDENT TRANSFERS

Student transfers shall be as per the guidelines issued by the Government of Andhra Pradesh from time to time.

25.0 GRADUATION DAY

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

26.0 CONDUCT AND DISCIPLINE

- Students shall conduct themselves within and outside the premises of the Institute in a descent and dignified manner befitting the students of Audisankara College of Engineering & Technology.
- As per the order of the Honorable Supreme Court of India, ragging in any form is considered a criminal offence and is totally banned. Any form of ragging will be severely dealt with the following acts of

omission and / or commission shall constitute gross violation of the code of conduct and are liable to invoke disciplinary measures with regard to ragging.

(i) Lack of courtesy and decorum; indecent behavior anywhere within or outside the college campus.

(ii) Damage of college property or distribution of alcoholic drinks or any kind of narcotics to fellow students / citizens.

- Possession, consumption or distribution of alcoholic drinks or any kind of narcotics or hallucinogenic drugs.
- Mutilation or unauthorized possession of library books.
- Noisy and unruly behavior, disturbing studies of fellow students.
- Hacking in computer systems (such as entering into other person's areas without prior permission, manipulation and / or damage of computer hardware and software or any other cyber crime etc.
- Usage of camera /cell phones in the campus.
- Plagiarism of any nature.
- Any other act of gross indiscipline as decided by the college academic council from time to time.
- Commensurate with the gravity of offense, the punishment may be reprimand, fine, expulsion from the institute/ hostel, debarring from examination, disallowing the use of certain facilities of the Institute, rustication for a specified period or even outright expulsion from the Institute, or even handing over the case to appropriate law enforcement authorities or the judiciary, as required by the circumstances.
- For an offence committed in (i) a hostel (ii) a department or in a class room and (iii) elsewhere, the chief Warden, the concern Head of the Department and the Principal respectively, shall have the authority to reprimand or impose fine.
- Cases of adoption of unfair means and/ or any malpractice in an examination shall be reported to the principal for taking appropriate corrective action.

- All cases of serious offence, possibly requiring punishment other than reprimand, shall be reported to the Academic council of the college.
- The Institute Level Standing Disciplinary Action Committee constituted by the academic council shall be the authority to investigate the details of the offence, and recommend disciplinary action based on the nature and extent of the offence committed.
- The Principal shall deal with any problem, which is not covered under these rules and regulations.

27.0 GRIEVANCE REDRESSAL COMMITTEE

Grievance and Redressal Committee constituted by the Principal shall deal with all grievances pertaining to the academic / administrative / disciplinary matters. All the students must abide by the code and conduct rules prescribed by the college from time to time.

28.0 TRANSITORY REGULATIONS

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

28.1 Four Year B.Tech Regular course

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

A student who is following JNTUA curriculum, detained due to lack of credits or shortage of attendance at the end of the second semester or at the subsequent semesters shall join with the autonomous batch in the appropriate

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

28.2 Three Year B.Tech program under Lateral Entry Scheme

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

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

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

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

28.4 Transfer candidates (from an autonomous college affiliated to JNTUA)

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

29.0 REVISION OF REGULATIONS AND CURRICULUM

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

FAILURE TO READ AND UNDERSTAND THE REGULATIONS IS NOT AN EXCUSE

B.TECH - PROGRAM OUTCOMES (POS)

PO-1: Apply the knowledge of Mathematics, Science, Engineering fundamentals, and Engineering specialization to the solution of complex Engineering problems (**Engineering Knowledge**).

PO-2: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences **(Problem Analysis).**

PO-3: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations **(Design/ Development of Solutions).**

PO-4: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions **(Conduct Investigations of Complex Problems).**

PO-5: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations **(Modern Tool Usage).**

PO-6: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice **(The Engineer and Society).**

PO-7: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development **(Environment and Sustainability).**

PO-8: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice **(Ethics).**

PO-9: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings **(Individual and Team Work).**

PO-10: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions **(Communication).**

PO-11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change **(Life-long learning).**

FREQUENTLY ASKED QUESTIONS AND ANSWERS ABOUT AUTONOMY

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

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

2 Shall Audisankara College of Engineering & Technology award its own Degree?

No. Degree will be awarded by Jawaharlal Nehru Technological University Anantapur, Ananthapuramu with a mention of the name Audisankara College of Engineering & Technology on the Degree Certificate.

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

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

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

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

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

An autonomous college carries a prestigious image. Autonomy is actually earned out of our continued past efforts on academic

performances, our capability of self- governance and the kind of quality education we offer.

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

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

7 Will the students of Audisankara College of Engineering & Technology as an Autonomous College qualify for University Medals and Prizes for academic excellence?

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

8 Can Audisankara College of Engineering & Technology have its own Convocation?

No. Since the University awards the Degree the Convocation will be that of the University, but there will be Graduation Day at Audisankara College of Engineering & Technology.

9 Can Audisankara College of Engineering & Technology give a provisional degree certificate?

Since the examinations are conducted by Audisankara College of Engineering & Technology and the results are also declared Audisankara College of Engineering & Technology, the college sends a list of successful candidates with their final Grades and Grade Point Averages including CGPA to the University. Therefore with the prior

permission of the University the college will be entitled to give the provisional certificate.

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

Certainly. The number of students qualifying for placement interviews is expected to improve, due to rigorous and repetitive classroom teaching and continuous assessment. Also the autonomous status is more responsive to the needs of the industry. As a result therefore, there will be a lot of scope for industry oriented skill development built-in into the system. The graduates from an autonomous college will therefore represent better employability.

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

Presently, it is 60 % external and 40% internal. As the autonomy matures the internal assessment component shall be increased at the cost of external assessment.

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

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

13 Why Credit based Grade System?

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

14 What exactly is a Credit based Grade System?

The credit based grade system defines a much better statistical way of judging the academic performance. One Lecture Hour per week of Teaching Learning process is assigned One Credit. One hour of laboratory work is assigned half credit. Letter Grades like S,A+,A, B+,B,C,F etc. are assigned for a Range of Marks. (e.g. 90% and above is S, 80 to 89 % could be A+ etc.) in Absolute Grading System while grades are awarded by statistical analysis in relative grading system. We thus dispense with sharp numerical boundaries. Secondly, the grades

are associated with defined Grade Points in the scale of 1 to 10. Weighted Average of Grade Points is also defined Grade Points are weighted by Credits and averaged over total credits in a Semester. This process is repeated for all Semesters and a CGPA defines the Final Academic Performance

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

These norms are usually defined by UGC or AICTE. Usually around 28 Credits per semester is the accepted norm.

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

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

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

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

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

$$CGPA = \sum_{j=1}^{m} \left(C_j S_j \right) / \sum_{j=1}^{m} C_j$$

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

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

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

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

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

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

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

21 How fast Syllabi can be and should be changed?

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

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

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

23 What are Statutory Academic Bodies?

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

24 Who takes Decisions on Academic matters?

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

25 What is the role of Examination committee?

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

26 Is there any mechanism for Grievance Redressal?

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

27 How many attempts are permitted for obtaining a Degree?

All such matters are defined in Rules & Regulation

28 Who declares the result?

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

29 Who will keep the Student Academic Records, University or Audisankara College of Engineering & Technology?

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

30 What is our relationship with the JNT University?

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

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

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

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

Yes, presently our PG programmes also enjoying autonomous status..

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

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

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

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

Course Structure for B.Tech (Computer Science & Engineering)
Regular Programme
Applicable for students admitted from 2016-17 Academic Year

B.Tech 1st Semester – Computer Science & Engineering

S.No	Code	Course	L	T	P	Drg	C
1	16HS1101	Professional English-I	3	0	0	0	3
2	16HS1102	Calculus and Differential Equations	3	1	0	0	3
3	16HS1103	Applied Physics	3	1	0	0	3
4	16HS1105	Environmental Studies	3	0	0	0	3
5	16EE1101	Basic Electrical and Electronics Engineering	E	l	0	0	3
6	16HS2106	Professional English Lab	0	0	3	0	2
7	16HS2107	Applied Physics Lab	0	0	3	0	2
8	16ME2104	Engineering Workshop and IT Workshop	0	0	3	0	2
	TOTAL		**15**	**3**	**9**	**0**	**21**

B.Tech 2nd Semester – Computer Science & Engineering

S.No	Code	Course	L	T	P	Drg	C
1	16HS1201	Professional English-II	3	0	0	0	3
2	16HS1202	Integral Transforms	3	1	0	0	3
3	16HS1104	Applied Chemistry	3	1	0	0	3
4	16CS1101	Computer Programming	3	0	0	0	3
5	16ME1102	Basic Mechanical and Civil Engineering	3	1	0	0	3
6	16HS2108	Applied Chemistry Lab	0	0	3	0	2
7	16CS2102	Computer Programming Lab	0	0	3	0	2
8	16ME2103	Engineering Drawing Practice	0	0	0	3	2
	TOTAL		**15**	**3**	**6**	**3**	**21**

B.Tech 3rd Semester – Computer Science & Engineering

S.No	Code	Course	L	T	P	Drg	C
1	16HS1101	Professional English-I	3	0	0	0	3
2	16HS1102	Calculus and Differential Equations	3	1	0	0	3
3	16HS1103	Applied Physics	3	1	0	0	3
4	16HS1105	Environmental Studies	3	0	0	0	3
5	16EE1101	Basic Electrical and Electronics Engineering	E	l	0	0	3
6	16HS2106	Professional English Lab	0	0	3	0	2
7	16HS2107	Applied Physics Lab	0	0	3	0	2
8	16ME2104	Engineering Workshop and IT Workshop	0	0	3	0	2
	TOTAL		**15**	**3**	**9**	**0**	**21**

B.Tech 4th Semester – Computer Science & Engineering

S.No	Code	Course	L	T	P	Oth	C
1	16CS1401	Database Management Systems	3	1	0	0	3
2	16CS1402	OOPs through JAVA	3	1	0	0	3
3	16CS1403	Operating Systems	3	1	0	0	3
4	16CS1404	Computer Organization	3	0	0	0	3
5	16CS1405	Software Engineering	3	0	0	0	3
6	16CS1406	Formal Languages and Automata Theory	3	0	0	0	3
7	16CS2408	Database Management Systems Lab	0	0	3	0	2
8	16CS2409	OOPs through JAVA Lab	0	0	3	0	2
9	16CS2410	Operating Systems Lab	0	0	3	0	2
10	16AS3401	Technical Seminar	0	0	0	3	1
11	16AS3402	Soft Skills Practice	0	0	0	3	1
12	16AS3403	Professional Society Activities-II	0	0	0	3	1
	TOTAL		**18**	**3**	**9**	**9**	**27**

B.Tech 5th Semester – Computer Science & Engineering

S.No	Code	Course	L	T	P	Oth	C
1	16HS1501	Linear Algebra and Numerical Methods	3	1	0	0	3
2	16CS1501	Computer Networks	3	1	0	0	3
3	16CS1502	Advanced JAVA Programming	3	1	0	0	3
4	16CS1503	Compiler Design	3	1	0	0	3
5	16CS1504	Data Warehousing and Data Mining	3	0	0	0	3
6	16CS1505	Design and Analysis of Algorithms	3	0	0	0	3
7	16CS2507	Computer Networks Lab	0	0	3	0	2
8	16CS2508	Advanced JAVA Programming Lab	0	0	3	0	2
9	16CS2509	Compiler Design Lab	0	0	3	0	2
10	16AS3501	Term Paper	0	0	0	3	2
11	16AS3502	Quantitative Aptitude	0	0	0	3	1
12	16AS3503	Professional Activities-III	0	0	0	3	1
		TOTAL	**18**	**4**	**9**	**9**	**28**

B.Tech 6th Semester – Computer Science & Engineering

S.No	Code	Course	L	T	P	Oth	C
1	16MB1411	Engineering Economics and Project Management	3	0	0	0	3
2	16CS1601	Web Technologies	3	1	0	0	3
3	16CS1602	Software Testing	3	1	0	0	3
4	16CS1603	Cryptography and Network Security	3	1	0	0	3
5	16CS1604	Object Oriented Analysis and Design	3	0	0	0	3
6	**ELECTIVE-I**						
	16CS1605	Artificial Intelligence	3	1	0	0	3
	16CS1606	Computer Graphics					
	16ME1703	Operations Research					
	16CS1607	Available Selected MOOCs					
7	16CS2608	Web Technologies Lab	0	0	3	0	2
8	16CS2609	Software Testing and Case Tools Lab	0	0	3	0	2
9	16CS2610	Cryptography and Network Security Lab	0	0	3	0	2

10	16CS2611	Mini Project	0	0	0	3	2
11	16AS3601	Technical Aptitude	0	0	0	3	1
12	16AS3602	Professional Society Activities-IV	0	0	0	3	1
		TOTAL	**18**	**4**	**9**	**9**	**28**

B.Tech 7th Semester – Computer Science & Engineering

S.No	Code	Course	L	T	P	Oth	C
1	16CS1701	Cloud Computing	3	1	0	0	3
2	16CS1702	Big Data Analysis	3	1	0	0	3
3	16CS1703	Mobile Application Development	3	1	0	0	3
4	**ELECTIVE-II (OPEN ELECTIVE)**		3	1	0	0	3
5	**ELECTIVE-III**						
	16CS1704	Software Project Management	3	1	0	0	3
	16CS1705	Advanced Computer Architecture					
	16CS1706	Design Patterns					
	16CS1707	Available Selected MOOCs					
6	16CS2710	Cloud Computing Lab	0	0	3	0	2
7	16CS2711	Big Data Analysis Lab	0	0	3	0	2
8	16CS2712	Mobile Application Development Lab	0	0	3	0	2
9	16AS3701	Internship	0	0	0	3	2
10	16AS3702	Professional Society Activities-V	0	0	0	3	1
		TOTAL	**15**	**5**	**9**	**6**	**24**

B.Tech 8th Semester – Computer Science & Engineering

S.No	Code	Course	L	T	P	Oth	C
1	**ELECTIVE-IV**						
	16CS1801	Advanced Computer Networks	3	1	0	0	3
	16CS1802	Soft Computing					
	16CS1803	Grid Computing					
	16CS1804	E-Commerce					
2	**ELECTIVE-V**						
	16CS1805	Model Driven Framework	3	1	0	0	3
	16CS1806	Object Oriented Software Engineering					
	16CS1807	Multimedia and Application Design					
	16CS1808	Available Selected MOOCs					
3	**ELECTIVE-VI**						
	16CS1809	Principles of Programming Languages	3	1	0	0	3
	16CS1810	TCP-IP					
	16CS1811	ICT in Education					
	16CS1812	Network Simulators					
4	16CS2813	Major Project and Comprehensive Viva-Voce	0	0	8	0	12
		TOTAL	**9**	**3**	**8**	**0**	**21**

ELECTIVE-II (OPEN ELECTIVE)

S.No	Code	Course
1	16CE1707	Disaster Management
2	16CE1708	Infrastructure Systems Planning
3	16EE1707	Renewable Energy Sources
4	16EE1708	Energy Auditing
5	16ME1708	Industrial Robotics
6	16ME1709	Nano Material Applications
7	16EC1707	Digital Image Processing
8	16EC1708	Electronic Product Design and Packaging
9	16EC1709	Bio-Medical Instrumentation
10	16CS1708	Internet of Things
11	16CS1709	Python Programming Language
12	16MB1302	Entrepreneurship Development

LINEAR ALGEBRA AND NUMERICAL METHODS

B.Tech 5th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16HS1501	H&S	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:51	Tutorial Classes: 9		Practical Classes: Nil			Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Find the rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
2. Calculate the Eigen values and eigen vectors.
3. Understand the concept of Cayley Hamilton theorem and apply for finding inverse and powers of a matrix. Reduce Quadratic form to canonical form.
4. Compute the solutions of the algebraic and transcendental equations and know the concept of finite differences to apply various engineering problems.
5. Evaluate the integrals numerically using Trapezoidal and Simpson's 1/3 rules, find the solutions of first order ODEs using Euler's and R-K methods of 2nd and 4th order.

UNIT-I	Matrices	Classes:15

Rank by Echelon and Normal forms – Solution of system of linear equations – Eigenvalues and Eigenvectors - Cayley- Hamilton theorem (without proof) and its applications-Reduction to diagonal form – Quadratic forms – Reduction of Quadratic form to canonical form by orthogonal transformation and their nature.

UNIT-II	Solutions of Algebraic and Transcendental Equations	Classes:15

Solutions of algebraic and transcendental equations by Bisection, Regula – Falsi and Newton – Raphson Method - System of linear equations – Gauss elimination - LU decomposition –Gauss Seidel Iteration Method.

UNIT-III	Interpolation and Curve fitting	Classes:15

Newton's forward and backward interpolation formulae - Relations between difference operators – Lagrange's interpolation.

Least squares curve fitting –fitting a straight line –non-linear curve fitting –Parabolic, Exponential and power function.

UNIT-IV	Numerical Differentiation & Integration and Differential Equations	Classes:15

Formulae for derivatives - Numerical integration using Trapezoidal and Simpson's 1/3 rules - Numerical solutions of first order ODEs – Euler's, Runge - Kutta methods of 2nd and 4th orders – Milne's Predictor – Corrector Method.

Text Books

1. Dr. B.S. Grewal "Higher Engineering Mathematics", 42nd Edition - Khanna Publications.
2. E.Rukmangadachari& E. Keshava Reddy "Engineering Mathematics" , Volume-I&II,

   2nd Edition-Pearson publishers

Reference Books

1. S. S. Sastry, "Introduction to Numerical Analysis" Prentice Hall of India
2. E. Kreyzig ,"Advanced Engineering Mathematics" 10th Edition – Wiley Publications

Web References

1. www.britannica.com
2. http://nptel.ac.in

E-Text Books

1. Introduction to Numerical Analysis by Homer Reid
2. Lecture Notes on Numerical Analysis by Peter J. Olver

Outcomes

At the end of the course students will be able to

1. Compute the rank of matrices, solve the linear system of equations (homogeneous as well as non – homogeneous)
2. Obtain the knowledge of the Eigen values and eigenvectors of the matrices.
3. Solve problems using Cayley – Hamilton theorem, reduce the given matrices into diagonal form
4. Reduce the matrices into canonical form by orthogonal transformation
5. Solve the Algebraic and transcendental equations by Bisection, Regula-Falsi and N-R method
6. know the concept of finite differences and apply to various engineering problems
7. Analyze problems using Trapezoidal and Simpson's 1/3 rules, solve first order ODEs using Euler's and R- K methods of 2nd and 4th order.

COMPUTER NETWORKS

B.Tech 5th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1501	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:51	Tutorial Classes: 9	Practical Classes: Nil			Total Classes:60			

OBJECTIVES

The course should enable the students to

1. Understand basic network models and Different transmission used for data communication.
2. Recognize the data link design issues and various data link protocols used for data transmission.
3. Understand different routing algorithms used for data transmission from source to destination in a network layer.
4. Know the installation of internet addresses and use of internet protocols.

UNIT-I	Introduction	Classes:15

Uses of computer networks- Business application, Home applications, Mobile users Social issues, Networks-Network criteria, Network Models, Categories of Networks, Layered tasks, OSI Reference Model-Layers architecture, Peer-to-peer process, Layers in OSI model, TCP/IP protocol Suite, Addressing-Physical, logical, Port and Specific addresses, Transmission media-Guided media, unguided media, switching-Circuit switching, Data gram networks, Virtual circuit networks.

UNIT-II	Data Link Control and Multiple accesses control	Classes:15

Data Link Layer Design Issues-Services, Framing, Error control, Flow control, Error Detection and Correction, Correcting codes, detecting codes,

Elementary Data Link Protocols-Simplex protocol, Stop-and-wait protocol, Sliding Window Protocols-One bit sliding window protocol, Protocol using Go Back N, Protocol using selective repeat, Examples of Data Link Protocols-HDLC, Data link layer in the internet,

Multiple accesses control: The Channel Allocation Problem, Multiple Access Protocols, Ethernet, Wireless LANS, and Bluetooth**.**

UNIT-III	Network Layer	Classes:15

Network Layer Design Issues: Store and forward Packet switching, Services provided to the transport layer, Implementation of Connection Less and Connection Oriented Services.

Routing Algorithms: Shortest path, Flooding, Distance Vector, Link State, Hierarchical, Broadcast and multicast routing. Congestion Control Algorithms and Quality of Service.

Internetworking: How networks differ, Concatenated Virtual Circuits, Tunneling, Routing and Fragmentation.

Network Layer in the Internet: IP Protocol, IP address, OSPF, BGP, and Multicasting.

UNIT-IV	Transport Layer & Application Layer	Classes:15

Transport service, elements of transport protocol, simple transport protocol,

Internet transport protocols: UDP, TCP, Performance issues.

Application Layer: Domain Name Space (DNS)-DNS name space, Resource Records, Name Servers, Electronic mail-Architecture and services, User Agent, Message Formats, Message Transfer, Delivery, World Wide Web (www)-Architecture, Static and Dynamic web documents, HTTP.

Text Books

1. Andrew S Tannenbaum, David J Wetherall, “Computer Networks”, 5th Edition, Pearson Education, 2012.

2. Behrouz Forouzan, “Data Communications and Networking”, 5th Edition, McGraw-Hill Education India Pvt. Ltd, 2013.

Reference Books

1. W.Stallings, “Data and computer communications”, 8th Edition, Prentice-Hall, Pearson Education, 2007.

Web References

1. https://www.cs.vu.nl/~ast/CN5/
2. https://www.geeksforgeeks.org/computer-network-tutorials/
3. http://people.sabanciuniv.edu/levi/cs408/

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Understand the basic network infrastructure to learn the overall function of networking Systems
2. Classify various wired and wireless transmission media for data communication networks
3. Apply knowledge of different techniques of error detection and correction to detect and

   solve error bit during data transmission
4. Compare various routing algorithm and select an appropriate one for a routing design
5. Design a network routing for IP networks
6. Understand the internal functionalities of main protocols such as HTTP, FTP, SMTP, TCP, UDP, IP

ADVANCED JAVA PROGRAMMING

B.Tech 5th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1502	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:51	Tutorial Classes: 9	Practical Classes: Nil			Total Classes:60			

OBJECTIVES

The course should enable the students to

1. Provide the ability to design console based, GUI based and web based applications.
2. Understand integrated development environment to create, debug and run applications.
3. Develop simple client server application.
4. Develop programs using jsp.
5. Perform operations on any Database through jsp.

UNIT-I	HTML, CSS & Java Script	Classes:15

HTML: Introduction, Basic tags, List, Table, Images, Forms, Frames, Audio, Video, Plug-ins, YouTube, Geo location.

CSS: Inline style sheet, internal style sheet, external style sheet.

Javascript: Introduction, Event Handling, Validation**.**

UNIT-II	Web Servers and Servlets	Classes:15

Web Servers And Servlets: Tomcat web server. Introduction to Servlets: Lifecycle of a Servlet, JSDK, The Servlet API, The javax.servlet Package, Reading Servlet parameters, Reading Initialization parameters. The javax.servlet HTTP package, Handling Http Request & Responses, Using Cookies-Session Tracking, servlet Chaining.

UNIT-III	Introduction to JSP	Classes:15

Introduction To Jsp: The Problem with Servlet, The Anatomy of a JSP Page, JSP Processing, Advantages of JSP, Developing First JSP. Components of JSP, Reading Request Information. Retrieving the Data posted from a HTML file to JSP File. JSP Sessions, JSP Cookies.

UNIT-IV	Database Access	Classes:15

Database Access: Data, Information, Metadata, Database, DDL, DML commands, DSN Creation, Database Programming using JDBC, Studying javax.sql.* package, Accessing a Database from a Servlets. Accessing a Database form a JSP, Application-Specific Database Actions, Deploying Java Beans in a JSP Page.

Text Books

1. Herbert Schildt, "Java The Complete Reference", 8th Edition, McGraw-Hill Education, New Delhi, 2011. [Unit – II]
2. Hans Bergsten, "Java Server Pages", II Edition ,O'Reilly Media [Unit – III]
3. Web programming, Building internet applications, Chris Bates 2nd editation

Reference Books

1. Paul J. Dietel and Dr. Harvey M. Deitel, "Java How to Program", 9th Edition, Prentice-Hall, Pearson Education, 2011.
2. David Geary, Cay S. Horstmann "Core Java Server Faces" Third edition, 2010, Prentice Hall

Web References

1. https://www.computerscienceonline.org/learn-java/
2. https://docs.oracle.com/javase/tutorial/
3. https://www.tutorialspoint.com/servlets/

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Make the web pages more dynamic and interactive.
2. Develop web-based solutions using servlets.
3. Design and develop an application based on JSP.
4. Implement database connectivity using JDBC.

COMPILER DESIGN

B.Tech 5th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1503	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:51	Tutorial Classes: 9	Practical Classes: Nil			Total Classes:60			

OBJECTIVES

The course should enable the students to

1. Learn the basic concept of compiler design.
2. Know different phases to construct new tools like LEX, YACC, etc.
3. Understand the Construction of LL, SLR, CLR and LALR parse table.
4. Learn the Techniques for code optimization.

UNIT-I	Compilation & Top Down Parsing	Classes:15

Overview of Compilation: Phases of Compilation – Lexical Analysis, Regular Grammar and regular expression for common programming language features, pass and Phases of translation, interpretation, bootstrapping, data structures in compilation – LEX lexical analyzer generator**.**

Top Down Parsing: Context free grammars, Top down parsing – Backtracking, LL (1), recursive descent parsing, Predictive parsing, Preprocessing steps required for predictive parsing.

UNIT-II	Bottom Up Parsing & Semantic Analysis	Classes:15

Bottom Up Parsing: Shift Reduce parsing, LR and LALR parsing, Error recovery in parsing, handling ambiguous grammar, YACC – automatic parser generator.

Semantic Analysis: Intermediate forms of source Programs – abstract syntax tree, polish notation and three address codes. Attributed grammars, Syntax directed translation, Conversion of popular Programming languages language Constructs into Intermediate code forms, Type checker.

UNIT-III	Symbol Tables & Code Optimization	Classes:15

Symbol Tables: Symbol table format, organization for block structures languages, hashing, tree structures representation of scope information. Block structures and non block structure storage allocation, static, Runtime stack and heap storage allocation, storage allocation for arrays, strings and records.

Code Optimization: Consideration for Optimization, Scope of Optimization, local optimization, loop optimization, frequency reduction, folding, DAG representation**.**

UNIT-IV	Data Flow Analysis & Object Code Generation	Classes:15

Data Flow Analysis: Flow graph, data flow equation, global optimization, redundant sub expression elimination, Induction variable elements, Live variable analysis, Copy propagation.

Object Code Generation: Object code forms, machine dependent code optimization, register allocation and assignment generic code generation algorithms, DAG for register allocation.

Text Books

1. Principles of compiler design -A.V. Aho. J.D.Ullman, Pearson Education, 1977.
2. Modern Compiler Implementation in C- Andrew N. Appel, Cambridge University Press,2004.

Reference Books

1. lex &yacc – John R. Levine, Tony Mason, Doug Brown, O'reilly
2. Modern Compiler Design- Dick Grune, Henry E. Bal, Cariel T. H. Jacobs, Wiley dreamtech.
3. Engineering a Compiler-Cooper & Linda, Elsevier.
4. Compiler Construction, Louden, Thomson.

Web References

1. https://www.geeksforgeeks.org/last-minute-notes-compiler-design-gq/
2. https://www.isi.edu/~pedro/Teaching/CSCI565-Spring17/
3. https://nptel.ac.in/courses/106104072/

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Explain different translators and acquire knowledge of compiler & its Phases
2. Identify formal grammars for specifying the syntax and Semantics of programming languages
3. Construct parse table for a given grammar.
4. Generate symbol table and intermediate code for a given program
5. Apply code optimization techniques to improve the performance of a program
6. Identify tools to construct the machine independent code

DATA WAREHOUSING AND DATA MINING

B.Tech 5th Semester: Computer science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1504	Core	L	T	P	C	CIA	SEE	TOTAL
		3	-	-	3	40	60	100
Contact Classes:60	Tutorial Classes: -	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Understand and implement classical models and algorithms in data warehousing and data mining.
2. Analyze the data, identify the problems, and choose the relevant models and algorithms to apply.
3. Assess the strengths and weaknesses of various methods and algorithms and to analyze their behavior.

UNIT-I	Data warehousing Components	Classes:15

Data Warehousing Components –Building a Data warehouse –- Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata.

UNIT-II	Reporting and Query Tools and Applications & OLAP	Classes:15

Reporting and Query tools and Applications – Tool Categories – The Need for Applications – Cognos Impromptu – Online Analytical Processing (OLAP) – Need – Multidimensional Data Model – OLAP Guidelines – Multidimensional versus Multirelational OLAP – Categories of Tools – OLAP Tools and the Internet**.**

UNIT-III	Data Mining	Classes:15

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data

Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues –Data Preprocessing.

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining various Kinds of Association Rules – Correlation Analysis – Constraint Based Association Mining.

UNIT-IV	Classification & Clustering	Classes:15

Classification & Clustering – Classification and Prediction - Basic Concepts - Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Prediction.

Cluster Analysis - Types of Data – Categorization of Major Clustering Methods – K-means– Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data

Text Books

1. Data Mining: Concepts and Techniques, Jiawei Han and Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, Second Edition, 2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson Education.

Reference Books

1. Data Mining Techniques, Arun K Pujari, Second Edition, Universities Press.
2. Data Warehousing in the Real World, Sam Aanhory & DennisMurray Pearson Edn Asia.

Web References

1. https://nptel.ac.in/courses/106105174/
2. http://cse.iitkgp.ac.in/~pabitra/course/cs698v.html
3. https://grid.cs.gsu.edu/~cscyqz/courses/dm/dmlectures.html

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Understand the basic concepts of Data warehouse and Data Mining.
2. Understand the three schemas of Data warehouse with examples.
3. Apply pre-processing techniques for data.
4. Analyze and evaluate performance of algorithms for Association Rules.
5. Analyze Classification and Clustering algorithms.
6. Develop further interest in research and design of new Data Mining techniques.

DESIGN AND ANALYSIS OF ALGORITHMS

B.Tech 5th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1505	Core	L	T	P	C	CIA	SEE	TOTAL
		3	-	-	3	40	60	100
Contact Classes:60	Tutorial Classes: -	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Analyze the performance of algorithms using asymptotic notations.
2. Write rigorous correctness proofs for algorithms.
3. Apply important algorithmic design paradigms and methods of analysis.
4. Synthesize efficient algorithms in common engineering design situations.

UNIT-I	Algorithms	Classes:15

Introduction- Algorithms – Pseudo code for algorithms, Performance Analysis-space complexity, time complexity, Asymptotic notation: big oh notation, omega notation, theta notation, and little oh notation. Disjoint Sets-Disjoint set operations, union and find algorithms, spanning trees.

UNIT-II	Divide and Conquer & Greedy Method	Classes:15

Divide and Conquer-General method, binary search, quick sort, merge sort, Stassen's matrix multiplication.

Greedy Method- General Method, knapsack problem, minimum cost spanning trees, single source shortest paths.

UNIT-III	Dynamic Programming & Backtracking	Classes:15

Dynamic Programming- General method, optimal binary search trees,0/1 knapsack problem, All pairs shortest paths, travelling sales person problem.

Backtracking - General method, n-queens problem, sum of subsets, graph coloring, Hamiltonian cycles.

UNIT-IV	Branch And Bound & P, Np And Np-Complete Problems	Classes:15

Branch And Bound: General method, travelling sales person problem, 0/1 knapsack problem**.**

P, Np And Np-Complete Problems: P and NP problems, NP-complete problems, non deterministic algorithms, cook's theorem.

Text Books

1. Ellis Horowitz,Sartaj Sahni and Sanguthevar Rajasekara, Fundamentals of Computer Algorithms, Galgotia, 2004.
2. Allen Weiss, Data structures and Algorithm Analysis in C++, 2nd Edn, Pearson Education.

Reference Books

1. Parag Himanshu Dave, Himanshu BhalchandraDave, "Design and Analysis algorithms", Pearson
2. M.T. Goodrich, Robert Tamassia, "Algorithm design: Foundations, Analysis and Internet examples" Wiley student Edn, John Wiley & sons.

Web References

1. http://openclassroom.stanford.edu/MainFolder/Course Page. php? course=Intro To Algorithms
2. https://nptel.ac.in/courses/106101060/
3. http://web.stanford.edu/class/archive/cs/cs161/cs161.1176/

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Analyze the asymptotic runtime complexity of algorithms for real world problem
2. Find the optimal solutions by using advanced design and analysis of algorithm techniques like greedy method and dynamic programming.
3. Apply the search space and optimization problem techniques like back-tracking and branch and bound method to solve problems optimally where advanced algorithm design techniques fail to find solution.
4. Distinguish the problems and its complexity as polynomial and NP problems and can formulate some real world problems to abstract mathematical problems.
5. Implement and analyze the best sorting method to various applications
6. Apply divide and conquer strategy for design of various algorithms.

COMPUTER NETWORKS LAB

B.Tech 5th Semester – Computer Science & Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16CS2507	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	3	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 33**				**Total Classes: 33**		

OBJECTIVES

The course should enable the students to

1. Write and execute routing algorithms
2. Write and execute different encryption algorithms.
3. Write and execute error handling, flow control and framing algorithms.

LIST OF EXPERIMENTS

Expt. 1 **IP Address, Topologies**

a) Study of IP Address b) Connect the computers in LAN for any two types of Topologies.

Expt. 2 **Framing methods**

Implement the data link layer framing methods such as character stuffing and bit stuffing.

Expt. 3 **Programs on CRC Polynomials**

Implement on a data set of characters the three CRC polynomials – CRC 12, CRC 16 & CCIP

Expt. 4 **Dijkstra's algorithm to compute the shortest path**

Implement Dijkstra's algorithm to compute the shortest path thru a graph.

Expt. 5 **Routing table at each node using distance-vector routing algorithm**

Take an example subnet graph with weights indicating delay between nodes. Now obtain routing table at each node using distance-vector routing algorithm.

Expt. 6	Subnet of Hosts

Take an example subnet of hosts. Obtain broadcast tree for it.

Expt.7	DES Algorithm

Take a 64 bit playing text and encrypt the same using DES algorithm.

Expt. 8	Break the DES coding

Write a program to break the above DES coding.

Expt. 9	RSA algorithm

Using RSA algorithm encrypt a text data and decrypt the same.

Expt. 10	Link State routing Algorithm

Implementation of Link state routing algorithm.

Expt. 11	Study on Protocols

Implementation and study of Goback-N and selective repeat protocols.

Reference Books

1. S.Tanenbaum, “Computer Networks”, 4th Edition, (Pearson Education / PHI), 2008.
2. Behrouz A. Forouzan, “Data communication and networking”, 4th Ed, TMH 2006.
3. William Stallings, “Data and Computer Communications”, Fifth edition, PHI, 1998.
4. Kurose & Ross, “COMPUTER NETWORKS– A Top-down approach featuring the Internet”,Pearson Education, Alberto Leon, Garciak.

Web References

1. https://www.cs.vu.nl/~ast/CN5/

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS

SOFTWARE: Dev C++ , Turbo C

HARDWARE: Desktop Computers

Outcomes

At the end of the course students will be able to

1. Demonstrate various networking devices to design a network
2. Examine various routing algorithms for reliable data communication networks
3. Categorize the algorithms for data link layer
4. Analyze the communication parameters of routing algorithms
5. Use TCP protocol to configure the network connection
6. Use internal modem and Wi-Fi to analyze the data communication

ADVANCED JAVA PROGRAMMING LAB

B.Tech 5th Semester – Computer Science & Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
16CS2508	**Core**	-	-	3	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 33**				**Total Classes: 33**		

OBJECTIVES

The course should enable the students to

1. Write and execute different web pages.
2. Develop programs on web applications.
3. Gain ability to develop responsive web applications using JSP.
4. Learn database connectivity using JDBC.

LIST OF EXPERIMENTS

Expt. 1	**Basic HTML**

Design a web page using HTML tags like list, table, image, form, frame.

Expt.2	**Advanced HTML**

Design a web page using Media, Plug-ins, YouTube, Geo location.

Expt.3	**CSS**

Design a Web page using CSS.

Expt.4	**Java Script**

Write a java script to validate the fields of the Registration page

Expt.5	**Apache tomcat Server**

Install and run Hello World Application in Apache tomcat server.

Expt.6	**SQL**

How to create a DSN for MS Access/SQL.

Expt.7	**Access database using Servlet**

Create web Application to access a database using Servlet.

Expt.8	**Cookie**

Write a servlet program using cookie based authentication.

Expt.9	Session

Write a servlet program using session based authentication.

Expt.10	JSP Program

Write a JSP Program using components of JSP.

Expt.11	Database using JSP

Create web Application to access a database using JSP.

Reference Books

1. Herbert Schildt, "Java The Complete Reference", 8th Edition, McGraw-Hill Education, New Delhi, 2011. [Unit – II]
2. Hans Bergsten, "JavaServer Pages" , II Edition , O'Reilly Media [Unit – III]
3. Web programming, Building internet applications, Chris Bates 2nd editation
4. Paul J. Dietel and Dr.Harvey M. Deitel, "Java How to Program", 9th Edition, Prentice-Hall, Pearson Education, 2011.
5. David Geary, Cay S. Horstmann "Core JavaServer Faces" Third edition, 2010, Prentice Hall

Web References

1. http://www.java2s.com/Tutorial/Java/CatalogJava.htm

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS

SOFTWARE: Web browser, Apache Tomcat web Server

HARDWARE: Desktop Computers

Outcomes

At the end of the course students will be able to

1. Make the web pages more dynamic and interactive.
2. Develop web-based solutions using servlets.
3. Design and develop an application based on JSP.
4. Implement database connectivity using JDBC.

COMPILER DESIGN LAB

B.Tech 5th Semester – Computer Science & Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
16CS2509	**Core**	-	-	3	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 21**				**Total Classes: 21**		

OBJECTIVES

The course should enable the students to

1. Write and execute program which generate parse trees.
2. Write and execute program perform stack operations.
3. Understand and implement optimization technique.

LIST OF EXPERIMENTS

Expt.1	**Lex/Yacc**

Practice of Lex / Yacc of compiler writing.

Expt.2	**Grammar**

Write a program to check whether a given string belongs to a grammar or not.

Expt.3	**Parse Tree**

Write a program to generate parse tree.

Expt.4	**LL(1)**

Develop on LL (1) parser (Construct parse table also).

Expt.5	**Operator Precedent**

Write a program to check whether a grammar is operator precedent.

Expt.6	**Stack operations**

Write a program to show all the operations of stack.

Expt.7	Code Optimizations

Given any intermediate code form implement code optimization techniques

Reference Books

1. Principles of compiler design - A.V. Aho. J.D.Ullman, Pearson Education, 1977.
2. Modern Compiler Implementation in C- Andrew N. Appel, Cambridge University Press, 2004.

Web References

1. http://books.google.co.in/books/about/COMPILER_DESIGN.html?id=AJt4O4AoCtgC

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS

SOFTWARE: Dev C++

HARDWARE: Desktop Computers

Outcomes

At the end of the course students will be able to

1. Apply different compiler writing tools to implement the different Phases.
2. Analyze the data flow and control flow.
3. Construct the intermediate representation.
4. Compare various code optimization techniques

TERM PAPER

B.Tech 5th Semester – Computer Science & Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
16AS3501	-	-	-	-	2	0	50	50
Contact Classes: 24	**Tutorial Classes: Nil**		**Practical Classes: Nil**			**Total Classes: 24**		

OBJECTIVES

The course should enable the students to

I. Guide students through the process of planning and executing a substantial project.

II. Allow students the opportunity to teach themselves.

III. Improves the power of designing, organizing, communication, coordination and judgment.

The Term Paper is a self study report and shall be carried out either during 5th Semester along with other lab courses. Every student will take up this term paper individually and submit a report. The scope of the term paper could be an exhaustive literature review choosing any engineering concept with reference to standard research papers or an extension of the concept of earlier course work in consultation with the term paper supervisor. The term paper reports submitted by the individual students during the 5th Semester shall be evaluated for a total of 50 marks for external evaluation, it shall be conducted by two Examiners, one of them being term paper supervisor as internal examiner and an external examiner nominated by the Principal from the panel of experts recommended by HOD.

Outcomes

1. Prepare comprehensive report based on literature survey related to considered area
2. Select the paper to be solved and analyze the extension possibilities
3. Identify the applicability of modern software tools and technology
4. Correct himself to improve write-up skills
5. Exhibit the professional behavior

QUANTITATIVE APTITUDE

B.Tech 5th Semester – Computer Science & Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
16AS3502	-	-	-	-	1	0	50	50
Contact Classes: 12	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 12**		

The external examination will be conducted for 50 Marks with 1 Credit; examination type is Multiple Choice Question (MCQ) – Offline/Online.

OBJECTIVES

The course should enable the students to

1. Formulate the problem quantitatively and use appropriate arithmetical methods to solve the problem.
2. Demonstrate various principles involved in solving mathematical problems and thereby reducing the time taken for performing job functions.
3. Solve campus placements aptitude papers covering Quantitative Ability
4. Compete in various competitive exams like CAT, CMAT, GATE, GRE, GATE, UPSC, GPSC etc.

UNIT-I	**Classes:3**

Calendars, Clocks, L. C. M & H. C. F, Problems on Numbers, Averages.

UNIT-II	**Classes:3**

Percentages, Profit, Loss & Discount, Simple Interest & Compound Interest.

UNIT-III	**Classes:3**

Ratio & Proportion, Mixture and Alligation, Partnership, problems on ages.

UNIT-IV	**Classes:3**
Time & Work, Pipes and Cisterns, Time & Distance, Problem on Trains, Boats and Streams, Mensuration.	

Text Books

1. Dr. R.S. Aggarwal, "Quantitative Aptitude", S.Chand Publication, New Delhi.

Reference Books

1. Quantitative Aptitude - G. L BARRONS
2. Abhijit Guha, "Quantitative Aptitude for Competitive Examinations", 4th Edition.

Web References

1. www.indiabix.com
2. https://www.campusgate.co.in
3. https://m4maths.com

PROFESSIONAL ACTIVITIES-III

B.Tech 5th Semester – Computer Science & Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
16AS3503	-	-	-	-	1	-	-	-
Contact Classes: 12	**Tutorial Classes: Nil**	**Practical Classes: Nil**			**Total Classes: 12**			

OBJECTIVES

The course should enable the students to

1. Improve communication skills
2. Develop leadership qualities

Professional Society Activities (PSA) course is aimed at enhancing the self-learning, communication, managerial skills of the students by engaging them in various Co & Extra Curricular activities during their course of study. Activities in each of the department shall be designed and conducted by the Professional Society Executive Committee whose composition is:

1. Faculty Mentors- 2 No.
2. Student Chairman: 1 No.- Final year Student
3. Student General Secretary: 1 No.- Third year Student
4. Treasurer: 1 No.- Third year Student

Student Members: 2 No's from each class

PSA related activities would be of the following nature but not limited to:

Activity#1	Just A Minute
Activity#2	Technical Quiz
Activity#3	Open House- Lab Demo

Activity#4	Technical Paper Presentation- Preliminary
Activity#5	Technical Paper Presentation- Final
Activity#6	Poster Presentation
Activity#7	Collage- A theme based event
Activity#8	Debate Competition
Activity#9	Group Discussion Competition
Activity#10	Mock Interviews
Activity#11	Model Exhibition
Activity#12	Valedictory Function

ENGINEERING ECONOMICS AND PROJECT MANAGEMENT

B.Tech 6th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16MB1411	Core	L	T	P	C	CIA	SEE	TOTAL
		3	-	-	3	40	60	100
Contact Classes:60	Tutorial Classes: -	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Develop knowledge over contemporary economic aspects.
2. Create knowledge over market structures and production aspects
3. Develop knowledge over project management concepts and other issues.

UNIT -I	Introduction to Economics	Classes-15

Introduction to Economics- Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics – Element of costs, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-even analysis – V ratio, Elementary economic Analysis – Material selection for product Design selection for a product, Process planning.

UNIT -II	Demand & Market Structures	Classes-15

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand.Meaning of Market, Types of Market – Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition Meaning of production and factors of production, Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

UNIT -III	Project Management	Classes-15

Basics of Project Management: Introduction, Need for Project Management, Project Management Knowledge Areas and Processes, The Project Life Cycle, The Project Manager (PM), Phases of Project Man-

agement Life Cycle, Project Management Processes, Impact of Delays in Project Completions, Essentials of Project Management Philosophy, Project Management Principles.

UNIT -IV	Project Identification and Selection	Classes-15

Introduction, Project Identification Process, Project Initiation, Pre-Feasibility Study, Feasibility Studies, Project Break-even point PERT and CPM: Introduction, Development of Project Network, Time Estimation, Determination of the Critical Path, PERT Model, Measures of variability, CPM Model, Network Cost System

TEXT BOOKS

1. Managerial Economics-AR Arya Sree, Tata McGraw HILL
2. Gupta, "Managerial Economics", TMH 2009
3. Management Science- AR Arya Sree, Tata Mc Graw HILL
4. Project Management-K Nagarajan

Reference Books

1. Joel Dean, Managerial Economics, PHI. Henry and Haynes, Managerial Economics (Analysis and Cases) Business Publications.

Web References

1. https://kantakji.com/media/175050/file1343.pdf

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Understand the concepts in economics related to demand and supply.
2. Know about the market structures and production functions.
3. Understand project management concept.
4. Do simple problems in PERT, CPM and crashing.
5. Understand the concepts of cost-profit analysis
6. Know the pricing strategies

WEB TECHNOLOGIES

B.Tech 6th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1601	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:51	Tutorial Classes: 9	Practical Classes: Nil			Total Classes:60			

OBJECTIVES

The course should enable the students to

1. Acquire knowledge and Skills for creation of Web Site considering both client and server side Programming.
2. Create Web application using tools and techniques used in industry.
3. Provide knowledge about database connection.

UNIT-I	Introduction to Web Technologies	Classes:15

Introduction to Web servers like Apache 1.1, IIS XAMPP(Bundle Server), WAMP(Bundle Server),Handling HTTP Request and Response , installations of above servers.

Introduction to PHP: The problem with other Technologies (Servelets and JSP), Downloading, installing, configuring PHP, Programming in a Web environment and The anatomy of a PHP Page.

UNIT-II	Overview of PHP Data Types and Concepts	Classes:15

Variables and data types, Operators, Expressions and Statements, Strings, Arrays and Functions.

Overview of Classes, Objects, and Interfaces: Creating instances using Constructors, Controlling access to class members, Extending classes, Abstract classes and methods, using interfaces, Using class destructors, File Handling and Using Exceptions.

UNIT-III	PHP Advanced Concepts	Classes:15

Using Cookies, Using HTTP Headers, Using Sessions, Authenticating users, Using Environment and Configuration variables, Working with Date and Time. Creating and Using Forms: Understanding Common Form Issues, GET vs. POST, Validating form input, Working with multiple forms, and Preventing Multiple Submissions of a form.

UNIT-IV	PHP AND DATABASE ACCESS	Classes:15

Basic Database Concepts, Connecting to a MYSQL database, Retrieving and Displaying results, Modifying, Updating and Deleting data. MVC architecture. PHP and Other Web Technologies: PHP and XML, PHP and AJAX.

Text Book

1. Beginning PHP and MySQL, 3rd Edition, Jason Gilmore, Apress Publications (Dream tech.).
2. PHP 5 Recipes A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann and Jon Stephens.

References

1. Open Source Web Development with LAMP using Linux, Apache, MySQL, Perl and PHP, J.Lee and B.Ware(Addison Wesley) Pearson Education.
2. PHP 6 Fast and Easy Web Development, Julie Meloni and Matt Telles, Cengage Learning Publications.

Web References

1. https://www.w3.org/standards/webdesign/
2. https://nptel.ac.in/courses/106106156/3
3. https://www.geeksforgeeks.org/web-technology/

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Design dynamic and interactive web pages.
2. Able to store and retrieve data in web pages.
3. Develop software components in a variety of environments.
4. Implement server side programming using WAMP, XAMPP.
5. Implement Model View Control architecture.
6. Manipulate DB operations using PHP page.

SOFTWARE TESTING

B.Tech 6th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1602	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:51	Tutorial Classes: 9	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Understand principles of testing like path, flow and domain testing's.
2. Analyze graph metrics
3. Apply software testing methods.

UNIT-I	Introduction	Classes:15

Basics of software testing – Testing principles – Goals – Testing life cycle – Phases of testing –Test plan (IEEE format) – Importance of testing in software production cycle – Testing techniques: Black box – White box – Gray box testing – Manual vs Automated testing – Static vs Dynamic testing – Taxonomy of software testing techniques.

UNIT-II	Verification and Validation	Classes:15

Verification & Validation Activities, Verification, Verification of Requirements, High level and low-level designs, verification of code, Validation.

Validation activities: Unit testing, Integration Testing, Function testing, system testing, acceptance testing. Dynamic Testing, I: Black Box testing techniques: Boundary Value Analysis, Equivalence class Testing, State Table based testing, Decision table-based testing.

UNIT-III	Dynamic Testing II	Classes:15

White-Box Testing: Need, Logic coverage criteria, Basis path testing, Graph matrices, Loop testing, data flow testing. **Static Testing:** inspections, Structured Walkthroughs, Technical reviews.

UNIT-IV	Regression Testing	Classes:15

Progressives Vs regressive testing, Objectives of regression testing, when regression testing done?State, State Graphs and Transition testing: state graphs, Good & Bad state graphs, State testing.

Text Book

1. Software Testing techniques, Boris Beizer, Dreamtech, Second Edition, 1990.
2. Software Testing Tools, Dr.K.V.K.K.Prasad, Dreamtech, 2006.

Reference Books

1. The craft of software testing - Brian Marick, Pearson Education.
2. Software Testing, Third edition, P.C.Jorgensen, Aurbach Publication.
3. Software Testing, N.Chauhan, Oxford University Press.

Web References

1. https://nptel.ac.in/courses/106105150/
2. https://www.geeksforgeeks.org/software-testing-basics/
3. https://www.softwaretestinghelp.com/manual-testing-tutorial-1/

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Understand the basic principles of testing, path testing and compare different path testing strategies.
2. Explain different transaction flow and data flow testing techniques.
3. Understand and identify various Domains testing strategies, methods and defining the method to find the regular expression used to find the testing paths.
4. Test the functions and state of the applications manually by using different testing methods.
5. Analyze various applications of Graph Metrics.
6. Apply and use software testing methods.

CRYPTOGRAPHYAND NETWORK SECURITY

B.Tech 6th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1603	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:51	Tutorial Classes:9	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Understand various data security concepts
2. Introduce various data encryption techniques.
3. Understand various emerging techniques.

UNIT-I	Introduction	Classes:15

Attacks, Services and Mechanisms, Security attacks, Security services, A Model for Inter-network security, Session Hijacking and Spoofing, Buffer overflow .Cryptography - Symmetric Cipher Model, Substitution Techniques, Confusion, Diffusion Steganography, Water mark security, Classical Encryption Techniques. Secret Key Cryptography -Simplified DES, Block Cipher principles, Data Encryption standard, Strength of DES, Differential and Linear Cryptanalysis, Block Cipher Design, Principles and Modes of operation, Algorithms: Triples DES, International Data Encryption algorithm, Blowfish, RC5,CAST-128, Characteristics of Advanced Symmetric block ciphers.

UNIT-II	Number Theory	Classes:15

Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's Theorems, Testing for primarily, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms. Public Key Cryptography-Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography. Message Authentication and Hash Functions-Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs. Hash and MAC algorithms-MD file, Message digests Algorithm, Secure Hash Algorithm, RIPEMD-160, HMAC.

UNIT-III	Digital Signatures and Authentication Protocols	Classes:15

Digital signatures, Authentication protocols, Digital signature Standards, Digital signature through Elliptic curve cryptosystem.

User Authentication: Remote user authentication principles. Authentication Applications -Kerberos, X.509 directory Authentication Service. Electronic Mail Security: Pretty Good Privacy, S/MIME.

UNIT-IV	Transport Level Security and Web Security	Classes:15

Web Security Requirements, Secure Socket Layer (SSL) and Transport Layer Security (TLS), Secure Shell (SSH). IP Security -Overview, Architecture, Authentication, Encapsulating Security Payload, Combining security Associations, Key Management.

Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction. Intruders, Viruses and Worms-Intruders, Viruses, Worms.Fire Walls: Fire wall Design Principles, Trusted systems.

Text Books

1. William Stallings, Cryptography and Network Security: Principles and Practice, 5th Edition, William Stallings, Pearson Education, 2011.
2. Behrouz A.Forouzan and Debdeep Mukhopadhay, Cryptography and Network Security, Tata McGraw-Hill, 2010.

Reference Books

1. Eric Maiwald ,Fundamentals of Network Security (Dreamtech press).
2. William Stallings, Network Security Essentials (Applications and Standards) Pearson Education
3. Whitman, Principles of Information Security, Thomson.

Web References

1. https://nptel.ac.in/courses/106106091/43
2. https://www.geeksforgeeks.org/computer-network-system-security/
3. https://www.edunotes.in/cryptography-and-network-security

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Use various Conventional Encryption Principles designed for providing security.
2. Analyze Private and Public Key Concepts.
3. Demonstrate IP Security features.
4. Describe data confidentiality, data integrity, data authentication and authentication.
5. Identify and evaluate current and emerging technologies in security.

OBJECT ORIENTED ANALYSIS AND DESIGN

B.Tech 6th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1604	Core	L	T	P	C	CIA	SEE	TOTAL
		3	-	-	3	40	60	100
Contact Classes:60	Tutorial Classes: -	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Understand the fundamental concepts and terms used in the object-oriented approach to system analysis and design.
2. Study on the importance of object-oriented analysis and design, principles of modeling and its limitations.
3. Apply the process of object-oriented analysis and design to development of software with the different applications.
4. Understand the importance and function of each UML model throughout the process of object oriented analysis and design and explaining the notation of various elements in these models.

UNIT-I	Introduction to UML	Classes:15

Importance of modeling, principles of modeling, object oriented modeling, A Conceptual model of the UML, Architecture, Software Development Life Cycle.

Basic Structural Modeling: Classes, Relationships, Common Mechanisms and Diagrams.

UNIT-II	Advanced Structural Modeling	Classes:15

Advanced classes, advanced relationships, Interfaces, Types and Roles, Packages.

Class & Object Diagrams: Terms, concepts, Common modeling techniques for class and Object Diagrams.

Basic Behavioral Modeling-I: Interactions, and Interaction diagrams.

UNIT-III	Basic Behavioral Modeling-II	Classes:15

Use cases, Use case Diagrams, Activity Diagrams.

Advanced Behavioral Modeling: Events and signals, State machines, Processes and Threads, Time and Space, state chart diagrams.

UNIT-IV	Architectural Modeling	Classes:15

Component, Deployment, Component diagrams, Deployment diagrams.

Case Study: The Unified Library Application

Text Books

1. Grady Booch, James Rumbaugh, Ivar Jacobson, "The Unified Modeling Language User Guide", 2nd edition, Pearson Education, 2009.
2. Hans-Erik Eriksson, Magnus Penker, Brian Lyons, David Fado, WILEY, "UML 2 Toolkit", -Dreamtech India Pvt.Ltd.

Reference Books

1. Meilir Page-Jones, Fundamentals of Object Oriented Design in UML, Pearson Education, 2000.
2. Pascal Roques, Modeling Software Systems Using UML2, WILEY Dreamtech India Pvt.

Web References

1. https://nptel.ac.in/courses/122105022/27
2. https://www.umsl.edu/~sauterv/analysis/488_f01_papers/quillin.htm
3. https://www.w3computing.com/systemsanalysis/object-oriented-systems-analysis-design/

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Analyze, design, and document the requirements through use case approach.
2. Identify, analyze, and model structural and behavioral concepts of the system.
3. Develop the conceptual model into various scenarios and applications.
4. Understanding the concepts of architectural design.
5. Apply the concepts of architectural design for deploying the code for software.
6. Design any system as a case study

ARTIFICIAL INTELLIGENCE (ELECTIVE-I)

B.Tech 6th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1605	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:51	Tutorial Classes: 9	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Learn problem solving methods.
2. Introduce logical reasoning of operational research.
3. Introduce uncertain knowledge and reasoning of operational research.

UNIT-I	Problem Solving	Classes:15

Introduction- Agents – Problem formulation – uninformed search strategies – heuristics – informed search strategies – constraint satisfaction

UNIT-II	Logical Reasoning	Classes:15

Logical agents – propositional logic – inferences – first-order logic – inferences in first order logic – forward chaining – backward chaining – unification – resolution

UNIT-III	Planning	Classes:15

Planning with state-space search – partial-order planning – planning graphs – planning and acting in the real world

UNIT-IV	Uncertain Knowledge and Reasoning	Classes:15

Uncertainty – review of probability - probabilistic Reasoning – Bayesian networks – inferences in Bayesian networks – Temporal models – Hidden Markov models.

Text Books

1. S. Russel and P. Norvig, -Artificial Intelligence – A Modern Approach, Second Edition, Pearson Education, 2003.

References Books

1. David Poole, Alan Mackworth, Randy Goebel, Computational Intelligence : a logical approach, Oxford University Press, 2004.
2. G. Luger, - Artificial Intelligence: Structures and Strategies for complex problem solving, Fourth Edition, Pearson Education, 2002.
3. J. Nilsson, -Artificial Intelligence: A new Synthesis, Elsevier Publishers, 1998.

Web References

1. https://nptel.ac.in/courses/106106126/
1. http://www.cs.toronto.edu/~fbacchus/csc384/Lectures/lectures.html
2. https://grid.cs.gsu.edu/~cscyqz/courses/ai/aiLectures.html

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Select a search algorithm for a problem and estimate its time and space complexities.
2. Possess the skill for representing knowledge using the appropriate technique for a given problem
3. Possess the ability to apply AI techniques to solve problems of game playing, expert systems,
4. Implement A* and iterative deepening search algorithms.
5. Carry out proofs in first order and propositional logic using techniques such as resolution,

   unification, backward and forward chaining.
6. Implement and execute by hand alpha-beta search.

COMPUTERGRAPHICS (ELECTIVE-I)

B.Tech 6th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1606	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:51	Tutorial Classes:9	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Learn output primitives of computer graphics.
2. Introduce two dimensional geometric transformations.
3. Entitle Three dimensional concepts and object representations of computer graphics

UNIT-I	Introduction	Classes:15

Usage of Graphics and their applications, Presentation Graphics-Computer Aided Design-Computer Art- Entertainment- Education and Training-Visualization- Image Processing- Graphical User Interfaces. Overview of Graphics systems: Video Display Devices- Raster Scan systems-random scan systems-Graphics monitors and workstations Input devices.

UNIT-II	Output Primitives	Classes:15

Points and Lines-Line Drawing Algorithms- Loading the Frame buffer Line function- Circle- Generating Algorithms- Ellipse Generating Algorithms-Other Curves Parallel Curve Algorithms-Curve Functions-Pixel Addressing- Filled Area Primitives-Filled Area Functions.

UNIT-III	Two Dimensional Geometric Transformations	Classes:15

Basic Transformations- Matrix Representations - Homogeneous Coordinates - Composite Transformations - Other Transformations-Transformations between Coordinate Systems - Affine Transformations Transformation Functions- Raster methods for Transformation. Two Dimensional Viewing: The viewing Pipeline-Viewing Coordinate Reference Frame Window-to-Viewport Coordinate Transformation-Two Dimensional Viewing Functions Clipping Operations-Point Clipping-Line Clipping-Polygon Clipping.

UNIT-IV	Three Dimensional Concepts and Object representations	Classes:15

3D display methods, 3DGraphics-Polygon Surfaces- Curved Lines and Surfaces- Quadratic Surfaces, Three Dimensional Geometric and Modeling Transformations: Translation-Rotation-scaling-Other Transformations-Composite Transformations-3D Transformation Functions-Modeling and Coordinate Transformations.

Text Books

1. Donald Hearn & M. Pauline Baker, "Computer Graphics C Version", Pearson Education, New Delhi, 2004 (Chapters 1 to 12 except 10-9 to 10-22 of the Text book)

Reference Books

1. David F. Rogers, "Procedural Elements for Computer Graphics", TMH Publications.
2. J. D. Foley, S. K Feiner, A Van Dam F. H John, "Computer Graphics: Principles & Practice in C", Pearson.

Web References

1. https://nptel.ac.in/courses/106106090/
2. https://www.geeksforgeeks.org/computer-graphics-2/
3. https://lecturenotes.in/notes/68-notes-for-computer-graphics-cg-by-verified-writer

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Design an application with the principles of virtual reality
2. List the basic concepts used in computer graphics.
3. Implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
4. Describe the importance of viewing and projections.
5. Define the fundamentals of animation, virtual reality and its related technologies.
6. Understand a typical graphics pipeline

OPERATIONS RESEARCH (ELECTIVE-I)

B.Tech 6th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16ME1703	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:51	Tutorial Classes: 9		Practical Classes: Nil			Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Understand the theoretical workings of the simplex method for linear
2. Understand the relationship between a linear program and its dual, including strong duality and complementary slackness
3. Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution
4. Solve specialized linear programming problems like the transportation and assignment problems
5. Solve network models like the shortest path, minimum spanning tree, and maximum flow problems
6. Understand how to model and solve problems using dynamic programming
7. Model a dynamic system as a queuing model and compute important performance measures

UNIT-I	Introduction to Operations Research	Classes:15

Basics definition, scope, objectives, phases, models and limitations of Operations Research. Linear Programming Problem – Formulation of LPP, Graphical solution of LPP. Simplex Method, Artificial variables, big-M method, two-phase method, degeneracy and unbound solutions

UNIT-II	Transportation Problem	Classes:15

Formulation, solution, unbalanced Transportation problem. Finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's

approximation method. Optimality test: the stepping stone method and MODI method

UNIT-III	Assignment model	Classes:15

Assignment model. Formulation. Hungarian method for optimal solution. Solving unbalanced problem. Traveling salesman problem and assignment problem

UNIT-IV	Dynamic programming	Classes:15

Dynamic programming. Characteristics of dynamic programming. Dynamic programming approach for Priority Management employment smoothening, capital budgeting, Stage Coach/Shortest Path, cargo loading and Reliability problems

Text Books

1. P. Sankara Iyer, "Operations Research", Tata McGraw-Hill, 2008.
2. A.M. Natarajan, P. Balasubramani, A. Tamilarasi, "Operations Research", Pearson Education, 2005.

Reference Books

1. J K Sharma., "Operations Research Theory & Applications , 3e", Macmillan India Ltd, 2007.
2. P. K. Gupta and D. S. Hira, "Operations Research", S. Chand & co., 2007.

Web References

1. https://nptel.ac.in/courses/112106134/
2. http://www.cs.toronto.edu/~stacho/public/IEOR4004-notes1.pdf
3. http://user.engineering.uiowa.edu/~dbricker/or_lectures.html

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Identify and develop OR models from the verbal description of the real system
2. Appreciate the mathematical tools that are needed to solve optimization problems
3. Apply mathematical software to solve the proposed models.
4. Develop a report that describes the model and the solving technique,
5. Analyze the results and propose recommendations in language understandable to the decision-making processes in Management Engineering.

AVAILABLE SELECTED MOOCs (ELECTIVE-I)

B.Tech 6th Semester: Computer Science & Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
16CS1607	**Elective**	3	-	-	3	40	60	100
Contact Classes: -	**Tutorial Classes: -**	**Practical Classes: Nil**				**Total Classes: -**		

Meeting with the global requirements, to inculcate the habit of self learning and incompliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers

Regulations for MOOCs

- The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.
- Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.
- A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.
- The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.
- Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.
- There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses.
- Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.

WEB TECHNOLOGIES LAB

B.Tech 6th Semester: Computer Science & Engineering								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
16CS2608	Core	-	-	3	2	25	50	75
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 33				Total Classes: 33		

OBJECTIVES

The course should enable the students to

1. Know about web servers.
2. Learn about PHP concepts.
3. Understand the object oriented concepts in PHP
4. Understand the basic concepts of database connectivity.

LIST OF EXPERIMENTS

Expt. 1	**WAMP or XAMPP**

How to install WAMP or XAMPP Web servers.

Expt. 2	**Basic Operations**

Write a PHP program using basic operators.

Expt. 3	**Control Statements**

Write a PHP program using control statements.

Expt. 4	**Access to class members**

Write a PHP program using controlling access to class members.

Expt. 5	**Inheritance**

Write a PHP program using the concept of inheritance and extending classes.

Expt. 6	**Abstract classes and methods**

Write a PHP program using abstract classes and methods.

Expt.7	**Interface**

Write a PHP program using interface.

Expt. 8	**Exception Handling**

Write a PHP program for Exception handling.

Expt. 9	**File Operations**

Write a PHP program for opening, reading, writing and closing a file.

Expt. 10	**Authentication**

Write a PHP program using authentication concepts.

Expt. 11	**Database connectivity**

Write a PHP program to connect to the database and extract data from the tables.

Reference Books

1. Beginning PHP and MySQL, 3rd Edition , Jason Gilmore, Apress Publications (Dream tech.).
2. PHP 5 Recipes A problem Solution Approach Lee Babin, Nathan A Good, Frank M.Kromann and Jon Stephens.

Web References

1. https://www.tutorialride.com/web-technologies.htm
2. https://www.tutorialspoint.com/web_development_tutorials.htm

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS

SOFTWARE: Web Browsers : WAMP/XAMPP

HARDWARE: Desktop Computers

Course Outcome

At the end of the course students will be able to

1. Design dynamic and interactive web pages.
2. Develop software components in a variety of environments.
3. Implement server side programming using WAMP, XAMPP.
4. Implement Model View Control architecture.
5. Manipulate DB operations using PHP page.

SOFTWARE TESTING AND CASETOOLS LAB

B.Tech 6th Semester: Computer Science & Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16CS2609	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	3	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**		**Practical Classes: 36**			**Total Classes: 36**		

OBJECTIVES

The course should enable the students to

1. Know about testing strategies.
2. Learn about test cases.

LIST OF EXPERIMENTS

Expt.1 **Decision table approach**

Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Derive test cases for your program based on decision-table approach, execute the test cases and discuss the results.

Expt. 2 **Equivalence class partitioning**

Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on equivalence class partitioning, execute the test cases and discuss the results.

Expt. 3 **Data Flow Testing**

Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of dataflow testing, derive different test cases, execute these test cases and discuss the test results.

Expt.4	Boundary value testing

Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of boundary value testing, derive different test cases, execute these test cases and discuss the test results.

Expt.5	Basis paths

Design, develop, code and run the program in any suitable language to implement an absolute letter grading procedure, making suitable assumptions. Determine the basis paths and using them derive different test cases, execute these test cases and discuss the test results.

Expt.6	Class Value testing

Design, develop, code and run the program in any suitable language to implement the Next Date function. Analyze it from the perspective of equivalence class value testing, derive different test cases, execute these test cases and discuss the test results.

Expt.7	Case Study 1: Library Information System

A library lends books and magazines to members, who are registered in the system. Also it handles the purchase of new titles for the library. Popular titles are bought in multiple copies. A member can reserve a book or magazine that is not currently available in the library, so that when it is returned by the library that person is notified. The library can easily create, update and delete information about the titles, members, loans and reservations in the systems.

Expt. 8	Case Study 2: Design a Student Registration System

Each student has access to his or her course and grade information only and must be authenticated prior to viewing or updating the information. A course instructor will use the system to view the list of courses he or she is assigned for a given semester or has taught previously, view the list of students registered for the course(s) he or she is teaching and record final grades for each student in the course(s). TA assignments will also be viewable through this system. Instructors must also be authenticated prior to viewing or updating any information

Expt. 9	Case Study 3: Automated Teller Machine (ATM)

Software is designed for supporting a computerized ATM banking network. All the process involved in the bank is computerized these days. All the accounts maintained in the bank and also the transactions effected,

including ATM transactions are to be processed by the computers in the bank. An ATM accepts a relevant cash card, interacts with user, communicates with the central system to carry out the transaction, dispenses cash, and prints receipts. The system to be designed and implemented must include appropriate record keeping and security provisions. The system must handle concurrent access to the same account.

Expt.10	**Case Study 4:Online Ticket Reservation for Railways**

Computer play an integral part of the day in today's life. It makes the entire job easier and faster, every job is computerized so as the ticket reservation we can book over the online ticket reservation system. During the booking of the ticket reservation passenger has to select origin, date of journey, destination, class of train etc. The reservation counter keeps track of passenger's information. Thus the system will have all the details about the trains and facilities provided by them. There are various trains with the different level of convenience for the passengers. The whole database will be maintained by database administrator. There are varieties of trains where the passengers can select the train according to the convenience for their destination journey. The journey could be within the state or across the India. Each train has the three types of classes i.e. Sleeper class, First class and the AC compartment. Design the application for the above problem description.

Expt.11	**Case Study 5: Online Auction Sales**

The online auction system is a design about a website where sellers collect and prepare a list of items they want to sell and place it on the website for visualizing. To accomplish this purpose the user has to access the site. Incase it's a new user he has to register. Purchaser's login and select items they want to buy and keep bidding for it. Interacting with the purchasers and sellers through messages does this. There is no need for customer to interact with the sellers because every time the purchasers bid, the details will be updated in the database. The purchaser making the highest bid for an item before the close of the auction is declared as the owner of the item. If the auctioneer or the purchaser doesn't want to bid for the product then there is fixed cutoff price mentioned for every product. He can pay that amount directly and own the product. The purchaser gets a confirmation of his purchase as an acknowledgement from the website. After the transition by going back to the main menu where he can view other items.

Expt.12	Case Study 6: A Point of Sale (POS) System

A POS System is a computerized application used to record sales and handle payments, it is typically used in a retail store. It includes hardware components such as a computer and bar code scanner, and software to run the system. It interfaces to various service applications, such as a third-party tax calculator and inventory control. These systems must be relatively fault tolerant, that is, even if remote services and temporarily unavailable they must still be of capturing sales and handling at least cash payments. A POS system must support multiple and varied client – side terminals and interfaces such as browser, PDA's, touch – screens.

Reference Books

1. Craig Larman, "Applying UML and Patterns: An Introduction to Object Oriented Analysis and Design and the Unified Process", 2nd ed., Pearson Education Asia, 2002.
2. Simon Sennet, Steve McRobb, and Ray Farmer, "Object Oriented Systems Analysis and Design using UML", 2nd ed., McGraw Hill, 2002.
3. Andrew Haigh, "Object-Oriented Analysis & Design," 1st ed., Tata McGraw-Hill, 2001.

Web References

1. https://mrcet.com/pdf/Lab%20Manuals/CSE%20III-II% 20 SEM (Case%20Tools%20Lab%20Manual).pdf
2. https://studylib.net/doc/6953621/software-testing-and-case-tools-lab

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS

SOFTWARE: Dev C++, Rational Rose

HARDWARE: Desktop Computers

Course Outcomes

At the end of the course students will be able to

1. Understand the basic testing procedures.
2. Generate test cases and test suites.
3. Test the applications manually by using different testing methods.

CRYPTOGRAPHYAND NETWORK SECURITY LAB

B.Tech 6th Semester: Computer Science & Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
16CS2610	**Core**	-	-	3	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 33**				**Total Classes: 33**		

OBJECTIVES

The course should enable the students to

1. Understand various data security concepts
2. Introduce various data encryption techniques.
3. Understand various emerging techniques.
4. Understand basics of Cryptography and Network Security.
5. Secure a message over insecure channel by various means.
6. Maintain the Confidentiality, Integrity and Availability of a data.
7. Understand various protocols for network security to protect against the threats in the networks.

LIST OF EXPERIMENTS

Expt.1 **XOR**

Write a C program that contains a string (char pointer) with a value ‘Hello world’. The program should XOR each character in this string with 0 and displays the result.

Expt.2 **AND and XOR**

Write a C 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.

Expt.3	Encryption and Decryption

Write a Java program to perform encryption and decryption using the following algorithms

a. Ceaser cipher b. Substitution cipher c. Hill Cipher

Expt.4	DES algorithm

Write a C/JAVA program to implement the DES algorithm logic.

Expt.5	Blowfish Algorithm

Write a C/JAVA program to implement the Blowfish algorithm logic.

Expt.6	Rijndael Algorithm

Write a C/JAVA program to implement the Rijndael algorithm logic.

Expt.7	RC4

Write the RC4 logic in Java Using Java cryptography, encrypt the text "Hello world" using Blowfish. Create your own key using Java key tool.

Expt.8	RSA Algorithm

Write a Java program to implement RSA algorithm.

Expt.9	Diffie- Hellman Key

Implement the Diffie-Hellman Key Exchange mechanism using HTML and JavaScript.

Expt.10	SHA-1

Calculate the message digest of a text using the SHA-1 algorithm in JAVA.

Expt.11	MD5

Calculate the message digest of a text using the MD5 algorithm in JAVA.

Reference Books

1. Cryptography and Network Security: Principles and Practice by William Stallings, 4th edition.

2. Cryptography & Network Security by Behrouz A. Forouzan, McGraw-Hill ...

Web References

1. https://wanguolin.github.io/assets/cryptography _ and _ network _ security. pdf
2. http://www.csa.iisc.ernet.in/~cris/

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS

SOFTWARE: Turbo C, Dev C++, jdk

HARDWARE: Desktop Computers

Course Outcomes

At the end of the course students will be able to

1. Appreciate various Conventional Encryption Principles designed for providing security.
2. Analyze Private and Public Key Concepts.
3. Demonstrate IP Security features.
4. Describe data confidentiality, data integrity, data authentication and authentication.
5. Identify and evaluate current and emerging technologies in security.

MINI PROJECT

B.Tech 6th Semester – Computer Science & Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16CS2611	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	-	2	25	50	75
Contact Classes: 36	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 36**		

OBJECTIVES

The course should enable the students to

I. Apply the programming knowledge into a real- world situation/problem and exposed the students how programming skills helps in developing a good engineer

II. The student should gain a thorough knowledge in the problem, he/she has selected and the language / software/Hardware, he/she is using.

The Mini Project shall be carried out during 6th Semester along with other lab courses by having regular weekly slots. Students will take mini project batch-wise and the batches will be divided as per the guidelines issued. The topic of mini project should be so selected that the students are enabled to complete the work in the stipulated time with the available resources in the respective laboratories. The scope of mini project could be handling part of the consultancy work, maintenance of the existing equipment, development of new experiment setup or can be a prelude to the main project with specific outcome.

Mini Project report will be evaluated for 75 marks. 25 marks for internal evaluation and 50 marks for external evaluation.

Assessment will be done by the supervisor/guide for 25 marks based on the work and presentation/ execution of the mini project.

The remaining 50 marks are based on report, presentation, execution and viva-voce. Evaluation is done by a committee comprising the mini project supervisor, Head of the Department and external examiner appointed by the Principal from the panel of experts recommended by Chairman, BOS in consultation with Head of the Department.

Outcomes

1. Acquire practical knowledge within the chosen area of technology for project development
2. contribute as an individual or in a team in development of technical projects
3. develop effective communication skills for presentation of project related activities
4. identify, analyze, formulate and handle programming projects with a comprehensive and systematic approach

TECHNICAL APTITUDE

B.Tech 6th Semester – Computer Science & Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16AS3601	-	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	-	1	25	50	75
Contact Classes: 36	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 36**		

OBJECTIVES

The course should enable the students to

I. To ensure that students learn to think critically about mathematical models.

II. To ensure students in solving problems effectively and accurately.

III. Application of mathematical or statistical models to different real world contexts.

UNIT-I	**Classes:5**

Problem Solving in Commercial Mathematics

(Percentages, Profit and Loss, Discount and Interest)

UNIT-II	**Classes:5**

Problem Solving in advanced level of Mathematical Ability

(Ratio and Proportions, Mixtures, Time and Work, Time and Distance)

UNIT-III	**Classes:7**

C - language concepts:

C language basics, Structure of a C Program, C Tokens, Variables, Constants, C functions, types, recursion, Header files, Preprocessor Commands, Storage Classes, Arrays, types of Arrays, Strings, Pointers, Structures.

UNIT-IV	**Classes:8**

Data Structures:

Introduction, Stacks, Queues, types of Queues, Applications of Stacks and Queues, Linked Lists, Search Techniques: Linear Search, Binary Search,

Sorting Techniques: Bubble Sort, Insertion Sort, Selection Sort, Merge Sort, Quick Sort, Trees: basic terminology, Binary Trees, Binary Search Trees.

UNIT-V	**Classes: 11**

Personality Development- Personal Grooming-Dressing, Body, Language, Leadership Skills, Basic Etiquettes, Mannerism / Confidence Building - Positive Attitude/ Mind Power Training etc

HR Fundamentals- Practice of self concept.

Kinds of Interviews –Structured Interview. A structured interview is typically formal and organized and may include several interviewers, commonly referred to as a panel interview. ...

Unstructured Interview. ...

Stress Interview. ...

Behavioral Interview. ...

Problem Solving or Case Interview. ...

Panel Interview. Required Key Skills – Corporate culture

Interview Skills - Mock Interviews [One –One, Panel, Telephonic & Skype]

Outcomes

1. Student can attempt different technical competitive exams.
2. Student can enhance technical ability and logical thinking.

PROFESSIONAL SOCIETY ACTIVITIES-IV

B.Tech 6th Semester – Computer Science & Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
16AS3602		-	-	-	1			
Contact Classes: 12	**Tutorial Classes: Nil**	**Practical Classes: Nil**			**Total Classes: 12**			

OBJECTIVES

The course should enable the students to

1. Improve communication skills
2. Develop leadership qualities

Professional Society Activities (PSA) course is aimed at enhancing the self-learning, communication, managerial skills of the students by engaging them in various Co & Extra Curricular activities during their course of study. Activities in each of the department shall be designed and conducted by the Professional Society Executive Committee whose composition is:

1. Faculty Mentors- 2 No.
2. Student Chairman: 1 No.- Final year Student
3. Student General Secretary: 1 No.- Third year Student
4. Treasurer: 1 No.- Third year Student

Student Members: 2 No's from each class

PSA related activities would be of the following nature but not limited to:

Activity#1	Just A Minute
Activity#2	Technical Quiz
Activity#3	Open House- Lab Demo

Activity#4	Technical Paper Presentation- Preliminary
Activity#5	Technical Paper Presentation- Final
Activity#6	Poster Presentation
Activity#7	Collage- A theme based event
Activity#8	Debate Competition
Activity#9	Group Discussion Competition
Activity#10	Mock Interviews
Activity#11	Model Exhibition
Activity#12	Valedictory Function

CLOUD COMPUTING

B.Tech 7th Semester: Computer Science & Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
16CS1701	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		3	1	-	3	40	60	100
Contact Classes:51	**Tutorial Classes: 9**	**Practical Classes: Nil**			**Total Classes: 60**			

OBJECTIVES

The course should enable the students to

1. Learn the Basics of cloud computing.
2. Understand the Key concepts of virtualization.
3. Understand Different Cloud Computing services
4. Apply Cloud Implementation, Programming and Mobile cloud computing
5. Apply Cloud Backup and Security solutions.
6. Know different open source tools for cloud services.

UNIT-I	**Introduction to Cloud Computing**	**Classes:15**

Computing Paradigms: High-Performance Computing, Parallel Computing, Distributed Computing, Cluster Computing, Grid Computing, Cloud Computing, Bio computing, Mobile Computing, Quantum Computing, Optical Computing, Nano computing, Network Computing.

Fundamentals: Motivation for Cloud Computing: The Need for Cloud Computing.

Defining Cloud Computing: NIST Definition of Cloud Computing, Cloud Computing Is a Service, Cloud Computing Is a Platform

Principles of Cloud computing: Five Essential Characteristics, Four Cloud Deployment Models, Three Service Offering Models Cloud Ecosystem, Requirements for Cloud Services, Cloud Application, Benefits and Drawbacks.

Architecture and Management: Cloud Architecture, Anatomy of the Cloud, Network Connectivity in Cloud Computing, Applications on the Cloud, Managing the Cloud, Migrating Application to Cloud.

UNIT-II	Cloud Deployment Models, Technological Drivers for Cloud Computing, Virtualization	Classes:15

Cloud Deployment Models : Private Cloud, Public Cloud, Community Cloud, Hybrid Cloud Cloud Service Models : Infrastructure as a Service, Platform as a Service, Software as a Service, Other Cloud Service Models

Technological Drivers for Cloud Computing: SOA and Cloud:SOA and SOC, Benefits of SOA, Technologies Used by SOA, Similarities and Differences between SOA and Cloud Computing.

Virtualization: Approaches in Virtualization, Hypervisor and Its Role, Types of Virtualization Multi-core Technology, Memory and Storage Technologies, Networking Technologies Web 2.0, Web 3.0.

UNIT-III	Programming Models in Cloud, Application Environment, Cloud Application Development Platforms, Cloud Computing APIs	Classes:15

Programming Models in Cloud: BSP Model, MapReduce Model, SAGA, Transformer, Grid Batch Framework Operating Systems: Role of OS in Cloud Computing, Features of Cloud OS, Cloud OS Requirements, Cloud-Based OS Application Environment

Application Environment: Need for Effective ADE, Application Development Methodologies, Power of Cloud Computing in Application Development

Cloud Application Development Platforms: Windows Azure, Google App Engine, Force.com, Manjrasoft Aneka

Cloud Computing APIs: Rackspace, IBM, Intel Software Development in Cloud : Introduction, Different perspectives on SaaS development, New challenges, Cloud aware software development using PaaS technology.

UNIT-IV	**Networking for Cloud Computing, Introduction, Open Source inCloud Computing, Security Aspects**	**Classes:15**

Networking for Cloud Computing : Introduction, Overview of Data Center Environment, Networking Issues in Data Centers Cloud Service Providers : Introduction, EMC, Google, Amazon Web Services, Microsoft, IBM, Salesforce, Rackspace Open Source Support for Cloud

Introduction, Open Source in Cloud Computing: An Overview, Difference between Open Source and Closed Source, Advantages of Having an Open Source

Open Source Tools for IaaS: Eucalyptus, Openstack

Open Source Tools for PaaS: Red Hat OpenShift Origin

Open Source Tools for SaaS: Google Drive, Dropbox

Open Source Tools for Research: CloudSim

Security Aspects: Data Security, Virtualization Security, Network Security Platform Related Security Security Issues in Cloud Service Models, Software-as-a-Service Security Issues, Platform-as-a-Service Security Issues, Infrastructure-as-a-Service Security Issues

Text Books

1. K. Chandrasekaran, Essentials of Cloud Computing, CRC Press, 2015 edition

Reference Books

1. 1. Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010
2. RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 2011

3. Nikos Antonopoulos, Lee Gillam, Cloud Computing: Principles, Systems and Applications, Springer, 2012.

Web References

1. https://www.guru99.com/cloud-computing-for-beginners.html
2. https://www.smartzworld.com/notes/cloud-computing-pdf-notes-cc/

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Understand the basic principles of cloud computing and importance of protocols and standards in management for cloud services.
2. Illustrate various problems and evaluate related cloud computing solutions.
3. Apply the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud and hybrid cloud to different problems.
4. Assess the comparative advantages and disadvantages of Virtualization Processes.
5. Analyze the different types of virtualization technologies.
6. Analyze authentication, confidentiality and privacy issues in cloud computing and security implications in cloud computing and case studies to derive the best practice.

BIG DATA ANALYSIS

B.Tech 7th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1702	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:51	Tutorial Classes: 9		Practical Classes: Nil			Total Classes: 60		

OBJECTIVES

The course should enable the students to

1. Discuss the challenges traditional data mining algorithms face when analyzing Big Data.
2. Introduce the tools required to manage and analyze big data like Hadoop, NoSql MapReduce.
3. Teach the fundamental techniques and principles in achieving big data analytics with scalability and streaming capability using HIVE and PIG.
4. Introduce to the students several types of big data like social media, web graphs and data streams.
5. Enable students to have skills that will help them to solve complex real-world problems in for decision support.

UNIT-I	Introduction to Bigdata	Classes:15

BigData: Introduction, Classification, Characteristics, Major Challenges, Traditional Approach of Storing and Processing.

Hadoop: Introduction, Important Features, How it Works, Eco Systems.

UNIT-II	Hadoop Distributed File Systems	Classes:15

Introduction to HDFS, HDFS Daemons, Core Components of HADOOP, HADOOP Architecture. Name Node, Data Node, Secondary Name Node, Job Tracker, Task Tracker. Reading Data from HDFS, Writing Data to HDFS. Setting up Development Environment, Exploring HADOOP Commands, Rack Awareness.

UNIT-III	Map Reduce	Classes:15

Map Reduce Architecture, Job submission, Job Initialization. Task Assignment, Task execution, Progress and status updates, Job Completion. Shuffle and sort on Map and reducer side. Map Reduce Types, Input formats, Output formats, sorting. Map side and Reduce side joins. Map Reduce Programs - Word Count Program, Maximum Temperature Program.

UNIT-IV	Hive and Pig	Classes:15

Hive: The Hive shell, Hive services, Comparison with traditional databases, Hive QL, Tables, Querying data, User-defined functions.

Pig: Introduction to Pig, Pig Latin.

Text Books

1. Tom White, Hadoop: The Definitive Guide, 3rd Edition, O'Reilly Publications, 2012.
2. Paul Zikopoulos, Chris Eaton, and Paul, Understanding Big Data: Analytics for Enterprise Class Hadoop and streaming Data, The McGraw-Hill Companies, 2012.

Reference Books

1. Bart Baesens, Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Wiley Publications, 2014.

Web References

1. https://www.edx.org/course/big-data-analytics-adelaidex-analyticsx
2. https://intellipaat.com/blog/big-data-tutorial-for-beginners/
3. https://www.analyticsvidhya.com/blog/2015/.../big-data-analytics-youtube-ted-resourc...

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Realize the Big Data Fundamentals, the evolution of Big Data, the characteristics of Big Data and the challenges introduced.
2. Apply non-relational databases, the techniques for storing and processing large volumes of structured and unstructured data, as well as streaming data.
3. Apply the novel architectures and platforms introduced for Big data, in particular Hadoop and MapReduce.
4. Appreciate the challenge of analyzing Bigdata
5. Implement large scale analytical tools for solving Bigdata applications.

MOBILE APPLICATION DEVELOPMENT

B.Tech 7th Semester: Computer Science & Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
16CS1703	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		3	1	-	3	40	60	100
Contact Classes:51	**Tutorial Classes: 9**		**Practical Classes: Nil**			**Total Classes: 60**		

OBJECTIVES

The course should enable the students to

1. Know Android platform basic widgets and its architecture.
2. Learn activity creation and Android UI designing.
3. Be familiar with the use of resources and Internet services.
4. Integrate multimedia, camera and Location based services in Android Application.
5. Be familiar with the creation of database, inserting, retrieving, deleting and updating data into SQLite Database.

UNIT-I	Introduction to Android:	Classes:15

Introduction to Android: The Android 4.1 jelly Bean SDK, Understanding the Android Software Stack, installing the Android SDK, Creating Android Virtual Devices, Creating the First Android Project, Using the Text view Control, Using the Android Emulator, The Android Debug Bridge(ADB), Launching Android Applications on a Handset.

UNIT-II	Basic Widgets	Classes:15

Basic Widgets: Understanding the Role of Android Application Components, Understanding the Utility of Android API, Overview of the Android Project Files, Understanding Activities, Role of the Android Manifest File, Creating the User Interface, Commonly Used Layouts and Controls, Event Handling, Displaying Messages Through Toast, Creating and Starting an Activity, Using the Edit Text Control, Choosing Options with Checkbox, Choosing Mutually Exclusive Items Using Radio Buttons.

UNIT-III	Building Blocks for Android Application Design and Utilizing Resources and Media Resources	Classes:15

Building Blocks for Android Application Design: Introduction to Layouts, Linear Layout, Relative Layout, Absolute Layout, Using Image View, Frame Layout, Table Layout, Grid Layout, Adapting to Screen orientation.

Utilizing Resources and Media Resources: Creating Values Resources, Using Drawable Resources, Switching States with Toggle Buttons, Creating an Images Switcher Application, Scrolling Through Scroll View, playing Audio, Playing Video, All Displaying Progress with Progress Bar, Using Assets.

UNIT-IV	Building Menus and Storing Data, Using Databases, Communicating with SMS and Emails	Classes:15

Building Menus and Storing Data: Creating Interface Menus and Action Bars, Menus and Their Types, Creating Menus Through XML, Creating Menus Through Coding, Applying a Context Menu to a List View, Using the Action Bar, Replacing a Menu with the Action Bar, Creating a Drop-Down List Action Bar **Using Databases**: Using the SQLiteOpenHelperclasss, Accessing Databases with the ADB, Creating a Data Entry Form, **Communicating with SMS and Emails:** Understanding Broadcast Receivers, Using the Notification System, Sending SMS Messages with Java Code, Receiving SMS Messages, Sending Email, Working With Telephony Manager.

Text Books

1. Android Programming by B.M Harwani, Pearson Education, 2013.
2. Android application Development for Java Programmers, James C Sheusi, Cengage Learning

Reference Books

1. Android In Action by w.Frank Ableson, Robi Sen, Chris King, C. Enrique Ortiz., Dreamtech.
2. Professional Android 4 applications development, Reto Meier, Wiley India, 2012.

Web References

1. https://developer.android.com/
2. https://www.tutorialspoint.com/android/
3. https://www.vogella.com/tutorials/android.html
4. https://developer.android.com/guide
5. https://www.codingninjas.in/courses/classroom-android-app-development-course
6. https://www.edx.org/learn/app-development

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Create data sharing with different applications and sending and intercepting SMS
2. Develop applications using services and publishing android applications.
3. Apply mobile application models/architectures and patterns to the development of a

   Mobile software application.
4. Describe and compare different mobile application models/architectures and patterns.
5. Apply a mobile development framework to the development of a mobile application.
6. Demonstrate advanced Java programming competency by developing a maintainable and efficient cloud based mobile application

INTERNET OF THINGS (Elective – II)

B.Tech 7th Semester: Computer Science & Engineering (Open Elective)								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16CS1708	Core	3	1	-	3	40	60	100
Contact Classes:51	Tutorial Classes: 9		Practical Classes: Nil			Total Classes: 60		

OBJECTIVES

The course should enable the students to

1. Know the concepts of IOT.
2. Understand different applications in IOT.
3. Know different protocols used in IOT.
4. Learn the concepts of smart city development in IOT.

UNIT-I	Introduction	Classes:15

Introduction to IoT Defining IoT, Characteristics of IoT, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models & APIs.

UNIT-II	IoT& M2M, Network & Communication aspects	Classes:15

IoT & M2M: Machine to Machine, Difference between IoT and M2M, Software define Network. **Network & Communication aspects**: Wireless medium access issues, MAC protocol survey, Survey routing protocols, Sensor deployment & Node discovery, Data aggregation & dissemination.

UNIT-III	Challenges and Domain specific applications	Classes:15

Challenges in IoT: Design challenges, Development challenges, Security challenges, other challenges. **Domain specific applications of IoT:** Home automation, Industry applications, Surveillance applications, Other IoT applications

UNIT-IV	Developing IoTs	Classes:15

Developing IoTs: Introduction to Python, Introduction to different IoT tools, Developing applications through IoT tools, Developing sensor based application through embedded system platform, Implementing IoT concepts with python, Introduction about clouds, Cloud connectivity with an embedded system through API key's.

Text Books

1. Vijay Madisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach"
2. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice".

Web References

1. https://nptel.ac.in/courses/106105166
2. https://lecturenotes.in/subject/370/internet-of-things-iot
3. https://karkare.github.io/cs664

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Understand the concepts of Internet of Things.
2. Analyze basic protocols in wireless sensor network.
3. Design IoT applications in different domain and be able to analyze their performance
4. Implement basic IoT applications on embedded platform.

OPEN SYSTEM SOFTWARE (Elective – II)

B.Tech 7th Semester: Computer Science & Engineering (Open Elective)								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
16CS1709	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		3	1	-	3	40	60	100
Contact Classes:51	**Tutorial Classes: 9**		**Practical Classes: Nil**			**Total Classes: 60**		

OBJECTIVES

The course should enable the students to

1. The history and emergence of open system software.
2. The open source development tools, API and GNU.
3. How we can build the community, blog, forum and Social Networks for social people.
4. About the open standards for search and retrieval of the information
5. Know in detail about the open source licenses
6. Explain open system project structure and how to successfully setup a Project

UNIT-I	**History and Emergence of Open System Software**	**Classes:15**

History and Emergence of Open System Software: The philosophy of OSS, Richard Stallman, The Cathedral and the Bazaar (CatB), commercial software vs OSS, free software vs freeware. Open source development models. Application Programming Interface (API). GNU Project, Free Software Foundation.

UNIT-II	**Community Building**	**Classes:15**

Community Building: Importance of Communities in Open Source Movement. JBoss Community. Developing blog, group, forum, social network for social purpose.

UNIT-III	**Open Standards**	**Classes:15**

Open Standards: National Information Standards Organization (NISO), The Digital Library Federation (DLF). The Dublin Core Metadata Initiative. MARC standards, Resource Description and Access (RDA). Open Archives Initiative. OAI-PMH. Search / Retrieval via URL (SRU), SRW/CQL. Java Platform, Enterprise Edition (Java EE).

UNIT-IV	Open Source Licenses	Classes:15

Open Source Licenses: GNU General Public License (GPL) version 2,3, GNU Lesser General Public License (LGPL) version 2.1,3, GNU Affero General Public License (AGPL) version 3, Apache License, Version 2.0, Artistic License 2.0, etc.

Text Books

1. Understanding Open Source and Free Software Licensing First Edition,Annotated Edition by Andrew M. St. Laurent.
2. Open Source Licensing: Software Freedom and Intellectual Property Law 1st Edition by Lawrence Rosen.

Reference Books

1. Open Sources: Voices from the Open Source Revolution by Brian Behlendorf, Bruce Perens, Chris DiBona, Eric S. Raymond, Larry Wall, Linus Torvalds, Marshall Kirk McKusick, Michael Tiemann, Paul Vixie, Richard Stallman, Scott Bradner, and Tim O'Reilly
2. Producing Open Source Software by Karl Fogel

Web References

1. www.cs.siu.edu/~carver/talks/foss.pdf
2. https://www.vidyarthiplus.com/vp/Thread-Open-Source-Software

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Explain common open system software licenses and the impact of choosing a license
2. Explain open system project structure and how to successfully setup a project
3. Be competent with distributed software engineering tools and processes such as test-driven
4. Development, issues tracking, unit testing, code review, distributed version control, and continuous integration.
5. Know to design the community building, blog, forum and Social Networks for social people.

PYTHON PROGRAMMING LANGUAGE (Elective – II)

B.Tech 7th Semester: Computer Science & Engineering (Open Elective)								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
16CS1709	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		3	1	0	3	40	60	100
Contact Classes:51	**Tutorial Classes:9**		**Practical Classes: Nil**			**Total Classes:60**		

OBJECTIVES

The course should enable the students to

1. Know the Basics of Python programming
2. Learn Decision Making and Functions in Python
3. Use Python Data structure-lists, tuples and dictionaries.
4. Learn Object Oriented Programming using Python.
5. Understand different types of errors and exceptions.

UNIT-I	**Introduction**	**Classes:15**

Introduction: History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

UNIT-II	**Types, Operators and Expressions**	**Classes:15**

Types, Operators and Expressions: Types - Integers, Strings, Booleans, Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass

UNIT-III	**Data Structures** and **Functions**	**Classes:15**

Data Structures: Lists - Operations, Slicing, Methods, Tuples, Sets, Dictionaries, Sequences. Comprehensions.

Functions - Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions(Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

UNIT-IV	OOP in Python and Error and Exceptions.	Classes:15

Object Oriented Programming in Python: Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Datahiding, **Error and Exceptions:** Difference between an error and Exception, Handling Exception, try except block, Raising Exceptions, User Defined Exceptions

Text Books

1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson
2. Learning Python, Mark Lutz, Orielly

Reference Books

1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage

Web References

1. https://www.tutorialspoint.com/python/
2. https://www.w3schools.com/python/
3. https://pythonprogramming.net/introduction-to-python-programming

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Acquire programming skills in core Python.
2. Acquire Object Oriented Skills in Python
3. Represent Compound data using Python lists, tuples and dictionaries.
4. Decompose a Python program into functions.
5. Differentiate types of errors and exceptions.

ENTERPRENUERSHIP DEVELOPMENT (Elective – II)

B.Tech 7th Semester: Computer Science & Engineering (Open Elective)								
Course code	Category	Hours/week			Credits	Maximum Marks		
16MB1302	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:51	Tutorial Classes: 9		Practical Classes: Nil			Total Classes: 60		

OBJECTIVES

The course should enable the students to

1. Know about the entrepreneurship, characteristics, evolution and importance of entrepreneurship.
2. Know the importance of small business in Indian Economy- Role of entrepreneurship in economic development.
3. Understand different forms of entrepreneurship and SWOT analysis.
4. Learn the Intellectual property rights (IPR), Patents, copy rights and trademarks.
5. Understand the Concept of women and rural entrepreneurship, problems, NGO's, Central and state Government policies to support rural enterprises.
6. Know MSME, Finance to Enterprise, different types of Funding.

UNIT-I	Entrepreneurship	Classes:15

Entrepreneurship: Concept of Entrepreneurship - Characteristics, types of Entrepreneurs, theories of entrepreneurship, evolution of entrepreneurship, importance of entrepreneurship - Difference between entrepreneurship and intrapreneurship.

Successful entrepreneurship: Need of entrepreneurship and devastating unemployment problems in India - Importance of small business in Indian Economy- Role of entrepreneurship in economic development.

UNIT-II	Forms of enterprise, Intellectual property rights (IPR)	Classes:15

Forms of enterprise: Types of Ownership - sole trading, partnership and other forms - Important features of various types of business - Corporate entrepreneurship - Distinction between an entrepreneur and a manager – Role of government in the promotion of entrepreneur - State enterprises in India- Business idea generation, business proposals, business opportunities and business plans - SWOT Analysis.

Intellectual property rights (IPR): Patents, copy rights and trademarks.

UNIT-III	Women and Rural Entrepreneurship	Classes:15

Women and Rural Entrepreneurship: Concept of women entrepreneurship- Functions- Growth of women entrepreneurship – Problems of women entrepreneurship- Women entrepreneurship development programs - Development of women entrepreneurship In India, Recent trends.

Rural Entrepreneurship: Need, problems of rural entrepreneurship- Development of rural entrepreneurship and its contribution - NGO's and rural entrepreneur- Central and state Government policies to support rural enterprises

UNIT-IV	MSME, Finance to Enterprise	Classes:15

MSME: Characteristics, problems - Role of MSME in economic development – Entrepreneur development cell (EDC) - Need, objectives and phases of entrepreneurship development programs (EDPs) - Institutional support to MSMEs.

Finance to Enterprise: Need for finance plans- Sources of finance - Capital structure and capital budgeting - Venture capital- Seed money/ seed funding- Angel funding, crowd funding, international funding agencies for start-ups - Institutional Finance to Entrepreneurs.

Text Books

1. Vasanth Desai, The Dynamics of Entrepreneurial Development and Management, Himalaya, 2009.

2. Bholanath Dutta, Entrepreneurship Management (Text and Cases), Excel Books, 2009.

Reference Books

1. S.S. Khanka, Entrepreneurial Development, S. Chand and Company Limited, New Delhi, 2009.
2. H. Nandan, Fundamentals of Entrepreneurship, PHI, New Delhi, 2009.
3. Robert D. Hisrich, Michael P. Peters, Dean A. Shepherd, Entrepreneurship, 6th edition, TMH, 2009.
4. Holt, Entrepreneurship, New venture Creation, PHI, 2009.

Web References

1. https://lecturenotes.in/subject/35/entrepreneurship-development-ed
2. https://sdak24.com › all

Outcomes

At the end of the course students will be able to

1. Understand the concept of entrepreneur.
2. Analyse how to be as successful entrepreneur.
3. Understand the key perspectives of women and rural entrepreneurs.
4. Evaluate different forms of ownership structures in business.
5. Comprehend MSME and ED programmes.
6. Understand Concept of women and rural entrepreneurship, problems, NGO's, Central and state Government policies to support rural enterprises.

SOFTWARE PROJECT MANAGEMANT (Elective – III)

B.Tech 7th Semester: Computer Science & Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
16CS1704	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		3	1	-	3	40	60	100
Contact Classes:51	**Tutorial Classes: 9**		**Practical Classes: Nil**			**Total Classes: 60**		

OBJECTIVES

The course should enable the students to

1. Understand the nature of software development and software life cycle process models,

   Agile software development, SCRUM and other agile practices.
2. Explain methods of capturing, specifying, visualizing and analyzing software requirements.
3. Understand concepts and principles of software design and user-centric approach and principles of effective user interfaces.
4. Know the basics of testing and understanding concept of software quality assurance and software configuration management process.
5. Understand the need of project management and project management life cycle.
6. Understand project scheduling concept and risk management associated to various types of projects.

UNIT-I	**Conventional Software Management, Software Economics**	**Classes:15**

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, Artifacts	Classes:15

Life Cycle: 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. **Workflows of the process:** Software process workflows, iteration workflows

UNIT-III	Checkpoints	Classes:15

Checkpoints of the Process: Major mile stones, minor milestones, periodic status assessments. Iterative process planning: Work breakdown structures, planning guidelines, the cost and schedule estimating process, Iteration planning process, Pragmatic planning. Project organizations and responsibilities: Line-of-Business organizations, Project organizations, evolution of Organizations. Process automation: Automation building blocks, the project environment.

UNIT-IV	Project Control and Process Instrumentation	Classes:15

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.

Next generation software economics: Next generation cost models, modern software economics.

Modern process transitions: Culture shifts, denouement. Case studies: The COCOMO cost estimation model, Process Improvement and Mapping to the CMM.

Text Books

1. Walker Royce, Software Project Management, Pearson Education, Eighth impression: 2010.
2. Hughes , Software Project Management, 5Ed

Reference Books

1. Bob Hughes and Mike Cotterell, Software Project Management, Tata McGraw-Hill Edition, 2006.
2. Shere K D, Software Engineering and Management, 1998, PHI.

Web References

1. https://cs.uwaterloo.ca/~dberry/COURSES/software.engr/lectures.pdf/projman.pdf
2. https://www.learnpick.in/.../notes/.../handwritten-notes-of-software-project-management
3. https://www.smartzworld.com/notes/software-project-management-pdf-notes-spm-pdf..

Outcomes

At the end of the course students will be able to

1. Learn about the art of planning and leading software projects.
2. Know about how the projects are planned, monitored and controlled.
3. Analyze work estimates needed to achieve each task, for each resource.
4. Understand managing resources for software projects.
5. Conduct project planning activities that accurately forecast project costs, timelines and Quality.
6. Implement processes for successful resource, communication, and risk and change Management.

ADVANCED COMPUTER ARCHITECTURE (Elective – III)

B.Tech 7th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1705	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	-	3	40	60	100
Contact Classes:51	Tutorial Classes: 9		Practical Classes: Nil			Total Classes: 60		

OBJECTIVES

The course should enable the students to

1. Conceptualize the basics of organizational and architectural issues of a digital computer.
2. Understand the processor performance improvement using instruction level parallelism.
3. Learn the function of each element of a memory hierarchy.
4. Study various data transfer techniques in digital computer.
5. Articulate design issues in the development of processor or other components that satisfy design requirements and objectives.
6. Learn microprocessor architecture and study assembly language programming.

UNIT-I	Parallel Computer Models	Classes:15

Parallel Computer Models: The state of computing, Multiprocessors and Multi computers,

Multi vector and SIMD Computers.

Program and Networks Properties: Conditions of Parallelism, Program Partitioning and Scheduling, System Interconnect Architectures.

Principles of Scalable Performance: Performance Metrics and Measures, Parallel Processing

Applications.

Processors and Memory Hierarchy: Advanced Processor Technology, Superscalar and Vector Processors, Memory Hierarchy Technology.

UNIT-II	Bus, Cache and Shared Memory, Multiprocessors and Multicomputer	Classes:15

Bus, Cache and Shared Memory: Bus Systems, Cache Memory Organizations, Shared-Memory Organizations.

Pipelining and Super Scalar Techniques: Linear Pipeline Processors, Nonlinear Pipeline Processors, Instruction Pipeline Design, Arithmetic Pipeline Design.

Multiprocessors and Multicomputer: Multiprocessor System Interconnects Cache Coherence and Synchronization Mechanisms, Three Generations of Multi computers, Message-Passing Mechanisms.

UNIT-III	Multivector and SIMD Computers	Classes:15

Multivector and SIMD Computers: Vector Processing Principles, Multi vector Multiprocessors,

Compound Vector Processing, SIMD Computer Organizations, The Connection Machine CM-5.

Scalable,

Multithreaded and Dataflow Architectures: Latency-Hiding Techniques, Principles of Multithreading, Fine-Grain Multicomputers, Scalable and Multithreaded Architectures, Dataflow and Hybrid Architectures.

UNIT-IV	Instruction Level Parallelism	Classes:15

Instruction Level Parallelism: Introduction, Basic Design Issues, Problem Definition, Model of a

Typical Processor, Reorder Buffer, Register Renaming, Tomasulo's Algorithm, Limitations in

Exploiting Instruction Level Parallelism, Thread Level Parallelism.

Trends in Parallel Systems: Brief Overview of Technology, Forms of Parallelism, Case Studies.

Text Books

1. Kai Hwang and Jotwani, Advanced Computer Architecture- by Second Edition, McGraw-Hill Publications, 2011.

2. David E. Culler, Jaswinder Pal Singh, Anoop Gupta:, Parallel Computer Architecture, A Hardware / Software Approach –Morgan Kaufman, first edition, 1998.

Reference Books

1. D.Sima, T.Fountain, P.Kacsuk, Advanced Computer Architecture, Pearson Education.
2. John L.Hennessy and David A.Patterson, Morgan Kufmann Computer Architecture A

   Quantitative approach Third Edition (An Imprint of Elsevier).

Web References

1. cs.baylor.edu/~maurer/aida/courses/archintro.pdf
2. 164.100.133.129:81/eCONTENT/Uploads/Advanced _ Computer _ Architecture. pdf
3. https://nptel.ac.in/courses/106102062

Outcomes

At the end of the course students will be able to

1. observe the classes of computers, and new trends and developments in computer architecture
2. Understand the performance of multi core processors using SPEC benchmarks.
3. Implement multithreading by using ILP and supporting thread-level parallelism (TLP).
4. Understand virtual memory and virtual machines
5. Understand the performance metrics of microprocessors, memory, networks, and disks
6. Design various models to achieve memory consistency.

DESIGN PATTERNS (Elective – III)

B.Tech 7th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	TOTAL
16CS1706	Core	3	1	-	3	40	60	100
Contact Classes:51	Tutorial Classes: 9	Practical Classes: Nil			Total Classes: 60			

OBJECTIVES

The course should enable the students to

1. Know the design patterns, catalog of design patterns and use of design patterns.
2. Learn about the Structure and creational patterns.
3. Learn the Structural and behavioral patterns
4. Understand the Design of pattern community.

UNIT-I	Introduction	Classes:15

Introduction: What is a Design Pattern? Design Patterns in Smalltalk MVC, Describing Design Patterns, The Catalog of Design patterns, Organizing the Catalog, How Design patterns solve Design problems, How to select a Design Pattern, How to use a Design Pattern.

UNIT-II	A Case Study, Creational Patterns	Classes:15

A Case Study: Designing a Document Editor, Design Problems, Document Structure, Formatting Embellishing the User Interface, Supporting Multiple Look and Feel Standards, Supporting Multiple Window systems, User Operations Spelling Checking and Hyphenation, Summary.

Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.

UNIT-III	Structural & Behavior Patterns	Classes:15

Structural Pattern Part – I: Adaptor, Bridge, Composite.

Structural Pattern Part – II: Decorator, acade, flyweight, proxy.

Behavior Patterns Part – I: Chain of Responsiblity, Command, Interpreter, Iterator.

Behavior Patterns Part – II: Mediator, Memento, Observer.

UNIT-IV	Behavioral Patterns	Classes:15

Behaviour Patterns Part – Ii (cont'd) State, strategy, Template Method, Visitor, Discussion of Behavioural Patterns.What to Expect from Design Patterns, A brief History, The Pattern Community An Invitation, A Parting Thought.

Text Books

1. Design Patterns Bya Erich Gamma, Pearson Education.
2. Vaskaran Sarcar, Java Design Patterns

Reference Books

1. Pattern's in JAVA Vol-I By Mark Grand, Wiley Dream Tech.
2. Pattern's in JAVA Vol – II BY Mark Grand, Wiley Dream Tech.
3. JAVA Enterprise Design Patterns Vol – III By Mark Grand, Wiley Dream TECH.
4. Head First Design Patterns By Eric Freeman – Oreilly – spd.
5. Peeling Design Patterns, Prof Meda Srinivasa Rao, Narsimha Karumanchi, Career Monk Publication.
6. Design Patterns Explained By Alan Shallowy, Pearson Education.
7. Pattern Oriented Software Architecture, af.Buschman & others, John Wiley & Sons.

Web References

1. https://nptel.ac.in/courses/106101061/15
2. https://www.geeksforgeeks.org/software-design-patterns/

Outcomes

At the end of the course students will be able to

1. Identify the appropriate design patterns to solve object oriented design problems.
2. Develop design solutions using creational patterns.
3. Apply structural patterns to solve design problems.
4. Construct design solutions by using behavioral patterns.
5. Develop design solutions using Structural patterns.
6. Design the pattern Community.

AVAILABLE SELECTED MOOCS (Elective – III)

B.Tech 7th Semester: Computer Science & Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
16CS1707	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		3	1	-	3	40	60	100
Contact Classes: -	**Tutorial Classes: -**		**Practical Classes: Nil**			**Total Classes: -**		

Meeting with the global requirements, to inculcate the habit of self learning and incompliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers

Regulations for MOOCs

- The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.
- Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.
- A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.
- The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.
- Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.
- There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses.

Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.

CLOUD COMPUTING LAB

B.Tech 7th Semester – Computer Science & Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16CS2710	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	3	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 30**				**Total Classes: 30**		

OBJECTIVES

The course should enable the students to

1. Know the Key concepts of virtualization & different types of Hypervisors used in virtualization along with implementation.
2. Learn the Concept of On demand Application Delivery like SaaS using Ulteo
3. Understand the Open source cloud implementation and administration using Open Stack
4. Know Various Cloud services provided by Amazon Web Services.
5. Develop programs for different types of algorithms.
6. Know the Im plementation of Storage as a service using Own Cloud.

LIST OF EXPERIMENTS

Expt. 1	**Web Services**

Study about Amazon AWS, Google Apps and Microsoft Azure

Expt. 2	**Building**

Building a simple cloud application using Google App Engine or Microsoft Azure

Expt. 3	**Hosting**

Hosting cloud application using Google App Engine or Microsoft Azure

Expt. 4	**Virtual OS**

Implement Virtual OS using virtual box.

Expt. 5	**VM Allocation Algorithm**
Simulate VM allocation algorithm using CloudSim.	
Expt. 6	**Task Scheduling Algorithm**
Simulate Task scheduling algorithm using CloudSim.	
Expt.7	**Energy- Conscious**
Simulate Energy-conscious mode using CloudSim	
Expt. 8	**Private Cloud**
Setup a Private Cloud Using Open Stack or Eucalyptus.	
Expt. 9	**Open Stack Storage**
Install and configure Open Stack Object Storage - Swift in Ubuntu.	
Expt. 10	**Open Stack Compute**
Implement Open Stack Nova-Compute	

Reference Books

1. Barrie Sosinsky, Cloud Computing Bible, Wiley-India, 2010
2. Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, Cloud Computing: Principles and Paradigms, Wiley, 2011.

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS

SOFTWARE: Web services like AWS, Google, VIM, Open Stack

HARDWARE: Computer Systems

Course Outcome

At the end of the course students will be able to

1. Analyze various cloud simulator
2. Apply resource allocation, scheduling algorithms.
3. Implement Energy-conscious model.
4. Create virtual machines from available physical resources.
5. Setup a private cloud.

BIG DATA ANALYSIS LAB

B.Tech 7th Semester – Computer Science & Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16CS2711	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	3	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 68**				**Total Classes: 68**		

OBJECTIVES

The course should enable the students to

1. Know about the tools required to manage and analyze big data like Hadoop, NoSql
2. Impart knowledge of Map reduce paradigm to solve complex problems Map-Reduce.
3. Introduce several new algorithms for big data mining like classification, clustering and finding frequent patterns.
4. Know about several types of big data like social media, web graphs and data Streams.
5. Identify various sources of Big data

LIST OF EXPERIMENTS

Expt. 1 **HDFS**

Install, configure and run Hadoop and HDFS.

Expt. 2 **Hadoop**

Implement the following file management tasks in Hadoop:

a. Adding files and directories

b. Retrieving files

c. Deleting files

Expt. 3 **MR Paradigm**

Run a basic Word Count Map Reduce program to understand MR Paradigm.

Expt. 4	Map Reduce

Run a basic Maximum Temperature Map Reduce program to understand MR Paradigm

Expt. 5	Weather Data

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

Expt. 6	Matrix Multiplication

Implement Matrix Multiplication with Hadoop Map Reduce.

Expt.7	Pig

Install and Run Pig then write Pig Latin scripts to sort, group, join, project, and filter your data.

Expt. 8	Hive

Install and Run Hive then use Hive to create, alter, and drop databases, tables, views, functions, and indexes.

Text Books

1. Tom White, Hadoop: The Definitive Guide, 3rd Edition, O'Reilly Publications, 2012.
2. Paul Zikopoulos, Chris Eaton, and Paul, Understanding Big Data: Analytics for Enterprise Class Hadoop and streaming Data, The McGraw-Hill Companies, 2012.

Reference Books

1. Bart Baesens, Analytics in a Big Data World: The Essential Guide to Data Science and its Applications, Wiley Publications, 2014.

Web References

1. https://www.edx.org/course/big-data-analytics-adelaidex-analyticsx
2. https://intellipaat.com/blog/big-data-tutorial-for-beginners/

3. https://www.analyticsvidhya.com/blog/2015/.../big-data-analytics-youtube-ted-resourc...

E-Text Books

1. https://ndl.iitkgp.ac.in/

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS

SOFTWARE: Hadoop,Hive

HARDWARE: Desktop Computer Systems

Outcomes

At the end of the course students will be able to

1. Remember the Big Data Fundamentals, including the evolution of Big Data, the characteristics of Big Data and the challenges introduced.
2. Apply non-relational databases, the techniques for storing and processing large volumes of structured and unstructured data, as well as streaming data.
3. Apply the novel architectures and platforms introduced for Big data, in particular Hadoop and MapReduce.
4. Classify the challenges of analyzing Bigdata
5. Implement Large scale analytical tools for solving Bigdata applications.

MOBILE APPLICATION DEVELOPMENT LAB

B.Tech 7th Semester – Computer Science & Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
16CS2712	**Core**	-	-	4	2	25	50	75
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 68**				**Total Classes: 68**		

OBJECTIVE

The course should enable the students to

1. Develop an application that uses GUI components, Font, Colors, Lay-out Managers and event listeners.
2. Develop calculator application, to draw basic graphical primitives on the screen.
3. Develop an application that makes use of database and RSS Feed.
4. Implement Multi threading and GPS location information.
5. Design an application that creates an alert upon receiving a message and creates alarm clock

LIST OF EXPERIMENTS

Expt. 1	**GUI Components**

Develop an application that uses GUI components, Font and Colors

Expt. 2	**Layout Managers**

Develop an application that uses Layout Managers and event listeners.

Expt. 3	**Calculator**

Develop a native calculator application.

Expt. 4	**Graphical Primitives**

Write an application that draws basic graphical primitives on the screen.

Expt. 5	**Database**

Develop an application that makes use of database.

Expt. 6	**RSS Feed**
Develop an application that makes use of RSS Feed.	
Expt.7	**Multithreading**
Implement an application that implements Multi threading	
Expt. 8	**GPS Location**
Develop a native application that uses GPS location information.	
Expt. 9	**Alert on message**
Implement an application that creates an alert upon receiving a message.	
Expt. 10	**Alarm Clock**
Write a mobile application that creates alarm clock	

Text Books

1. Android Programming by B.M Harwani, Pearson Education, 2013.

Reference Books

1. Android application Development for Java Programmers, James C Sheusi, Cengage Learning
2. Android In Action by w.Frank Ableson, Robi Sen, Chris King, C. Enrique Ortiz., Dreamtech.
3. Professional Android 4 applications development, Reto Meier, Wiley India, 2012.

Web References

1. https://developer.android.com/
2. https://www.tutorialspoint.com/android/
3. https://www.vogella.com/tutorials/android.html
4. https://developer.android.com/guide

5. https://www.codingninjas.in/courses/classroom-android-app-development-course
6. https://www.edx.org/learn/app-development

E-Text Books

1. https://ndl.iitkgp.ac.in/

Course Home Page

SOFTWARE AND HARDWARE REQUIREMENTS

SOFTWARE: JDK, Android

HARDWARE: Desktop Computers

Outcomes

At the end of the course students will be able to

1. Create data sharing with different applications and sending and intercepting SMS
2. Develop applications using services and publishing android applications.
3. Apply mobile application models/architectures and patterns to the development of a Mobile software application.
4. Describe and compare different mobile application models/architectures and patterns.
5. Apply a mobile development framework to the development of a mobile application.
6. Demonstrate advanced Java programming competency by developing a maintainable and efficient cloud based mobile application

INTERNSHIP

B.Tech 7th Semester – Computer Science &Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
16AS3701	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
		-	-	-	2	25	-	25
Contact Classes: Nil	**Tutorial Classes: Nil**	**Practical Classes: 68**				**Total Classes: 68**		

OBJECTIVES

The course should enable the students to

I. Assist the student's development of employer-valued skills such as teamwork, communications and attention to detail

II. Expose the student to the environment and expectations of performance on the part of accountants in professional accounting practice, private/public companies or government entities.

III. Expose the student to professional role models or mentors who will provide the student with support in the early stages of the internship and provide an example of the behaviors expected in the intern's workplace.

There shall be 60 hours duration to complete summer internship during summer vacations. The total internal weightage for internship course is 25 marks and will be evaluated based on day to day assessment by concern industry.

The external examination shall be evaluated by the two senior faculties (i.e one faculty act as external examiner and other one as internal examiner) for 50 marks based on the his/her report and presentation

Course Outcome

1. An internship motivate you to create opportunities, embrace new ideas, and give direction to positive change
2. Enhance some of the skills that are transferable to any professional work setting.
3. Applied your knowledge, skills, experience to a work environment
4. Developed self-understanding, self-discipline, maturity and confidence.
5. Reflected on the content and process of the learning experience

PROFESSIONAL ACTIVITIES-V

B.Tech 7th Semester: Computer Science & Engineering								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
16AS3702	-	-	-	-	1	-	-	-
Contact Classes: 12	**Tutorial Classes: Nil**	**Practical Classes: Nil**			**Total Classes: 12**			

OBJECTIVES

The course should enable the students to

1. Improve communication skills
2. Develop leadership qualities

Professional Society Activities (PSA) course is aimed at enhancing the self-learning, communication, managerial skills of the students by engaging them in various Co & Extra Curricular activities during their course of study. Activities in each of the department shall be designed and conducted by the Professional Society Executive Committee whose composition is:

1. Faculty Mentors- 2 No.
2. Student Chairman: 1 No.- Final year Student
3. Student General Secretary: 1 No.- Third year Student
4. Treasurer: 1 No.- Third year Student

Student Members: 2 No's from each class

PSA related activities would be of the following nature but not limited to:

Activity#1	Just A Minute
Activity#2	Technical Quiz
Activity#3	Open House- Lab Demo

Activity#4	Technical Paper Presentation- Preliminary
Activity#5	Technical Paper Presentation- Final
Activity#6	Poster Presentation
Activity#7	Collage- A theme based event
Activity#8	Debate Competition
Activity#9	Group Discussion Competition
Activity#10	Mock Interviews
Activity#11	Model Exhibition
Activity#12	Valedictory Function

ADVANCED COMPUTER NETWORKS (ELECTIVE-IV)

B.Tech 8th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1801	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	0	3	40	60	100
Contact Classes:51	Tutorial Classes:9	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Build an understanding of the fundamental concepts of computer networking.
2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.
3. Learn advanced networking concepts.

UNIT-I	Overview of computer networks	Classes:15

Overview of computer networks, seven-layer architecture, TCP/IP suite of protocols, etc.

MAC protocols for high-speed LANS, MANs, and wireless LANs. (For example, FDDI, DQDB, HIPPI, Gigabit Ethernet, Wireless Ethernet, etc.)

UNIT-II	Fast access technologies, IPv6	Classes:15

Fast access technologies. (For example, ADSL, Cable Modem, etc.)

IPv6: Why IPv6, basic protocol, extensions and options, support for QoS, security, etc., neighbor discovery, auto-configuration, routing. Changes to other protocols. Application Programming Interface for IPv6. 6bone.

UNIT-III	Mobility in networks, IP Multi-casting.	Classes:15

Mobility in networks: Mobile IP. Security related issues.

IP Multicasting. Multicast routing protocols, address assignments, session discovery, etc.

UNIT-IV	TCP, Network security	Classes:15

TCP extensions for high-speed networks, transaction-oriented applications. Other new options in TCP.Network security at various layers. Secure-HTTP, SSL, ESP, Authentication header, Key distribution protocols. Digital signatures, digital certificates.

Text Books

1. W. R. Stevens.TCP/IP Illustrated, Volume 1: The protocols, Addison Wesley, 1994.
2. G. R. Wright.TCP/IP Illustrated, Volume 2: The Implementation, Addison Wesley, 1995.
3. W. R. Stevens.TCP/IP Illustrated, Volume 3: TCP for Transactions, HTTP, NNTP, and the Unix Domain Protocols,Addison Wesley, 1996.

Reference Books

1. R. Handel, M. N. Huber, and S. Schroeder.ATM Networks: Concepts, Protocols, Applications, Addison Wesley, 1998.
2. W. Stallings. Cryptography and Network Security: Principles and Practice, 2nd Edition, Prentice Hall, 1998.

Web References

1. https://nptel.ac.in/courses/106102062/
2. http://cse.unl.edu/~jiang/cse430/Lecture%20Notes/index.html
3. https://csenotescorner.blogspot.com/2017/10/cp5152-advanced-computer-architecture.html

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Describe the functions of each layer in OSI and TCP/IP model.
2. Classify the routing protocols and analyze how to assign the IP addresses for the given network.
3. Explain the functions of Application layer and Presentation layer paradigms and Protocols.
4. Be familiar with wireless networking concepts,
5. Describe the functions of data link layer and explain the protocols
6. Classify the routing protocols and analyze how to assign the IP addresses for the given network.

SOFT COMPUTING (ELECTIVE-IV)

B.Tech 8th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1802	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	0	3	40	60	100
Contact Classes:51	Tutorial Classes:9		Practical Classes: Nil			Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Develop the skills to gain a basic understanding of neural network theory and fuzzy logic theory.
2. Understand artificial neural networks and fuzzy theory from an engineering perspective of Fuzzy logic and its applications, artificial neural networks and its applications.
3. Solve single-objective optimization problems using GAs.
4. Observe the Applications of soft computing.

UNIT-I	Fuzzy Sets and Relations	Classes:15

Computing constituents and conventions, characteristics.

Fuzzy set theory: basic definitions and terminology set theoretic operations, Mf formulation and parameterization.

Fuzzy rules and reasoning: extension principles and fuzzy relations, fuzzy if-then rules, fuzzy reasoning.

UNIT-II	Fuzzy Inference Systems	Classes:15

Mamdani fuzzy models, Sugeno fuzzy models, Tsukamoto fuzzy models, other considerations.

Fuzzy logic control: Basic of fuzzy control, Fuzzy control architecture, Properties of fuzzy control, robustness and stability

Fundamentals of Artificial neural networks: Learning and acquisition of knowledge, features of artificial neural networks, fundamentals of connectionist modeling, Perceptron.

UNIT-III	Major Classes Of Neural Networks	Classes:15

The multi-layer perceptrons, radial basis function networks, Kohonen's self-organizing network, The Hopfield network

Dynamic neural networks and their applications to control and chaos prediction: Training algorithms, fields of applications of RNN, dynamic neural networks for chaos time series prediction, artificial neural networks for chaos predictions.

Deep Learning : Introductory Concepts

UNIT-IV	Evolutionary Computing	Classes:15

Over view of Evolutionary computing, Genetic algorithms and optimization,

The schema theorem: the fundamental algorithm of Genetic algorithms, Genetic algorithms - operations, integration of Genetic algorithms with neural networks, integration of Genetic algorithms with fuzzy logic.

Text Books

1. Fakhreddine O. Karry, Clarence De Silva, "Soft Computing and Intelligent systems Design Theory, Tools and Applications", Pearson, (2009).
2. J.S.R.Jang, C.T. Sun and E.Mizutani, "Neuro-Fuzzy and Soft Computing", PHI / Pearson Education,(2004).

Reference Books

1. Laurene Fausett, "Fundamentals of Neural Networks", Pearson, (2004).
2. Timothy J Ross "Fuzzy Logic with Engineering Applications", 3rd Edition, Wiley, (2010).
3. Bart Kosko, "Neural Networks and Fuzzy Systems", PHI, (2004).

Web References

1. https://nptel.ac.in/courses/106105173/
2. https://sites.google.com/site/7csesoftcomputing/course/lecture-note
3. http://www.soft-computing.de/def.html

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Understand the importance of soft computing.
2. Understand different soft computing techniques like Genetic Algorithms, Fuzzy Logic, Neural Networks and their combination.
3. Implement algorithms based on soft computing.
4. Apply soft computing techniques to solve engineering or real life problems.

GRID COMPUTING (ELECTIVE-IV)

B.Tech 8th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1803	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	0	3	40	60	100
Contact Classes:51	Tutorial Classes:9	Practical Classes: Nil			Total Classes:60			

OBJECTIVES

The course should enable the students to

1. Understand and explain the key concepts of grid computing
2. Identify the resource selection for grid environment
3. Understand about grid computing history, evaluation of grid and its security issues.
4. Understand data management and transfer in grid environment
5. Know about resource management techniques for grid
6. Understand the recent versions of Globus tool kit.

UNIT-I	Introduction	Classes:15

The Different Forms of Computing, The Architecture of Distributed Applications, Paradigms for Distributed Applications,

Parallel Computing: Overview, Parallel Programming Models and Paradigms.

Cluster Computing: Introduction, Cluster Architecture, Applications of Clusters.

UNIT-II	Grid Computing	Classes:15

Introduction, Grid Computing Anatomy – Architecture, Architecture and Relationship to Other Distributed Technologies, Grid Computing Road Map. Merging the Grid Services Architecture with the Web Services Architecture.

UNIT-III	Open Grid Service Architecture	Classes:15

Introduction, Architecture and Goal, Sample Use Cases, Commercial Data Center, National Fusion Collaboratory, Online Media and Entertainment, OGSA Platform Components, Open Grid Services Infrastructure.

UNIT-IV	Globus GT3 Toolkit	Classes:15

Architecture, Programming Model, A Sample Implementation, High Level Services, OGSI.NET Middleware Solutions.

Text Books

1. Distributed Computing, Principles and Applications, M.L.Liu, Pearson Education, 2004.
2. High Performance Cluster Computing, Rajkumar Buyya, Pearson Education.
3. Grid Computing, Joshy, Joseph and Craig Fellenstein, Pearson Education, 2004.

Reference Books

1. Grid Computing: Making the Global Infrastructure A Reality, Fran Berman, Geoffrey C Fox, Anthony J G Hey, Wiley India, 2010.
2. A Networking Approach to Grid Computing, D.Minoli, Wiley and Sons, 2006.
3. Grid Computing: A Practical Guide to Technology and Applications, A.Abbas, Firewall Media, 2008.

Web References

1. https://nptel.ac.in/courses/106105033/41
2. http://csetube.blogspot.com/2013/05/cs2063-cs810-grid-computing-gc-topic.html
3. http://www.cs.kent.edu/~farrell/grid06/lectures/index.html

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Evaluate enabling technologies such as high-speed links and storage area networks for building computer grids.
2. Utilise grid computing and clustering middleware, such as Parallel Virtual Machine (PVM),
3. Use Message Passing Interface (MPI), HPC Portals, and Peer-to-Peer networks for implementing virtual super computing resources.
4. Design a grid computing application in one of the key application areas e.g. Computer Animation, E-Research.
5. Install a grid computing environment.
6. Develop communications skills and accept the code of professional conduct and practice through short presentations and group work.

E-COMMERCE (ELECTIVE-IV)

B.Tech 8th Semester: Computer Science & Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
16CS1804	**Core**	3	1	0	3	40	60	100
Contact Classes:51	**Tutorial Classes:9**	**Practical Classes: Nil**				**Total Classes:60**		

OBJECTIVES

The course should enable the students to

1. Become familiar with state of the art Electronic Model, Payment
2. Understand the basic principal of E-Government, Securities, Supply Chain Mechanisms.
3. Evaluate and observe various online businesses Management.

UNIT-I	**Introduction**	**Classes:15**

History of E- Commerce – Overview of E- Commerce framework – E-Business models – Network infrastructure - Role of Internet – E- commerce and World wide Web.

E-Commerce: Consumer oriented E- Commerce applications – Mercantile process models.

UNIT-II	**Electronic Payment Systems**	**Classes:15**

Electronic Payment Systems –Digital Token based EPS – Smart cards – Credit cards – Risks – designing EPS.

Organizational Commerce and EDI: Electronic Data Interchange – EDI applications in Business – EDI and e Commerce – EDI standardization and implementation – Internet based EDI.

UNIT-III	**Security**	**Classes:15**

Internet security standards – secure electronic payment protocols , cryptography and authentication – security issues – encryption techniques, e commerce payment mechanisms–SET protocol – electronic check – electronic cash, E-commerce ethics, regulations and social responsibility.

UNIT-IV	Intelligent Agents	Classes:15

Definition and capabilities – limitation of agents – security – web based marketing – search engines and Directory registration – online advertisements – Portables and info mechanics – website design issues.

Text Books

1. Ravi Kalakota and Andrew B Whinston, " Frontiers of Electronic Commerce ",Pearson Education Asia, 1999.(Chapters 1,2,3,6-10,16)
2. Marilyn Greenstein and Todd M Feinman , " Electronic commerce: Security, Risk Management andControl " Tata McGraw-Hill , 2000.(Chapters 7,8,10-12)

Reference Books

1. Judy Strauss and Raymond Frost , " E Marketing ", PHI, 2002
2. Brenda Kienan , " Managing e Commerce Business" , PHI,2001
3. Vivek Sharma and Rajiv Sharma , " Developing e Commerce Sites – an integrated approach",Pearson Education Asia, 2000

Web References

1. https://nptel.ac.in/courses/106105084/35
2. https://nptel.ac.in/courses/106108103/pdf/Lecture_Notes/LNm13.pdf
3. http://ocw.metu.edu.tr/course/view.php?id=20

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Identify the major categories and trends of e-commerce applications.
2. Recognize the essential processes of an e-commerce system.
3. Identify several factors and web store requirements needed to succeed in e-commerce.
4. Discuss the benefits and trade-offs of various e-commerce clicks and bricks alternatives.
5. Discuss the various marketing strategies for an online business.
6. Explain policy and regulatory issues in E-commerce

MODEL DRIVEN FRAMEWORK (ELECTIVE-V)

B.Tech 8th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1805	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	0	3	30	70	100
Contact Classes:51	Tutorial Classes:9	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Know about the modular-based software design
2. Understand Model Driven Architecture
3. Understand the integration of MDSE in development process
4. Learn about different transformations

UNIT-I	Introduction	Classes:15

Traditional software engineering approach: Drawbacks, Software processes, modular-based software design.

Model Driven Software Engineering (MDSE) Principles: MDSE basis, Overview of MDSE Technology, Criticism of MDSE, MDSE use cases.

UNIT-II	Model driven Architecture (MDA)	Classes:15

Model driven Architecture (MDA): MDA Definitions and Assumptions, The modeling levels CIM, PIM, PSM, mapping, general purpose and domain specific language in MDA, architecture. Driven modernization.

UNIT-III	Integration of MDSE in Development Process	Classes:15

Integration of MDSE in development process: introducing MDSE in software development process, traditional development process and MDSE, Domain driven design and MDSE, Test driven Development and MDSE.

Modeling Language at a glance: Anatomy of modeling language, general purpose vs. domain specific modeling language, General purpose modeling-the case of UML,UML profile platforms, software artifacts using UML standard modeling language, defining modeling constraints, automated GUI generation.

UNIT-IV	Transformations	Classes:15

Transformations: Model to model transformations, model to text transformations MDA Practice, Usage of QVT, Kermeta, etc., MDA Transformation Languages, model editors, model valuators, model metrics, modeling framework, middleware to support transformations, MDA applications.

Text Books

1. Thomas Stahl, Markus Voelter, Model-Driven Software Development: Technology, Engineering, Management, Wiley, 2006.
2. Jordi Cabot,The model-driven book – 2nd edition

Reference Books

1. Anne Kleppe, Jos Warmer, and Wim Bast, MDA Explained - The Model Driven Architecture: Practice and Promise, Pearson Education, Boston, USA, 2003.
2. Marco Brambilla, Model-Driven Software Engineering in Practice: Second Edition (Synthesis Lectures on Software Engineering) 2nd Edition

Web References

1. https://www.semanticscholar.org/paper/A-Model-Driven-Framework-for - Integrated - Materials - Das - Yeddula / 1a06 fe 96579f d3dd8a4e d1a6a9 d93c169 bedeb 37

E-Text Books

1. https://www.oreilly.com/library/view/mda-explained-the/032119442X/
2. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Construct domain specific languages.
2. Construct model transformations.
3. Synthesize model metrics.
4. Understand contemporary approaches to model driven engineering.
5. Apply domain specific modeling approach to authentic cases.

OBJECT ORIENTED SOFTWARE ENGINEERING (ELECTIVE-V)

B.Tech 8th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1806	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	0	3	40	60	100
Contact Classes:51	Tutorial Classes:9	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Learn and understand various O-O concepts along with their applicability contexts.
2. Identify domain objects, their properties, and relationships among them for a given problem.
3. Identify and model domain constraints on the objects and (or) on their relationships
4. Develop design solutions for problems on various O-O concepts.
5. Learn various modeling techniques of object-oriented software design (UML)
6. Understand SDLC of Object-Oriented solutions for Real-World Problems
7. Learn O-O design solutions for the recurring problems.

UNIT-I	Object Oriented Concepts	Classes:15

Object oriented Paradigm, Object oriented Concepts, Classes, Objects, Attributes, Methods and services, Messages, Encapsulation, Inheritance, Polymorphism, Identifying the elements of object model, management of object oriented Software projects.

UNIT-II	Object Oriented Analysis & Design	Classes:15

Object Oriented Analysis, Domain Analysis, Generic Components of OOA model, OOA Process, Object Relationship model, Object Behavior Model,

Object Oriented Design: Design for Object- Oriented systems, The Generic components of the OO design model, The System design process, The Object design process, Design Patterns, Object Oriented Programming.

UNIT-III	Object Oriented testing	Classes:15

Object Oriented testing: Broadening the view of Testing, Testing of OOA and OOD models, Object-Oriented testing strategies, Test case design for OO software, testing methods applicable at the class level, Interclass test case design .

UNIT-IV	Technical Metrics & CASE	Classes:15

Technical Metrics for Object Oriented Systems: The Intent of Object Oriented metrics, The distinguishing Characteristics, Metrics for the OO Design model, Class-Oriented metrics, Operation-Oriented Metrics, Metrics foe Object Oriented testing, Metrics for Object Oriented projects.

Computer-Aided Software Engineering: What is CASE?, Building blocks for CASE, A taxonomy of CASE tools, Integrated CASE environments, The Integration Architecture, The CASE Repository.

Text Books

1. Stephen R. Schach, Object Oriented and Classical Software Engineering, 5th Edition, TMH, 2010
2. Roger S. Pressman, Software Engineering - A Practitioner's Approach, 6th Edition, MGH, 2005.

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. AtulKahate: Object Oriented Analysis & Design, The McGraw-Hill Companies.
4. Mark Priestley: Practical Object-Oriented Design with UML,TATAMcGrawHill.

Web References

1. https://www.cs.uic.edu/~jbell/CourseNotes/OO_SoftwareEngineering/index.html
2. http://people.cs.uchicago.edu/~mark/cccis/ace101/syllabus.html
3. http://www.cs.gordon.edu/courses/cs211/lectures-2009/index.html

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Implement SDLC of Object-Oriented solutions for Real-World Problems
2. Work effectively using various O-O concepts along with their applicability contexts.
3. Identify domain objects, their properties, and relationships among them.
4. Identify and model/represent domain constraints on the objects and (or) on their relationships
5. Develop design solutions for problems on various O-O concepts
6. Use various modeling techniques to model different perspectives of object-oriented software design (UML)

MULTIMEDIA AND APPLICATION DESIGN (ELECTIVE-V)

B.Tech 8th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1807	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	0	3	40	60	100
Contact Classes:51	Tutorial Classes:9	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Formulate a working definition of interactive multimedia
2. Understand competence in using the authoring program Hyper Studio
3. Know the use of animation, digitized sound, video control, and scanned images
4. Demonstrate the use of Netscape to access the Course Home Page, Tips and Tricks
5. Develop conceptual maps of content and process for interactive multimedia instructional programs.

UNIT-I	Introduction to Action Script in Flash	Classes:15

Programming Concepts – Variables, Data types, conditionals, loops, arrays, Functions, Custom objects - Properties, Methods and Events – Display List, Timeline Control.

UNIT-II	Advance Concepts in Action Script Using Flash Builder	Classes:15

OOP –Motion –Drawing with Vectors and Pixels –Text –Sound and video – Understanding XML.

UNIT-III	Action Script In Flex	Classes:15

Setting up the environment –Using Design mode and Source mode –Adding Interactivity –Using Data Binding –Layout –Creating Rich Forms.

UNIT-IV	Adobe Air	Classes:15

Introduction – Applications, Windows, Menus –File System Integration – Using Local databases –HTML in AIR.

Text Books

1. Rich Shupe and Zevan Rosser, "Learning ActionScript 3.0: A Beginner's Guide", Adobe Developer Library.
2. Chafic Kazoun and Joey Lott, "Programming Flex 3", Adobe Developer Library.

Reference Books

1. Alaric Cole, "Learning Flex 3", Adobe Developer Library
2. Paul Wilton and Jeremy McPeak, "Beginning JavaScript, 3rd Edition", Wrox Press Inc., 2007.
3. Mercer, Kent, Nowicki, Squier and Choi, "Beginning PHP5", John Wiley & Sons, Inc., 2004.

Web References

1. http://www.mit.edu/~bhdavis/Getty/CIDOC/08-Des.html
2. https://users.cs.cf.ac.uk/Dave.Marshall/Multimedia/node26.html
3. http://engr.iupui.edu/departments/cigt/courses/cgt/index.php

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Understand the basics of event based programming using Adobe Flash together with XML capabilities to render rich content in the browser.
2. Comprehend the standards of Flex by which applications can be deployed consistently on all major browsers, desktops, and devices with necessary skills to design rich forms that apply the use of data binding and validation.
3. Gain knowledge on both client and server side scripting with JavaScript and PHP
4. Understand Adobe Integrated Runtime (AIR) for building Rich Internet applications (RIA).

AVAILABLE SELECTED MOOCs (ELECTIVE-V)

B.Tech 8th Semester: : Computer Science & Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
16CS1808	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		3	1	-	3	40	60	100
Contact Classes: -	**Tutorial Classes: -**		**Practical Classes: Nil**			**Total Classes: -**		

Meeting with the global requirements, to inculcate the habit of self learning and incompliance with UGC guidelines, MOOC (Massive Open Online Course) courses have been introduced as electives. The main intension to introduce MOOCs is to obtain enough exposure through online tutorials, self-learning at one's own pace, attempt quizzes, discuss with professors from various universities and finally to obtain certificate of completion for the course from the MOOCs providers

Regulations for MOOCs

- The respective departments shall give a list from NPTEL or any other standard providers, whose credentials are endorsed by the HOD.
- Each department shall appoint Coordinators/Mentors and allot the students to them who shall be responsible to guide students in selecting online courses and provide guidance for the registration, progress and completion of the same.
- A student shall choose an online course (relevant to his/her programme of study) from the given list of MOOCs providers, as endorsed by the teacher concerned, with the approval of the HOD.
- The details of MOOC(s) shall be displayed in Grade card of a student, provided he/she submits the proof of completion of it to the department concerned through the Coordinator/Mentor.
- Student can get certificate from SWAYAM/NPTEL or any other standard providers, whose credentials are endorsed by the HOD. The course work should not be less than 12 weeks or student may appear for end examination conducted by the Institute.
- There shall be one Mid Continuous Internal Examination (Quiz exam for 40 marks) after 9 weeks of the commencement of the course and semester end examination (Descriptive exam for 60 marks) shall be done along with the other regular courses.

Three credits will be awarded upon successful completion of each MOOC courses having minimum of 8 weeks duration.

PRINCIPLES OF P ROGRAMMING LANGUAGES (ELECTIVE-VI)

B.Tech 8th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1809	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	0	3	40	60	100
Contact Classes:51	Tutorial Classes:9	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Learn the major programming paradigms, and the principles and techniques involved in design and implementation of modern programming languages.
2. Know the notations used for the syntax and semantics of programming languages.
3. Analyze and explain behavior of simple programs in imperative languages using binding, scope, control structures, subprograms and parameter passing mechanisms.
4. Understand the concepts of ADT and object oriented programming for large scale software development.
5. Learn the concepts of concurrency control and exception handling.

UNIT-IP	Reliminaries	Classes:15

Reasons for studying concepts of Programming languages, Programming domains, Language Evaluation Criteria, influences on Language design, Language categories, language design tradeoffs, Implementation methods, Programming environments.

Describing Syntax and Semantics: General Problem of describing Syntax, formal methods of describing syntax, Attribute grammars. Names, Bindings, Type checking, and Scopes: Introduction, names, variables, type checking, scope and Life time.

UNIT-II	Data Types	Classes:15

Introduction, primitive data types, character data types, user defined data types, array types, associative types, record types, union types, pointer and reference types.

Expressions and Assignment Statements: Introduction, Arithmetic expressions, Overloaded Operators, Type conversions, Relational and Boolean expressions, Short circuit evaluation, Assignment Statements, mixed mode assignment.

Statement level Control Structures: Selection statements, Iterative Statements, Unconditional Branching, guarded commands.

UNIT-III	Subprograms, Concurrency	Classes:15

Introduction, Fundamentals of sub-programs, Design issues of subprograms, local referencing environments, parameter passing methods, overloaded sub-programs, generic sub-programs, user defined overloaded operators, co routines.

Abstract Data types and Encapsulation Constructs: Concept of Abstraction, introductions to data abstraction, design issues for abstract data types.

Concurrency: Introduction to subprogram level concurrency, semaphores, monitors, message passing.

UNIT-IV	Exception Handling	Classes:15

Introduction to Exception handling: exception handling in C++ and Java. Logic Programming Language.

Functional Programming Languages: Introduction, Fundamentals of Functional programming languages, LISP, ML, Haskell, applications of Functional Programming Languages.

Logic programming language: Introduction, Basic elements of prolog, application of logic programming.

Text Books

1. Robert W.Sebesta, Concepts of Programming Languages, Eighth Edition, Pearson Education, 2008.
2. D. A. Watt, Programming Language Design Concepts, Wiley Dreamtech, rp-2007.

Reference Books

1. A.B. Tucker, R.E. Noonan, Programming Languages, Second Edition, TMH.
2. K. C.Louden, Thomson, Programming Languages, Second Edition, 2003.
3. Patric Henry Winston and Paul Horn, LISP, Pearson Education.
4. W.F. Clocksin and C.S.Mellish, Programming in Prolog, Fifth Edition, Springer.

Web References

1. https://nptel.ac.in/courses/106102067/
2. https://www.cs.rice.edu/~javaplt/411/14-spring/
3. http://www.cs.bham.ac.uk/~udr/popl/index.html

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Review the concepts of programming languages.
2. List out various programming paradigms used in different languages.
3. Elaborate the features of attribute grammars and draw parse trees.
4. List out various data types in different programming languages.
5. Tabulate different parameter passing techniques of different programming languages.
6. Recall the importance of semaphores, monitors, message passing.
7. Use functional programming languages like LISP, ML, Haskell.
8. Apply scripting languages in web design and real-time application

TCP-IP (ELECTIVE-VI)

B.Tech 8th Semester: Computer Science & Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
16CS1810	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		3	1	0	3	40	60	100
Contact Classes:51	**Tutorial Classes:9**		**Practical Classes: Nil**			**Total Classes:60**		

OBJECTIVES

The course should enable the students to

1. Configure subnets using IP classes B and C.
2. Know TCP/IP protocols, ports, sockets, and data encapsulation.
3. Describe the process of packet fragmentation and reassembly.
4. Understand the key features and functions of TCP and UDP.
5. Understand DNS queries, name resolution, zone data transfers and reverse DNS queries.
6. Describe how basic routing works including the use of routing protocols.

UNIT-I	**The OSI Model and the TCP/IP Protocol Suite, IPV4.**	**Classes:15**

The OSI Model and the TCP/IP Protocol suite: TCP/IP Protocol Suite, Addressing.

Internet Protocol Version 4 (IPv4): Data grams, Fragmentation, Options, And Checksum.

IPv4 Addresses: Introduction, Classful Addressing, Classless Addressing, Special Addresses, NAT.

UNIT-II	**ARP & IPV6**	**Classes:15**

Address Resolution Protocol (ARP): Address Mapping, The ARP Protocol, ATMARP, ARP PACKAGE. Internet Control Message Protocol Version 4: Introduction, Messages, Debugging Tools, ICMP Package.

Internet Protocol Version 6: Introduction, Advantages of IPv6, IPv6 Addressing Format, IPv6 Header, IPv6 Extension Headers, ICMPv6.

UNIT-III	Unicast Routing Protocols and UDP	Classes:15

Unicast Routing Protocols (RIP, OSPE, and BGP): Introduction, Intra and Inter-Domain Routing, Distance Vector Routing, RIP, Link State Routing, OSPF, Path Vector Routing, BGP.

User Datagram Protocol (UDP): Introduction, User Datagram, UDP Services, UDP Applications, UDP Package.

UNIT-IV	TCP, Remote Login, FTP	Classes:15

Transmission Control Protocol (TCP): TCP Services, TCP Features, Segment, A TCP Connection. Windows in TCP, Flow Control, Error Control, Congestion Control, TCP Timers, Options, TCP Package.

Remote Login: TELNET and SSH**:** TELNET, Secure Shell (SSH).

File Transfer: FTP, TFTP.

Text Books

1. TCP/IP Protocol Suite, Behrouz A.Forouzan- Fourth Edition-TATA McGraw-Hill.
2. Introduction to Data Communications and Networking, Wayne Tomasi, Pearson.

Reference Books

1. Internetworking with TCP/IP, Second Edition, Douglas E. Comier, Stevens, PHI.
2. CP/IP Network Administration, Third Edition, Craig Hunt, O'Reilly.

Web References

1. http://www.cs.virginia.edu/~cs458/slides.html
2. http://www.facweb.iitkgp.ac.in/~isg/INTERNET/SLIDES/Lecture-04.pdf
3. http://www.tcpipguide.com/

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Understand various standards on data communication.
2. Understand the basic concepts of data communication and responsibility of each layers of reference model.
3. Remember the functionality of reference model for data communication
4. Know the various layers of different protocols
5. Implement the concept of client server technology and remote login protocols
6. Apply the basic concept of socket programming and client server model

ICT IN EDUCATION (ELECTIVE-VI)

B.Tech 8th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1811	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	0	3	40	60	100
Contact Classes:51	Tutorial Classes:9	Practical Classes: Nil				Total Classes:60		

OBJECTIVES

The course should enable the students to

1. Understand the benefits of ICT in Education
2. Develop their language and communication skills
3. Know the lesson plan considerations
4. Equip with the skills necessary to use technology to become independent learners
5. Apply their ICT skills and knowledge to their learning in other areas.

UNIT-I	Benefits, Pedagogy of ICT	Classes:15

Benefits: ICT use in Education, networks, What it Consists- computers, devices, applications/tools, and digital content, Benefits & barriers- teaching, learning, assessment.

Pedagogy and ICT: Its support in different learning styles, different teaching/learning strategies, different learning environments

UNIT-II	Lesson Planning Considerations	Classes:15

Lesson Planning Considerations: ICT Enhanced Lesson-steps in Plan, preparation, teaching activities, learning activities, assessment activities, practical considerations, importance of ensuring equal access to ICT, options for enhancing accessibility, potential risks for students using the Internet, ways to minimize risks, Understand the teacher's role and responsibilities in implementing data protection policies

UNIT-III	Selecting ICT resources	Classes:15

Selection of ICT resources for enhance teaching and learning: Types of digital content supports, communication tools used, online collaboration tools, productivity tools, on-screen assessment tools for Assessment, how ICT can support and enhance collaborative assessment, tools that can be used to support the management and administration of assessment

UNIT-IV	Managing the Learning Environment	Classes:15

Managing the Learning Environment in Class Room: Understand the concept of an interactive whiteboard, the purpose of a digital projector, the purpose of a digital visualiser, concept of mobile learning and outline the key features of mobile devices, concept of a learning platform, Creation of a course in a learning platform

Text Books

1. ICT: Changing Education, Chris Abbott, Publisher: Routledge Falmer. Place of publication: London. Publication year: 2001. Page number: iii
2. Meeting the Standards in Using ICT for Secondary Teaching. Contributors: Steve Kennewell - Author. Publisher: RoutledgeFalmer. Place of publication: London. Publication year: 2004

Reference Books

1. ICT in the Early Years. Contributors: Mary Hayes - Editor, David Whitebread - Editor. Publisher: Open University Press. Place of publication: Maidenhead, England. Publication year: 2006
2. Developing Thinking and Learning with ICT: Raising Achievement in Primary Classrooms. Contributors: Rupert Wegerif - Author, Lyn Dawes - Author. Publisher: RoutledgeFalmer. Place of publication: New York. Publication year: 2004.
3. Technology, innovation, AND educational change A GLOBAL PERSPECTIVE A Report of the Second Information Technology in Education Study MODULE 2 *Robert B . Kozma , Editor*

Web References

1. https://www.isi.edu/nsnam/ns/
2. https://nptel.ac.in/courses/110107081/44
3. http://www.cs.virginia.edu/~cs757/slidespdf/index.html

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Pursue further studies and respond to modern society's needs using ICT.
2. Foster the development of information and communication technologies knowledge and skills in view of achieving general digital literacy.
3. Ensure equal opportunities for all students

NETWORK SIMULATORS (ELECTIVE-VI)

B.Tech 8th Semester: Computer Science & Engineering								
Course code	Category	Hours/week			Credits	Maximum Marks		
16CS1812	Core	L	T	P	C	CIA	SEE	TOTAL
		3	1	0	3	40	60	100
Contact Classes:51	Tutorial Classes:9	Practical Classes: Nil			Total Classes:60			

OBJECTIVES

The course should enable the students to

1. Study the communication networks characteristics and to analyze various MAC and routing layer Protocols.
2. Configure a network on commercial equipment
3. Analyze and troubleshoot pre-configured systems
4. Design and carry out simulations and experiments to test and verify network performance
5. Participate in the implementation of a network operating system.

UNIT-I	Simulation of Computer Networks, NS2, Linkage between OTcl and C++ in NS2	Classes:15

Simulation of Computer Networks: Computer Networks and the Layering Concept, System Modeling, Basics of Computer Network Simulation, Time-Dependent Simulation, A Simulation Example: A Single-Channel Queuing System.

Introduction to Network Simulator 2 (NS2): Introduction, Basic Architecture, Installation, Directories and Convention, Running NS2 Simulation, A Simulation Example, Including C++ Modules into NS2 and the make Utility.

Linkage between OTcl and C++ in NS2: The Two-Language Concept in NS2, Class Tcl, Class InstVar, Class TclObject, Class TclClass, Class TclCommand, Class EmbeddedTcl.

UNIT-II	Implementation of Discrete-Event Simulation in NS2, Nodes as Routers or Computer Hosts	Classes:15

Implementation of Discrete-Event Simulation in NS2: NS2 Simulation Concept, Events and Handlers, The Scheduler, The Simulator. Network Objects: Creation, Configuration, and Packet Forwarding: Overview of NS2 Components, NsObjects: A Network Object Template, Connectors. **Nodes as Routers or Computer Hosts:** An Overview of Nodes in NS2, Routing Mechanism in NS2, Route Logic, Classifiers: Multi-target Packet Forwarders, Routing Modules, Node Object Configuration.

UNIT-III	Link and Buffer Management, Packets, Packet Headers, and Header Format, TCP Part 1 – An Overview and UDP implementation	Classes:15

Link and Buffer Management: Introduction to SimpleLink Objects, Modeling Packet Departure, Buffer Management, A Sample Two-Node Network.

Packets, Packet Headers, and Header Format: An Overview of Packet Modeling Principle, Packet Allocation and Deallocation, Packet Header, Data Payload, Customizing Packets.

Transport Control Protocols Part 1 – An Overview and User Datagram Protocol implementation: UDP and TCP Basics, Basic Agents, UDP (User Datagram Protocol) and Null Agents.

UNIT-IV	TCP Part 2 –TCP, Application: User Demand Indicator and Related Helper Classes	Classes:15

Transport Control Protocols Part 2 –Transmission Control Protocol (TCP): An Overview of TCP Agents in NS2, TCP Receiver, TCP Sender, TCP Packet Transmission Functions, ACK Processing Functions, Timer Related Functions, Window Adjustment Functions.

Application: User Demand Indicator: Relationship Between an Application and a Transport Layer Agent, Details of Class Application, Traffic Generators, Simulated Applications.

Related Helper Classes: Timers, Implementation of Random Numbers in NS2, Built-in Error Models, Bit Operations in NS2.

Text Books

1. Introduction to Network Simulator NS2 2nd edition by Teerawat Issariyakul & Ekram Hossain
2. Network Simulation by Aboelela, Elsevier; Third edition (2013)

Reference Books

1. T. Issariyakul and E. Hossain, Introduction to Network Simulator NS2, Springer 2008.
2. Modeling and Simulation of Computer Networks and Systems Mohammad Obaidat Faouzi Zarai Petros Nicopolitidis 1st Edition

Web References

1. https://nptel.ac.in/courses/126104006/
2. http://www.itdesk.info/en/module-1-concepts-information-communication-technology-ict/module-1-basic-concepts-of-information-and-communication-technology-ict-notes/

E-Text Books

1. https://ndl.iitkgp.ac.in/

Outcomes

At the end of the course students will be able to

1. Model the network topology and links between those nodes.
2. Model the application flow (traffic) between the nodes.
3. Provide the network performance metrics as output.
4. Visualize the packet flow.
5. Evaluate Technology / protocol and device designs.

MAJOR PROJECT AND COMPREHENSIVE VIVA-VOCE

B.Tech 8th Semester: Computer Science & Engineering								
Course code	**Category**	**Hours/week**			**Credits**	**Maximum Marks**		
16CS2813	**Core**	**L**	**T**	**P**	**C**	**CIA**	**SEE**	**TOTAL**
		-	-	8	12	60	140	200
Contact Classes:	**Tutorial Classes: -**		**Practical Classes: 75**			**Total Classes: 75**		

Internal Evaluation for Major Project Work

The major project shall be carried out during the 8th Semester in the **Non FSI Model** and shall be evaluated for 200 marks out of which 60 marks for internal evaluation and 140 marks for semester end evaluation. Major project will be taken up batch wise and batches will be divided as per the guidelines. The object of major project is to enable the student to extend further the investigative study taken up as the project in Mini project under the guidance of the supervisor/ guide from the department.

The assignment normally includes:

- Preparing an action plan for conducting the investigation including the team work.
- In depth study of the topic assigned.
- Review and finalization of the approach to the problem relating to the assigned topic.
- Final development of product/process, testing, results, conclusions and further direction.
- Preparing a paper for conference presentation/ publication in journal if possible.
- Preparing a dissertation in the standard format for being evaluated by the department.
- Final presentation of the work done before the Project Review Committee (PRC).

Major Project is allocated 60 internal marks. Out of 60, 30 marks are allocated for the supervisor/guide and head of the department to be evaluated based on two seminars given by each student on the topic of the project. The other 30 marks shall be evaluated on the basis of his presentation on the work done on his project by the Departmental Committee comprising of Head of the Department, respective supervisor/ guide and two senior faculty of the department appointed by the Principal.

External Evaluation for Major Project

The major project shall be carried out during the 8th Semester in the **Non FSI Model** and shall be evaluated for 200 marks. The Semester End Examination for major project work done during 8th Semester and for 140 marks shall be conducted by a Project Review Committee (PRC). The committee comprises of an External Examiner appointed by the Principal, Head of the Department and Project Guide/Supervisor. The evaluation of project work shall be conducted at the end of the 8th Semester. The above committee evaluates the project work report with weightages of 50% of the marks (50 marks) awarded by external examiner, 20% of marks (20 marks) awarded by HOD & 30% of the marks (30 marks) by Project Guide/Supervisor respectively for a total of 100 marks. Of the 40 marks for Presentation & Viva-Voce examination, HOD evaluates for 10 marks and external examiner for 30 marks. The evaluation of 140 marks is distributed as given below:

Distribution of projrct Work Marks

Sl. No.	Criterion	Marks
1	Report	100
2	Presentation & Viva – Voce	40

A candidate shall be declared to have passed in major project if he secures a minimum of 50% aggregate marks (100 marks) (Internal & Semester External Examination marks put together), subject to a minimum of 50% marks (70 marks) in the major project end examination.