CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTOMOUNS)
Affiliated to OU; Accredited by NBA;
Accredited by NAAC-'A' Grade (UGC); ISO 9001: 2015
Gandipet, Hyderabad – 500075

Scheme of Regulations, Instruction, and Syllabi
of
MODEL CURRICULUM
of
BE I TO VIII SEMESTERS OF
FOUR YEAR DEGREE COURSE

IN

COMPUTER SCIENCE AND ENGINEERING

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Academic Rules

I. Preliminary Definitions And Nomenclature

These rules are applicable to the students who are admitted to BE/B.Tech (Eight Semesters) programme from the academic year 2018-2019. The preliminary definitions and nomenclature are furnished in the following table.

S. No	Keywords	Definition
1.	Programme	An educational programme leading to award of a Degree BE/B.Tech
2.	Admission Procedure	As prescribed by Government of Telangana
3.	Academic Year	Two consecutive (one odd + one even) semesters constitute one academic year
4.	Semester	Each semester will consist of 15-17 weeks of academic work equivalent to 90 actual teaching days. The odd semester may be scheduled from July to December and even semester from January to June.
5.	Course	Usually referred to, as „papers" is a component of a programme. All courses need not carry the same weight. The courses should define learning objectives and learning outcomes. A course may be designed to comprise lectures/tutorials/laboratory work/ Project work/seminars/ Exams/viva/assignments/presentations/self-study etc. or a combination of some of these. The medium of instruction, examinations and project report will be in English
6.	Credit	A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (lecture or tutorial) or two hours of practical work per week.
7.	Letter Grade	It is an index of the performance of students in a said course. Grades are denoted by letters like O, A++, A, A,B+, B, C etc
8.	Grade Point	It is a numerical weight allotted to each letter grade on a 10-point scale.
9.	Credit Point	It is the product of grade point and number of credits for a Course
10.	SGPA	Semester Grade Point Average (SGPA), it is a measure of performance of work done in a semester. It is ratio of total credit points secured by a student in various courses registered in a semester and the total course credits taken during that semester. It shall be expressed up to two decimal places.
11.	CGPA	Cumulative Grade Point Average (CGPA), it is a measure of overall cumulative performance of a student over all semesters. The CGPA is the ratio of total credit points secured by a student in various courses in all semesters and the sum of the total credits of all courses in all the semesters. It is expressed up to two decimal places.
12.	Grade Sheet	Based on the grades earned, a grade sheet shall be issued to all the registered students after every semester. The grade sheet will display the course details (Course title, number of credits, grade secured) along with SGPA of that semester and CGPA earned till that semester.

II. Types of Courses in the Programme

Courses in a programme may be of the following kinds:

- Humanities and Social Sciences including Management courses
- Basic Science courses
- Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc
- Professional core courses
- Professional Elective courses relevant to chosen specialization/branch
- Open subjects – Electives from other technical and /or emerging subjects
- Project work, seminar and internship in industry or elsewhere
- Mandatory (non-credit)Courses: Environmental Sciences, Induction training, Indian Constitution, Essence of Indian Traditional Knowledge

III. Contact hours and credits

The norms for course credits are as follows:
Lecture (L)/Tutorials (T):One (1) hour per week is assigned one(1) credit(C).
Practical (P): Two (2) hours session per week is assigned one(1) credit(C).

For example, a theory course with a L-T-P schedule of 2-1-0 will be assigned three (3) credits.

L	T	P	C
2	1	0	3

A laboratory practical course with a L-T-P schedule of 0-1-3 will be assigned two and half (2.5) credits.

L	T	P	C
0	1	3	2.5

IV. Course Structure and Sample Scheme for eight semesters

The following table shows the course structure with the credit weightage distribution.

Chaitanya Bharathi Institute of Technology (A)					
Name of the Program : B.E/B.Tech (Detailed Structure)					
L-Lecture, T-Tutorial, P-Practical/Drawing/Project/Seminar					
S.No	Name of the Course	No . of Hours			Credits
		L	T	P	
1.	**Humanities and Social Sciences including Management courses (10 Credits)**				
	English	**2**		**2**	**3**
	Sof t Skills			**2**	**1**
	Principles of Management	**3**			**3**
	Engg. Economics and Accountancy	**3**			**3**
2.	**Basic Science courses (26 Credits)**				
	Physics	**3**	**1**	**3**	**5.5**
	Chemistry	**3**	**1**	**3**	**5.5**
	Ma thematics – I	**3**	**1**		**4**
	Ma thematics – II	**3**	**1**		**4**
	Ma thematics – III	**3**	**1**		**4**
	Biology	**3**			**3**
3.	**Engineering Science courses including workshop, drawing, basics of electrical/ mechanical/ computer etc (23 Credits)**				
	Workshop/Manufacturing Practice	**1**		**4**	**3**
	Engineering Graphics and Design	**1**		**4**	**3**
	Eng ineering Mechanics	**3**	**1**		**4**
	Basic Electrical Engineering	**3**	**1**	**2**	**5**
	Programming for Problem Solving	**3**		**4**	**5**
	Basics of data structures	**2**		**2**	**3**
4.	**Professional core courses (61 Credits) (To be exercised by the respective department Board of Studies)**				
5.	**Professional Elective courses relevant to chosen specialization/branch (18 Credits) (Six Electives are possible and each of 3 credits weighatge. To be exercised by the respective department Board of Studies)**				
6.	**Open subjects – Electives from other technical and /or emerging subjects (09 Credits) (Three open Electives are possible and each of 3 credits weighatge. To be exercised by the respective department Board of Studies)**				
7.	**Project work, seminar and internship in industry or elsewhere (13 Credits)**				
	Pro ject Part1 -(VII Semester)			**4**	**2**
	P ro ject Part2 -(VIII Semester)			**20**	**10**
	Technical Seminar (other than Project)- (VIII Semester)			**2**	**1**
	Internship – During Semester Break Industry Visits (At least two) During V and VII Semesters				
	8. Mandatory Courses (non-credit				
	Environmental Sciences				
	Indian Constitution				
	Essence of Indian Traditional Knowledge				
Induction training : To be conducted for Three weeks before commencement of I-Semester class work					
Total Credits :160					

A sample scheme/plan of study from I-semester to VIII-semester is furnished in the following tables and it is common to all the disciplines of B.E/B.Tech.

GROUP-1 (Civ/EEE/Mech/Prod/Chem/Bio)							GROUP-1 (Civ/EEE/Mech/Prod/Chem/Bio)						
SEMESTER-I							SEMESTER-II						
S. NO	Name of the Course	No . of Hours			Credits		Sl NO	Name of the Course	No . of Hours			Credits	
		L	T	P					L	T	P		
1	Mathematics -1*	3	1	-	4		1	Mathematics -2*	3	1	-	4	
2	Physics	3	1	3	5.5		2	Chemistry	3	1	3	5.5	
3	Programming for Problem Solving	3	-	4	5		3	Engineering Mechanics	3	1	-	4	
4	Workshop/ Manufacturing Practice	1	-	4	3		4	Engineering Graphics and Design	1	-	4	3	
5	English	2	-	2	3		5	Basic Electrical Engineering	3	1	2	5	
	Total	12	02	13	20.5			Total	13	04	09	21.5	
	Clock Hours per week:27							Clock Hours per week:27					

*In place of 'Mathematics-1 & 2', ' Basics of Biology -1&2' will be introduced for Bio-Tech(MPC) stream, and 'Engineering Mathematics- 1 & 2' will be introduced for Bio-Tech(BiPC) stream.

GROUP-2 (CSE/ECE/IT)							GROUP-2 (CSE/ECE/IT)						
SEMESTER-I							SEMESTER-II						
S. NO	Name of the Course	No . of Hours			Credits		Sl NO	Name of the Course	No . of Hours			Credits	
		L	T	P					L	T	P		
1	Mathematics -1	3	1	-	4		1	Mathematics -2	3	1	-	4	
2	Chemistry	3	1	3	5.5		2	Physics	3	1	3	5.5	
3	Engineering Mechanics	3	1	-	4		3	Programming for Problem Solving	3	-	4	5	
4	Engineering Graphics and Design	1	-	4	3		4	Workshop/ Manufacturing Practice	1	-	4	3	
5	Basic Electrical Engineering	3	1	2	5		5	English	2	-	2	3	
	Total	13	04	09	21.5			Total	12	02	13	20.5	
	Clock Hours per week:26							Clock Hours per week:27					

L : Lecture, T : Tutorial , P : Practical/Drawing/Seminar/Project

GROUP-1 (Civ/EEE/Mech/Prod/Chem/Bio)							GROUP-1 (Civ/EEE/Mech/Prod/Chem/Bio)					
SEMESTER-III							SEMESTER-IV					
S. NO	Name of the Course	No . of Hours			Credits		Sl NO	Name of the Course	No . of Hours			Credits
		L	T	P					L	T	P	
1	Mathematics -3	3	1	-	4			Basics of Data Structures	2	2		3
2	Biology	3	-	-	3			Core 4	3	1	2	5
3	Core 1	3	1	2	5			Core 5	3	1	2	5
4	Core 2	3	1	2	5			Core 6	3			3
5	Core 3	3	-	-	3			Soft Skills			2	1
6	Indian Constitution	2	-	-	Non - Credit			Principles of Management	3			3
7	Indian Traditional Knowledge	2	-	-	Non - Credit			Environmental Science	2	-	-	Non - Credit
	Total	19	03	04	20			Total	16	04	06	20
	Clock Hours per week:26							Clock Hours per week:26				

GROUP-2 (CSE/ECE/IT)							GROUP-2 (CSE/ECE/IT)					
SEMESTER-III							SEMESTER-IV					
S. NO	Name of the Course	No . of Hours			Credits		Sl NO	Name of the Course	No . of Hours			Credits
		L	T	P					L	T	P	
1	Mathematics -3	3	1	-	4		1	Biology	3			3
2	Basics of Data Structures	2	2	-	3		2	Core 3	3	1	2	5
3	Core 1	3	1	2	5		3	Core 4	3	1	2	5
4	Core 2	3	1	2	5		4	Core 5	3		2	4
5	Soft Skills			2	1		5	Core 6	3			3
6	Principles of Management	3	-	-	3		6	Indian Constitution	2	-	-	Non - Credit
7	Environmental Science	2	-	-	Non - Credit		7	Indian Traditional Knowledge	2	-	-	Non - Credit
	Total	16	03	06	20			Total	19	05	06	20
	Clock Hours per week:25							Clock Hours per week:27				

L : Lecture, T : Tutorial , P : Practical/Drawing/Seminar/Project

SEMESTER-V							SEMESTER-VI					
S. NO	Name of the Course	No . of Hours			Credits		Sl NO	Name of the Course	No . of Hours			Credits
		L	T	P					L	T	P	
1	Core 7	3		2	4			Core 10	3		2	4
2	Core 8	3		2	4			Core 11	3		2	4
3	Core 9	3		2	4			Core 12	3		2	4
4	Core Elective 1	3	-	-	3			Core Elective 3	3	-	-	3
5	Core Elective 2	3	-	-	3			Core Elective 4	3	-	-	3
6	Open Elective1/Engg. Economics and Accountancy	3	-	-	3			Open Elective1/Engg. Economics and Accountancy	3	-	-	3
	Total	18	-	06	21			Total	18	-	04	20
	Clock Hours per week:24							Clock Hours per week:22				

SEMESTER-VII						SEMESTER-VIII					
S. NO	Name of the Course	No . of Hours			Credits	Sl NO	Name of the Course	No . of Hours			Credits
		L	T	P				L	T	P	
1	Core 13	3	-	3	4.5	1	Core Elective 6	3	-	-	3
2	Core 14	3	-	3	4.5	2	Open Elective 3	3	-	-	3
3	Core 15	3	-	-	3	3	Technical Seminar(on latest trends and other than Project	-	-	2	1
4	Core Elective 5	3	-	-	3	4	Project Part 2	-	-	20	10
5	Open Elective 2	3	-	-	3						
6	Project Part 1	-	-	4	2		Total	18	-	04	20
	Total	15	-	10	20						
	Clock Hours per week:25						Clock Hours per week:28				

L : Lecture, T : Tutorial , P : Practical/Drawing/Seminar/Project

Summary...									TOTAL CREDITS
Semester	I	II	III	IV	V	VI	VII	VIII	
Credits	20.5	21.5	20	20	21	20	20	17	160
Credits	21.5	20.5	20	20	21	20	20	17	

The time-table is prepared with the following timings

1st Hour	2nd Hour	3rd Hour	Lunch	4th Hour	5th Hour	6th Hour
09:40-10:40	10:40-11:40	11:40-12:40	12:40-13:20	13:20-14:20	14:20-15:20	15:20-16:20

V. Examination, Assessment and Letter Grades/Grade Points

In assessing the performance of the students in examinations, the approach is to award marks based on the examinations conducted at various stages (CIE and semester end exam) in a semester. Converting of these marks to letter grades based on absolute and award the grades. As per the UGC recommendations, the following system will be implemented in awarding the grades and CGPA.

Letter Grades and Grade Points:

The absolute grading mechanism is followed in mapping the letter grades. The marks are converted to grades based on pre-determined class interval. As per the UGC recommendations a 10-point grading system with the following letter grades are followed. The same is furnished in the following tables for theory courses and laboratory/project/seminar courses.

For Theory/Engg. Graphics courses...			
% of Marks	Grade points	Letter Grade	Grade description
90.00-100	9.00-10	O	Outstanding
80.00-89. 99	8.00-8.99	A++	Excellent
70.00-79.99	7.00-7.99	A+	Very good
60.00-69.99	6.00-6.99	A	Good
55.00-59.99	5.50-5.99	B+	Fair
50.00-54.99	5.00-5.49	B	Above Average
45.00-49.99	4.50-4.99	C+	Average
40.01-44.99	4.01-4.49	C	Below average
40	4.00	D	Pass
<40	0.00	F	Fail
----	0.00	Ab	Absent

For Laboratory/Project/Seminar courses...			
% of Marks	Grade points	Letter Grade	Grade description
90.00-100 9	.00-10	O	Outstanding
80.00-89. 99	8.00-8.99	A++	Excellent
70.00-79.99	7.00-7.99	A+	Very good
60.00-69.99	6.00-6.99	A	Good
55.00-59.99	5.50-5.99	B+	Fair
50.00-54.99	5.00-5.49	B	Above Average
<50	0.00	F	Fail
----	0.00	Ab	Absent

A student obtaining Grade F shall be considered failed and will be required to reappearing the examination. For non-credit courses „Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA. For the non-credit courses, the students must have secured ' Satisfactory' for the award of degree along with other requirements.

VI. Computation of SGPA and CGPA

The computations of SGPA and CGPA are followed as per the UGC guidelines.

The **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.,

$$\textbf{SGPA}\ (Si) = \Sigma(Ci \times Gi) / \Sigma Ci$$

where **Ci** is the number of credits of the ith course and Gi is the grade point scored by the student in the ith course.

The **CGPA** is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$\textbf{CGPA} = \Sigma(Ci \times Si) / \Sigma\ Ci$$

where Si is the SGPA of the ith semester and Ci is the total number of credits in that semester.

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

Grade Sheet: Based on the above guidelines on Letter grades, Grade points and SGPA and CCPA, the institute issues the grade sheet for each semester and a consolidated grade sheet indicating the performance in all semesters.

VII. Assessment Procedures for Awarding Marks

The distribution of marks is based on CIE by concerned teacher and the Semester end examination shall be as follows:

Course (in terms of credits)	CIE	Semester end Examination(Marks)	Remarks	Duration of Semester End Examination
Three(3) Credits/ Four(4) Credits	30*	70**	Theory Course/Engg . Graphics	3 Hours
Two(2) Credits	20*	50***	Theory	2 Hours
Three (3),Two(2) Credits/One and Half(1.5) Credits	25	50	Lab Course /Workshop	3 Hours
One(1) Credit	15	35	Lab Course	2 Hours
Two(2) Credits	50	--	Project Part 1	--
Ten (10) Credits	100	100	Project Part 2	Viva
One (1) Credit	50	--	Technical Seminar	--
One (1) Credit	50	--	Mini Project	--
Non- Credit	--	50***	Environmental Sciences, Indian Constitution and Essence of Indian Traditional Knowledge	2 Hours

CIE: Continuous Internal Evaluation

* Out of 30/20 sessional marks(CIE), 10/5 marks are allotted for slip-tests (Two slips tests and two assignments will be conducted, each of 10/5 marks, best three average is considered) and the remaining 20/15 marks are based on the average of two tests, weightage for each test is 20/15 marks.

** The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 20 marks. Part-B carries 50 marks and covers all the units of the syllabus. Student has to answer five questions, each question will have internal choice. (The question paper with five questions is framed from the respective five units).

***The question paper will be in two parts, Part-A and Part-B. Part A is for Ten(10) questions and is compulsory, covers the entire syllabus, and carries 15 marks. Part-B carries 35 marks and covers all the units of the syllabus . Student has to answer five questions and each question will have internal choice. (The question paper with five questions is framed from the respective five units).

Note: A course that has CIE(sessional marks) but no semester end examination as per scheme, is treated as Pass/Fail for which pass marks are 50% of CIE.

A candidate has earned the credits of a particular course, if he/she secures not less than the minimum marks/ grade as prescribed. Minimum pass marks for theory course is 40% of total marks i.e., CIE plus semester end examinations where as for the lab course/project is 50%.

For non-credit courses also the minimum pass mark is 40% and the students who secures more than are equal to 40% of maximum mark, then the student will be awarded with 'Satisfactory' otherwise they will be awarded with 'Not-satisfactory'. The students must have secured with 'Satisfactory' in these non-credit courses for the award of degree.

VIII. Duration of the programmes and Credit Requirements for the award of degree

A student is normally expected to complete the B.E. / B.Tech. Programme in eight(8) Semesters but in any case not more than Twelve(12) semesters. Each semester shall normally consist of 90 teaching days (including examination days). The Head of the Department shall ensure that every teacher imparts instruction as per the number of hours specified in the syllabus covering the

full content of the syllabus for the course being taught.

A student has to earn the total number of credits specified in the curriculum of the respective Programme of study in order to be eligible to obtain the degree. Credit Requirement for the award of B.E/B.Tech degree is 160 and in the non-credit courses, the student must have secured with 'Satisfactory' grade .

IX. Rules and Regulations of Attendance

1. The Degree of Bachelor of Engineering / Technology will be conferred on a candidate who has pursued a „Regular Course of Study" for eight semesters (six semesters for candidates admitted under lateral entry scheme) as hereinafter prescribed in the scheme of instruction and has earned the required credits.
2. i) A regular course of study for eligibility to appear at the B.E/ B.Tech Examination of any Semester shall mean putting in attendance of not less than 75% aggregate in lectures/theory, Practicals, Drawings, Workshops, Project, Seminars etc.

   ii) Attendance of N.C.C/N.S.S. Camps or Inter collegiate or Inter University or Inter State or International matches or debates or Educational Excursion or such other Inter University activities as approved by the authorities involving journeys outside the city in which the college is situated will not be counted as absence. However, such absence shall not exceed four (4) weeks per semester of the total period of instructions. Such facility should not be availed twice during the course of study.

   iii) In any semester of the course if a candidate fails to secure the minimum percentage of attendance, he/she shall not be eligible to appear in the examination of that semester and he/she shall have to enroll himself/ herself to undergo afresh a „Regular Course of Study" of the corresponding semester in subsequent academic session, in order to become eligible to appear for the examination. The student need to pay the required tuition fee for that corresponding semester as per institute rules.

   iv) The attendance shall be calculated on the aggregate of the courses/ subjects from the date of commencement of classes / date of readmission in case of detained candidates as per the almanac communicated by the Chaitanya Bharathi Institute of Technology (Autonomous).

   v) Candidates admitted to the first semester through an entrance test and do not have the requisite attendance but have not less than 40% attendance can seek readmission without once again appearing for the entrance test again in respect of candidates of such courses where the admissions are governed through an entrance test. Candidates of I-Semester, who do not have the minimum 40% attendance, would lose their seat.
3. i) In special cases and for sufficient cause shown, the Principal may, on the specific recommendation of the Head of the Department, condone the deficiency in attendance to the extent of 10% on medical grounds subject to submission of medical certificate and payment of condonation fee.

   ii) However, in respect of women candidates who seek condonation of attendance due to pregnancy, the Principal may condone the deficiency in attendance to the extent of 15% (as against 10% Condonation for others) on medical grounds subject to submission of medical certificate to this effect. Such condonation shall not be availed twice during the course of study.
4. The fee for condonation of attendance on medical grounds shall be Rs.1000.00.

X. Promotion Rules

The following rules are applicable to the students who are taking admission into first year of B.E/B.Tech programme in the academic year 2018-19.

S.No.	Semester	Conditions to be fulfilled
1	From I-Sem to II-Sem	i) Regular course of study of I-Sem. ii)Student must secure atleast 40% of maximum marks of CIE of I-Semester
2	From II-Sem to III-Sem	i) Regular course of study of II-Sem. ii) Student must secure atleast 40% of maximum marks of CIE of II-Semester ii) Student Must have earned at least 21Credits of I& II Semester.
3	F rom III-Sem to IV-Sem	i) Regular course of study of III-Semester. ii) Student must secure atleast 40% of maximum marks of CIE of III-Semester
4	F rom IV-Sem to V-Sem.	i) Regular course of study of IV-Sem. ii) Student must secure atleast 40% of maximum marks of CIE of IV-Semester iii) Student must have earned atleast 62 Credits of I,II III and IV Semesters.
5	From V-Sem to VI Sem	i) Regular course of study of V-Semester. ii) Student must secure atleast 40% of maximum marks of CIE of V-Semester
6	From VI-Sem to VII-Sem	i) Regular course of study of VI-Sem. ii) Student must secure atleast 40% of maximum marks of CIE of VI-Semester iii) Student must have earned atleast 102 Credits of I,II,III,IV,V and VI Semesters.
7	From VII-Sem to VIII-Sem	i) Regular course of study of VII Semester. ii) Student must secure atleast 40% of maximum marks of CIE of VII-Semester

The following rules are applicable to the promotion of lateral entry students from one semester to the next semester who will be taking admission of B.E/B.Tech programme in the academic year 2019-20

S.No.	Semester	Conditions to be fulfilled
1	F rom III-Sem to IV-Sem	i) Regular course of study of III-Sem. ii)Student must secure atleast 40% of maximum marks of CIE of III-Semester
2	F rom IV-Sem to V-Sem.	i)Regular course of study of IV-Sem. ii)Student must secure atleast 40% of maximum marks of CIE of IV-Semester ii) Student Must have earned at least 20 Credits of III and IV Semesters.
3	From V-Sem to VI Sem	i)Regular course of study of V-Semester. ii) Student must secure atleast 40% of maximum marks of CIE of V-Semester
4	From VI-Sem to VII-Sem	i)Regular course of study of VI-Semester. ii) Student must secure atleast 40% of maximum marks of CIE of VI-Semester iii)Student must have earned atleast 60 Credits of III, IV,V and VI Semesters.
5	From VII-Sem to VIII-Sem	i)Regular course of study of VII Semester. ii)Student must secure atleast 40% of maximum marks of CIE of VII-Semester.

XI. Reappearing /Readmission/Revaluation/Physical Verification of answer scripts

If a student fails in a theory course/lab course, the student has to appear for semester end exam in the subsequent semester for earning the credits for that failed course.

If a student is prevented from writing end semester examination due to lack of attendance, the student has to take re-admission of that particular semester (by paying appropriate tuition fee as prescribed by the institute) when offered next and must attend the classes and fulfill the attendance requirements.

A student can apply for revaluation of the student‟s semester examination answer paper in a theory course, within two(2) weeks from the declaration of results, on payment of a prescribed fee along with prescribed application.

After the declaration of results, the interested student(s) can go through/evidence their semester end theory examination answer scripts (by paying the prescribed fee) physically on issuing of the notification by the respective authorities.

The student(s) who have failed in the courses for which there is only internal evaluation, such students are required to reappear for the same, when offered next time, by the respective department.

If a student is detained due to non-earning of required credit(s), such student(s) are eligible for re-admission after earning the required number of credits only. Further, if any student is detained due non-earning of required credit(s) and wants to repeat the semester class work, such students are eligible for re-admission in the odd semesters only, such students are required pay tuition fee as per the institute rules

The student who has failed the course for which there is only CIE, such students required the reappear for the same when offered next time by the respect the department.

XII. Industrial Training / Internship

The students may undergo Industrial training/Internship during summer / winter vacation. In this case the training has to be undergone continuously for the entire period.

The students may undergo Internship at Research organization / University (after due approval from the Head of the Department/Principal during summer / winter vacation or during semester break.

Duration of Training/ Internship	Credits
2 Weeks	1
4 Weeks	2
6 Weeks	3

If Industrial Training / Internship are not prescribed in the curriculum, the student may undergo Industrial Training / Internship optionally and the credits earned will be indicated in the grade Sheet. If the student earns three (3) credits in Industrial Training / Internship, the student may drop one 'Open Elective'. **In such cases Industrial Training / Internship needs to be undergone continuously from one organization only.**

Students are permitted to complete online certification courses through Massive Open Online Courses (MOOCs) offered by reputed Universities/ Government Organizations duly approved by the Head of the Department. The Credits allotted for the Certification course is one (1)/ two (2)/three(3) Credit(s) and will be decided by the Head of the Department.

A student will be eligible to get Under Graduate degree with Honours or additional Minor Engineering, if he/she completes an additional 20 credits. These could be acquired through MOOCs. However, if the number of credits earned is 1 or 2, these credits shall not be considered for dropping any elective or in process of award of degree. The student is allowed to undergo a

maximum of 6 weeks Industrial Training / Internship during the entire duration of study, no credits will be allotted for the internship beyond six(6) weeks.

The detailed procedures are furnished in the **ANNEXURE** regarding the earning of credits by the student for **Industrial Training / Internship**

Industrial Visit

Every student is required to go for at least two industrial visits during the IVsemester to VII-semester of the Programme. The Heads of Departments shall ensure that necessary arrangements are made in this regard. **It is non-credit course and is awarded with „Satisfactory/Un-satisfactory‟ and will be reflected in grade sheet.**

XIII. Common Course Committee

A theory course handled by more than one teacher shall have a "Common Course Committee" comprising of all teachers teaching that course and students who have registered for that course. There shall be at least one/two student representatives from each class of that course. One of the teachers shall be nominated as Course Coordinator by the Head of the Department.

The first meeting of the Common Course Committee shall be held within fifteen days from the date of commencement of the semester. The nature and weight-age of the continuous assessments like CIE and syllabus coverage schedules shall be decided in the first meeting, within the framework of the Regulations.

Two or three subsequent meetings in a semester may be held at suitable intervals. During these meetings, the student members shall meaningfully interact and express their opinions and suggestions of all the students to improve the effectiveness of the teaching-learning process. It is the responsibility of the student representatives to convey the proceedings of these meetings to their respective class.

In addition the "Common Course Committee" (without the student representatives) shall meet to ensure uniform evaluation of continuous assessments after arriving at a common scheme of evaluation for the assessments. Wherever feasible, the common course committee (without the student representatives) shall prepare a common question paper for the continuous internal evaluation.

XIV. Multiple Courses Committee and Overall Monitoring Committee

Course(s) handled by a single teacher, there will be a "Multiple Courses Committee" comprising of all the above teachers and two student representatives from each course. One of the above teachers, nominated by the Head of the Department shall coordinate the activities of this committee. The functions of this committee are similar to that of the common course committee.

In addition, there shall be an overall monitoring committee for each semester of a programme which comprises of the Course Coordinators / Course teachers (as applicable), the Head of Department. This overall monitoring committee shall meet periodically to discuss academic related matters, progress and status of the students of the semester concerned. The overall monitoring committee can invite the students

of the semester concerned for any of the committee meetings if necessary.

XV. Revision of Regulations, Curriculum and Syllabi

The institute may revise from time to time, amend or change the Rules & Regulations, Syllabus and Scheme of examinations after obtaining approval by Academic Council.

XVI. Eligibility for the award of degree

A student shall be declared to be eligible for the award of the B.E/B.Tech, provided the student has successfully gained the required number of total credits and other requirements as specified in the curriculum corresponding to the student‟s programme within the stipulated time. Successfully completed the course requirements, appeared for the Semester End Examinations and passed all the subjects prescribed in all the eight(8) semesters within a maximum period of six(6) academic years considered from the

commencement of the first semester to which the candidate was admitted.

Successfully passed, any additional courses prescribed by the institute whenever readmitted under regulation.

A student will be eligible to get Under Graduate degree with Honours or additional Minor Engineering, if he/she completes an additional 20 credits. These could be acquired through MOOC/NPTEL.

No disciplinary action pending against the student.

The award of Degree must have been approved by the University.

XVII. Improvement of overall score

A candidate who wishes to improve his/her overall score may do so within one academic year immediately after having passed all the examinations of the B.E/B.Tech degree course by reappearing to all courses/subjects of any one semester as prescribed by the syllabus and curriculum.

XVIII. Award of Division

CGPA	DIVISION
7.0 and above	First Class with distinction
6.0 and less than 7.0	First Class
5.0 and less than 6. 0	Second Class
4.0 and less than 5.0	Pass

XIX. Award of Gold Medal

A student securing highest CGPA in single attempt is eligible for award of Gold Medal in the course of B.E/B.Tech for each specialization/Branch.

XX. Additional rules for lateral entry students

These are applicable to the students who are admitted directly through ECET to the III semester of BE/B.Tech programme from the academic year 2019-2020. These students are admitted as per the rules governed by Telangana State government. These students are waived with all the courses of I-semester and II-Semester curriculum of regular eight semesters B.E/B.Tech programme. All the rules except the **'promotion rules and credit requirement for the award of degree'** are same as that of eight semesters B.E/B.Tech programme under CBCS. However, the students need to undergo two(2) bridge courses and are furnished below:

1. C- programming Lab (Lab Course)
2. English Language Lab (Lab Course)

The above said course(s) will be offered by the respective departments of the institute and they are mandatory for every student. The students need to secure atleast 'D' grade in all the above two(2) courses. The grades secured in these courses shall not be considered for dropping any elective/core course or in the
process of award of degree. It is a pre requisite for the award of Degree for securing atleast "D" grade in all the above said bridge courses.

Credit requirement for the award of degree for lateral entry students: 118

All the rules and regulations, specified herein after shall be read as whole for the purpose of interpretation and when a doubt arises, the interpretation of the Chairman, Academic Council, Chaitanya Bharathi Institute of Technology (Autonomous) is final. As per the requirements of the Statutory Bodies, Principal, Chaitanya Bharathi Institute of Technology (Autonomous), shall be the Chairman of the College Academic Council.

XXI. Annexure

Industrial Training / Internship

Guide lines for earning three (3) credits by the student towards the Industrial Training/ Internship:

"If the student earns three (3) credits in Industrial Training / Internship, the student may drop one 'Open Elective'. In such cases Industrial Training / Internship needs to be undergone continuously from one organization only, during the semester break/summer vacation "

Procedure for granting permission to the student to carryout Industrial Training / Internship by the student, continuously for at least for six (6) weeks duration from one organization during the semester break/summer vacation:

1. The student needs to approach the respective Head of the department with a request that he/she is interested to carry out an Industrial Training / Internship, with the details of the industry/organisation
2. A committee is constituted in the department which is preceded by the head of department and head nominates one of the senior faculties as a mentor to that student.
3. The mentor visits the industry/organization and discuss with CEO/Director /Responsible person of that industry/organization on the following points
    - Duration of the Industrial Training / Internship
    - Nature of work to be carried out by the student
    - Facilities to be extended to the student in the industry
    - Requesting the industry personnel to assign a guide or an incharge
    - to monitor the student"s work in the industry
    - Number of man hours to be spend by the student
    - Preparation of documentation/report by the student To apprise the industry personnel that the **Industrial Training / Internship** is equivalent to earning of three(3) credits
4. After having all the required details from the industry personnel, the mentor presents the deliberations made with industry and discusses with the committee to draft the necessary recommendations/conclusions.
5. If the committee recommends then the student is permitted to carry out Industrial Training / Internship in that particular

industry/organization, continuously for a minimum of six(6) weeks during the semester break/summer vacation.

Assessment procedure for earnings three (3) credits:

- A minimum of six(6) weeks continuously to be spend by the student in one industry/organization during the semester break/summer vacation.
- Two (2) midterm evaluations, one at the end of third (3rd) week of Industrial Training / Internship and the other at the end of fifth(5th) week of Industrial Training / Internship are to be carried out by the mentor. The midterm evaluation may be based on oral presentations by the student and a documentary evidence of the work carried out by the student in industry/organization. For awarding marks for midterm evaluations the mentor has to coordinate with the guide/in-charge of the student in the industry. The midterm evaluations are to be carried out for a maximum 30 Marks.
- After Industrial Training / Internship, the student has to submit a hard copy of the Industrial Training / Internship report in a standard format which is prescribed by the department. Finally, the committee evaluates the performance of the student for a maximum of seventy (70) marks which is equivalent to the semester end examination.
- The student has to deliver power point presentation before the committee on the work which is carried out by the student during Industrial Training /Internship. Committee examines the student and the marks (Maximum 70 Marks) are to be awarded on the following aspects.

  Power Point Presentation : 25 Marks
  Hard copy of the Report : 20 Marks
  Viva-Voce : 25 Marks

The department sends the performance of the student to the CoE for awarding Grade/Grade points towards earning of three (3) credits by the student for Industrial Training / Internship. Based on the result declared by the CoE, the student may be permitted to **drop one "Open Elective".**

Guide lines for earning one(1)/two(2) credit(s) by the student towards the Industrial Training/ Internship for two(2) to four(4) weeks duration during the semester break or summer/winter vacation:

1. The student needs to approach the respective Head of the department with a request that he/she is interested to carry out an Industrial Training / Internship, with the details of the industry/organization.
2. The Head of the department issues a letter to the industry with a request to permit the students for Industrial Training / Internship.
3. On Completion of Industrial Training / Internship by the student, the student is required to submit the following to the respective department.
   - Industrial Training / Internship completion certificate from the industry
   - Hardcopy of the report in a standard format which is prescribed by the department
4. Department committee evaluates the student performance on the Industrial Training / Internship for awarding the credits.

Assessment procedure for earning one (1)/two (2) credit(s):

The student has to deliver power point presentation before the committee on the work which is carried out by the student during Industrial Training /Internship. Committee examines the student and the marks (Maximum :50 Marks, in case of four weeks Industrial Training / Internship, 25 Marks, in case of two weeks Industrial Training / Internship) are to be awarded on the following aspects

Description	For Four(4) weeks Industrial Training	For Two(2) weeks Industrial Training
	Max. Marks	Max. Marks
Power Point Presentation	25	10
Hard copy of the Report	15	10
Viva-Voce	10	05
Total	50	25

The department sends the performance of the student to the CoE for awarding Grade/Grade points towards earning one(1)/two(2) credit(s) by the student for Industrial Training / Internship.

Note: The credits earned by the student towards the Industrial Training/ Internship for two(2) to four(4) weeks duration during the semester break or summer/winter vacation shall not be considered for dropping any elective or in process of award of degree.

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Institute Vision & Mission

Vision:

To be a Centre of Excellence in Technical Education and Research

Mission:

To address the emerging needs through quality technical education and advanced research

Department Vision & Mission

Vision:

To become a center of excellence in the field of Computer Science and Engineering that produces innovative, skillful and socially responsible professionals who can contribute significantly to industry and research.

Mission:

The mission of Computer Science and Engineering Department is:

1. To provide a curriculum that balances engineering fundamentals, modern technologies and research.
2. To provide opportunities for solving practical problems.
3. To provide opportunities for overall personality development.

Program Education Objectives (PEOs):

After the completion of the program:

1. Practice their profession with confidence by applying new ideas and technologies for the sustainable growth of Industry and Society.
2. To pursue higher studies for professional growth with superior ethics.
3. Engage in Research leading to new products or become a successful entrepreneur.

Program Specific Outcomes (PSOs):

At the end of the program, Graduates able to

1. Knowledge and skills in the areas of Computer Vision and Machine Learning
2. Create Innovative career paths through Open Source Technologies.

B.E. Program Outcomes (PO's)

Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization for the solution of complex engineering problems

Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.

Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling to complex engineering activities, with an understanding of the limitations.

The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

Communication: Communicate effectively on complex engineering activities with the engineering community and with the 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.

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.

Life-long learning: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

AICTE - Model Curriculum

B.E Syllabus for I and II Semester

with effect from 2018 – 2019

Specialization /Branch: Computer Science and Engineering

Chaitanya Bharathi Institute of Technology (A)
Chaitanya Bharathi (P.O), Gandipet
Hyderabad-500075, Telangana State.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION
I-Semester of B.E, Model Curriculum
COMPUTER SCIENCE AND ENGINEERING

SEMESTER – I

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	18MT C01	Mathematics -I	3	1	-	3	30	70	4
2	18CY C01	Chemistry	3	1	-	3	30	70	4
3	18CEC01N*	Engineering Mechanics	3	1	-	3	30	70	4
4	18CS C01	Programming for Problem Solving	3	-	-	3	30	70	3
PRACTICALS									
5	18MEC01N*	Engineering Graphics and Design	1	-	4	3	50	50	3
6	18CS C02	Programming for Problem Solving Lab	-	-	4	3	25	50	2
7	18CY CO2	Chemistry Lab	-	-	3	3	25	50	1.5
Total			**13**	**03**	**11**	**-**	**200**	**450**	**21.5**

L: Lecture D: Drawing CIE - Continuous Internal Evaluation
T: Tutorial P: Practical SEE - Semester End Examination

18MT CO1

MATHEMATICS–I

(Common to all branches and except for Bio-Tech)

Instruction	3 L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	4

Course Objectives: The objectives of this course are

1. To solve linear system of equations using Matrix Methods.
2. To know the convergence of the Series.
3. To represent the function in series form.
4. To know the Partial Derivatives and use them to interpret the way a function of two variables behaves.
5. To learn Vector Differential Operator and its Physical interpretations on Scalars and vector functions.
6. To solve improper integrals.

Course Outcomes: On Successful completion of the course, students will be able to

1. Solve system of linear equations and identify the Eigen values and Eigen vectors in engineering problems.
2. Check the series convergence.
3. Find the evolutes of the given curves.
4. Expand and find extreme values of functions of two variables.
5. Understanding the significance of gradient, divergence and curl.
6. An ability to solve the problems and interpret in geometrical approach.

UNIT-I

Matrices: Rank of the matrix, Echelon form, System of linear equations, Linearly dependence and independence of vectors, Eigenvalues, Eigenvectors, Properties of eigenvalues, Cayley-Hamilton theorem, Quadratic forms, Diagonalization of Matrices, Reduction of quadratic form to canonical form by linear transformation, Nature of quadratic forms.

UNIT-II

Sequences and Series: Definition of Convergence of sequence and series. Tests for convergence of series: Comparison test, limit comparison test, D'Alembert ratio test, Raabe's test, Cauchy's n^{th} root test, logarithmic test, alternative series, absolute and conditional convergence.

UNIT-III

Calculus: Rolle's Theorem, Lagranges Mean value theorem, Cauchy's mean value theorem (without proofs). Curvature, radius of curvature, Evolutes and involutes. Fourier series, half range sine and cosine series.

UNIT-IV

Multivariable Calculus (Differentiation): Functions of two variables, Partial derivatives, Total differential and differentiability, Derivatives of composite and implicit functions (Chain rule), Change of variables, Jacobian, Higher order partial derivatives, Taylor's series of functions of two variables, Maximum and minimum values of functions of two variables, Lagrange's multipliers method.

UNIT-V

Vector Calculus (Differentiation): Scalar and vector fields, Gradient of a scalar field, Directional derivative, Divergence and Curl of a vector field, vector identities. Improper integrals: Beta and Gamma functions and their properties.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th Reprint, 2010.

Suggested Reading:

1. Veerarajan T., Engineering Mathematics for first year, Tata McGraw- Hill, New Delhi, 2008.
2. R.K. Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications, 5th edition, 2016.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/ Cole, 2005.

18CY C01

CHEMISTRY

(Common **to** all branches)

Instruction	3L+1T Hours per Week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	4

Course Objectives: The objectives of this course are

1. The aim of framing the syllabus is to impart intensive and extensive knowledge of the subject so that students can understand the role of chemistry in the field of engineering.
2. This syllabus helps at providing the necessary introduction of the inorganic chemistry principles and concepts of chemical bonding involved in a comprehensive manner understandable to the students aspiring to become practicing engineers.
3. Thermodynamic and Electrochemistry units give conceptual knowledge about spontaneous processes and how can they be harnessed for producing electrical energy and efficiency of systems.
4. To teach students the value of chemistry and to improve the research opportunities knowledge of stereochemistry and organic reactions is essential.
5. New materials lead to discovering of technologies in strategic areas like defense and space research for which an insight into nano and composite materials of modern chemistry is essential.

Course Outcomes: On Successful completion of the course, students will be able to

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications. Quantum theory is more than 100 years old and to understand phenomena at nanometer levels; one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

1. Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
2. Rationalize bulk properties and processes using thermodynamic considerations & Ionic Equilibria.
3. List major chemical reactions that are used in the synthesis of molecules.
4. Apply the various methods used in treatment of water for domestic and industrial use.
5. Discuss the various Engineering materials & Drug synthesis & their applications.

UNIT-I Atomic and Molecular Structure:

Molecular Orbital theory - atomic and molecular orbitals.Linear combination of atomic orbitals (LCAO) method. Molecular orbitals of diatomic molecules. Energy level diagrams of diatomics (H_2 , He_2^+,N_2 , O_2 , O_2^- , CO, NO). Pi- molecular orbitals of butadiene, benzene and their aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties.

UNIT-II Use of Free Energy in Chemical Equilibria and Ionic Equilibria:

Use of free energy in chemical equilibria : Thermodynamic functions: Internal energy, entropy and free energy. Significance of entropy and free energy (criteria of spontaneity). Free energy and emf (Gibbs Helmholtz equations and its applications). Cell potentials –electrochemical series. Nernst equation and its applications. Potentiometric Acid base & Redox Titrations. Numericals.

Ionic Equilibria: Solubility product, Determination of solubility product, Applications of solubility product- Determination of solubilities of sparingly soluble salts; Predicting precipitation reactions; Precipitation of an insoluble salt; Precipitation of soluble salts; Inorganic analysis. Numericals.

UNIT- III Stereochemistry and Organic Reactions

Stereochemistry: Representations of 3 dimensional structures, Symmetry and chirality, Stereoisomers - Configurational isomers (Geometrical & Optical isomers), Conformational isomers - Newman and sawhorse representations of n-butane, enantiomers (lactic acid), diastereomers (Tartaric acid) , optical activity, absolute configurations , Sequence rules for R&S notation.

Organic Reactions Types of Organic reactions:

Substitution Reactions- Electrophilic substitution (Nitration of Benzene) ; Nucleophilic Substitution (S_N1& S_N2) ; Free Radical Substitution(Halogenation of Alkanes)

Addition Reactions:

Electrophilic Addition – Markonikoff's rule
Nucleophilic Addition – (Addition of HCN to carbonyl compounds)
Free radical Addition - Anti Markonikoff's rule (Peroxide effect)

Eliminations-E_1 and E_2 (dehydrohalogenation of alkyl halides) **Oxidation** with $KMno_4$, K_2 Cr_2O_7 ; **Reduction** with $LiAlH_4$,$NaBH_4$ **Cyclization** (Diels - Alder reaction)

UNIT–IV Water Chemistry:

Hardness of water – Types, units of hardness, Disadvantages of hard water , Boiler troubles - scales & sludge formation ,

causes and effects , Softening of water by ion exchange method and Reverse Osmosis. Specifications of potable water & industrial water. Disinfection of water by Chlorination, Ozonisation & UV radiation.

UNIT-V Engineering Materials and Drugs:

Nano materials-Introduction to nano materials and general applications, basic chemical methods of preparation- Sol gel method. Carbon nanotubes and their applications.

Composite materials- Definition, types of composites, fibre reinforced, glass fibre reinforced and carbon fibre reinforced composites and applications.

Conducting polymers- Definition, classification and applications.

Drugs-Introduction,Synthesis and uses of Aspirin (analgesic), Paracetamol (Antipyretic), Atenolol (antihypertensive).

Text Books:

1. P.C. Jain and M. Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company Ltd., New Delhi,16th edition (2015).
2. W.U. Malik, G.D.Tuli and R.D.Madan, "Selected topics in Inorganic Chemistry", S Chand & CompanyLtd, New Delhi,reprint (2009).
3. R.T. Morrison, R.N. Boyd and S.K. Bhattacharjee, "Organic Chemistry", Pearson, Delhi, 7thedition(2011).
4. G.L. David Krupadanam, D. Vijaya Prasad, K. Varaprasad Rao, K.L.N. Reddy and C. Sudhakar, "Drugs", Universities Press (India) Limited, Hyderabad (2007).

Suggested Reading:

1. B. H. Mahan, "University Chemistry", Narosa Publishing house, New Delhi, 3rd edition (2013).
2. B.R. Puri, L.R. Sharma and M.S. Pathania, "Principles of Physical Chemistry", S. Nagin Chand & Company Ltd.,46thedition(2013).
3. T.W. Graham Solomons, C.B. Fryhle and S.A. Snyder, "Organic Chemistry", Wiley,12th edition (2017).
4. P.W.Atkins, J.D. Paula, "Physical Chemistry", Oxford, 8thedition (2006).

18CE C01N

ENGINEERING MECHANICS

(Common to all branches)

Instruction	3L + 1T per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	4

Course Objectives: The objectives of this course are

1. Concept of forces, resolution, resultant, moment, couple and equilibrium of force systems.
2. Effect of frictional resistance to force systems and methods of analysing the simple trusses.
3. Centroid, centre of gravity and area moment of inertia for various regular and composite lines, areas and volumes.
4. Basic concepts of dynamics (kinematics and kinetics) and analysis of particle motion and connected bodies.
5. Work energy principle, impulse-momentum equation and their applications for translatory motion bodies.

Course Outcomes: On Successful completion of the course, students will be able to

1. Solve problems dealing with forces in plane systems, draw free body diagrams and analyse problems using equilibrium equations for a smooth surface.
2. Solve problems involving force system with frictional resistance and to analyse simple trusses for forces in various members of a truss.
3. Determine centroid and area moment of inertia for elementary and composite figures.
4. Solve problems in kinematics and kinetics of a particle and connected systems.
5. Solve problems for body motion using work energy principle and impulse-momentum approach for translatory motion bodies.

UNIT–I

Resolution, Resultant and Equilibrium of Force System: Concepts of force, system of forces, components of forces in a plane. Resultant of coplanar- concurrent force systems. Moment of a force and its applications. Couple and its applications. Resultant of coplanar-non-concurrent force systems. Equilibrium of force systems. Free body diagram, equations of equilibrium for coplanar force system.

UNIT–II

Friction and Analysis of Simple Trusses: Types of friction, laws of friction, application of friction to a single body and connecting systems, wedge friction. Analysis of simple trusses using method of joints and method of sections.

UNIT–III

Centroid, Centre of Gravity and Moment of Inertia: Centroid of lines and areas from first principle, centroid of composite figures. Centre of gravity and its implications. Area moment of inertia of a plane section from first principles, theorems of moment of inertia, moment of inertia of composite sections.

UNIT–IV

Particle Dynamics: Kinematics: Rectilinear and curvilinear translation. Rectangular, normal and tangential components of acceleration. General principles of kinetics: D' Alembert's principle and its application to particle motion and connected bodies.

UNIT–V

Work-Energy and Impulse-Momentum: Equation of work energy for translation- applied to particle motion and connected systems. Introduction to linear impulse- momentum, principle of conservation of linear momentum and its applications.

Text Books:

1. 1. K. Vijaya Kumar Reddy and J. Suresh Kumar, "Singer's Engineering Mechanics: Statics and Dynamics", B. S. Publications (SI Units), 3rd edn., Rpt.,2019.

Suggested Reading:

2. Nelson., "Engineering Mechanics", Tata Mc Graw Hill, Delhi, 2010.
3. K. Tayal , "Engineering Mechanics: Statics and Dynamics", Umesh Publications, Delhi, 14th edn., Rpt., 2015.
   1. Basudeb Bhattacharyya, "Engineering Mechanics", Oxford University Press, 2nd edn., 2016.

18CS C01

PROGRAMMING FOR PROBLEM SOLVING
(Common to All Programs)

Instruction	3 Periods per week
Duration of Semester-End Examination	3 Hours
Semester-End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Objectives
1. Identification of computer components, Operating environments, IDEs.
2. Understanding the steps in problem solving and formulation of algorithms to problems.
3. Develop programming skills as an means of implementing an algorithmic solution with appropriate control and data structures.
4. Develop intuition to enable students to come up with creative approaches to problems.
5. Manipulation of text data using files.

Course Outcomes: At the end of the course, students will be able to:
1. Identify the computing environments.
2. Formulate solutions to problems and represent them using algorithms/ Flowcharts.
3. Choose proper control statements and data structures to implement the algorithms.
4. Decompose a problem into modules and use functions to implement the modules.
5. Develop applications using file I/O.

UNIT-I
Introduction to computers and Problem Solving: Components of a computer, Operating system, compilers, Program Development Environments, steps to solve problems, Algorithm, Flowchart / Pseudocode with examples.
Introduction to programming: Programming languages and generations, categorization of high level languages.
Introduction to C: Introduction, structure of C program, keywords, identifiers, Variables, constants, I/O statements, operators, precedence and associativity.

UNIT – II
Introduction to decision control statements: Selective, looping and nested statements.
Functions: Introduction, uses of functions, Function definition, declaration, passing parameters to functions, recursion, scope of variables and storage classes. **Case study**

UNIT – III
Arrays: Introduction, declaration of arrays, accessing and storage of array elements, 1-dimensional array, Searching (linear and binary search algorithms) and sorting(selection and bubble) algorithms, 2-D arrays, matrix operations.
Strings: Introduction, string representation, string operations with examples. **Case study**

UNIT – IV
Pointers: Understanding computer's memory, introduction to pointers, declaration of pointer variables, pointer arithmetic, pointers and strings, array of pointers, function pointers, array of function pointers, dynamic memory allocation, advantages and drawbacks of pointers.
Structures: Structure definition, initialization and accessing the members of a structure, nested structures, structures and functions, self- referential structures, unions and enumerated data types.

UNIT-V
Files: Introduction to files, file operations, reading data from files, writing data to files, error handing during file operations.
Preprocessor Directives: Types of preprocessor directives, examples.

Text Books:
1. A K Sharma "Computer Fundamentals and Programming", 2nd Edition, University Press, 2018.
2. PradeepDey and Manas Ghosh, "Programming in C", Oxford Press, 2nd Edition, 2017.

Suggested Reading:
1. Byron Gottfried, Schaum's"Outline of Programming with C", McGraw- Hill.
2. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.
3. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
4. ReemaTharaja "Introduction to C Programming", Second Edition, OXFORD Press,2015.
5. https://www.tutorialspoint.com/cprogramming/index.htm.
6. https://onlinecourses.nptel.ac.in/noc18-cs10/preview.

18ME C01N

ENGINEERING GRAPHICS AND DESIGN

Instruction	1 Lecture + 4 Drawing Hours per week
Duration of Semester End Examination	3 Hours
SEE	50 Marks
CIE	50 Marks
Credits	3

Course Objectives: The objectives of this course are

1. To get exposure to a cad package and its utility.
2. Understanding orthographic projections.
3. To visualize different solids and their sections in orthographic projection
4. To prepare the student to communicate effectively by using isometric projection.
5. To prepare the student to use the techniques, skills, and modern tools necessary for practice.

Course Outcomes: On Successful completion of the course, students will be able to

1. Exposure to graphics package.
2. Exposure to the visual aspects of engineering design.
3. To become familiar with engineering graphics standards.
4. Exposure to orthographic projections.
5. Exposure to engineering communication.

List of exercises:

1. Introduction to CAD package: Settings, draw, modify tools, dimensioning and documentation
2. Construction of Ellipse by General method, Cycloid and Involute
3. Orthographic projection: Principles, conventions, Projection of points
4. Projection of straight lines: Simple position, inclined to one plane
5. Projection of straight lines inclined to both the planes (without traces and mid-point)
6. Projection of planes: Perpendicular planes
7. Projection of planes: Oblique planes
8. Projection of solids: Simple position
9. Projection of solids: Inclined to one plane
10. Sections of solids: Prism, pyramid in simple position
11. Sections of solids: Cone and cylinder in simple position
12. Development of surfaces: Prism and Pyramid
13. Development of surfaces: Cone and Cylinder
14. Isometric projections: Simple solids (Prism, pyramid, cone and cylinder)

Text Books:

1. N.D.Bhatt, "Elementary Engineering Drawing", Charotar Publishers, 2012.
2. K.L.Narayana and P.K.Kannaiah, "Text Book of Engineering Drawing", Scitech Publications, 2011.
3. Basanth Agrawal and C M Agrawal, "Engineering Drawing", 2/e, McGraw-Hill Education (India) Pvt. Ltd.

Suggested Reading:

1. Shaw M.B and Rana B.C., "Engineering Drawing", *2/e,* Pearson, 2009.
2. K.Veenugopal, "Engineering Drawing and Graphics + AutoCAD", New Age International Pvt.Ltd, 2011.
3. Bhattacharya. B, "Engineering Graphics", I. K. International Pvt. Ltd, 2009.

18CS 02

PROGRAMMING FOR PROBLEM SOLVING LAB

Instruction	4 Periods per week
Duration of Semester-End Examination	3 Hours
Semester-End Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Objectives: The objectives of this course are

1. Setting up programming environment.
2. Develop Programming skills to solve problems.
3. Use of appropriate C programming constructs to implement algorithms.
4. Identification and rectification of coding errors in program.
4. Develop applications in a modular fashion.
5. Manage data using files.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and setup program development environment.
2. Implement the algorithms using C programming language constructs.
3. Identify and rectify the syntax errors and debug program for semantic errors.
4. Solve problems in a modular approach using functions.
5. Implement file operations with simple text data.

List of Experiments:

1. Familiarization with programming environment.
2. Simple computational problems using arithmetic expressions.
3. Problems involving if-then-else structures.
4. Iterative problems e.g., sum of series.
5. Simple functions.
6. Recursive functions.
7. 1D Array manipulation.
8. 2D arrays and strings.
9. Matrix problems, String operations.
10. Pointers and structures.
11. Dynamic memory allocation and error handling.
12. File handling Design the experiments in such a way that the students will be able to end up the solution for a real world problem that uses most of the concepts of C programming language. For example: A banking application where it uses the concepts of operators, control structures, switch case for menu, structures, functions, error handling, files etc.

Text Books:

1. Pradeep Dey and Manas Ghosh, "**Programming in C"**, Oxford Press, 2nd Edition, 2017.
2. ReemaTharaja "**Introduction to C Programming**", Second Edition, OXFORD Press,2015.

Suggested Reading:

1. https://www.tutorialspoint.com/cprogramming/index.htm
2. https://www.w3resource.com/c-programming/programming-in-c.php
3. https://www.w3schools.in/c-tutorial/

18CY C02

CHEMISTRY LAB

(Common to all branches)

Instruction:	3 Hours per Week
Duration of Semester End Examination:	3 Hours
Semester End Examination:	50 Marks
Continuous Internal Evaluation:	25 Marks
Credits:	1.5

Course Objectives: The objectives of this course are

1. To impart fundamental knowledge in handling the equipment / glassware and chemicals in chemistry laboratory.
2. The student should be conversant with the principles of volumetric analysis and identification of organic functional groups.
3. To apply various instrumental methods to analyze the chemical compounds and to improve understanding of theoretical concepts.

Course Outcomes:

The chemistry laboratory course will consist of experiments illustrating the principles of chemistry relevant to the study of science and engineering. On Successful completion of the course, students will be able to

1. Identify the basic chemical analysis methods to calculate the substances quantitatively.
2. Determine the rate constants of reactions from concentration of reactants/ products as a function of time
3. Calculate the concentration and amount of various substances using instrumental techniques.
4. Develop the basic drug molecule and Identify the organic compounds
5. Analyse the molecular properties such as surface tension and viscosity

Chemistry Lab

1. Estimation of temporary and permanent hardness of water using EDTA solution
2. Estimation of amount of chloride in water.
3. Determination of rate constant for the reaction of hydrolysis of methyl acetate.(first order)
4. Estimation of amount of HCl Conductometerically using NaOH solution.
5. Estimation of (a) amount of CH_3 COOH Conductometerically using NaOH solution. (b) amount of HCl and CH_3 COOH present in the given mixture of acids Conductometerically using NaOH solution.
6. Estimation of amount of HCl Potentiometrically using NaOH solution.
7. Estimation of amount of Fe^{+2} Potentiometrically using KMnO solution.
8. Distribution of acetic acid between n-butanol and water.
9. Synthesis of drug - Aspirin.
10. Organic Chemistry- Identification of Functional groups - neutral group (carbonyl groups-acetaldehyde and acetone); acidic group(benzoic acid); basic group (aniline)
11. Determination of surface tension of organic solvents (ethanol, ethyl acetate)
12. Determination of Viscosity.

Text Books:

1. J. Mendham and Thomas,"Vogel' s text book of quantitative chemical analysis",Pearson education Pvt.Ltd. New Delhi ,6th ed. 2002.

Suggested Reading:

1. Dr. Subdharani , "Laboratory Manual on Engineering Chemistry", Dhanpat Rai Publishing, 2012.
2. S.S. Dara , "A Textbook on experiment and calculation in engineering chemistry", S.Chand and Company, 9th revised edition, 2015.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION
II-Semester of B.E, Model Curriculum
COMPUTER SCIENCE AND ENGINEERING

SEMESTER – II

S.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE inHours	MaximumMarks		
			L	T	P/D		CIE	SEE	
	THEORY								
1	18MT C03	Mathematics -II	3	1	-	3	30	70	4
2	18PY C01	Optics and Semiconductor Physics	3	1	-	3	30	70	4
3	18CS C03	Object-Oriented Programming	3	-	-	3	30	70	3
4	18EG C01	English	2	-	-	2	20	50	2
	PRACTICALS								
5	18PY C02	Optics and Semiconductor Physics Laboratory	-	-	3	3	25	50	1.5
6	18CS C04	Object-Oriented Programming Lab	-	-	4	3	25	50	2
7	18ME C02	Workshop/ Manufacturing Practice	1	-	4	3	25	50	3
8	18EG C02	English Lab	-	-	2	2	15	35	1
Total			**12**	**02**	**13**	**-**	**200**	**445**	**20.5**

L: Lecture D: Drawing CIE - Continuous Internal Evaluation
T: Tutorial P: Practical SEE - Semester End Examination

18MT C03

MATHEMATICS-II

(Common to all branches and except for Bio-Tech)

Instruction	3 L+1T Hours per week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	4

Course Objectives: The objectives of this course are

1. To evaluate double and triple integrals of various functions and their significance.
2. To evaluate vector line, surface and volume integrals.
3. To know the relevant method to solve higher order differential equations.
4. To evaluate complex integration.
5. To evaluate real and definite integrals.
6. To know the methods to solve real life problems.

Course Outcomes: On Successful completion of the course, students will be able to

1. Find the areas, volumes and surface of solids revolution.
2. Use Greens, Gauss and Stoke's theorems to find the surface and volume integrals.
3. Able to solve solutions of differential equations with initial and boundary value problems.
4. Solve the problems on analytic functions, Cauchy's theorem and Cauchy's integral formula.
5. Real and complex integrals by using Cauchy's theorems.
6. Solve physical and engineering problems.

UNIT-I

Multivariable Calculus (Integration): Applications of definite integrals to evaluate surface areas and volumes of revolutions. Double integrals, Change of order of integration, Triple integrals, Change of variables in integrals, Applications: areas and volumes, Centre of mass and Gravity (constant and variable densities).

UNIT-II

Vector Integral Calculus: Line, Surface and Volume integrals, Green's theorem in a plane, Gauss's divergence theorem and Stoke's theorem (without proof). **First Order Ordinary Differential Equations:** Exact first order differential equations , Integrating factors, Linear first order equations , Bernoulli's, Riccati's and Clairaut's differential equations ,Orthogonal trajectories of a given family of curves.

UNIT-III

Ordinary Differential Equations of Higher Orders: Solutions of higher order linear equations with constants coefficients, Method of variation of parameters, solution of Euler-Cauchy equation. Ordinary point, singular point and regular singular point, Power Series solution. Legendre Polynomial of first kind (without proof), Rodrigues formula, Generating function, recurrence relations, orthogonality of Legendre polynomials, Bessel's function of first kind (without proof), recurrence relations and problems.

UNIT-IV

Complex Variables – I: Differentiation, analytic functions, Cauchy-Riemann equations, harmonic functions, finding harmonic conjugate, elementary analytic functions (exponential, trigonometric, logarithm) and their properties. Conformal mappings, Mobius transformations and their properties. Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof).

UNIT-V

Complex Variables – II: Liouville's theorem and Maximum-Modulus theorem (without proof). Taylor's series, Laurent's series, zeros of analytic functions, singularities, Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine. Improper real integrals with singular points on the upper half plane.

Text Books:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 44th Edition, 2017.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

Suggested Reading:

1. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
2. R.K. Jain, S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publications,5th edition,2016.
3. G.B. Thomas and R.L. Finney, Calculus and Analytic Geometry, 9th Edition, Pearson, Reprint, 2002.

18PY C01

OPTICS AND SEMICONDUCTOR PHYSICS

(for CSE, ECE & IT)

Instruction	3L+1T Hours per Week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	4

Course Objectives: The objectives of this course are

1. Understands the fundamentals of wave nature of light.
2. Acquires knowledge of lasers.
3. Familiar with Quantum Mechanics.
4. Learns the fundamental concepts of solids.
5. Understands the basics of semiconductors.

Course Outcomes: On Successful completion of the course, students will be able to

1. Demonstrate the wave nature of the light.
2. Describe the types of lasers and their applications.
3. Explain the importance of wave mechanics.
4. Demonstrate the importance of band theory of solids.
5. Identify the semiconductors for engineering applications.

UNIT-I

Wave Optics: Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer. Farunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

UNIT-II

Lasers: Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO2), solid-state lasers (ruby, Neodymium), dye lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine.

UNIT-III

Wave Nature of Particles and Schrodinger Equation: Introduction to Quantum mechanics, Wave nature of Particles, Time-dependent and time independent Schrodinger equation for wavefunction, Born interpretation, probability current, Expectation values, Free-particle wavefunction and wave-packets, Uncertainty principle.

UNIT – IV

Introduction to Solids: Free electron theory of metals, Fermi level, density of states, Application to white dwarfs and neutron stars, Bloch's theorem for particles in a periodic potential, Kronig-Penney model, Scattering from a potential barrier and tunneling; related examples like alpha-decay, field-ionization and scanning tunneling microscope.

UNIT-V

Semiconductors: Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal-semiconductor junction (Ohmic and Schottky), Thermistor, Hall effect, LED, Solar cell.

Text Books:

1. B.K. Pandey and S. Chaturvedi, *Engineering Physics*, Cengage Publications, 2012.
2. M.N. Avadhanulu and P.G. Kshirsagar, *A Text BookEngineering Physics*, S. Chand Publications, 2014.
3. M. Arumugam, *Materials Science*, Anuradha Publications, 2015.
4. S.L. Gupta and Sanjeev Gupta, *Modern Engineering Physics*, Dhanpat Rai Publications, 2011.

Suggested Reading:

1. R. Murugeshan and Kiruthiga Sivaprasath, *Modern Physics*, S. Chand Publications S. Chand Publications, 2014.
2. V. Rajendran, *Engineering Physics*, McGahill Education Publications, 2013.
3. P.K. Palanisamy, *Engineering Physics*, Scitech Publications, 2012.
4. V. Raghavan, *Materials Science and Engineering*, Prentice Hall India Learning Private Limited; 6th Revised edition, 2015.

18CS C03

OBJECT ORIENTED P ROGRAMMING

Instruction	3 Periods per week
Duration of Semester-End Examination	3 Hours
Semester-End Examination	70 Marks
Sessional	30 Marks
Credits	3

Course Objectives: The objectives of this course are
1. Describe the principles of Object-Oriented Programming.
2. Enable the students to solve problems using OOPs features.
3. Debugging in programs and files.
4. Use of library modules to develop GUI applications.

Course Outcomes: On Successful completion of the course, students will be able to
1. Understand the concepts Object-Oriented Programming Languages.
2. Adequately use the constructs such as selection, repetition, functions and aggregated data .
3. Develop applications in modular approach with classes/modules.
4. Develop solutions to the problems using exception handling.
5. Build packages for simple real world problems and use libraries/packages for graphics and plotting.

Unit-I

Introduction to Object Oriented Programming: Computer Programming and Programming Languages, Generations of Programming Languages, Programming Paradigms, Features of Object Oriented Programming, Merits and Demerits of OOPs
Basics of Python Programming: Features of Python, Variables, Identifiers, Datatypes, Input/ Output operations, Operators and Expressions, operations on strings, Type conversion.

Unit-II

Decision Control Statement: Selection/Conditional Branching, Loop Control Structures, Nested loops.
Functions and Modules: Uses of functions, Function definition, function call, Variable scope and Lifetime, Recursion, Lambda functions, Recursive Functions, Modules, Packages.

Unit-III

Classes and Objects: Introduction, Classes and Objects, _init method, Class variables, and Object variables, Public and Private Data members , calling methods from other methods, built-in class attributes, garbage collection, class methods, static methods.

Unit-IV

Inheritance: Introduction, Inheriting classes, Polymorphism and method overloading, Composition or Containership, Abstract classes and inheritance. **Operator Overloading**: Introduction, Implementation of Operator Overloading, Overriding.
File Handling: File types, opening and closing files, reading and writing files, file positions.

Unit-V

Error and Exception Handling: Introduction, to errors and exceptions, Handling Exceptions Simple GUI Programming with tkinterpackage, Sample Graphics using Turtle, Plotting Graphs in Python.

Text Books:
1. ReemaThareja "Python Programming", Oxford Press, 2017.
2. Mike McGrath "Python in easy steps: Makes Programming Fun", Kindle Edition, 2017.

Suggested Reading:
1. https://anandology.com/python-practice-book/ object_oriented_programming.html
2. http://python-textbok.readthedocs.io/en/1.0/ Object_Oriented_Programming.html
3. http://www.tutorialspoint.com/python/python_classes_objects.html

18EG C01

ENGLISH

(Common to all branches)

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	20 Marks
Credits	2

Course Objectives: The objectives of this course are

1. To enable the students to understand the role and importance of communication and to develop their basic communication skills in English.
2. To equip the students with basics of writing correct sentences to coherent paragraphs.
3. To equip the students with techniques of writing a précis and an essay by using accurate grammar and appropriate vocabulary.
4. To train the students to describe, define and classify processes and to draft formal reports by adhering to the proper structure.
5. To develop the reading skills and reading comprehension techniques of the students.

Course Outcomes: On Successful completion of the course, students will be able to

1. The students will understand the nature, process and types of communication and will communicate effectively without barriers.
2. The students will write correct sentences and coherent paragraphs.
3. The students will know how to condense passages by writing précis and write essays by using accurate grammar and appropriate vocabulary.
4. The students will demonstrate advanced writing skills by drafting formal reports.
5. The students will apply their reading techniques and analyze reading comprehension passages.

UNIT - I

Understanding Communication in English:

Introduction, nature and importance of communication.Process of communication.Basic types of communication - verbal and non-verbal.Barriers to communication.Intrapersonal and interpersonal communication.Johari Window

Vocabulary and Grammar: The concept of Word Formation. Importance of proper punctuation.Articles.

UNIT - II

Developing Writing Skills I:

Types of sentences.Use of phrases and clauses in sentences.Cohesion and coherence. Paragraph writing. Organizing principles of paragraphs in documents. **Vocabulary and Grammar:** Cohesive devices. Root words from foreign languages and their use in English. Prepositions.

UNIT- III

Developing Writing Skills II:

Techniques for writing precisely. Précis Writing. Essay Writing.

Vocabulary and Grammar: Subject-verb agreement, Noun-pronoun agreement Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Redundancies, Clichés.

UNIT - IV

Developing Writing Skills III:

Describing, Defining, Classifying, Providing examples or evidence.Writing introduction and conclusion.

Report writing – Importance, structure and elements of style of formal reports.

Vocabulary and Grammar: Misplaced modifiers. Synonyms, antonyms.

UNIT - V

Developing Reading Skills:

The reading process, purpose, different kinds of texts.Reading comprehension. Techniques of comprehension – skimming, scanning, drawing inferences and conclusions.

Vocabulary and Grammar : Words often Confused. Standard abbreviations

Text Books:

1. Language and Life: A Skills Approach, Board of Editors, Orient Black Swan, 2017.
2. Swan Michael, Practical English Usage.OUP. 1995.

Suggested Readings:

1. Wood F.T,Remedial English Grammar, Macmillan, 2007.
2. Zinsser William,On Writing Well, Harper Resource Book, 2001.
3. Sanjay Kumar and PushpLata,Communication Skills.Oxford University Press, 2011.

18PY C02

OPTICS AND SEMICONDUCTOR PHYSICS LABORATORY

Instruction	3 Hours per Week
Duration of Semester End Examination	3Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	1.5

Course Objectives: The objectives of this course are

1. Apply theoretical physics knowledge in doing experiments.
2. Understand the behavior of the light experimentally.
3. Analyze the behavior of semiconductor materials and optoelectronic devices.

Course Outcomes: On Successful completion of the course, students will be able to

1. Understand the concept of errors and find the ways to minimize the errors.
2. Demonstrate interference and diffraction phenomena experimentally.
3. Understand the applications of semiconductor materials.
4. Know the working of optoelectronic devices.
5. Use LCR circuits in different applications.

List of Experiments:

1. Error analysis - Estimation of errors in the determination of time period of a torsional pendulum.
2. Hall effect – Determination of Hall coefficient, carrier concentration & mobility of charge carriers of given semiconductor specimen.
3. Thermistor – Determination of temperature coefficient of resistance of given thermistor.
4. Solar cell - Study of I-V characteristics of given solar cell and calculation of fill factor, efficiency and series resistance.
5. P-N junction diode – Study of V-I characteristics and calculation of resistance of given diode in forward and reverse bias.
6. Energy gap – Determination of energy gap of given semiconductor.
7. Planck's constant – Determination of Planck's Constant using photo cell.
8. I-V characteristics of LED.
9. Photodiode.
10. Laser – Determination of wavelength of given semiconductor red laser.
11. Newton's rings - Determination of wavelength of given monochromatic source.
12. Diffraction grating – Determination of wavelengths of two yellow lines of mercury light.
13. LCR circuit (Resonance).

Suggested Readings:

1. Engineering Physics Manual by Department of Physics, CBIT, 2016.
2. S.K. Gupta, Engineering Physics Practical, Krishna's Educational Publishers, 2014.
3. O.P. Singh, V. Kumar and R.P. Singh, Engineering Physics Practical Manual, Ram Prasad & Sons Publications, 2009.
4. Indu Prakash, Ram Krishna and A.K. Jha, A Text Book of Practical Physics, Kitab Mahal Publications, 2012.

18CS C04

OBJECT ORIENTED PROGRAMMING LAB

Instruction	4 Periods per week
Duration of Semester-End Examination	3 Hours
Semester-End Examination	50 Marks
Sessional	25 Marks
Credits	2

Course Objectives: The objectives of this course are

1. Identification and installation of required software to work with Python.
2. Program development using OOPs concepts.
3. Handling of errors in program code.
4. Use of library modules to develop GUI applications.

Course Outcomes: On Successful completion of the course, students will be able to

1. Set up programming environment to work with Python.
2. Chose appropriate control constructs, data structures to implement the solutions. Design and develop solutions in to the modular approach using OOPs concepts.
3. Debug programs to verify and validate one code.
4. Use of STLs and modules for graphics and plotting.
5. Design and develop solutions to the problems in modular approach using OOPs concepts.

Lab experiments:

1. Installation of any Object Oriented Programming Language and IDE.
2. Simple scripts to demonstrate the use of basic data types and operators.
3. Simple scripts to demonstrate the use of control structures.
4. Functions and Lambda function and parameter passing.
5. Experimentation with Modules.
6. Implementation of classes with attributes and methods.
7. Demonstration of inheritance.
8. Experiments on Overloading.
9. Exceptions and built-in tools.
10. Experiments on System interfaces and GUIs.

Text Book:

1. ReemaThareja "Python Programming", Oxford Press, 2017.

Suggested Reading:

2. https://vknight.org/cfm/labsheets/04-object-oriented-programming/
1. http://learning-python.com/class/Workbook/x-exercises.htm
2. https://inst.eecs.berkeley.edu/~cs61a/fa14/lab/lab06/#inheritance
3. https://anandology.com/python-practice-book/ object_oriented_programming.html
4. http://stanfordpython.com/

18ME C02

WORKSHOP/ MANUFACTURING PRACTICE

Instruction	1T+4P Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	3

Course Objectives: The objectives of this course are

1. Give a feel of Engineering Practices & develop holistic understanding of various Engineering materials and Manufacturing processes.
2. Develop skills of manufacturing, safety, precision, quality, intelligent effort, optimization, positive & team work attitude to get things right the first time.
3. To provide basic knowledge of Steel, Plastic, Composite and other materials for suitable applications.
4. Study of Principle and hands on practice on techniques of fabrication, welding, casting, manufacturing, metrology, and allied skills.
5. To advance important hard & pertinent soft skills, productivity, create skilled manpower which is cognizant of industrial workshop compo- nents and processes and can communicate their work in a technical, clear and effective way.

Course Outcomes – (Laboratory): On Successful completion of the course, students will be able to

1. Fabricate components with their own hands.
2. Get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
3. Assembling different components, student will be able to produce small mechanisms/devices of their interest.
4. Gain practical skills of carpentry, tinsmithy, fitting, house wiring.
5. Gain knowledge of different Engineering Materials and Manufacturing Methods and Understand trades and techniques used in Workshop and chooses the best material/ manufacturing process for the application

List of Exercises

CYCLE 1

Exercises in Carpentry

1. To plane the given wooden piece to required size
2. To make a lap joint on the given wooden piece according to the given dimensions.
3. To make a dove tail-joint on the given wooden piece according to the given dimensions.

Exercises in Tin Smithy

4. To make a rectangular box from the given sheet metal with base and top open. Solder the corners.
5. To make a scoop.
6. To make a pamphlet box.

Exercises in Fitting

7. To make a perfect rectangular MS flat and to do parallel cuts using Hack saw
8. To make male and female fitting using MS flats-Assembly1
9. To make male and female fitting using MS flats-Assembly2

Exercises in House Wiring

10. Wiring of one light point controlled by one single pole switch, a three pin socket controlled by a single pole switch, and wiring of one buzzer controlled by a bell push
11. Wiring of two light points connected in series and controlled by single pole switch. Verify the above circuit with different bulbs.Wiring of two light points connected in parallel from two single pole switches and a three pin socket
12. Stair case wiring-wiring of one light point controlled from two different places independently using two 2-way switches.

CYCLE 2

Exercises in Casting

1. Green sand moulding practice for a single piece pattern
2. Green sand moulding practice for a split pattern with a horizontal core
3. Melting and Pouring of Aluminium
4. Study and Demonstration of Injection moulding

Exercises in Welding

5. Study of gas welding equipment and process. Identification of flames, making Butt joint with gas welding.
6. Study of Arc welding process, making Butt joint with DCSP, DCRP
7. Study of Arc welding process, making Lap joint with A.C
8. Study of resistance welding process and making Lap joint with spot welding

Exercises in Machine shop

9. Introduction to Machine Tools, like Lathe, Drilling, Milling and Shaper
10. Plain and step turning operations on Lathe
11. Step turning and Knurling on Lathe machine
12. Taper turning on Lathe

Text Books:

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology",4th edition, Pearson Education India Edition, 2002.

Suggested Reading:

1. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
2. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
3. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House,2017.

18EG C02

ENGLISH LAB

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
Continuous Internal Evaluation:	15 Marks
Credits	1

Course Objectives: The objectives of this course are

1. To introduce students to phonetics and the different sounds in English.
2. To familiarize the students with the software and give them sufficient practice in correct pronunciation.
3. To enable students to speak English correctly with focus on stress and intonation.
4. The students will enhance their listening skills by practicing IELTS and TOEFL material.
5. To help students overcome their inhibitions while speaking in English and to build their confidence. The focus shall be on fluency rather than accuracy.

Course Outcomes: On Successful completion of the course, students will be able to

1. Differentiate the speech sounds in English.
2. Interact with the software and understand the nuances of pronunciation in English.
3. Speak with the proper tone, intonation and rhythm and apply stress correctly. The students will demonstrate their listening skills by analyzing the IELTS and TOEFL listening comprehension texts.
4. Speak with clarity and confidence.
5. Work in teams and discuss various topics and demonstrate their presentation skills through posters.

Exercises

1. **Introduction to English Phonetics**: Introduction to auditory, acoustic and articulatory phonetics, organs of speech: the respiratory, articulatory and phonatory systems.
2. **Sound system of English**: Phonetic sounds and phonemic sounds, introduction to international phonetic alphabet, classification and description of English phonemic sounds, minimal pairs . The syllable: types of syllables, consonant clusters.
3. **Word stress**: Primary stress, secondary stress, functional stress, rules of word stress.
4. **Rhythm &Intonation** : Introduction to Rhythm and Intonation. Major patterns, intonation of English with the semantic implications.
5. **Listening skills** – practice with IELTS and TOEFL material
6. **Situational dialogues and role play –** Dialogue writing, – Role behavior and role enactment.
7. **Group Discussions -** Dynamics of a group discussion, group discussion techniques, body language.
8. **Public speaking –** Speaking with confidence and clarity in different contexts on various issues.
9. **Poster presentation –** Theme, poster preparation, team work and presentation.

Suggested Reading

1. T Balasubramanian. A Textbook of English Phonetics for Indian Students, Macmillan, 2008.
2. J Sethi et al. A Practical Course in English Pronunciation (with CD), Prentice Hall India, 2005.
3. Priyadarshi Patnaik. Group Discussions and Interviews, Cambridge University Press Pvt Ltd 2011.
4. Aruna Koneru, Professional Speaking Skills, Oxford University Press, 2016.

Model Curriculum

B.E Syllabus for III and IV Semester

With effect from 2019-20

Specialization /Branch: Computer Science and Engineering

Chaitanya Bharathi Institute of Technology (A)
Chaitanya Bharathi (P.O), Gandipet
Hyderabad-500075, Telangana State.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (A)
SCHEME OF INSTRUCTION AND EXAMINATION
III-Semester of B.E, Model Curriculum
COMPUTER SCIENCE AND ENGINEERING

SEMESTER – III

S.No	Course Code	Title of the Course	Scheme of Instruction			Duration of SEE in Hours	Scheme of Examination		
			Hours per Week				Maximum Marks		Credits
			L	T	P/D		CIE	SEE	
THEORY									
1.	18EEC01	Basic Electrical Engineering	3	1	0	3	30	70	4
2.	18CSC07	Data Structures	3	0	0	3	30	70	3
3.	18CSC08	Discrete Mathematics	3	1	0	3	30	70	4
4.	18CSC09	Digital Electronics and Logic Design	3	0	0	3	30	70	3
5.	18MEC09	Principles of Management	3	0	0	3	30	70	3
6.	18CEM01	Environmental Science	2	0	0	2	-	50	0
PRACTICAL									
7.	18EEC02	Basic Electrical Engineering Lab	0	0	2	2	15	35	1
8.	18CSC10	Data Structures Lab	0	0	2	2	15	35	1
9.	18CSC11	Digital Electronics and Logic Design Lab	0	0	2	2	15	35	1
10.	18EGC03	Soft Skills	0	0	2	2	15	35	1
TOTAL			**17**	**2**	**8**		**210**	**540**	**21**

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

18EE C01

BASIC ELECTRICAL ENGINEERING

Instruction:	3L+1T Hours per Week
Duration of Semester End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	4

Course Objectives: The objectives of this course are

1. To understand the behavior of different circuit elements R,L & C, and the basic concepts of electrical circuit analysis.
2. To know the concepts of AC circuits, RMS value, Average value, Phasor analysis etc.
3. To understand the basic concepts of Transformer.
4. To understand the basic concepts of DC machines and AC machines.
5. To know about different types of electrical wires and cables and to understand safety rules and methods of earthing.

Course Outcomes: On Successful completion of the course, students will be able to

1. Acquire the concepts of Kirchhoff's laws and network theorems and able to get the solution of simple dc circuits Obtain the steady state response of RLC circuits and also determine the different powers in AC circuits
2. Acquire the concepts of principle of operation of Transformers and DC machines
3. Acquire the concepts of principle of operation of DC machines and AC machines
4. Acquire the knowledge of electrical wiring and cables and electrical safety precautions
5. Recognize importance of earthing and methods of earthing and electrical installations

UNIT-I: DC Circuits

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation, Superposition, Thevenin and Norton Theorems, Time-domain analysis of firstorder RL and RC circuits.

UNIT-II: AC Circuits

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel). Three phase balanced circuits, voltage and current relations in star and delta connections.

UNIT-III: Transformers

Construction, Working principle, EMF Equation, Ideal and Practical transformer, Equivalent circuit of Transformer, OC and SC tests on a transformer, Efficiency and Regulation, Auto transformer.

UNIT-IV: DC and AC Machines

DC Generators: Construction, Principle of operation, EMF equation, Classification, Characteristics of shunt, series and compound generators. DC Motors: Classification, Torque equation, Characteristics, Efficiency, Speed Control of Series and Shunt Motors. Three - Phase Induction Motors: Construction, Principle of operation, Torque equation, torque-slip characteristics, Power stages, speed control of induction motors.

UNIT-V: Electrical Installations and Electrical Wiring

Types of wires and cables, Electrical Safety precautions in handling electrical appliances, electric shock, first aid for electric shock, safety rules.

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Earthing, Elementary calculations for energy consumption.

Text books:

1. L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.
2. E. Hughes, Electrical and Electronics Technology, Pearson, 2010.

Suggested Reading:

1. D. P. Kothari & I. J. Nagrath, –Basic Electrical Engineering Tata McGraw Hill, 2010.
2. V. D. Toro, –Electrical Engineering Fundamentals Prentice Hall India, 1989.
3. D.C. Kulshreshtha, –Basic Electrical Engineering McGraw Hill, 2009
4. P.V.Prasad, S.sivanagaraju, R.Prasad, "Basic Electrical and Electronics Engineering" Cengage Learning, 1st Edition, 2013.

18CS C07

DATA STRUCTURES

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Basic knowledge of programming language such as C or C++ is preferred (but not mandatory) and some mathematical maturity also will be expected.

Course Objectives: The objectives of this course are

1. Basic linear and non-linear data structures.
2. Analyzing the performance of operations on data structures.
3. Different balanced binary trees, which provides efficient implementation for data structures.

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand the basic concepts of data structures.
2. Analyze the performance of algorithms.
3. Distinguish between linear and non-linear data structures.
4. Identify the significance of balanced search trees.
5. Establish a suitable data structure for real world applications.

UNIT - I

Introduction: Data Types, Data structures, Types of Data Structures, Operations, ADTs, Algorithms, Comparison of Algorithms, Complexity, Time- space tradeoff. **Recursion**: Introduction, format of recursive functions, recursion Vs. Iteration, examples. **Sorting:** Quick sort, Merge Sort, Selection Sort

UNIT - II

Linked Lists: Introduction, Linked lists, Representation of linked list, operations on linked list, Comparison of Linked Lists with Arrays and Dynamic Arrays, Types of Linked Lists and operations-Circular Single Linked List, Double Linked List, Circular Double Linked List

UNIT- III

Stacks and Queues: Introduction to stacks, applications of stacks, implementation and comparison of stack implementations. Introduction to queues, applications of queues and implementations, Priority Queues and applications

UNIT - IV

Trees: Definitions and Concepts, Operations on Binary Trees, Representation of binary tree, Conversion of General Trees to Binary Trees, Representations of Binary Trees, Tree Traversal. **Binary Search Trees:** Representation and operations. **Heap Tree:** definition, representation, Heap Sort. **Graphs:** Introduction, Applications of graphs, Graph representations, graph traversals, Minimal Spanning Trees.

UNIT - V

Hashing: Introduction, Hashing Functions- Modulo, Middle of Square, Folding, Collision Techniques-Linear Probing, Quadratic Probing, Double Hashing, **Balanced Search Trees:** AVL Trees, Red-Black Trees, Splay Trees, B-Trees

Text Books:

1. Narasimha karumanchi, "Data Structures and Algorithms Made Easy", Career Monk Publications, 2017
2. S. Sahni and Susan Anderson-Freed, "Fundamentals of Data structures in C", E.Horowitz, Universities Press, 2nd Edition.
3. ReemaThareja, "Data Structures using C", Oxford University Press.

Suggested Reading:

1. D.S.Kushwaha and A.K.Misra, "Data structures A Programming Approach with C", PHI.
2. Seymour Lipschutz, "Data Structures with C", Schaums Outlines, Kindle Edition

Online Resources:

1. https://www.tutorialspoint.com/data_structures_algorithms/ index.htm
2. https://www.edx.org/course/foundations-of-data-structures
3. https://sites.google.com/site/merasemester/data-structures/data- structures-1#DS

18CS C08

DISCRETE MATHEMATICS

Instruction	3L+1T Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives: The objectives of this course are

1. To provide theoretical foundations of computer sciences.
2. To develop an understanding of logic, set theory, counting, functions, relations and proof techniques.
3. To familiarize with algebraic systems and graph theory.

Course Outcomes: On Successful completion of this course, student will be able to

1. Apply Propositional and Predicate logic for problem solving in various domains.
2. Understand Set Theory, Relations, Functions and Lattices as partially ordered sets.
3. Model and solve the real world problems using Generating Functions and Recurrence Relations.
4. Understand and apply the principles of graphs and trees to simple applications.
5. Study Algebraic systems and their general Properties.

UNIT - I

Fundamental Principles of counting: The Rules of Sum and Product, permutations, Combinations. **Introduction to Propositional Calculus**: Basic Connectives and Truth tables, Logical Equivalence: Laws of Logic, Logical Implication; Rules of Inference. **Predicates**: The Use of Quantifiers, Quantifiers, Definitions and the Proofs of Theorems.

UNIT - II

Sets: Sets and Subsets, Operations on sets and the Laws of Set Theory, Counting and Venn Diagrams. **Relations and Functions:** Cartesian Products and Relations, Functions: Composition of functions, one-one, Onto and Inverse of functions, Pigeon hole principle, partial ordering relations, POSET, Hasse diagrams, Lattices as Partially Ordered Sets, Equivalence relations.

UNIT- III

Generating Functions: Binomial Theorem, Generating Functions, Calculating Coefficient of generating functions.

Recurrence Relations: The First Order Linear Recurrence Relation, Second Order Linear. Homogeneous Recurrence relations with constant coefficients, Non Homogeneous Recurrence relations

UNIT - IV

Introduction to Graphs: Graphs and their basic properties - degree, path, cycle, Sub graphs, Complements and Graph Isomorphism, Euler trails and circuits, Hamiltonian paths and cycles, planar graphs, Euler formula, Graph Coloring and Chromatic polynomial. **Trees**: Definitions, Properties, Rooted Trees, Spanning Trees, Minimum Spanning trees: The Algorithms of Kruskal and Prims.

UNIT - V

Algebraic Structures: Algebraic Systems: Examples and General Properties, Semi groups and Monoids. **Groups:** Definitions and Examples, Subgroups, Homomorphisms and cyclic groups.

Text Books:

1. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics", An Applied Introduction, 4th edition, Pearson Education, 2003.
2. R.K.Bisht, H.S.Dhami, "Discrete Mathematics", Oxford University Press, Published in 2015.

Suggested Reading:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", 7th edition, Tata McGraw-Hill, 2005
2. J.P. Tremblay, R.Manohar, "Discrete Mathematical Structures with Applications to Computer Science", TATA McGraw-Hill Edition, 1995.
3. Joe L.Mott, Abraham Kandel, Theodore P. Baker, "Discrete Mathematics for Computer Scientists & Mathematicians", 2nd Edition, PHI, 1986.
4. David D.Railey, Kenny A. Hunt, "Computational Thinking for the Modern Problem Solving", CRC Press, 2014.

Online Resources:

1. https://nptel.ac.in/courses/111107058/
2. https://nptel-discrete-mathematics-5217

18CS C09

DIGITAL ELECTRONICS AND LOGIC DESIGN

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are

1. To understand the architecture of basic building blocks, logic gates and minimization techniques including Quine-Mcclusky method.
2. To analyze and design the Combinational and Sequential circuits.
3. To familiarize the notations of HDL descriptions in Verilog.

Course Outcomes: On Successful completion of this course, student will be able to

1. Familiarize with number systems, simplification of Boolean functions.
2. Manipulate simple Boolean expressions using maps and tabulation method.
3. Design basic digital circuits in Computer Hardware and Digital system.
4. Use high level HDLs such as Verilog for the design of Combinational and Sequential circuits.
5. Configure registers and counters for different applications.

UNIT - I

Digital Systems and Binary Numbers: Digital systems, Binary numbers, Number base conversions, Octal and Hexadecimal numbers, Complements of Numbers, Binary codes. **Boolean Algebra and logic Gates:** Binary logic, Basic Definitions, Axiomatic Definition of Boolean Algebra, Basic Theorems and Properties of Boolean Algebra, Boolean Functions, Canonical and Standard Forms, Other Logic Operations, Digital Logic Gates, Integrated Circuits.

UNIT - II

Minimization of Switching Functions: Introduction, the map method, minimal functions and their properties, the tabulation procedure, the prime implicant chart. **NAND and NOR Gates**: NAND Circuits, Two-level Implementation, Multilevel NAND Circuits, NOR Circuits. **Exclusive OR Gates**: Odd Function, Parity Generation and Checking.

UNIT- III

Combinational Logic Design: Combinational Circuits. **Analysis Procedure:** Derivation of Boolean Functions, Derivation of the Truth Table, Logic Simulation. **Design Procedure:** Decoders, Encoders, Multiplexers, Binary Adders, Adder- Subtractor, Binary Multiplier, HDL Representations – Verilog.

UNIT - IV

Sequential Circuits: Sequential circuit definitions, Latches, Flip-Flops, sequential circuit analysis, sequential circuit design, design with D Flip-Flops, designing with JK Flip-Flops, HDL representation for sequential circuits - Verilog.

UNIT - V

Registers: Registers, Shift registers. **Counters**: Ripple Counters, Synchronous Binary counters, Other Counters. **Memory and Programmable Logic**: Introduction, Random-Access Memory, Memory Decoding, Error Detection and Correction, Read-Only Memory, Programmable Logic Array (PLA), Programmable Array Logic (PAL).

Text Books:

1. Morris Mano M. and Michael D.Ciletti, "Digital Design, With an Introduction to Verilog HDL", Pearson 5th edition, 2013.
2. ZVI Kohavi, "Switching and Finite Automata Theory", Tata McGraw Hill 2 edition, 1995.

Suggested Reading:

1. H.T. Nagle, "Introduction to Computer logic", Prentice Hall 1975.
2. Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital Logic with VHDL design, McGraw Hill 2nd Edition, 2009.

18ME C09

PRINCIPLES OF MANAGEMENT

Instruction	3 Hours perweek
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are to

1. Understand basic fundamentals and insights of management
2. Understand the nature and purpose of planning
3. Gain the knowledge about the frame work of organizing
4. Understand the essence and significance of directing
5. Recognize the importance of controlling and its outcomes

Course Outcomes: On Successful completion of this course, student will be able to

1. Get an exposure to common electrical components and their ratings
2. Make electrical connections by wires of appropriate ratings
3. Understand the circuit analysis techniques.
4. Determine the parameters of the given coil.
5. Understand the basic characteristics of transformer
6. Understand the basic characteristics of dc and ac machines

UNIT - I

Management: Definition of management**,** science or art, manager vs entrepreneur; managerial roles and skills;. Evolution of management, Basic management theories by FW Taylor, Henry Fayol, Types of Business Organizations, sole proprietorship, partnership, companies, public and private enterprises; Organization culture and environment; Current trends and issues in management

UNIT - II

Planning: Nature and purpose of Planning, types of Planning, objectives, setting objectives, policies, Strategic Management, Planning Tools and Techniques, Planning plant location and layout, Decision making steps & processes.

UNIT- III

Organizing: Nature and purpose of Organizing, formal and informal organizations, organization structure, types, line and staff authority, departmentalization, delegation of authority, centralization and decentralization, job design, human resource management, HR planning, Recruitment selection, Training & Development, Performance Management, Career planning and Management

UNIT - IV

Directing: Individual and group behavior, motivation, theories of motivation, motivational techniques, job satisfaction, job enrichment, leadership, types & theories of leadership, effective communication.

UNIT - V

Controlling: system and process of controlling, budgetary and non-budgetary control techniques, use of computers and IT in management control, productivity problems and management, control and performance, direct and preventive control, reporting.

Text Books:

1. S.P. Robins and M. Couiter, "Management", 10/e.,Prentice Hall India, 2009.
2. JAF Stoner, RE Freeman and DR Gilbert, "Management", 6/e., Pearson Education,2004.

Suggested Reading:

1. P.C. Tripathy & P.N. Reddy, "Principles of Management", Tata McGraw Hill,1999
2. Harold Koontz and Cyril O'Donnell "Principles of Management'', Tata McGraw Hill, 2017

18CE M01

ENVIRONMENTAL SCIENCE
(MANDATORY COURSE)

Instruction	2L Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
CIE	0 Marks
Credits	0

Course Objectives: The objectives of this course are

1. Identify environmental problems arising due to engineering and technological activities and the science behind those problems.
2. Become aware about the importance of eco system and biodiversity for maintaining ecological balance.
3. To identify the importance of interlinking of food chain.
4. Learn about various attributes of pollution management and waste management practices.
5. To make the students contribute for capacity building of nation for arresting and/or managing environmental disasters.

Course Outcomes: On successful completion of this course, student will be able to

1. Define environment, identify the natural resources and ecosystems and contribute for the conservation of bio-diversity.
2. Suggest suitable remedial measure for the problems of environmental pollution and contribute for the framing of legislation for protection of environment.
3. Relate the social issues and the environment and contribute for the sustainable development.
4. Follow the environmental ethics.
5. Contribute for the mitigation and management of environmental disasters.

UNIT - I

Environmental Studies: Definition, Scope And Importance, Need For Public Awareness. Natural resources: Use And Over Utilization of Natural Resources - Water Resources, Food Resources, Forest Resources, Mineral Resources, Energy Resources, Land Resources.

UNIT - II

Ecosystems: Concept of an Ecosystem, Structure And Function of an Ecosystem, Role of Producers, Consumers And Decomposers, Energy Flow in an Ecosystem, Food Chains, Food Webs, Ecological Pyramids, Nutrient Cycling, Bio-Geo Chemical Cycles, Terrestrial And Aquatic Acosystems.

UNIT- III

Biodiversity: Genetic, Species And Ecosystem Biodiversity, Bio-Geographical Classification of India, India as a Mega Diversity Nation. Values of Biodiversity, Hot-Spots of Biodiversity, Threats to Biodiversity, Endangered And Endemic Species of India, Methods of Conservation of Biodiversity

UNIT - IV

Environmental Pollution: Cause, Effects And Control Measures of Air Pollution, Water Pollution, Marine Pollution, Soil Pollution, Noise Pollution And Solid Waste Management, Nuclear Hazards. Environmental Legislations: Environment Protection Act, Air, Water, Forest & Wild Life Acts, Issues Involved in Enforcement of Environmental Legislation, Responsibilities of State And Central Pollution Control Boards.

UNIT - V

Social issues and the environment: Water Conservation Methods: Rain Water Harvesting And Watershed Management, Environmental Ethics, Sustainable Development and Climate Change: Global Warming, Ozone Layer Depletion, Forest Fires, And Contemporary Issues.

Text Books:

1. Y. Anjaneyulu, "Introduction to Environmental Science", B S Publications, 2004.
2. Suresh K. Dhameja, "Environmental Studies", S. K. Kataria& Sons, 2009.

Suggested Reading:

3. C. S. Rao," Environmental Pollution Control Engineering", Wiley, 1991.
4. S. S. Dara, "A Text Book of Environmental Chemistry &Pollution Control", S. Chand Limited, 2006.

18EE C02

BASIC ELECTRICAL ENGINEERING LAB

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	35 Marks
Continuous Internal Evaluation:	15 Marks
Credits	1

Course Objectives: The objectives of this course are

1. To verify the basic electrical circuit laws and theorems.
2. To determine the parameters and power factor of a coil.
3. To calculate the time and frequency responses of RLC circuits
4. To determine the characteristics of Transformers.
5. To determine the characteristics of dc and ac machines.

Course Outcomes: On Successful completion of the course, students will be able to

1. Make electrical connections by wires of appropriate ratings.
2. Understand the circuit analysis techniques.
3. Determine the parameters of the given coil.
4. Understand the basic characteristics of transformer.
5. Understand the basic characteristics of dc and ac machines.

List of Laboratory Experiments/Demonstrations:

1. Demonstration of Measuring Instruments and Electrical Lab components
2. Verification of KCL and KVL.
3. Time response of RL and RC circuits.
4. Calculation of parameters of a choke coil by Wattmeter Method.
5. Verification of Thevenin's and Norton's theorems.
6. Turns ratio /voltage ratio verification of 1-Ph Transformers.
7. OC and SC tests on a given 1-Ph Transformer.
8. Observation of Excitation Phenomenon in Transformer.
9. Measurement of 3-Ph power in a balanced system (By 2- Wattmeter method).
10. Measurement of 3-Ph Energy by an Energy Meter (Demonstration of Principle).
11. Load test of DC Shunt motor.
12. Speed control of DC Shunt motor.
13. Load test of 3-Ph Induction motor.
14. Demonstration of LT Switchgear Equipment/Components.
15. Demonstration of cut - out section of Machines like DC Machine, Induction Machine etc.

Note: At least **TEN** experiments should be conducted in the semester.

18CS C10

DATA STRUCTURES LAB

Instruction	2 Hours per week
Duration of End Examination	2 Hours
Semester End Examination	35 Marks
Continuous Internal Evaluation	15 Marks
Credits	1

Pre-requisites: Any Programming Language(C/Python)

Course Objectives: The objectives of this course are to:

1. Understand basic concepts data structures and abstract data types.
2. Differentiate between linear and non-linear data structures.
3. Analyze various searching, sorting and hashing techniques.

Course Outcomes: On Successful completion of the course, students will be able to

1. Implement the abstract data type.
2. Implement linear data structures such as stacks, queues using array and linked list.
3. Implement non-linear data structures such as trees, graphs.
4. Analyze various searching and sorting techniques.
5. Design and develop real world problem using suitable data structures.

List of Experiments

1. Implementation of Quick Sort, Merge Sort, Selection Sort.
2. Implementation of Insert, Delete and Search operations on Single Linked List.
3. Implementation of Insert, Delete and Search operations on doubly Linked List.
4. Implementation of Stack using array and linked list.
5. Converting of Infix Expression to Postfix.
6. Implement the algorithm for Evaluation of Postfix.
7. Implementation of Queue using array and linked list.
8. Implementation of Binary Tree Traversals.
9. Implementation of Binary Search Tree.
10. Implementation of Heap Sort.
11. Implementation of Graph Traversal Techniques.
12. Implementation of Hashing.

Text Books

1. Brian W Kernighan, Dennis Ritchie, "C Programming Language", PH PTR, 2nd Edition.
2. Richard M Reese, "Understanding and Using C Pointers", O`Reily, 2013.

Online Resources:

1. https://nptel.ac.in/courses/106102064/
2. https://www.udemy.com/algorithms-and-data-structures-in-python/

18CS C11

DIGITAL ELECTRONICS AND LOGIC DESIGN LAB

Instruction	2 Hours per week
Duration of End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives: The objectives of this course are

1. To simulate and synthesize combinational logic circuits.
2. To simulate and synthesize sequential logic circuits.
3. To write a test bench for verifying the functionality and implement procedures for any digital design.

Course Outcomes: On Successful completion of this course, student will be able to

1. Design a Digital circuit using Verilog HDL.
2. Understand various abstraction levels of a digital design.
3. Verify the functionality of a design using Test bench.
4. Simulate and synthesize combinational logic circuits.
5. Simulate and synthesize sequential logic circuits.

Write a Verilog HDL to Simulate and synthesize the following

1. Implement operators and operands using Verilog.
2. Logic Gates: AND, OR, BUFFER.
3. Arithmetic Units: Adders and Subtractors.
4. Magnitude Comparator, BCD to Excess 3, BCD to 7-segment display.
5. Multiplexers and De-multiplexers.
6. Encoders, Decoders, Priority Encoder.
7. Implementation of logic function using Multiplexers and Decoders.
8. Implementation of Ripple Carry Adder.
9. Flip-Flops.
10. Design of Synchronous Counters.

Text Book:

1. Samir Palnitkar, "Verilog HDL, A guide to Digital design and synthesis", 2/e, Pearson Education, 2008.

Suggested Reading:

1. Michael D. Ciletti, "Advanced Digital Design with Verilog HDL", PHI, 2005.

18EG C03

SOFT SKILLS

Instruction	2 Hours per week
Duration of End Examination	2 Hours
Semester End Examination	35 Marks
CIE	15 Marks
Credits	1

Course Objectives: The objectives of this course are:

1. Imbibe an impressive personality, etiquette, professional ethics & values, effective time management & goal setting.
2. Understand the elements of professional update & upgrade through industry exposure in a mini-live project. Understand confidence building strategies and thereby to make effective presentations through PPTs.
3. Learn what constitutes proper grooming and etiquette in a professional environment. Acquire the necessary skills to make a smooth transition from campus to corporate.

Course Outcomes: On Successful completion of the course, students will be able to

1. Be effective communicators and participate in group discussions and case studies with confidence. Also be able to make presentations in a professional context.
2. Write Resumes, prepare and face interviews confidently.
3. Be assertive and set short term and long term goals. Also learn to manage time effectively and deal with stress.
4. Make the transition smoothly from Campus to Corporate. Also use media with etiquette and know what academic ethics are.
5. To do a live, mini project by collecting and analyzing data and making oral and written presentation of the same.

Exercise 1

Main Topics: Thinking Skills, Personality Development – Effective Time Management, setting realistic goals, self confidence and assertiveness, stress management, moral values.
Flipped Sessions: Personal Sensitivity & Professional Sensibility (Reading & Discussion),
Writing Input: Writing to Express - Drafting & Delivering a Speech (Free Writing Exercise).

Exercise 2

Main Topics: Advanced Group Discussion with Case studies: Dynamics of group discussion, intervention, summarizing and modulation of voice, body language, relevance, fluency and coherence. **Flipped Sessions:** Importance of Professional Updating & Upgrading (Reading & Discussions). **Writing Input:** Writing with Precision - Writing Abstracts.

Exercise 3

Main Topics: Interview Skills – concept and process, pre-interview planning, opening strategies, answering strategies, mock interviews. Resume' writing – structure and presentation, planning, defining the career objective, projecting ones strengths and skills.
Flipped Sessions: Mock Interviews (Video Sessions &Practice), **Writing Input:**
Writing to Reflect - Resume Writing.

Exercise 4

Main Topic: Corporate Culture – Grooming and etiquette, communication media, academic ethics and integrity, **Flipped Sessions:** Corporate Culture, Etiquette & Grooming (Video Sessions and Practice through Role-play), **Writing Input:** Writing to Define - Writing an effective SOP.

Exercise 5

Main Topic: Mini Project – General/Technical. Research, developing a questionnaire, data collection, analysis, written report and project seminar.Elements and Structure of effective presentation. Presentation tools – Body language, Eye-contact, Props and PPT.
Flipped Sessions: Effective Presentations (Video & Writing Sessions, Practice through Emulation), **Writing Input:** Writing to Record - Writing minutes of meeting.

Suggested Reading:

1. Madhavi Apte , "A Course in English communication", Prentice-Hall of India, 2007.
2. Dr. Shalini Verma, "Body Language- Your Success Mantra", S Chand, 2006.
3. Ramesh, Gopalswamy, and Mahadevan Ramesh, "The ACE of Soft Skills", New Delhi: Pearson, 2010.
4. Van Emden, Joan, and Lucinda Becker, "Presentation Skills for Students", New York: Palgrave Macmillan, 2004.
5. Flipped Class-room: Students explore the concept first and then trainer explains it, students work on their own.

Web Resources:

1. https://www.goskills.com/Soft-Skills
2. https://www.trainerbubble.com
3. https://www.skillsconverged.com

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
SCHEME OF INSTRUCTION AND EXAMINATION
IV-Semester of B.E, Model Curriculum
COMPUTER SCIENCE AND ENGINEERING

SEMESTER – IV

S.No	Course Code	Title of the Course	Scheme of Instruction				Scheme of Examination		
			Hours per week			Duration of SEE in Hours	Maximum Marks		Credits
			L	T	P/D		CIE	SEE	
THEORY									
1	18ECC34	Basic Electronics	3	-	-	3	30	70	3
2	18MTC09	Probability and Statistics	3	1	-	3	30	70	4
3	18CSC12	Computer Architecture and Micro Processor	3	-	-	3	30	70	3
4	18CSC13	Data Base Management Systems	3	-	-	3	30	70	3
5	18EGM01	Indian Constitution and Fundamental Principles	2	-	-	2	-	* 50	0
PRACTICALS									
6	18ECC35	Basic Electronics Lab	-	-	2	2	15	35	1
7	18CSC14	Computer Architecture and Micro Processor Lab	-	-	3	3	25	50	1.5
8	18CSC15	Data Base Management Systems Lab	-	-	3	3	25	50	1.5
9	18CSC16	IT Workshop (Latex/Scilab)	-	1	2	3	25	50	2
		TOTAL	**14**	**2**	**10**	**-**	**210**	**515**	**19**

L: Lecture D: Drawing CIE - Continuous Internal Evaluation
T: Tutorial P: Practical SEE - Semester End Examination

18ECC34

BASIC ELECTRONICS

Instruction	3 L Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Prerequisite: Knowledge about semiconductor physics and basic electrical engineering.

Course Objectives: The objectives of this course are

1. Describe semiconductor devices principle and to understand the characteristics of junction diode and transistors.
2. Understand working principles of Oscillators and Amplifiers.
3. Understand the working principle of the regulators and transducers.

Course Outcomes: On Successful completion of the course, students will be able to

1. Use semiconductor devices in making circuits like rectifiers, filters, regulators etc.
2. Design amplifier and oscillators
3. Compare various types of power amplifiers.
4. Analyze the principles and practices for instrument design to development the real world Problems.
5. Apply concepts of various electronic circuits.

UNIT – I

Semiconductor Theory: Energy levels, Intrinsic and Extrinsic Semiconductor, Mobility, Diffusion and Drift current, Hall effect, Law of mass action, Characteristics of P-N Junction diode, current equation, Parameters and Applications. **Rectifiers:** Half wave and Full wave Rectifiers Bridge and center tapped with and without filters, Ripple factor, regulation and efficiency.

UNIT – II

Transistors: Bipolar and field effect transistors with their h-parameter equivalent circuits, Basic Amplifiers classification and their circuits (Qualitative treatment only). **Regulators and Inverters**: Zener Diode**,** Breakdown mechanisms, Characteristics, Effect of Temperature, Application as voltage regulator.

UNIT – III

Feedback Amplifiers: Properties of Negative Feedback Amplifier, Types of Negative Feedback, Effect of negative feedback on Input impedance and Output impedance, Applications (Qualitative treatment only).

Oscillators: principle of oscillations, LC Type-Hartley, Colpitt and RC Type- Phase shift, Wien Bridge and Crystal Oscillator (Qualitative treatment only).

UNIT – IV

Operational Amplifiers: Basic Principle, Ideal and practical Characteristics and Applications-Summer, Integrator, Differentiator, Instrumentation Amplifier. **Power Amplifiers:** Operation of Class A, Class B, Class AB and Class C power amplifiers

UNIT – V

Data Acquisition systems: Study of transducers-LVDT, Strain gauge. **Photo Electric Devices and Industrial Devices:** Photo diode, Photo Transistor, LED, LCD, SCR, UJT Construction and Characteristics and their applications only. **Display Systems:** Constructional details of C.R.O and Applications.

Text Books:

1. Robert L. Boylestad, Louis Nashelsky, "Electronic Devices and Circuits Theory", Pearson Education, 9thedition, LPE, Reprinted, 2006.
2. Morris Mano, "Digital Design", Pearson Education, Asia 2002.

Suggested Reading:

1. Jacob Millman and C., Halkias, "Electronic Devices", McGraw Hill, Eight Edition, Reprint1985.
2. Ramakanth A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Prentice Hall of India, 3rd edition,1985.
3. W. D. Cooper, A. Helfric, "Electronic Instrumentation and Measurement Techniques", PHI, 4th edition,2010.

18MT C09

PROBABILITY AND STATISTICS
(For CSE and IT)

Instruction	3 L+1T Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	4

Course Objectives: The objectives of this course are
1. To Able to learn and Analyzing data in Linear and Non-Linear form.
2. To Able to fit the hypothetical data using probability distribution.
3. To Understand the data using the testing of Hypothesis.
4. To Able to Analyzing time series data using trend analysis.
5. To Able to formulate and get the solution of real world problem.

Course Outcomes: On Successful completion of the course, students will be able to
1. Use the principle of Least Squares approximating for estimating the value.
2. Use the basic probability for fitting the Random phenomenon.
3. Analyzing data using different methods of hypothesis testing.
4. Use the Moving Averages Methods for trend analysis.
5. Analyze the random phenomena of real world data.

UNIT – I

Basic Statistics: Measures of Central Tendency, Measures of Dispersion, Skewness (SKP & SKB) For Frequency Distribution, Kurtosis, Curve Fitting by The Method of Least Squares, Fitting of Straight Lines, Second Degree Parabola And Growth Curve. ($y = ae^{bx}, y = ax^b$ & $y = ab^x$.)

UNIT – II

Discrete Probability Distributions: Basic Probability, Conditional Probability, Bayes Theorem, Random Variable, Discrete Random Variable, Continuous Random Variable, Properties of Probability Mass Function, Probability Density Function, Mathematical Expectation Variance, Co-Variance And Properties, Poisson Distribution, MGF, CGF, Fitting of Poisson Distribution.

UNIT – III

Continuous Probability Distribution And Bivariate Distribution: Continuous Probability Distribution-Normal Distribution-Standard Normal Random Variable (MGF, Expectation, Variance, Properties of Normal Curve)-Areas Under Normal Curve-Exponential Distribution (MGF, CGF, Expectation, Variance)-Uniform Distribution (MGF, Expectation, Variance)-Bivariate Data Two Dimensional Discrete Random Variable, Continuous Random Variable, Marginal Probability Function, Properties of Joint Probability Function-Sum And Differences.

UNIT – IV

Small Sample Test: Inferential Statistics-Test of Significance-Large Sample Test For Single Proportion, Difference of Proportions, Single Mean, Difference of Means And Differences of Standard Deviations. Small Sample Test-Test For Single Mean, Differences of Means, Test For Ratio of Variances, Chi-Square Test For Goodness of Fit And Independent of Attributes.

UNIT – V

Time Series Analysis and ANOVA: One Way Classification-Assumptions For ANOVA Test-ANOVA For Fixed Effect Model-Two Way Classification-ANOVA For Fixed Effect Model-Components of Time Series-Measurement of Trend - Method of Semi Averages- Moving Averages Method (3 Years And 5 Years).

Text Books:
1. S.C.Gupta, V.K.Kappoor, "Fundamentals of Mathematical Statistics", Sultan Chand and Sons, 2014.
2. S.C.Gupta, V.K.Kappoor, "Fundamentals of Applied Statistics", Sultan Chand and Sons, 2014.
3. Sheldon Ross, "A First Course in Probability", 9th Edition, Pearson publications, 2014.

Suggested Reading:
1. W. Feller, "An Introduction to Probability Theory and its Applications", Vol. 1, 3rd Ed., Wiley, 1968.

18CS C12

COMPUTER ARCHITECTURE AND MICRO PROCESSOR

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Digital Electronics and Logic Design.

Course Objectives: The objectives of this course are

1. To understand the basic principles of Instruction Level Architecture and Instruction Execution, Memory System Design.
2. To learn various I/O devices and its operations, knowledge on Instruction Level Parallelism.
3. To impart the knowledge on Micro Programming and Pipelining techniques.

Course Outcomes: On Successful completion of the course, students will be able to

1. Understand the functional block diagram of single bus architecture of a computer and describe the function of the instruction execution cycle, RTL interpretation of instructions, addressing modes, instruction set.
2. Design assembly language program for specified computing 16 bit multiplication, division and I/O device interface.
3. Derive flowchart for Concurrent access to memory and cache coherency in Parallel Processors and describe the process.
4. Design a memory module and analyze its operation by interfacing with the CPU.
5. Apply design techniques to enhance performance using pipelining, parallelism and RISC methodology.

UNIT - I

Basic Structure of Computers: Computer Types, Functional Units, Basic Operational Concepts, Bus Structures, Software, Performance, Multiprocessors and Multi-computers. **Arithmetic:** Addition and Subtraction of Signed numbers, Design of fast adders, Multiplication of positive numbers, Signed-Operand Multiplication, Integer Division.

UNIT - II

Basic Processing Unit: Fundamental concepts, Execution of a complete instruction, Multiple-Bus organization, Hardwired control, Micro programmed control. **8086 Architecture:** CPU Architecture, Internal operation, Machine language instructions Addressing modes, Instruction formats, Instruction execution timing.

UNIT- III

Assembly Language Programming: Instruction format, Data transfer instructions, Arithmetic instructions. **Assembly Language Programming:** Branch instructions, Loop instructions, NOP and HLT, Flag manipulation instructions, Logical instructions, Shift and Rotate instructions, Directives and Operators. **Modular Programming:** Linking and Relocation, Stacks, Procedures, Interrupts and Interrupt routines, Macros and String instructions, REP prefix.

UNIT - IV

Peripheral devices and their characteristics: Input-output subsystems, I/O device interface, I/O transfers –Program Controlled, Interrupt Driven and DMA, privileged and non-privileged instructions, software interrupts and exceptions. Programs and processes – role of interrupts in process state transitions, I/O device interfaces – SCSI, USB.

Pipelining: Basic concepts, Data hazards, Instruction hazards, Influence on instruction sets, Data path and control considerations, Superscalar operation, Performance considerations.

UNIT – V

The Memory System: Semiconductor RAM Memories, Cache Memories, Performance considerations, Virtual Memories, Memory Management requirements, Secondary Storage. **Large Computer Systems:** Forms of Parallel Processing, Array Processors, Structure of general purpose multiprocessors, Program parallelism and shared variables.

Text Books:

1. Carl Hamacher, ZvonkoVranesic, SafwatZaky, “Computer Organization”, 5th Edition, McGrawHill Education Edition 2011.
2. Yu-chengLiu, Glenn A.Gibson, “Microcomputer Systems: The 8086/ 8088 Family”, 2nd Edition, PHI Learning 2011.

Suggested Reading:

1. M. M. Mano, “Computer System Architecture”, 3rd edition, Prentice Hall, 1994.
2. William Stallings, “Computer Organisation and Architecture, Design for Performance”, Pearson, 9th Edition, 2013.
3. Douglas Hall. “Microprocessor and Interfacing programming and Hardware”, Tata McGraw Hill, Revised 2nd Edition, 2007.
4. Brey B.Brey, “The Intel Microprocessor, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium Pro-Processors-Architecture, Programming and Interfacing”, 4thEdition, Prentice Hall.

18CS C13

DATABASE MANAGEMENT SYSTEMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Discrete mathematics of computer science, Programming and data structures.

Course Objectives: The objectives of this course are

1. To become familiar with fundamental concepts of database management. These concepts include aspects of database design, database languages and database-system implementation.
2. To understand about data storage techniques and indexing.
3. To impart knowledge in transaction management, concurrency control techniques and recovery procedures.

Course Outcomes: On Successful completion of this course, student will be able to

1. Classify the difference between FMS and DBMS; describe the roles of different users and the structure of the DBMS.
2. Design the database using ER modeling and Write queries using DDL, DML and DCL of SQL, Relational Algebra and Procedures, Functions using PL/SQL
3. Outline the inference rules for functional dependencies and apply the principles of normal forms to decompose the relations in a database.
4. Summarize basic concepts of storage techniques like indexing, hashing and familiar with states and properties of transaction.
5. Illustrate locking, time stamp, graph and validation-based protocols for concurrency control.
6. Relate log based, ARIES recovery techniques to increase the robustness of the database, identify to resolve the deadlocks in the transaction.

UNIT - I

Introduction : Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Users and Administrators, Database System Architecture, Application Architectures.

Database Design and E-R Model: Overview of the Design Process, Data Models, The E-R Model, Constraints, E-R Diagrams, E-R Design Issues, Extended E-R Features, Reduction to Relation Schemas.

UNIT - II

Relational Model: Structure of Relational Databases, Database Schema, Keys, Relational Algebra, Fundamental Operations, Additional Relational Algebra Operations, Extended Relational Algebra Operations.

Structured Query Language: Overviews, SQL Data Types, Basic Structure of SQL Queries, Modification of the Database, Set Operations, Aggregate Functions, Data-Definition Language, Integrity Constraints, Null Values, Views, Join Expression. Index Definition in SQL.

UNIT- III

Relational Database Design: Undesirable Properties in Relational Database Design, Functional Dependencies, Trivial and Nontrivial Dependencies, Closure of Set of Functional Dependencies, Closure of Set of Attributes, Irreducible Set of Functional Dependencies, Normalization–1NF,2NF and 3 NF, Dependency Preservation, BCNF, Comparison of BCNF and 3NF.

Indexing: Basic Concepts, Primary Index, Dense and Sparse Indices, Secondary Indices, Tree-Structured Indexing, Indexed Sequential Access Method (ISAM), B+ Tree Index Files.

UNIT - IV

Hash based Indexing: Static Hashing, Extendible Hashing. **Transaction Management and Concurrency Control:** Transaction Concept – ACID Properties, States of Transaction, Implementation of Atomicity and Durability, Concurrent Executions, Serializability, Recoverability, Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Multiple Granularity.

UNIT - V

Deadlocks: Deadlock Prevention, Deadlock Detection and Recovery. **Recovery System:** Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Nonvolatile Storage, ARIES Recovery Method, Remote Backup Systems.

Text Books:

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, "Database System Concepts", Sixth Edition, McGraw-Hill International Edition, 2011.
2. Date CJ, Kannan A, Swamynathan S, "An Introduction to Database Systems", Eight Editions, Pearson Education, 2006.
3. Raghu Ramakrishnan, Johnnes Gehrke, "Database Management Systems", Third Edition, McGraw Hill, 2003.
4. Ramez Elmasri, Durvasul VLN Somayazulu, Shamkant B Navathe, Shyam K Gupta, "Fundamentals of Database Systems", Fourth Edition, Pearson Education, 2006.

Suggested Reading:

1. J.D.Ullman, "Principles of Database Systems", Galgotia.

Online Resources:

1. http://www.nptelvideos.in/2012/11/database-management- system.html

18EG M01

INDIAN CONSTITUTION AND FUNDAMENTAL PRINCIPLES

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
SEE	50 Marks
CIE	-
Credits	-

Course Objectives: The objectives of this course are
1. The history of Indian Constitution and how it reflects the social, political and economic perspectives of the Indian society.
2. Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. Have knowledge of the various Organs of Governance and Local Administration.

Course Outcomes: On Successful completion of the course, students will be able to
1. Understand the making of the Indian Constitution, its features and know the importance of Directive Principles of State Policy.
2. Identify the difference between Right to Equality and Right to Freedom and acquires the legal status of Fundamental Duties.
3. Analyze the structuring of the Indian Union, distribution of powers between the Union and the States, and the role and position of President in Union Government.
4. Distinguish between the Lok Sabha and Rajya Sabha in law making while appreciating the importance of Judiciary in interpretation of law.
5. Differentiate between the Municipalities and Panchayats in their structure and functions.
6. Apply the knowledge of Indian Constitution to real-life or professional situation for better civic society

UNIT - I
Constitution of India: Introduction and salient features, Constitutional history, Directive principles of state policy - Its importance and implementation.

UNIT - II
Union Government and its Administration: Structure of the Indian Union: Federalism, distribution of legislative and financial powers between the Union and the States, Parliamentary form of government in India. **President**: role, power and position.

UNIT- III
Emergency Provisions in India: National emergency, President rule, Financial emergency

UNIT – IV
Local Self Government: District's Administration Head: Role and Importance. Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation.
Panchayati Raj: Introduction, Zilla Panchayat, Elected officials and their roles, CEO Zilla Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments). Village level: Role of Elected and officials.

UNIT – V
Scheme of the Fundamental Rights & Duties: Fundamental Duties - the legal status.
Scheme of the Fundamental Rights: To Equality, to certain Freedom under Article 19, to Life and Personal Liberty under Article 21.

Text Books:
1. Indian Government & Politics, Ed Prof V Ravindra Sastry, Telugu Akademy, 2nd edition, 2018.
2. Indian Constitution at Work, NCERT, 10th edition, 2018.

Suggested Reading:
1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar, Framing of Indian Constitution, 1st Edition,2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

Online Resources:
1. http://www.nptel.ac.in/courses/103107084/Script.pdf

18EC C35

BASIC ELECTRONICS LAB

Instruction	2 Hours per week
Duration of End Examination	2 Hours
Semester End Examination	35 Marks
Continuous Internal Evaluation	15 Marks
Credits	1

Prerequisite: Knowledge about semiconductor physics and basic electrical engineering.

Course Objectives: The objectives of this course are
1. Learn about various electronic components and devices.
2. Study the transistor characteristics in different modes.
3. Learn about oscillators and amplifiers.

Course Outcomes: On Successful completion of the course, students will be able to
1. Familiarize on basic electronic components, devices and system.
2. Analyze the measurements of time period, amplitude and phase of different waveforms.
3. Design and analyze the behavior of the regulator and rectifier.
4. Develop various types of oscillators and power amplifiers
5. Design the various circuits using operational amplifiers.

LIST OF EXPERIMENTS:
1. Study of Electronic components.
2. Characteristics of Semiconductor diodes (Ge, Si and Zener).
3. CRO and its Applications.
4. Half, Full wave rectifiers with and without filters.
5. Voltage Regulator using zener diode.
6. Characteristics of BJT in CE Configuration.
7. Characteristics of FET in CS Configuration.
8. Amplifier with and without feedback.
9. RC Phase shift oscillator
10. Operational Amplifier and its applications.
11. Power Amplifiers Characteristics
12. Realization of Half and Full adder

Text Books:

1. Paul B. Zbar, Albert P. Malvino, Michael A. Miller, "Basic Electronics, a Text - Lab Manual", 7th Edition, TMH, 1994.
2. Paul B. Zbar, "Industrial Electronics, a Text - Lab Manual", 4th Edition, 2008.

18CS C14

COMPUTER ARCHITECTURE AND MICRO PROCESSOR LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	1.5

Pre-requisites: Digital Electronics and Logic Design, Computer Architecture.

Course Objectives: The objectives of this course are
1. To become familiar with the architecture and Instruction set of 8086 microprocessor.
2. To provide practical hands on experience with Assembly Language Programming.
3. To provide solid foundation on interfacing the external devices to the processor according to the user requirements to create novel products and solutions for the real time problems.

Course Outcomes: On Successful completion of this course, student will be able to
1. Describe the architecture and comprehend the instruction set of 8086.
2. Understand and apply the principles of Assembly Language Programming in developing microprocessor based applications.
3. Get familiarized with different assembly language software tools.
4. Work with standard microprocessor interfaces to know how a processor will communicate with the External world.
5. Design and develop of various Embedded Applications.

LIST OF EXPERIMENTS:
1. Examining and understanding the working nature of internal components of computer like North bridge and South bridge of mother board, Memories like cache, ROM, RAM, Secondary storage devices, understanding CMOS and analyzing configuration using inbuilt or external tools.
2. Implementation of 2's complement to represent signed numbers in C/ Java/Python for a user specified bit length like 8/16 bit.
3. Implementation of Booth's Binary Multiplication algorithm in C/Java/ Python.
4. Implementation of Non restoring Division algorithm in C/Java/Python.
5. Tutorials with 8086 kit / MASM / NASM software tool.
6. Addition of 32-bit numbers using 16-bit registers.
7. Fixed-point multiplication and division.
8. Sorting hexadecimal array.
9. Code conversion from hexadecimal to decimal.
10. Packed and Unpacked BCD numbers.
11. Sum of set of BCD numbers.
12. Searching.
13. Display a string of characters using 8279.

Suggested Reading:

1. Yu-cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086/ 8088 Family", 2nd Edition, PHI Learning 2011.
2. Douglas Hall. "Microprocessor and Interfacing programming and Hardware", Tata McGraw Hill, Revised 2nd Edition, 2007.
3. B. Brey, "The Intel Microprocessor, 8086/8088, 80186/80188, 80286, 80386, 80486, Pentium and Pentium Pro-Processors-Architecture, Programming and Interfacing", 4th Edition, Prentice Hall, 1993.

18CS C15

DATABASE MANAGEMENT SYSTEMS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	1.5

Course Objectives: The objectives of this course are
1. To become familiar with the concepts of structured query language.
2. To understand about programming language / structured query language (PL/SQL).
3. To become familiar with generation of form and open database connectivity.

Course Outcomes: On Successful completion of this course, student will be able to
1. Apply the built-in functions and write simple queries on various databases.
2. Perform definition and manipulation of data using SQL commands.
3. Develop complex queries using joins and nested queries.
4. Add constraints on Databases implement DCL, TCL and advanced SQL commands.
5. Develop programs using cursors, triggers, exceptions, procedures and functions in PL/SQL.

LIST OF EXPERIMENTS:

SQL:
1. Queries using Built-In functions, like aggregate functions, String Functions, Numeric Functions, Data Functions, Conversion Functions and other miscellaneous.
2. Queries using operators in SQL.
3. Queries to Retrieve and Change Data: Select, Insert, Delete and Update.
4. Queries using Group By, Order By and Having Clauses.
5. Queries on Controlling Data: Commit, Rollback and Save point.
6. Queries to Build Report in SQL *PLUS.
7. Queries for Creating, Dropping and Altering Tables, Views and Constraints.
8. Queries on Joins and Correlated Sub-Queries.
9. Queries on Working with Index, Sequence, Synonym, Controlling Access and Locking Rows for Update, Creating Password and Security features.

PL/SQL:
1. Write a PL/SQL code using Basic Variable, Anchored Declarations and Usage of Assignment Operation.
2. Write a PL/SQL code Bind and Substitution Variables, Printing in PL/ SQL.
3. Write a PL/SQL block using SQL and Control Structures in PL/SQL.
4. Write a PL/SQL code using Cursors, Exception and Composite Data Types.
5. Write a PL/SQL code using Procedures, Functions and Packages.

Note: The creation of sample database for the purpose of the experiments is expected to be pre-decided by the instructor.

Text Books / Suggested Reading:

1. "Oracle: The complete Reference", by Oracle Press.
2. Nilesh Shah, "Databse Systems Using Oracle", PHI, 2007.
3. Rick F Van der Lans, "Introduction to SQL", Fourth Edition, Pearson Education, 2007.

18CS C16

IT WORKSHOP (Latex / Scilab)

Instruction	1T + 2P Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	2

Course Objectives: The objectives of this course are
1. Familiarize the students with documentation and visualization tools like Latex and Scilab.
2. Development of proficiency in documentation for presentation and report writing.
3. Explore the utilities in Latex and Scilab.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand the need of documentation tools.
2. Install the documentation tools.
3. Generate templates for generation report using Latex.
4. Generate templates for presentation using Beamer.
5. Explore the utilities of Scilab

LIST OF EXPERIMENTS:
1. Installation of Latex and Scilab.
2. Understanding Latex compilation, basic syntax, writing of equations, matrices, tables.
3. Page Layout –Titles, abstract, chapters, sections, references, equation, references, citation, table of contents, generating new commands, figure handling, numbering, list of figures, list of tables, generating index.
4. Packages: Geometry, hyperref, amsmath, amssymb, algorithms, algorithmic graphic, color, tiles listing.
5. Understanding of Classes: article, book, reports,
6. Beamer, slides preparation.
7. Writing Resume, question paper, articles, research papers, Presentation using beamer.
8. Basic syntax, Mathematical Operators, Predefined constants, Built in functions.
9. Scilab Programming: Functions, loops, conditional statements, handling .sci files.
10. Graphics handling: 2D, 3D, Generating .jpg files, function plotting, data plotting.
11. Solving linear equations, Eigen values and numerical analysis, iterative methods, ordinary differential equation, plotting solution curves,
12. Comparison OS Scilab with C / C++/ Matlab.

Text Books / Suggested Reading / Online Resources:
1. https://www.latex-project.org/help/documentation/
2. https://spoken-tutorial.org/tutorial ef,search?search_foss=LaTeX& search_language=English
3. https://www.scilab.org/sites/default/files/Scilab_beginners_0.pdf
4. https://www.scilab.org/tutorials\

AICTE-Model Curriculum

B.E Syllabus for Semester V and VI

With effect from 2020 - 21

Specialization /Branch: Computer Science and Engineering

Chaitanya Bharathi Institute of Technology (A)

Chaitanya Bharathi (P.O), Gandipet

Hyderabad-500075, Telangana State.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)

SCHEME OF INSTRUCTION AND EXAMINATION
V-Semester of B.E, Model Curriculum
COMPUTER SCIENCE AND ENGINEERING

SEMESTER-V

Sl.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	18CSC17	Formal Language and Automata Theory	3	0	0	3	30	70	3
2	18CSC18	Operating System	3	0	0	3	30	70	3
3	18CSC19	Design and Analysis of Algorithms	3	0	0	3	30	70	3
4	18CSE XX	Professional Elective-I	3	0	0	3	30	70	3
5	18MTO XX	Open Elective-I	3	0	0	3	30	70	3
PRACTICALS									
6	18CSC20	Operating System Lab	0	0	3	3	25	50	1.5
7	18CSC21	Design and Analysis of Algorithms Lab	0	0	3	3	25	50	1.5
8	18CSE XX	Professional Elective-I Lab	0	0	3	3	25	50	1.5
9	18CSC22	Mini Project	0	0	3	-	50	-	1
		TOTAL	**15**	**0**	**12**		**275**	**500**	**20.5**

PROFESSIONAL ELECTIVE-I			**OPEN ELECTIVE-I**	
Course Code	**Title of the Course**		**Course Code**	**Title of the Course**
18CSE01	Web and Internet Technologies		18MTO 01	Decision Theory
18CSE02	GUI Programming		18MTO 02	Graph Theory
18CSE03	Image Processing		18MTO 03	Number Theory and Cryptography
18CSE04	Mobile Application Development		18MTO 04	Quantum Computing

PROFESSIONAL ELECTIVE-I LAB	
Course Code	**Title of the Course**
18CSE05	Web and Internet Technologies Lab
18CSE06	GUI Programming Lab
18CSE07	Image Processing Lab
18CSE08	Mobile Application Development Lab

L: Lecture **T: Tutorial** **D: Drawing** **P: Practical**
CIE - Continuous Internal Evaluation **SEE - Semester End Examination**

18CSC17

FORMAL LANGUAGE AND AUTOMATA THEORY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Discrete Mathematics, Data Structures, Algorithms.

Course Objectives: The objectives of this course are

1. Identify the hierarchy of formal languages, grammars and Design finite automata to accept a set of strings of a language.
2. Prove that a given language is regular and apply the closure properties of languages and design context free grammars, conversions into normal forms.
3. Equivalence of languages accepted by Push Down Automata and distinguish between computability and non-computability and Decidability and Undecidability.

Course Outcomes: On Successful completion of this course, student will be able to

1. Describe language basics like Alphabet, strings, grammars, productions, derivations, and Chomskyhierarchy.
2. Recognize regular expressions, formulate, and build equivalent finite automata for various languages.
3. Identify closure, decision properties of the languages and prove the membership.
4. Demonstrate context-free grammars, check the ambiguity of the grammars and design equivalent PDA to accept.
5. Use mathematical tools and abstract machine models to solve complex problems.
6. Distinguish between decidability and undecidability.

UNIT - I

Introduction: Alphabet, languages and grammars, productions and derivation, Chomsky hierarchy of languages**.** Regular languages and finite automata: Regular expressions and languages, Deterministic Finite Automata (DFA) and equivalence with regular expressions, Nondeterministic Finite Automata (NFA) and equivalence with DFA.

UNIT - II

Finite Automata and Regular Expression: From DFAs to Regular Expressions, Converting DFA's to Regular Expressions by Eliminating States, Converting Regular Expressions to Automata, Applications of Regular Expressions, and Algebraic Laws for Regular Expressions. **Properties of Regular Languages:** Proving Languages not to be Regular: The pumping lemma for Regular Languages, Applications of Pumping Lemma, Closure Properties of Regular Languages, Decision Properties of Regular Languages: Testing Emptiness of Regular Languages, Testing Membership in a Regular Language. Equivalence and Minimization of Automata:

UNIT - III

Context-free Languages and Pushdown Automata: Context-free grammars (CFG) and languages (CFL), Chomsky and Greibach normal forms, nondeterministic pushdown automata (PDA) and equivalence with CFG, parse trees, ambiguity in CFG, pumping lemma for context-free languages, deterministic pushdown automata, Closure properties of CFLs.

UNIT - IV

Context-sensitive Languages: Context-sensitive grammars (CSG) and languages, linear bounded automata and equivalence with CSG. **Turing Machines:** The basic model for Turing machines (TM), Turing recognizable (recursively enumerable) and Turing-decidable (recursive) languages and their closure properties, variants of Turing machines, nondeterministic TMs and equivalence with deterministic TMs.

UNIT - V

Unrestricted grammars and equivalence with Turing machines, TMs as enumerators. Undecidability: Church-Turing thesis, universal Turing machine, the universal and diagonalization languages, reduction between languages and Rice s theorem, undecidable problems about languages.

Text Books:

1. John E. Hopcroft, Rajeev Motwani, Jeffery D Ullman, "Introduction to Automata Theory Languages and Computation", Third edition, Pearson Education, 2007.

Suggested Reading:

1. John C Martin. "Introduction to Language and Theory of Computation", 3rdedition, TMH, 2003.
2. Daniel Cohen, "Introduction to Computer Theory", 2ndedition, Wiley Publications, 2007.

3. Mishra K., Chandrasekaran N., "Theory of Computer Science (Automata, Languages and Computation)", 3rd edition, Prentice Hall of India 2008.
4. Shyamalendra Kandar, "Introduction to Automata Theory, Formal Languages and Computation", Pearson, 2013.
5. Kamala Krithivasan, Rama R. "Introduction to Automata Theory, and Computation", Pearson 2009.

Web Resources:

1. http://courses.cs.vt.edu/cs4114/spring2012/index.php
2. www.pearsoned.co.in/KamalaKrithivasan

18CSC18

OPERATING SYSTEMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Programming for Problem Solving, Object Oriented Programming, Discrete Mathematics and Data Structure, Basic object-oriented design principles

Course Objectives: The objectives of this course are

1. Make the students to understand the basic components of a computer operating system, and interactionsamong the components
2. Cover an introduction on policies for scheduling, deadlocks, memory management, synchronization,system calls, and file systems.
3. Design operating system solutions

Course Outcomes: On Successful completion of the course, students will be able to

1. Define the fundamental components of a computer operating system and the interactions among them
2. Illustrate CPU scheduling algorithms, memory management techniques and deadlock handling methods
3. Build applications using semaphores and monitors to synchronize their operations
4. Analyse the performance of CPU scheduling and page replacement algorithms
5. Evaluate the structure of GNU/Linux and Android

UNIT - I

Introduction: Components of a computer operating systems, types of operating systems, operating system services, basic structure of Windows, Linux.

Processes & threads: Process states and transitions, Process Control Block (PCB), context switching, dispatcher. Threads, thread states, benefits of threads, types of threads

UNIT - II

Process Scheduling: Types of schedulers, Scheduling Criteria, scheduling algorithms, multiprocessor and real Time scheduling CPU scheduling in MS Windows

Memory Management: Memory management techniques, fragmentation, paging, segmentation, paged segmentation

UNIT - III

Inter-process Communication: Critical Section, race conditions, mutual exclusion, shared memory, message passing, semaphores and monitors, classical IPC Problems: producer-consumer, readers-writer and dinning philosopher

Deadlocks: conditions, deadlock handling methods, RAG, Banker's algorithm, deadlock recovery.

UNIT - IV

Virtual Memory: Introduction, locality of reference, page fault, thrashing, working Set, demand paging, pagereplacement algorithms, allocation of frames.

File Management: File access methods, directory structure, file system structure, Allocation methods, directory implementation, efficiency, and performance.

Disk Management: Disk structure, scheduling, reliability, disk formatting, swap space management

UNIT - V

I/O: devices, controllers, types of I/O, device drivers, Kernel I/O Structure, performance, Streams

Linux System-Design principles, modules, Process management, scheduling, memory management, I/Omanagement, file System, inter-process communication.

Mobile OS: iOS and Android architecture and SDK framework, media layer, services layer, core OS layer, filesystem.

Textbooks:

1. AviSilberschatz, Peter Galvin, Greg Gagne, " Operating System Concepts Essentials", Wiley Asia Student Edition, 9th Edition, 2015
2. William Stallings, "Operating Systems: Internals and Design Principles", Prentice Hall of India, 5th Edition, 2013.
3. Neil Smyth, iPhone iOS 4 Development Essentials Xcode, Fourth Edition, Payload media, 2011

Suggested Reading:

1. Charles Crowley, "Operating System: A Design-oriented Approach", Irwin Publishing, 1st Edition, 1996.

Online Resources:

1. https://nptel.ac.in/courses/106108101/

18CSC19

DESIGN AND ANALYSIS OF ALGORITHMS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Basics of Data structures and algorithms.

Course Objectives: The objectives of this course are

1. Provide an introduction to formalisms to understand, analyze and denote time complexities of algorithms.
2. Introduce the different algorithmic approaches for problem solving through numerous example problems.
3. Provide some theoretical grounding in terms of finding the lower bounds of algorithms and the NP-completeness.

Course Outcomes: On Successful completion of this course, student will be able to

1. List the performance metrics and design strategies of algorithms.
2. Describe the algorithmic design techniques of divide and conquer, greedy, dynamic programming,backtracking and branch and bound to solve problems.
3. Apply suitable algorithmic design techniques to solve problems.
4. Analyze the performance of a given algorithm.
5. Evaluate various algorithmic design techniques.
6. Formulate solutions to NP problem.

UNIT - I

Introduction: Characteristics of algorithm. **Analysis of algorithm:** Asymptotic analysis of complexity bounds – best, average and worst-case behavior. Performance measurements of Algorithm, Time and space trade-offs. **Analysis of recursive algorithms through recurrence relations:** Substitution method, Recursion tree method and Masters' theorem.

UNIT - II

Greedy Algorithms: The general method, Knapsack Problem, Huffman Codes, Job scheduling with deadlines. **Dynamic Programming**: The general method, 0/1 Knapsack, Travelling Salesman Problem, Matrix chain multiplication, Longest Common subsequence, Optimal Binary search tree.

UNIT - III

Backtracking: The general Method, 8-Queens Problem, Graph Coloring, Hamiltonian Cycle. **Branch-and-Bound**: The general method, FIFO branch and bound, LC branch and bound, 0/1 Knapsack Problem, Travelling Salesperson problem.

UNIT - IV

Graph Algorithms: Applications of DFS: Bi-Connected components, strongly connected components, topological sorting. **Shortest Path Algorithms**: Dijkstra's, Bellman-Ford, Floyd-Warshall and Johnson's algorithms. **Minimum Spanning Tree Algorithms**: Prim's and Kruskal's.

UNIT - V

Theory of NP-Completeness: Polynomial time, Polynomial time verification, P, NP, NP-hard and NP-Complete classes, NP-Completeness and Reducibility. **Standard NP-Complete Problems and Reduction Techniques:** The Clique Problem, vertex-cover and Subset Sum Problem.

Text Books:

1. Thomas H Cormen, Charles E Lieserson, Ronald L Rivest and Clifford Stein, "Introduction to Algorithms", MIT Press/McGraw-Hill, 3rd Edition, 2009.
2. E. Horowitz, sartaj sahni and sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press, 2007.

Suggested Reading:

1. Michael T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis", and Internet Examples, Wiley Second Edition.

Online Resources:

1. https://nptel.ac.in/courses/106101060/

18CSE01

WEB AND INTERNET TECHNOLOGIES
(PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Programming and Problem Solving, Object Oriented Programming, DBMS.

Course Objectives: The objectives of this course are

1. Acquire knowledge of XHTML, Java Script and XML to develop web applications.
2. Develop dynamic web content using Java Servlets and JSP and JDBC.
3. Develop to complete web applications.

Course Outcomes: On Successful completion of the course, students will be able to

1. Develop static web sites using XHTML and Java Scripts.
2. Understand the role of XML and Java Script in web applications.
3. Write programs in java using all of its object oriented concepts.
4. Differentiate between Servlets and JSPs and use them according to the demands of the situation in developing dynamic web content.
5. Use JDBC to access a remote database in a web application.

UNIT - I

Web Basics and Overview: Introduction to Internet, World Wide Web, URL, MIME, HTTP. Introduction and basics of XHTML, Cascading Style Sheets, Introduction to XML, XML document structure, DTD, Namespacesand Schemas.

UNIT - II

The Basics of Java script: General Syntactic Characteristics, Primitive operations and Expressions, Arrays, Functions, Pattern Matching Using Regular Expressions, Document Object Model, Element Access in JavaScript, Events and Event Handling, Handling Events from Body, Button, Text Box and Password Elements. **Dynamic Documents with Java Script:** Positioning Elements, Moving Elements, Changing Colors and Fonts, Dynamic Content.

UNIT - III

The Java Language: Basics an overview of Java, The General Form of a class, Declaring Objects, Constructors, Overloading Methods, Overloading Constructors, static and final keywords, Inheritance Basics, Using Super, Using Abstract classes, Packages and Interfaces, dynamic method dispatch and Exception Handling.

UNIT - IV

J2EE Platform: Enterprise Architecture Styles, Containers and Technologies. **Servlet Programming**: Overview of Java Servlet API, Servlet Implementation, Servlet Configuration, Servlet Exceptions, Servlet Life cycle, Request and Responses. **Servlet Sessions, Context and Collaboration**: Approaches to Session tracking, Session Tracking with java servlet API, Servlet Context, Servlet Collaboration. **Filters for web applications**: Introduction to filters, filter API, Deployment descriptor for filters.

UNIT - V

JSP Basics: Introduction to JSP, Directives, Scripting Elements, Standard Objects, Design Strategies. **JSP Tag extensions**: Tag extensions, A simple Tag Anatomy of a Tag extension, Writing Tag Extensions. **Java Database Connection**: Introduction to JDBC, Database Drivers. Database Access with JDBC using servlet and jsp**:** Connection to a remote data base, CRUD operations, Callable Statement and Prepared Statement. ResultSet and RowSet objects.

Textbooks:

1. Robert W Sebesta, "Programming the World Wide Web", Pearson Education, 2013
2. CeditBuest, Subramanyam Allamraju, "Professional Java Server programming: J2EE 1.3 Edition", Apress Publications, 2007.

Suggested Reading:

1. Santosh Kumar K., "JDBC 4.2. Servlet 3.1 and JSP 2.3 Includes JSF 2.2 and Design Patterns", 2nd edition, 2016
2. 2. P. J. Deitel Deitel, H. M. Deitel – Deitel, "Internet & World Wide Web How To Program", Fourth Edition, Prentice Hall, 2007.
3. Chris Bates, "Web Programming, building intenet applications", 2nd edition, John Wiley & Sons, 2002

Online Resources:

1. https://www.w3.org/standards/webdesign/
2. https://www.w3schools.com/
3. https://devdocs.io/

18CSE02

GUI PROGRAMMING (PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Basics of Python Programming.

Course Objectives: The objectives of this course are
1. Understand the essence of GUI programming.
2. Identify various GUI frameworks.
3. Develop GUI based applications using GUI tools/frameworks.

Course Outcomes: On Successful completion of the course, students will be able to
1. Understand GUI frameworks / tool required for GUI programming.
2. Explore the features of PyQt for the develop GUI applications.
3. Customize GUIs by using layout managers and look-and-feel features.
4. Develop beautiful charts using the free Matplotlib Python module.
5. Design and develop UIs using threading in a networked environment to make the GUIs responsive andcompatible with Android, iOS.

UNIT - I

Introduction to GUI Programming: UI and interaction design, examples, components of GUI, comparison to other interfaces, 3-D user interfaces, and other GUI frameworks. **Introduction to PyQt5 Framework:** Overview, installation of PyQt framework, creation of a simple GUI, adding widgets to GUI, layout of widgets.

UNIT - II

Design of GUIs with Qt Designer: Installation of Qt Designer and tools, creation of a GUI, adding widgets, conversion of Qt Designer UI code to Python code.

UNIT - III

Enhancing Qt5 GUI functionality: Calling Dialogs from main window, decoupling Python code from generated UI code, building a complex GUI with PyQt5, Multi-threading to keep GUI responsive, Drag and Drop within the PyQt5 GUI.

UNIT - IV

Advanced Qt5 Programming: OpenGL Graphics library, networking and SQL database, Animation inside the GUI, CSS styling to enhancement for look-and-feel, PyQt's signals and slots, event handling.

UNIT - V

User Interface Design: Design of uesr interfaces, displaying Google and Qt5 Maps, creation of iPhone and Android Apps with Qt5. **Creation of 3D GUI with PyOpenGL and Pyglet**: PyOpenGL transforms for GUI, GUI in 3D, Pyglet transform for easy GUI, creation of slideshow using tkinter, best practices.

Text Books:

1. Burkhard A. Meier "Python GUI Programming Recipes using PyQt5", Packt, 2017.
2. Burkhard A. Meier, "Hands-on Python 3.x GUI Programming: Pack 2019.

Online Resources:

1. https://en.wikipedia.org/wiki/Graphical_user_interface#Technologies.

18CSE03

IMAGE PROCESSING
(PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Analysis of algorithms and linear algebra.

Course Objectives: The objectives of this course are
1. Gain the fundamentals of digital image processing.
2. Comprehend the relation between human visual system and machine perception and processing ofdigital images.
3. Provide a detailed approach towards image processing applications like enhancement, segmentation,and compression.

Course Outcomes: On Successful completion of this course, student will be able to
1. Explain the basic principles of image processing and its significance in real world.
2. Interpret various types of images and applies image transformations.
3. Evaluate various approaches for image segmentation and image restoration.
4. Define image processing methods and recognize morphological image processing techniques.
5. Recognize image compression and comprehend image compression techniques in both domains.
6. Apply image processing algorithms for real world problems.

UNIT - I

Digital Image Fundamentals & Image Transforms: Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels. **Image Transforms:** 2-D FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

UNIT - II

Image Enhancement (Spatial Domain): Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram Manipulation, Linear and Non – Linear Gray Level Transformation, Local or Neighborhood criterion, Median Filter, Spatial Domain High-Pass Filtering. **Image Enhancement (Frequency Domain):** Filtering in Frequency Domain, Low Pass (Smoothing) and High Pass (Sharpening) Filters in Frequency Domain.

UNIT - III

Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

Image Segmentation: Detection of Discontinuities, Edge Linking and Boundary Detection, thresholding, Region Oriented Segmentation.

UNIT - IV

Morphological Image Processing: Basics, Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, Hit or Miss Transformation. Boundary Detection, Hole filling, Connected components, convex hull, thinning, thickening, skeletons, pruning, Geodesic Dilation, Erosion, Reconstruction by dilation and erosion.

UNIT - V

Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

Text Books:

1. Rafael C. Gonzalez, Richard E. Woods, “Digital Image Processing”, Pearson 4th Edition, 2018.
2. S Jayaraman, S Esakkirajan, T Veerakumar, “Digital Image Processing”, McGraw Hill Education, 2010.

Suggested Reading:

1. Scotte Umbaugh, “Digital Image Processing and Analysis: Human and Computer Vision Application with using CVIP Tools”, CRC Press,2nd Ed, 2011.
2. Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, “Digital Image Processing using MATLAB”, McGraw Hill Education, 2nd Edition, 2010.
3. Somka, Hlavac, Boyle, “Digital Image Processing and Computer Vision”, Cengage Learning (Indian edition) 2008.
4. Adrian Andrew Low, “Introductory Computer Vision Imaging Techniques and Solutions”, BS Pub, Second Edition, 2008.

Online Resources:

1. https://nptel.ac.in/courses/117105079/
2. www.nptelvideos.in/2012/12/digital-image-processing-html

18CSE04

MOBILE APPLICATION DEVELOPMENT
(PROFESSIONAL ELECTIVE-I)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Programming language skills, Problem solving skills, Applying technologies.

Course Objectives: The objectives of this course are

1. To demonstrate their understanding of the fundamentals of Android operating systems.
2. To demonstrate their skills of using Android software development tools.
3. To demonstrate their ability to develop software with reasonable complexity on mobile platform.

Course Outcomes: On Successful completion of the course, students will be able to

1. Interpret and Analyze Android platform architecture and features to learn best practices in Androidprogramming.
2. Design the User Interface for Mobile applications.
3. Apply Intents, Broadcast receivers and Internet services in Android App.
4. Develop database management system to retrieve and/or store data for Mobile application.
5. Evaluate and select appropriate Android solutions to the Mobile computing platform.
6. Build Android applications for complex problems.

UNIT - I

Introduction to Android Operating System: Android SDK Features, Developing for Android, Best practices in Android programming, Android Development Tools. Android application components – Android Manifest file, Externalizing resources, The Android Application Lifecycle, A Closer Look at Android Activities.

UNIT - II

Android User Interface: Introducing Layouts, User Interface (UI) Components – Editable and non editable Text Views, Buttons, Radio and Toggle Buttons, Checkboxes, Spinners, Dialog and pickers. Event Handling – Handling clicks or changes of various UI components. Introducing Fragments, Multi-screen Activities.

UNIT - III

Intents and Broadcasts: Introducing Intents: Using Intents to Launch Activities. Using Intent to dial a number or to send SMS. **Broadcast Receivers** –Creating Intent Filters and Broadcast Receivers: Using Intent Filters to Service Implicit Intents. Finding and using Intents received within an Activity. Notifications – Creating and Displaying notifications, Displaying Toasts.

UNIT - IV

Persistent Storage: Files – Reading data from files, listing contents of a directory, Creating and Saving Shared Preferences, Retrieving Shared Preferences. Database –Introducing Android Databases, Introducing SQLite, Content Values and Cursors, Working with SQLite Databases. Registering Content Providers, Using content Providers (insert, delete, retrieve and update).

UNIT - V

Advanced Topics: Alarms –Using Alarms. Using Internet Resources – Connecting to internet resource, using download manager. Location Based Services –Using Location-Based Services, Using the Emulator with Location-Based Services.

Text Books:

1. Reto Meier, "Professional Android 4 Application Development", Wiley India, (Wrox), 2012
2. James C Sheusi, "Android Application Development for Java Programmers", Cengage Learning, 2013

Suggested Reading:

1. Wei-Meng Lee, "Beginning Android 4 Application Development", Wiley India (Wrox), 2013

18MTO 05

DECISION THEORY(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are

1. Identifying and develop Operations Research Models from the verbal description of real system.
2. Able to learn different techniques to get optimum solution LPP.
3. Able to understand the Mathematical tools that are needed to solve optimization problem.
4. Able to analyze the results of the different real-world problems.
5. Able to formulate the problems and solve situation using dynamic programming problem technique.

Course Outcomes: On the successful completion of this course, the student shall be able to

1. Calculate the optimum values for given objective function by LPP
2. Solve the solution for maximise the profit with minimum cost by Transportation problem.
3. Determine the optimum feasible solution for sequencing the Jobs
4. Arrange the jobs for different Machines to get optimum values
5. Measure the solution of dynamical system problems

UNIT-I

Introduction to Operations Research: 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.

UNIT-II

Transportation problems, Formulation, solution, unbalanced transportation problems, finding basic feasible solutions-steppingstone method and MODI method. Northwest corner rule, least cost method and Vogel's approximations method, Optimality test: the

UNIT-III

Assignment model, formulation, Hungarian method for optimal solution, solving unbalanced problem, Travelingsalesman problem and assignment problem

UNIT IV

Sequencing models, solution of sequencing problem-processing n jobs through 2 Machines-processing n jobs through 3 Machines-processing 2 jobs through m machines-processing n jobs through m machines.

U

NIT-V

Dynamic Programming, Characteristics of dynamic programming, Solution of LPP by dynamic programming and Network scheduling by PET/CPM.

Textbooks:

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

Suggested Reading:

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.
3. Kranti Swarup ,P.K.Gupta and Man Mohan "Operations Research", Sultan Chand & Sons, 2019.

18MTO 02

GRAPH THEORY
(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are

1. To discuss the basic and core concepts in Graph, Euler Graph and its path.
2. To explain the Matching and Covering in Bipartite Graph.
3. To demonstrate how Matching are used in Principles, Models underlying theory.
4. To explain One-Way Traffic, Rankings in a tournament.
5. To discuss Algorithmic approach to solve Network flow problems.

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify the concepts of the Graph Theory in related problems.
2. Determine the solutions in Matching and Covers, Maximum Matching in Bipartite Graph.
3. Calculate the solutions for Matching and Faster Bipartite Matching, Matching in general graphs andrelated Algorithms.
4. Apply the Knowledge of Job sequencing, One-Way Traffic, Rankings to solve real time problems.
5. Solve combinatorial optimization problems pertaining to Network flow.
6. Construct solutions to real world problems.

UNIT – I

Introduction to Graphs and its Applications: Basics of Paths, Cycles, and Trails, Connection, Bipartite Graphs, Eulerian Circuits, Vertex Degrees and Counting, Degree-sum formula, The Chinese –Postman- Problem and Graphic Sequences.

UNIT – II

Matchings: Matchings and Covers, Hall's Condition, Min-Max Theorem, Independent Sets, Covers and Maximum Bipartite Matching, Augmenting Path Algorithm.

UNIT – III

Matchings and its Applications: Weighted Bipartite Matching, Hungarian Algorithm, Stable Matchings and Faster Bipartite Matching, Factors & Perfect Matching in General Graphs, Matching in General Graphs: Edmonds' Blossom Algorithm.

UNIT – IV

Directed graphs and its Applications: Directed Graphs, Directed Paths, Directed Cycles, Applications - A Job Sequencing Problem, Designing an Efficient Computer Drum, Making a Road System One-way, Ranking the Participants in a Tournament.

UNIT – V

Networks and its Applications: Flows, cuts, Ford-Fulkerson labelling algorithm, the max-flow min-cut theorem, Applications-Menger's theorems, Feasible flows.

Text Books:

1. J.A. Bondy and U.S.R.Murty, "Graph Theory with Applications", Springer, 2008 (Freely downloadable from Bondy's website).
2. D.B.West, "Introduction to Graph Theory", Prentice-Hall of India/Pearson, 2009 (latest impression).
3. N. Deo, "Graph Theory with Applications to Engineering and Computer Science", PHI Publication, 3rd edition, 2009.

Suggested Reading:

1. R.Diestel, "Graph Theory", Springer (low price edition) 2000.
2. F.Harary, "Graph Theory", Narosa, print 2013.
3. C.L. Liu, "Elements of Discrete Mathematics", Tata McGraw Hill, 2nd Edition, 2000.

18MTO 03

NUMBER THEORY AND CRYPTOGRAPHY
(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are
1. To introduce impart the knowledge of cryptography before computer age.
2. To introduce discrete logarithmic problem.
3. To introduce some primality tests.
4. To introduce RSA cryptography.
5. To get on exposure to elliptic curve cryptography.

Course Outcomes: On Successful completion of this course, student will be able to
1. Count different operations of basic number theory.
2. Distinguish between public Key and related algorithms.
3. Define algebraic theorems with respect to well-known algorithms.
4. Apply the Euler's φ function and related algorithms in RSA crypto system.
5. Appraise security issues on elliptic curve cryptography.

UNIT – I
Simple substitution ciphers, Divisibility and greatest common divisors, Modular arithmetic, Prime numbers, unique factorisation, and finite fields, Powers and primitive roots in finite fields, Cryptography before the computer age Symmetric and asymmetric ciphers.

UNIT – II
The birth of public key cryptography, The discrete logarithm problem, Diffie–Hellman key exchange, The ElGamal public key cryptosystem, An overview of the theory of groups, How hard is the discrete logarithm problem? A collision algorithm for the DLP.

UNIT – III
The Chinese remainder theorem, The Pohlig–Hellman algorithm, Rings, quotients, polynomials, and finite fields, Euler's formula and roots modulo pq, Primality testing.

UNIT – IV
The RSA public key cryptosystem ,Implementation and security issues, Pollard's p−1 factorisation algorithm, Factorisation via difference of squares, Smooth numbers and sieves.

UNIT – V
Elliptic curves, Elliptic curves over finite fields, The elliptic curve discrete logarithm problem, Elliptic curve cryptography.

Textbooks:
1. Mathematical Cryptography by JefreyHostein, Jill Pipher, Joseph H. Silverman Springer Science+ Business Media, LLC.
2. G.A. Jones & J.M. Jones, "Elementary Number Theory", Springer UTM, 2007.

Suggested Reading:
1. Keith Martin, "Everyday Cryptography: Fundamental Principles and Applications"
2. N. P. Smart, "Cryptography: An Introduction" 3rd edition, Springer,2016.

18MTO 04

QUANTUM COMPUTING
(OPEN ELECTIVE-I)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are
1. To translate fluently between the major mathematical representations and its quantum operations.
2. To implement basic quantum algorithms.
3. To explain quantum decoherence in systems for computation.
4. To discuss the physical basis of uniquely quantum phenomena.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify the working of a Quantum Computing Program, its architecture and program model.
2. Compute basic mathematical operations.
3. Demonstrate quantum logic gate circuits.
4. Develop quantum algorithm.
5. Appraise quantum algorithm on major toolkits.

UNIT – I
Introduction to Quantum Computing: Motivation for Studying Quantum Computing, Major players in the industry (IBM, Microsoft, Rigetti, D-Wave etc), Origin of Quantum Computing, Overview of major concepts in Quantum Commuting (Qubits and multi-qubits states, Bra-ket notation, Bloch Sphere representation, Quantum Superposition, Quantum Entanglement).

UNIT – II
Math Foundation for Quantum Computing: Matrix Algebra: Basis vectors and orthogonality, inner product and Hilbert spaces, matrices and tensors, unitary operators and projectors, Dirac notation, Eigen values and Eigen Vectors.

UNIT – III
Building Blocks for Quantum Program: Architecture of a Quantum Computing Platform, Details of q-bit system of information representation (Block Sphere, Multi-qubits States, Quantum superposition of qubits (valid and invalid superposition), Quantum Entanglement, Useful states from Quantum algorithmic perceptive e.g. Bell State.

UNIT – IV
Quantum Logic gates and Circuits: Quantum Logic gates and Circuit:Pauli, Hadamard, Phase shift, controlled gates, ising, Deutsch, Swap etc.), Programming model for a Quantum Computing program (Steps performed on classical computer, steps performed on Quantum Computer, Moving data between bits and qubits).

UNIT – V
Quantum Algorithms: Basic techniques exploited by quantum algorithms (Amplitude amplification, Quantum Fourier Transform, Phase Kick-back, Quantum Phase estimation, Quantum walks), Major Algorithms (Shor's Algorithm, Grover's Algorithm, Deutsch's Algorithm, Deutsch-Jozsa Algorithm), OSS Toolkits for implementing Quantum program (IBM quantum experience, Microsoft Q, Rigetti PyQuil (QPU/QVM)).

Textbooks:
1. Michael A.Nielsen, "Quantum Computation and Quantum Information", Cambridge University Press.
2. David McMahon, "Quantum Computing Explained", Wiley

Suggested Reading:
1. Jack D. HidaryQuantum Computing - An Applied Approach (Springer) 2019

18CSC20

OPERATING SYSTEMS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives: The objectives of this course are

1. Familiarize the students with GNU/Linux environment
2. To design and apply the process management concepts.
3. To design and apply the storage management concepts.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Able to use and develop shell scripts for process management
2. Demonstrate CPU scheduling and page replacement algorithms
3. Demonstrate GNU/Linux interprocess communication mechanisms and deadlock detection using Banker's algorithm
4. Evaluate CPU scheduling and page replacement algorithms
5. Design and create system calls

LIST OF EXPERIMENTS

1. Explore basic GNU/Linux utilities and vim/gvim editor features
2. Demonstration of process management system calls
3. Demonstration of thread related system calls
4. Demonstration of CPU scheduling algorithms
5. Performance evaluation of CPU scheduling algorithms
6. Demonstration of GNU/Linux IPC mechanisms- semaphores, shared memory, message passing
7. Evaluation of page replacement algorithms
8. Implementation of producer-consumer, readers- writers and dining philosopher's problem using semaphores
9. System call implementation

Textbooks:

1. K A Robbin and Steve Robbins "UNIX Systems Programming", PHI, 2003.
2. Deitel and Deitel, "Operating System", Pearson Education, New Delhi, Third Edition, 2007.

Online Resources:

1. https://www.kernel.org/
2. https://www.kernel.org/doc/html/v4.10/process/adding-syscalls.html

18CSC21

DESIGN AND ANALYSIS OF ALGORITHMS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: PPS, Basics of Data structures and algorithms lab and OOP.

Course Objectives: The objectives of this course are

1. Design and construct simple programs by using the different design strategies for solving different problems.
2. To enhance programming skills while improving their practical knowledge in implementing the algorithms.
3. To strengthen the practical ability and to apply suitable algorithmic approaches for solving real time problems.

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify and setup environment for the implementation of algorithms.
2. Implement divide and conquer, greedy, dynamic programming, backtracking and branch and boundtechniques.
3. Demonstrate various algorithmic design techniques.
4. Analyze the performance of various algorithms.
5. Compare various design strategies.
6. Formulate solutions to solve real world problems use acquired knowledge.

The following task should be carried out by the students in the laboratory for each experiment:-

1. Setup the environment for the experiment.
2. Select appropriate design technique to implement the problem.
3. Represent the solution using algorithm
4. Analyze the performance of the algorithm (Time and Space complexity)
5. Justify the performance of your solution is better than other strategies.

By performing the above task for each experiment the following COs are achieved,

Course Outcome	1	2	3	4	5	6
Task	1	2	3	4	5	*

*As all the questions are real world applications so CO6 is achieved

List of Experiments:

1. You are given the task of choosing the optimal path to connect 'N' devices. The devices are connected with the minimum required N-1 wires into a tree structure, and each device is connected with the other with a wire of length 'L' ie 'D1'connected to 'D2' with a wire of length 'L1'. This information will be available for all 'N' devices.
   a) Determine the minimum length of the wire which consists of N-1 wires that will connect all devices.
   b) Determine the minimum length of the wire which connects Di and Dj
   c) Determine the minimum length of the wire which connects Di to all other devices.
   d) Determine the minimum length of the wire which connects Di to all other devices where $1 \leq i \leq N$.
2. An X-ray telescope (XRT) is a telescope that is designed to observe remote objects in the X-ray spectrum. In order to get above the Earth's atmosphere, which is opaque to X-rays, X-ray telescopes must be mounted on high altitude rockets, balloons or artificial satellites. Planets, stars and galaxies and the observations are to be made with telescope. Here the process of rotating equipment into position to observe the objects is called slewing. Slewing is a complicated and time consuming procedure handled by computer driven motors. The problem is to find the tour of the telescope that moves from one object to other by observing each object exactly once with a minimum total slewing time.
3. CSE department of CBIT want to generate a time table for 'N' subjects. The following information is given- subject name, subject code and list of subjects code which clashes with this subject. The problem is to identify the list of subjects which can be scheduled on the same time line such that clashes among them do not exist.
4. A Test has 'N' questions with a heterogeneous distribution of points. The test-taker has a choice as to which questions can be answered. Each question Qi has points Pi and time Tito answer the question, where $1 \leq i \leq N$. The students are asked to answer the possible subsets of problems whose total point values add up to a maximum score within the time limit 'T'. Determine which subset of questions gives student the highest possible score.
5. Given N items with their corresponding weights and values, and a package of capacity C, choose eitherthe entire item or fractional part of the item among these N unique items to fill the package such that the package has maximum value.
6. Given a bunch of projects, where every project has a deadline and associated profit if the project is finished

before the deadline. It is also given that every project takes one month duration, so the minimum possible deadline for any project is 1 month. In what way the total profits can be maximized if only one project can be scheduled at a time.

7. N-Queen is the problem of placing 'N' chess queens on an N×N chessboard. Design a solution for this problem so that no two queens attack each other.
   Note: A queen can attack when an opponent is on the same row, column or diagonal.
8. Bi-connected graphs are used in the design of power grid networks. Consider the nodes as cities and the edges as electrical connections between them, you would like the network to be robust and a failure at one city should not result in a loss of power in other cities.
9. Consider a source code structure where you are building several libraries DLLs (Dynamic- Link Library) and they have dependencies on each other. For example, to build DLL , you must have built DLLs B, C and D (Maybe you have a reference of B,C and D in the project that builds A).

Textbooks:

1. Thomas H Cormen, Charles E Lieserso, Ronald L Rivesr and Clifford Stein, "Introduction to algorithms", 3rd Edition, MIT Press/McGraw-Hill, 2009
2. Michel T Goodrich and Roberto Tamassia, "Algorithm Design: Foundations, Analysis and Internet Examples". Second Edition, Wiley, 2001.

18CSE05

WEB AND INTERNET TECHNOLOGIES LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Programming and Problem Solving, Object Oriented Programming, DBMS.

Course Objectives: The objectives of this course are

1. To acquire knowledge of XHTML, Java Script and XML to develop web applications.
2. Ability to develop dynamic web content using Java Servlets, JSP and JDBC.
3. To understand the design and development process of a complete web application.

Course Outcomes: On Successful completion of this course, student will be able to

1. Students will be able to develop static web sites using XHTML and CSS
2. Validate form data and create dynamic content using javascript
3. Develop Dynamic web content using Java Servlets and JSP
4. Handle Sessions and use servlet filters in web applications.
5. Validate form data and create dynamic content using javascript

LIST OF PROGRAMS

1. Design simple web pages using XHTML and CSS.
2. Categorize the content of web page using XML and validate using DTD and XML schema.
3. Create well structured, easily maintained web pages using CSS and Java script.
4. Examine dynamic web pages using Java script.
5. Design a dynamic webpage that meets specified requirements and interests of end users.
6. Apply the concepts of Inheritance and interfaces to solve complex problems.
7. Analyse and apply the concepts of Exception handling and packages.
8. Handling HTTP Sessions in web applications.
9. Demonstrate Servlet Collaboration using Servlet Context.
10. Creation of dynamic content in web application using JSP.
11. Provide a program level interface for communicating with database using JDBC.

Text Books:

1. Robert W Sebesta, "Programming the World Wide Web", Pearson Education, 2013
2. Cedit Buest, Subramanyam Allamraju, "Professional Java Server programming: J2EE 1.3 Edition", Apress Publications, 2007.

Suggested Reading:

1. Santosh Kumar K, "JDBC 4.2, Servlet 3.1 and JSP 2.3 Includes JSF 2.2 and Design Patterns", 2nd edition, 2016.

Online Resources:

1. https://www.w3schools.com/
2. https://www.tutorialspoint.com/servlets/index.htm.
3. https://www.oracle.com/technical-resources/articles/javase/servlets-jsp.html

18CSE06

GUI PROGRAMMING LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Basics of Python Programming.

Course Objectives: The main objectives of this course are

1. To familiarize the students with GUI development tools/frame works.
2. To Explore the features of PyQt and GUI Module.
3. To prepare the students developing GUI Applications.

Course Outcomes: On Successful completion of this course, student will be able to

1. Install and explore the features of selected IDE and frameworks.
2. Create widgets, buttons, tools and customize them using layout management tools.
3. Design user interfaces for the selected problem.
4. Implement the designed UI using PyQt and Dt Designer.
5. Customize UIs by using threading and make them responsive that are compatible with Android and iOS.

LIST OF PROGRAMS

1. Identification and installation of required software and tools.
2. Exploration of the installed IDEfor the development of GUI based applications
3. Demonstration of various buttons and tools.
4. Layout management of Widgets, buttons usngPyQt layout management tools.
5. Applying multithreading to make the GUI responsive.
6. Installation and exploration of Qt Designer.
7. Understanding and I/O requirements gathering for the selected problem.
8. Design of UI for the selected problem.
9. Implementation of the selected problem.
10. Enhancement of UI with CSS, event handling.
11. Applying 3D transformations using PyOpenGL.
12. Creation of slideshow using Tkinter.

Sample problems: Student marks management, Leave management, Attendance management, bank management, Student gate pass system, library management system, salary management system, canteen billing system, Bus ticket reservation system, Flight reservation system etc

Text Books:

1. Burkhard A. Meier “Python GUI Programming Recipes using PyQt5”, Packt, 2017
2. Burkhard A. Meier, “Hands-on Python 3.x GUI Programming: Pack 2019

Online Resources:

1. https://www.tutorialspoint.com/python/python_gui_programming.htm
2. https://www.geeksforgeeks.org/python-gui-tkinter/

18CSE07

IMAGE PROCESSING LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Basics of programming language.

Course Objectives: The objectives of this course are
1. To impart knowledge about the fundaments concepts of digital image processing.
2. To study various image transformation and enhancement techniques used in digital image processing.
3. To discuss about the image reformation, segmentation techniques used in digital image processing.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify the fundamental issues and challenges of image processing.
2. Translate images from spatial to frequency domain by applying various transformations.
3. Perform point operations and filtering in both domains.
4. Apply various techniques to enhance and analyze the image in detail.
5. Interpret various compression techniques and edge detection methods.
6. Evaluate Image processing algorithms for real-world problems.

LIST OF THE EXPERIMENTS:
1. Implement Point processing on images in spatial domain.
    a. Negation of an image.
    b. Thresholding of an image.
    c. Contrast Stretching of an image.
2. Implement Bit Plane Slicing on images.
3. Implement Histogram Equalization on images.
4. Implement Histogram Specification on images.
5. Implement Zooming by interpolation and replication on images.
6. Implement Filtering in spatial domain
    a. Low Pass Filtering
    b. High Pass Filtering
    c. Median filtering.
7. Implement Edge Detection using derivative filter mask
    a. Prewitt
    b. Sobel
    c. Laplacian
8. Implement Data compression using Huffman coding
9. Implement filtering in frequency domain
    a. Low pass filter
    b. High pass filter
10. Implement Hadamard transformation.

Text Books:
1. Rafael C. Gonzalez, Richard E. Woods, "Digital Image Processing", 4th Edition, Pearson, 2018
2. S Jayaraman, S Esakkirajan, T Veerakumar, "Digital Image Processing", - Mc Graw Hill Education, 2010.

Suggested Readings:
1. Scotte Umbaugh, "Digital Image Processing and Analysis-Human and Computer Vision Application with using CVIP Tools", 2nd Ed, CRC Press, 2011
2. Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, "Digital Image Processing using MATLAB", 2nd Edition, Mc Graw Hill Education, 2010.

18CSE08

MOBILE APPLICATION DEVELOPMENT LAB
(PROFESSIONAL ELECTIVE-I LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Programming language skills, Problem solving skills.

Course Objectives: The objectives of this course are

1. To learn how to develop Applications in android environment.
2. To learn how to develop user interface applications.
3. To learn how to develop URL related applications.

Course Outcomes: On Successful completion of this course, student will be able to

1. Analyze all the components and their properties of various Emulators to select appropriate Emulator for Android App.
2. Apply essential Android programming concepts for developing efficient Mobile App.
3. Develop Android applications related to various Layouts.
4. Design applications with rich User interactive Interfaces.
5. Develop Android applications related to Mobile related server -less database like SQLite.
6. Extend Event Handling to develop various Mobile applications.

The student is expected to be able to do the following problems, though not limited.

1. Create an Android application that shows Hello + name of the user and run it on an emulator. (b) Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
2. Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button. Use (a) Linear Layout, (b) Relative Layout and (c) Grid Layout or Table Layout.
3. Develop an application that shows names as a list and on selecting a name it should show the details of the candidate on the next screen with a "Back" button. If the screen is rotated to landscape mode (width greater than height), then the screen should show list on left fragment and details on right fragment instead of second screen with back button. Use Fragment transactions and Rotation event listener.
4. Develop an application that uses a menu with 3 options for dialing a number, opening a website and to send an SMS. On selecting an option, the appropriate action should be invoked using intents.
5. Develop an application that inserts some notifications into Notification area and whenever a notification is inserted, it should show a toast with details of the notification.
6. Create an application that uses a text file to store user names and passwords (tab separated fields and one record per line). When the user submits a login name and password through a screen, the details should be verified with the text file data and if they match, show a dialog saying that login is successful. Otherwise, show the dialog with Login Failed message.
7. Create a user registration application that stores the user details in a database table.
8. Create a database and a user table where the details of login names and passwords are stored. Insert some names and passwords initially. Now the login details entered by the user should be verified with the database and an appropriate dialog should be shown to the user.

Tools:

1. Geny Motion Emulator.
2. Android Application Development with MIT App Inventor: For the first one week, the student is advised to go through the App Inventor from MIT which gives insight into the various properties of each component. The student should pay attention to the properties of each component, which are used later in Android programming.

Following are useful links:

1. http://ai2.appinventor.mit.edu
2. https://drive.google.com/file/d/0B8rTtW_91YclTWF4czdBMEpZcWs/view

18CSC22

MINI PROJECT

Instruction	3Hours per week
CIE	50 Marks
Credits	1

Objective: The main objective of this mini project is to explore and strengthen the understanding of fundamentals through practical application of theoretical concepts. It enables the students to design and develop solutions to real world problems by applying programming knowledge to become a good engineer. It acts like a beginners guide to do larger projects later in their career.

Course Outcomes: At the end of the course, students will be able to

1. Identify and understand the real world problems.
2. Formulate the solutions to the problems by applying Computer Science and Mathematical fundamentals.
3. Represent the solutions by using various design aids/charts/diagrams.
4. Implement the solutions using modern tools/languages.
5. Analyze and interpret the experimentation results, draw conclusions
6. Communicate effectively through technical reports and presentation according to the documentation/report guidelines

Some of the guidelines for Mini Project:

1. **Selection of Topic**: Selection of topic is a huge and important task in a Mini Project. One should have a clear idea about one's subject strengths and the selected topic should be relevant to it. Always select the project that has value addition. As a graduate you should select a project which is either advantageous to a lot of people or enhance your technical and managerial skills. Your project must play its role towards a positive growth/development in that specific field.
2. **Research about the selected topic online:** Do some online research about the selected topic. Go through the research papers from different researchers around the world on the topics related to Mini Project. Find some websites containing the information about the materials used for Mini Project.
3. **Suggestions from subject experts:** Go to the subject experts in your department and interact with them about the Mini Project topic. You can also meet many subject experts from other department or various parts of the society through physically or social media and some discussion forums. This helps you in getting suggestions in different possible ways, through which you can get a clear idea on your Mini Project topic.
4. **Planning:** After getting a clear idea about the topic, prepare a rough plan about procurement of resources, experimentation and fabrication along with your teammates. Make a rough schedule, adapt to it and distribute the work among your teammates. This will keep your Mini Project on track and individuals will come to know about their part in the Mini Project rather than any individual (leader) taking full responsibilities.
5. **Execution of plans:** Make sure that the materials will be ready for the experimentation/fabrication by the scheduled time. Follow the schedule during experimentation/fabrication to get accurate and efficient results.
6. **Presentation:** Experimentation/Fabrication does not make a Mini Project successful; one should be able to present the results in proper way. So it should be prepared in such a way that, it reflects the exact objective of your Mini Project.

Guide lines / Instructions:

1. Each Mini project must be done in a group of 2-3 students.
2. Choose the topic/problem related to the fields/courses studied earlier or current semester
3. Each group must prepare a title of the mini project that relates to any engineering discipline and the title must emulate any real-world situation / problem.
4. Submit an early proposal (1-2 pages report describing what is the project about and the outcome of the final product would be, by the end of **Fourth Week**.
5. The title must be submitted to the respective lecturer by the end of week 9
6. Report must be submitted during the project presentation (**14^{th} Week**)
7. Students are required to carry out the mini project in any one of the areas/courses that they have studied earlier or studying currently.
8. The progress of the mini project is monitored by the mentor and coordinator **every week**. Each student has to maintain a **project diary** duly signed by the mentor

Assessment:

1. 10% Early proposal (abstract)
2. 50% Continuous evaluation (progress of the project including literature review, design, development, coding, documentation according to the time lines)
3. 20% presentation and demonstration (structured, fluent, logic, output) ; 10% Viva Voce (Evaluated by internal PRC-Project Review Committee)
4. 10% Final Report writing

Report: A report must contain the complete project details. The layout or the organization of the report as follows:

- Summary / Abstract
- Introduction
- Software specifications
- Design of the problem (Block diagram / structured chart; Flow Chart functions or Pseudocode for the subprogram
- Results and Discussions
- Conclusion and Future work
- References, Appendix and coding. System manual-How to use the system

Note: Please find the specimen copy of the project report in the institute website.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
SCHEME OF INSTRUCTION AND EXAMINATION
B.E. COMPUTER SCIENCE AND ENGINEERING

SEMESTER –VI

S. No	Course Code	Title of the Course	Scheme of Instruction			Duration of SEE in Hours	Scheme of Examination		
			Hours per Week				Maximum Marks		Credits
			L	T	P/D		CIE	SEE	
THEORY									
1	18CSC23	Data Communication and Computer Networks	3	0	0	3	30	70	3
2	18CSC24	Software Engineering	3	0	0	3	30	70	3
3	18CSC25	Artificial Intelligence	3	0	0	3	30	70	3
4	18CSE XX	Professional Elective-II	3	0	0	3	30	70	3
5	18CSE XX	Professional Elective-III	3	0	0	3	30	70	3
6	18MBC 01	Engineering Economics and Accountancy	3	0	0	3	30	70	3
7	18EEM 01	Indian Traditional Knowledge	2	0	0	2	-	50	0
PRACTICAL									
8	18CSC26	Data Communication and Computer Networks Lab	0	0	3	3	25	50	1.5
9	18CSC27	Case Study	0	0	2	2	50	-	1
		TOTAL	**20**	**00**	**05**		**255**	**520**	**20.5**

PROFESSIONAL ELECTIVE-II	
Course Code	**Title of the Course**
18CSE09	Internet of Things
18CSE10	Parallel and Distributed Algorithms
18CSE11	Cloud Computing
18CSE12	Computer Vision

PROFESSIONAL ELECTIVE-III	
Course Code	**Title of the Course**
18CSE13	Soft Computing
18CSE14	Network and System Administration
18CSE15	Mobile Computing
18CSE16	Free and Open-Source Software

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

18CSC23

DATA COMMUNICATION AND COMPUTER NETWORKS

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Basic programming and problem solving.

Course Objectives: The objectives of this course are

1. To understand the principles of data communication and organization of computer networks
2. To analyze various routing and congestion control algorithms.
3. To study the functionality of the transport layer and understanding different application layer protocols.

Course Outcomes: On Successful completion of this course, student will be able to

1. Define the communication protocol suites like ISO-OSI and TCP/IP.
2. Illustrate and explain Data Communications System and its components.
3. Identify and analyze various routing algorithms, congestion control algorithms.
4. Distinguish the internet protocols like IP, ARP, ICMP, IGMP, BGP, OSPF, and DHCP.
5. Outline the transport layer protocols like TCP, UDP, RTCP.
6. List and examine the applications of HTTP, WWW, DNS, Email, FTP and the underlying protocols.

UNIT - I

Introduction: Data communication, network types and models, TCP/IP and OSI Protocol Suite, transmission media (wired and wireless), switching.

UNIT - II

Data Link Layer: Design issues, error detection and correction, elementary data link protocols, sliding window protocols, multiple access protocols.

LAN: Wired LAN, wireless LAN, connecting devices and wireless LAN.

UNIT - III

Network Layer: Network layer design issues, routing algorithms, congestion control algorithms, Quality of service, IPV4, IPV6, Internet, network layer protocols -ARP, RARP, BOOTP and DHCP.

UNIT - IV

Transport Layer: Process to Process Communication, User Datagram Protocol (UDP), Transmission Control Protocol (TCP), SCTP, congestion control, quality of service.

UNIT - V

Application Layer: Domain Name Space (DNS), DDNS, TELNET, EMAIL, File Transfer Protocol (FTP), WWW, HTTP, SNMP, Bluetooth, Firewalls.

Textbooks:

1. Behrouz A. Forouzan, “Data communication and Networking”, Tata McGraw– Hill, Fifth Edition, 2013.
2. S. Tanenbaum, "Computer Networks", Pearson Education, Fifth Edition, 2013
3. William Stallings, “Data and Computer Communication”, Eighth Edition, Pearson Education, 2007.

Suggested Reading:

1. Larry L.Peterson, Peter S. Davie, “Computer Networks”, Elsevier, Fifth Edition, 2012. 2. James F. Kurose, Keith W. Ross, “Computer Networking: A Top–Down Approach Featuring the Internet”, Pearson Education, 2005.

Online Resources:

1. https://nptel.ac.in/courses/106/105/106105081/
2. https://nptel.ac.in/courses/106/106/106106091/

18CSC24

SOFTWARE ENGINEERING

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are
1. To understand the Software Engineering Practice & Process Models.
2. To understand Design Engineering, and Software Project Management.
3. To gain knowledge of the overall project activities.

Course Outcomes: On Successful completion of this course, student will be able to
1. State the software process and the perspective process model, evolutionary and agile process models.
2. Interpret the Requirements of Software Product and Estimate the cost of software using empiricalmodels.
3. Demonstrate the skills necessary to specify the requirements of software product.
4. Recall the design principles and construct a product using coding principles and standards.
5. Prepare test cases and Apply software testing methods like White Box, Black box, and O-O.
6. Identify the configuration Management and estimates software quality and metrics of maintenance.

UNIT - I

Introduction to Software Engineering: The nature of Software, Software Engineering, The Software Process**,** Software Engineering Practice. **Process Models:** A Generic Process Model, Process Framework, CMMI, Prescriptive Process Models: Waterfall Model, Incremental Process Models, Evolutionary Process Models -Prototyping, The Spiral Model, Concurrent Models. **An Agile View of Process**: Agility, Agile Process, and Agile Process Models- Extreme Programming (XP), Adaptive Software Development (ASD).

UNIT - II

Requirement Engineering: Understanding Requirements: Establishing the Groundwork, Requirement Engineering tasks, Initiating the Requirements Engineering Process, Eliciting Requirements. **Software Requirements Analysis and Specification**: Problem Analysis, Requirements Specification, Decision Tables, SRS Document, IEEE Standards for SRS, Case Studies. **Planning and Managing the Project**: Managing Software Project, Project Personnel, Effort Estimation, Risk Management, the Project Plan and Software project estimation – Empirical estimation models.

UNIT - III

Design Engineering: Design Principles, Design Notation and Specification, Design Concepts, Flow oriented modeling. The function-oriented design for the case studies, O-O Design Concepts, Modeling Component-Level Design. **Architectural Design:** Software Architecture, Data Design, A Brief Taxonomy of Architectural Styles. **Implementation:** Coding Principles and Standards, Coding Process, Code Verification.

UNIT - IV

Testing Strategies: A Strategic approach to software testing, strategic issues, test strategies for Conventional and O-O Software, Validation Testing, System Testing, Art of Debugging. **Testing Tactics**: Software Testing Fundamentals, White Box Testing: Basis Path Testing, Control Structure Testing, O-O Testing methods. Black Box Testing

UNIT - V

Software Quality Assurance – Managing Software Project, Quality concepts Software Quality Assurance Software Reviews, Technical Reviews, Software Reliability. **Software Configuration Management**: Identification of Objects in the Software Configuration, Configuration Audit, SCM standards. **Software Maintenance**: Categories of Maintenance, Software reuse, Metrics for maintenance.

Text Books:
1. Roger S. Pressman, “Software Engineering: A practitioner’s approach”, 7th edition, McGraw Hill, 2010.
2. Shari Lawrence Pfleeger, “Software Engineering Theory and Practices”, 4th Edition, Pearson Education, India, 2011.
3. Pankaj Jalote”An integrated approach to Software Engineering”, Springer/ Narosa, 2014

Suggested Reading:
1. Sommerveli “Software Engineering”, 10TH Edition, Pearson,2015
2. Rajib Mal “Fundamental of Software Engineering”, 4th Edition, PHI Learning, 2014.

Online Resources:
1. https://nptel.ac.in/courses/106101061/

18CSC25

ARTIFICIAL INTELLIGENCE

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Data structures, Discrete Mathematics, Probability Theory.

Course Objectives: The objectives of this course are

1. To list the significance of AI.
2. To discuss the various components that is involved in solving an AI problem.
3. To analyze the various knowledge representation schemes, reasoning and learning techniques of AI.

Course Outcomes: On Successful completion of this course, student will be able to

1. Explain the role of agents and interaction with the environment to establish goals.
2. Identify and formulate search strategies to solve problems by applying suitable search strategy.
3. Compare and contrast the various knowledge representation schemes of AI.
4. Appraise probabilistic reasoning and Markov decision process to solve real world problems.
5. Apply the AI concepts to build an expert system to solve the real-world problems.
6. Describe learning paradigms in machine learning.

UNIT - I

Introduction: Concept of Al, history, current status, scope, Problem Formulations, Review of tree and graph structures. **Intelligent agents:** Classification, Working of an agent, single agent and multi agent systems, multi agent application.

UNIT - II

Problem Solving - State - Space Search and Control Strategies: State space representation, Search graph and Search tree. Random search, Search with closed and open list, Depth first and Breadth first search. Heuristic search, Best first search. A* algorithm, problem reduction, constraint satisfaction, Game Search, minmax algorithm, alpha beta pruning.

UNIT - III

Logic Concepts and Logic Programming: Introduction, Propositional Calculus Propositional Logic, Natural Deduction System, Axiomatic System, Semantic Table, A System in Propositional Logic, Resolution, Refutation in Propositional Logic, Predicate Logic, Logic Programming.

Knowledge Representation: Introduction, Approaches to knowledge Representation, Knowledge Representation using Semantic Network, Extended Semantic Networks for KR, Knowledge Representation using Frames.

UNIT - IV

Probabilistic Reasoning: Probability, inference using full joint distributions, Bayes rule, Bayesian networks-representation, construction, exact and approximate inference, temporal model, hidden Markov model. **Markov Decision process:** MDP formulation, utility theory, multi attribute utility functions, decision networks, value iteration, policy iteration and partially observable MDPs.

UNIT - V

Expert System and Applications: Introduction, Phases in Building Expert Systems Expert System Architecture, Expert Systems Vs Traditional Systems, Truth Maintenance Systems, Application of Expert Systems, List of Shells and tools. **Machine - Learning Paradigms:** Introduction, Machine learning System, Supervised and Unsupervised Learning, Inductive Learning, Learning Decision Trees, Deductive Learning, Clustering.

Text Books:

1. Russell, Norvig, “Artificial Intelligence: A Modern Approach”, Pearson Education, 3nd Edition, 2010.
2. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, First Edition, 2011.

Suggested Reading:

1. Rich, Knight, Nair, “Artificial Intelligence”, Tata McGraw Hill, 3rd Edition 2009.
2. Trivedi. M.C., “A classical approach to Artificial Intelligence”, Khanna Publishing House, Delhi.

Online Resources:

1. http://nptel.ac.in/courses/106106126/
2. http://nptel.ac.in/courses/106105077/

18MBC01

ENGINEERING ECONOMICS AND ACCOUNTANCY

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:

1. To demonstrate the importance of Managerial Economics in decision making.
2. To understand the importance of project evaluation in achieving a firm's objective.
3. To explain the concept of Accountancy and provide basic knowledge on preparation and analyzing of Final accounts.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Apply fundamental knowledge of Managerial economics concepts and tools.
2. Understand various aspects of demand analysis and forecasting
3. Analyze production and cost relationships to make best use of resources available.
4. Analyze different opportunities and come out with best feasible capital investment decisions
5. Apply accountancy concepts and conventions and preparation of final accounts.

UNIT - I

Introduction to Managerial Economics : Introduction to Economics and itsevolution - Managerial Economics - its Nature and Scope, Importance; Relationship with other Subjects. Its usefulness to Engineers; Basic concepts of Managerial economics - Incremental, Time perspective, Discounting Principle, Opportunity Cost, Equimarginal Principle, Contribution, Negotiation Principle.

UNIT II –

Demand and Supply Analysis : Demand Analysis - Concept of Demand, Determinants, Law of demand - Assumptions and Exceptions; Elasticity of demand - Price, Income and Cross elasticity - simple numerical problems; Concept of Supply - Determinants of Supply, Law of Supply; Demand Forecasting - Methods.

UNIT III –

Production and Cost Analysis: Theory of Production - Production function - Isoquants and Isocosts, MRTS, Input-Output Relations; Laws of returns; Internal and External Economies of Scale.

Cost Analysis: Cost concepts Types of Costs, Cost-Output Relationship Short Run and Long Run; Market structures Types of Competition, Features, Price Output Determination under Perfect Competition, Monopoly and Monopolistic Competition; Break-even Analysis Concepts, Assumptions, Limitations, Numerical problems.

UNIT IV –

Accountancy: Book-keeping, Principles and Significance of Double Entry Book Keeping, Accounting Concepts and Conventions, Accounting Cycle, Journalization, Subsidiary books, Ledger accounts, Trial Balance concept and preparation of Final Accounts with simple adjustments. Ratio Analysis.

UNIT V –

Capital and Capital Budgeting: Capital and its Significance, Types of Capital, Estimation of Fixed and Working capital requirements, Methods and sources of raising finance. Capital Budgeting, Methods: Traditional and Discounted Cash Flow Methods - Numerical problems.

Text Books:

1. MehtaP.L.,"Managerial Economics: Analysis, Problems and Cases", Sultan Chand & Son's
2. Educational publishers, 2016.
3. Maheswari S.N. "Introduction to Accountancy", Vikas Publishing House, 11th Edition, 2013. PandayI.M. "Financial Management", 11th edition, Vikas Publishing House, 2015.

Suggested Readings:

1. Varshney and KL Maheswari, "Managerial Economics", Sultan Chand, 2014.
2. M.Kasi Reddy and S.Saraswathi, "Managerial Economics and Financial Accounting", Prentice Hall of India Pvt Ltd, 2007.
3. A.R.Aryasri, "Managerial Economics and Financial Analysis", McGraw-Hill, 2013.

18EEM 01

INDIAN TRADITIONAL KNOWLEDGE

Instruction	2 Hours per week
Duration of Semester End Examination	2 Hours
Semester End Examination	50 Marks
Credits	0

Course Objectives: The objectives of this course are :

1. To get a knowledge in Indian Culture
2. To Know Indian Languages and Literature and the fine arts in India
3. To explore the Science and Scientists of Medieval and Modern India

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand the culture, civilization, and heritage of Ancient, Medieval and Modern India.
2. Distinguish various Languages and Literature existing in India
3. Discuss and Compare Philosophy and Religion in Indian since ancient times
4. Explore various Fine arts in Indian History, and Illustrate the development of Science and Technologyin India.
5. Describe the Indian Education System, and recognize the efforts of scientist to the development ofIndia

UNIT-I

Introduction to Culture: Culture, civilization, culture and heritage, general characteristics of culture, importance of culture in human literature, Indian Culture, Ancient India, Medieval India, Modern India

UNIT-II

Indian Languages, Culture and Literature:

Indian Languages and Literature-I: the role of Sanskrit, significance of scriptures to current society, Indian philosophies, other Sanskrit literature, literature of south India.

Indian Languages and Literature-II: Northern Indian languages & literature

UNIT-III

Religion and Philosophy: Religion and Philosophy in ancient India, Religion and Philosophy in Medieval India, Religious Reform Movements in Modern India (selected movements only)

UNIT-IV

Fine arts in India (Art, Technology& Engineering): Indian Painting, Indian handicrafts, Music, divisions of Indian classic music, modern Indian music, Dance and Drama, Indian Architecture (ancient, medieval and modern), Science and Technology in India, development of science in ancient, medieval and modern India

UNIT-V

Education system in India: Education in ancient, medieval and modern India, aims of education, subjects, languages, Science and Scientists of Ancient India, Science and Scientists of Medieval India, Scientists of Modern India

Text Books:

1. Kapil Kapoor, "Text and Interpretation: The India Tradition", ISBN: 81246033375, 2005
2. "Science in Samskrit", Samskrita Bharti Publisher, ISBN-13: 978-8187276333, 2007
3. S. Narain, "Examinations in ancient India", Arya Book Depot, 1993
4. Satya Prakash, "Founders of Sciences in Ancient India", Vijay Kumar Publisher, 1989
5. M. Hiriyanna, "Essentials of Indian Philosophy", Motilal Banarsidass Publishers, ISBN-13: 978-8120810990, 2014

Suggested Reading:

1. Kapil Kapoor, "Language, Linguistics and Literature: The Indian Perspective", ISBN-10: 8171880649, 1994.
2. Karan Singh, "A Treasury of Indian Wisdom: An Anthology of Spiritual Learn", ISBN: 978-0143426158, 2016.

18CSC26

DATA COMMUNICATION AND COMPUTER NETWORKS LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Basics of Operating System, Linux Commands.

Course Objectives: The objectives of this course are

1. To familiarize students with the communication media, devices, and protocols.
2. To expose students to gain practical knowledge of computer networks configuration and monitoring.
3. To create network simple computer networks using simulation tools.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify the different types of equipment like cables used in the networks Lab.
2. Recognize the various network devices like repeater, hub, switch.
3. Practice the basic network commands like ifconfig, ping, traceroute, nslookup, dig, arp, netstat, nmap.
4. Design and demonstrate network topologies using NS3 simulation tool.
5. Examine the packet transfer using NetAnim.
6. Analyze the network performance using Wire shark or any tool.

LIST OF EXPERIMENTS:

1. Study of Network media, cables, and devices and Cable Construction
2. Demonstration of basic network commands/utilities (both in Windows and Linux)
3. PC Network Configuration
4. Building a switch-based network / Configuration of Cisco Catalyst Switch 3560
5. Configuration of Cisco Router 2900
6. Basic OSPF configuration
7. Basic EIGRP Configuration
8. Analysis of network traces using tcpdump
9. Analysis of network traces using Whireshark

Textbooks:

1. S. Tanenbaum, "Computer Networks", Pearson Education, Fifth Edition, 2013.

Online Resources:

1. https://learningnetwork.cisco.com/s/question/0D53i00000Kt7EkCAJ/tools-for-ccnp-network- simulator-lab-tasks
2. https://www.packettracernetwork.com/
3. https://www.ghacks.net/2019/11/13/gns3-is-an-open-source-graphical-network-simulator-for- windows-linux-and-macos/
4. https://www.imedita.com/blog/top-10-list-of-network-simulation-tools/

18CSC27

CASE STUDY

Instruction	2 Hours per week
Duration of End Examination	2 Hours
Semester End Examination	35 Marks
Continuous Internal Evaluation	15 Marks
Credits	1

Case studies are common in engineering where we analyse (study) situations. Case study exercise is a realistic simulation of a real life situation or strategic problem we are likely to encounter in our workplace or surroundings. A case study is actually "analysing, applying engineering and science knowledge, reasoning and drawing conclusions" to solve a real situation. Case studies are different types including historical, real life, problem oriented etc.

Course Objectives: The objectives of this course are

1. To expose students to real life problems/events/situations and technologies
2. To promote individual study, critical thinking and group discussions to build team work
3. To inculcate the culture of self-learning, professional ethics communication

Course Outcomes: On successful completion of the case study, students will be able to

1. Understand real life situations, problems, developments of technologies in Computer science
2. Interpret, analyse, and think critically about the events, situations and gather information from varioussources for formulating solutions
3. Apply learned knowledge and commit to decisions
4. Evaluate the approach and solution to the event/problem by considering efficiency and optimization
5. Communicate efficiently both in written and orally to discuss the recommendations

Suggestions to select case studies

- For a real situation case study, you can choose an event at your workplace to analyse.
- For a historical case study, you can take a recent collapse/development of a company /technology /project (Cambridge Analytica, Google, Facebook, AI, ML, IoT, GitHub, GNU, LibreOffice, FOSS etc.) and analyse what went wrong or gave raise.
- For a problem oriented case study, choose a problem where they need to (Situation-- Problem-Solution(s)-- Evaluation):
    - understand the situation faced (significance),
    - analyse the specific problem to be tackled,
    - create, analyse, and refine a solution and
    - further evaluate, improve and implement

Instructions:

- Students need to choose a case in consultation with any one of their class teachers and mentor
- The topic should be confined to the areas/courses of AI, SE, IoT,
- Submit an abstract consisting of the significance, objectives, methodology and work plan by the end of 3rd week
- Every week they need to show progress to the concerned teacher and mentor
- Shall present/demonstrate and submit a report(read the Case Study guide lines)

Assessment: The main focus of case studies are to assess the approach and the solution arrived. In fact, case studies are usually designed not to have one 'correct' answer. As long as the students justify their recommendation, and stand up to interrogation from the assessor, they are likely to score marks. Students will be monitored by an internal teacher along with their mentors and evaluated by the external examiner at end.

18CSE09

INTERNET OF THINGS
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Computer Architecture and Microprocessor, Programming Basics.

Course Objectives: The objectives of this course are

1. Impart necessary and practical knowledge of components of Internet of Things.
2. Understand IoT Protocols.
3. Develop skills required to build real-time IoT based projects.

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify hardware and software components of Internet of Things.
2. Interface Input-Output devices, sensors with Arduino and Raspberry Pi using communication modules.
3. Analyze the use of communication protocols in IoT.
4. Remotely monitor data and subsequently control various devices.
5. Develop real time IoT based projects.
6. Applications of IoT in various domains such as health care, industrial automation.

UNIT - I

Introduction to IoT: Architectural Overview, Design principles and requirements of IoT, IoT Applications. **Elements of IoT:** Basics of networking, sensors, actuators, computing devices, software, data management and processing environment and Security issues.

UNIT - II

IoT Hardware Components: Computing (Arduino, Raspberry Pi), Communication, Sensors, Actuators, I/0 interfaces, Programming API's (for Arduino and Rasp berry Pi).

UNIT - III

IoT Protocols: 6LowPAN,RPL, IPV6, WiFi, ZigBee, Bluetooth, BLE, MQTT, CoAP, RFID.

UNIT - IV

IoT Application Development: Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT - V

IoT Case Studies: IoT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation.

Text Books:

1. Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.
2. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2018.
3. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Reading:

1. Dr. SRN Reddy, Rachit Tirnkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, “Internet of Things: Architecture and Design”, McGraw Hill, 2017.
4. Cuno Pfister, "Getting Started with the Internet of Things", 0 Reilly Media, 2011.
5. O. Vermesan, P. Fries**s, “**Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publishers, Series in Communications, 2013.

Online Resources / Web links / NPTEL Courses:

1. Li Da Xu, Wu He, and Shancang Li, “Internet of Things in Industries: A Survey “, IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. T. Winter, P. Thubert, A. Brandt, J. Hui, R. Kelsey, P. Levis, K. Pister, R. Struik , JP. Vasseur, R. Alexander, “RPL: IPv6 Routing Protocol for Low-Power and Lossy Networks”, IETF, Standards Track, Mar. 2012.

3. Z. Shelby, K. Hartke, C. Bormann, “The Constrained Application Protocol (CoAP)”**,** Internet Engineering Task Force (IETF), Standards Track, 2014.
4. L.Fenzel, “What’s The Difference Between IEEE 802.15.4 And ZigBee Wireless?”, Electronic Design (Online), Mar. 2013.
5. S. N. Das and S. Misra, "Information theoretic self-management of Wireless Sensor Networks", Proceedings of NCC 2013.
6. F. Luo et al., "A Distributed Gateway Selection Algorithm for UAV Networks," in IEEE Transactions on Emerging Topics in Computing, vol. 3, no. 1, pp. 22-33, March 2015.

18CSE10

PARALLEL AND DISTRIBUTED ALGORITHMS
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are

1. To acquaint students with the basic concepts of parallel and distributed computing.
2. To provide knowledge of parallel computing platforms.
3. To learn parallel and distributed algorithms development techniques for shared memory and message passing models.
4. To equip the students with modern parallel and distributed approaches for solving problems in emerging applications.

Course Outcomes: On Successful completion of this course, student will be able to

1. Describe the models and techniques for parallelization.
2. Make use of list ranking and graph coloring parallel Algorithms.
3. Analyze parallel algorithms and compute their complexity measures.
4. Develop parallel programs for search and matrix multiplication using open MP.
5. Choose a parallel algorithm that makes good use of the target Architecture.
6. Describe the distributed Algorithms to learn its models and complexity measures.

UNIT - I

The Idea of Parallelism: A Parallelized version of the Sieve of Eratosthenes. PRAM Model of Parallel Computation. Pointer Jumping and Divide & Conquer: Useful Techniques for Parallelization.

UNIT - II

PRAM Algorithms: Parallel Reduction, Prefix Sums, List Ranking, Preorder Tree Traversal, Merging Two Sorted Lists, Graph Coloring, Reducing the Number of Processors and Brent's Theorem, Dichotomy of Parallel Computing Platforms, Cost of Communication, Programmer's view of modern multi-core processors.

UNIT - III

The role of compilers and writing efficient serial programs, Parallel Complexity: The P-Complete Class, Mapping and Scheduling, Elementary Parallel Algorithms for Sorting.

UNIT - IV

Parallel Programming Languages: Shared Memory Parallel Programming using OpenMP
Writing efficient openMP programs, Dictionary Operations: Parallel Search, Graph, Algorithms and Matrix Multiplication.

UNIT - V

Distributed Algorithms: models and complexity measures. Safety, liveness, termination, logical time and event ordering, Global state and snapshot algorithms, Mutual exclusion and Clock Synchronization, Distributed Graph algorithms.

Text Books:

1. Michael J Quinn, “Parallel Computing: Theory and practice”, Tata McGraw Hill, 1993.
2. Roman Trobec, Boštjan Slivnik, Patricio Bulić, Borut Robič, “Introduction to Parallel Computing”, Springer, 2018.
3. Joseph Jaja, “Introduction to Parallel Algorithms”, First Edition, Addison Wesley, 1992.

Suggested Reading:

1. Ananth Grama, Anshul Gupta, George Karypis, Vipin Kumar, “Introduction to Parallel Computing”, Second Edition, Addison Wesley, 2003

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc19_cs17/preview
2. https://nptel.ac.in/courses/106102163/

18CSE11

CLOUD COMPUTING
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:

1. To impart the fundamentals and essentials of Cloud Computing.
2. To provide students a sound foundation of the Cloud Computing so that they can adopt Cloud Computing services and tools in their real life scenarios.
3. To provide knowledge about security and privacy issues related to cloud computing environments.
4. To enable students explore cloud computing driven commercial systems such as Google App Engine, Microsoft Azure and Amazon Web Services and others

Course Outcomes: On successful of the course **s**tudent will be able to:

1. Define Cloud Computing and related concepts and describe the characteristics, advantages, risks and challenges associated with cloud computing.
2. Explain and characterize various cloud service models, cloud deployment models.
3. Explore virtualization techniques that serve in offering software, computation and storage Services onthe cloud.
4. Illustrate the concepts of cloud storage and demonstrate their use in storage systems such as AmazonS3 and HDFS.
5. Understand the security and privacy issues related to cloud computing environments.
6. Investigate/Interpret the security and privacy issues related to cloud computing environments.

UNIT - I

Introduction to Cloud Computing: Cloud Computing in a Nutshell, System Models for Distributed and Cloud Computing, Roots of Cloud Computing, Grid and Cloud, Layers and Types of Clouds, Desired Features of a Cloud, Basic Principles of Cloud Computing, Challenges and Risks, Service Models.

UNIT - II

Virtual Machines and Virtualization of Clusters and Data Centers: Levels of Virtualization, Virtualization Structures//Tools and Mechanisms, Virtualization of CPU, Memory and I/O Devices, Virtual Clusters and Resource Management, Virtualization Data-Center Automation. Case studies: Xen Virtual machine monitors- Xen API. VMware - VMware products-Vmware Features. Microsoft Virtual Server - Features of Microsoft Virtual Server.

UNIT - III

Cloud computing architectures over Virtualized Data Centers: Data-Center design and Interconnection networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms, GAE, AWS, Azure, Inter-cloud Resource Management.

UNIT - IV

Cloud Security and Trust Management, Data Security in the Cloud : An Introduction to the Idea of Data Security, The Current State of Data Security in the Cloud, CryptDb: Onion Encryption layers-DET,RND,OPE,JOIN,SEARCH, HOM, and Homomorphic Encryption, FPE. Trust, Reputation and Security Management.

UNIT - V

Cloud Programming and Software Environments: Features of Cloud and Grid Platforms, parallel and distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments. Common Standards in Cloud Computing: The Open Cloud Consortium, the Distributed Management Task Force, Standards for Application Developers, Standards for Messaging. Internet Messaging Access Protocol (IMAP), Standards for Security, Examples of End-User Access to Cloud Computing.

Text Books:

1. John W. Rittinghouse, "Cloud Computing: Implementation, Management, and Security ". James F. Ransome, CRC Press 2009.
2. Kai Hwang. Geoffrey C.Fox, Jack J. Dongarra, “Distributed and Cloud Computing From Parallel Processing to the Internet of Things”, Elsevier, 2012.
3. Rajkumar Buyya, James Broberg and Andrzej M. Goscinski,” Cloud Computing: Principles and Paradigms (Wiley Series on Parallel and Distributed Computing), Wiley Publishing ©2011.

Suggested Reading:

1. Raluca Ada Popa, Catherine M.S. Redfield, Nickolai Zeldovich, and Hari Balakrishnan, “CryptDB: Protecting Confidentiality with encrypted Query Processing”, 23rd ACM Symposium on Operating Systems Principles (SOSP 2011), Cascais, Portugal October 2011.
2. A Fully Homomorhic Encryption Scheme, Craig Gentry, September 2009.
3. David Marshall, Wade A. Reynolds, "Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center", Auerbach Publications, 2006.

Online Resources:

1. http://aws.amazon.com
2. http://code.google.com/appsengine
3. http://www.buyya.com/

18CSE12

COMPUTER VISION
(PROFESSIONAL ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Linear Algebra and Probability, Digital Image Processing.

Course Objectives: The objectives of this course are
1. To understand the Fundamental Concepts Related To Multi-Dimensional Signal Processing.
2. To understand Feature Extraction algorithms.
3. To understand Visual Geometric Modeling and Stochastic Optimization.

Course Outcomes: On Successful completion of this course, student will be able to
1. Recognize the basic fundamentals of vision and describe the scope of challenges.
2. Develop algorithms to analyze feature detection and feature alignment.
3. Analyze images and videos for problems such as tracking and structure from motion.
4. Choose object, scene recognition and categorization algorithms for real time images.
5. Explain recovery of 3D structure of ill-posed scenes.
6. Apply various techniques to build computer vision applications.

UNIT - I

Introduction to Computer Vision and Image Formation: Introduction, Geometric primitives and transformations, Photometric image formation, Digital Camera image formation. **Image Processing:** Point operators, Linear filtering, More neighborhood operators, Fourier transforms, Pyramids and wavelets, Geometric transformations.

UNIT - II

Feature detection and matching: Points and patches, Edges, Lines. **Segmentation**: Active contours, Split and merge, Mean shift and mode finding, Normalized cuts. **Feature-based alignment**: 2D and 3D feature-based alignment, Pose estimation.

UNIT - III

Structure from motion: Triangulation, Two-frame structure from motion, Factorization, Bundle adjustment, Constrained structure and motion. **Dense motion estimation:** Translational alignment, Parametric motion, Spline-based motion, Optical flow, Layered motion.

UNIT - IV

Recognition: Object detection, Face recognition, Instance recognition, Category recognition, Context and scene understanding.

UNIT - V

3D Reconstruction: Shape from X, Active range finding, Surface representations, Point-based representations, volumetric representations, Model-based reconstruction, Recovering texture maps.

Text Books:

1. Richard Szeliski “Computer Vision: Algorithms and Applications”, Springer-Verlag London Limited, 2011.
2. R. C. Gonzalez and R. E. Woods, “Digital Image Processing”; Addison Wesley, 2008.

Suggested Reading:

1. Robert J. Schallkoff, “Pattern Recognition: Statistical. Structural and Neural Approaches”, John Wiley and Sons; 1992+.
2. D. A. Forsyth and J. Ponce, “Computer Vision: A Modern Approach”, Pearson Education, 2003.
3. R. Hartley and A. Zisserman, “Multiple View geometry”, Cambridge university Press, 2002.
4. Richard Hartley and Andrew Zisserman, “Multiple View Geometry in Computer Vision”, Second Edition, Cambridge University Press, March 2004.
5. K. Fukunaga; “Introduction to Statistical Pattern Recognition”, Second Edition, Academic Press, Morgan Kaufmann, 1990.

Online Resources:

1. CV online: http://homepages.inf.ed.ac.uk/rbf/CVonline
2. Computer Vision Homepage: http://www2.cs.cmu.edu/afs/cs/project/cil/ftp/html/vision.html

18CSE13

SOFT COMPUTING
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Fundamental Mathematics.

Course Objectives: The objectives of this course are
1. To learn various types of soft computing techniques and their applications.
2. To acquire the knowledge of neural network architectures, learning methods and algorithms.
3. To understand Fuzzy logic, Genetic algorithms and their applications.

Course Outcomes: On Successful completion of this course, student will be able to
1. Understand various soft computing techniques.
2. Analyze and design various learning models and Neural Network Architectures.
3. Apply the Neural Network Architecture for various Real time applications.
4. Understand approximate reasoning using fuzzy logic.
5. Analyze and design Genetic algorithms in different applications.
6. Apply soft computing techniques to solve different applications.

UNIT - I

Soft computing vs. Hard computing, Various types of soft computing techniques.
Artificial Neural Networks: Fundamental concepts, Evolution of neural networks, Basic models of artificial neural network, important terminologies of ANNs. McCulloch-Pitts neuron, linear separability, Hebb network.

UNIT - II

Supervised Learning Neural Networks: Perceptron networks, Adaptive linear neuron (Adaline), Multiple Adaptive linear neuron (Madaline), Back propagation network.

UNIT - III

Unsupervised Learning Neural Networks: Kohonen Self Organizing networks, Adaptive resonance theory. **Associate Memory Networks:** Bidirectional associative memory network, Hopfield networks.

UNIT - IV

Fuzzy Logic: Introduction to classical sets and Fuzzy sets, Fuzzy relations, Tolerance and equivalence relations, Membership functions, Defuzzification.

UNIT - V

Genetic Algorithms: Introduction, Basic operators and terminology, Traditional algorithm vs. genetic algorithm, Simple genetic algorithm, General genetic algorithm, Classification of genetic algorithm, Genetic programming, Applications of genetic algorithm.

Text Books:

1. S.N. Sivanandam& S.N. Deepa, “Principles of soft computing”, Wiley publications, 2nd Edition, 2011.

Suggested Reading:

1. S. Rajasekaran& G.A. Vijayalakshmipai, “Neural Networks, Fuzzy logic & Genetic Algorithms, Synthesis & Applications”, PHI publication, 2008.
2. LiMin Fu, “Neural Networks in Computer Intelligence”, McGraw-Hill edition, 1994.
3. K.L.Du& M.N.S Swamy, “Neural Networks in a Soft Computing Framework”, Springer International edition, 2008.
4. Simon Haykins, “Neural Networks a Comprehensive Foundation”, PHI, second edition.
5. Goldberg, David E., “Genetic Algorithms in Search, Optimization and Machine Learning”, Addison Wesley, New Delhi, 2002.
6. N.P. Padhy and S.P. Simon, ”Soft Computing: With Matlab Programming”, Oxford University Press, 2015.

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_cs13/preview.

18CSE14

NETWORK AND SYSTEM ADMINISTRATION
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Operating System Concepts, Data Communications and Computer networks

Course Objectives: The objectives of this course are

1. To study about the operation of computers, servers and the networking
2. Familiarize the students with system and network administration tools.
3. Prepare the students to analyze the performance of system and network to resolve the issues

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and define the the basic system administration and networking tools
2. Illustrate system boot process, administration tools
3. Configure various services like mail, ftp, web hosting, security, use remote administration tools
4. Analyze and interpret log messages for troubleshooting the issues
5. Measure and evaluate the performance of system and network,
6. Write scripts to automate system administration process

UNIT - I

Networking Overview: History, Protocol Standards, Reference Models (ISO-OSI, TCP/IP), Windows and Linux networking basics, switching and routing basics.

Server Administration Basics: Server and Client Installation, Boot Process and Startup Services: Xinetd, Managing accounts: users, groups and other privileges, File Systems and Quota Management , Job Scheduling with cron, crontab, anacron and system log analysis, Process controlling and management, Online Server upgrade/update process.

UNIT - II

Network Configuration Basics: IPv4 and IPv6 addressing, Network Interface Configuration, Diagnosing Network startup issues, Linux and Microsoft, Firewall configuration, Network troubleshooting commands. **Dynamic Host Configuration Protocol (DHCP),** DHCP Principle, DHCP Server Configuration DHCP Options, Scope, Reservation and Relaying, DHCP Troubleshooting.

UNIT - III

Name Server and Configuration: DNS principles and Operations, Basic Name Server and Client Configuration, Caching Only name server, Primary and Slave Name Server, DNS Zone Transfers, dynamic Updates, delegation, DNS Server Security, troubleshooting.

Web and Proxy Server Configuration: HTTP Server Configuration Basics, Virtual Hosting, HTTP Caching, Proxy Caching Server Configuration, Proxy ACL, Proxy-Authentication Mechanisms, Troubleshooting.

UNIT - IV

FTP, File and Print Server: General Samba Configuration, SAMBA SWAT, NFS and NFS Client Configuration, CUPS configuration basics, FTP Principles, Anonymous FTP Server, Troubleshooting.

Mail Server basics: SMTP, POP and IMAP principles, SMTP Relaying Principles, Mail Domain Administration, Basic Mail Server Configuration, SPAM control and Filtering.

UNIT - V

Remote Administration and Management: Router Configuration, Webmin/ usermin, Team Viewer, Telnet, SSH, SCP, Rsync.

Text Books / Suggested Reading:

1. Thomas A. Limoncelli, Christina J. Hogan , Strata R. Chalup, “The Practice of System and Network Administration”, Pearson Education, Second Edition, 2012
2. Roderick W. Smith, “Advanced Linux Networking, Addison”, Wesley Professional (Pearson Education), 2002.
3. Tony Bautts, Terry Dawson, Gregor N. Purdy, “Linux Network Administrator’s Guide”, O’Reilly Publisher, Third Edition, 2005

Suggested readings:

1. Evi Nemeth, Garth Snyder, Trent R. Hein, Ben Whaley, Dan Mackin, "UNIX and Linux System Administration Handbook", Fifth Edition, 2017, Addison Wesley

Online resource:

1. https://study-ccna.com/
2. https://www.edx.org/course/it-support-networking-essentials

18CSE15

MOBILE COMPUTING
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:

1. Understand the concepts of mobile computing
2. Study network layer and transport layer protocols and Ad-Hoc networks.
3. Discuss about mobile platforms and application development.

Course Outcomes: On Successful completion of this course, student will be able to

1. Explain the basics of mobile telecommunication systems
2. Illustrate the generations of telecommunication systems in wireless networks
3. Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network
4. Explain the functionality of Transport and Application layers
5. Develop a mobile application using android/blackberry/ios/Windows SDK

UNIT-I

Introduction: Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA- FDMA- CDMA.

UNIT-II

Mobile Telecommunication System: Introduction to Cellular Systems – GSM – Services & Architecture – Protocols – Connection Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRS- UMTS – Architecture – Handover – Security.

UNIT-III

Mobile Network Layer: Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security.

UNIT-IV

Mobile Transport And Application Layer: Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML

UNIT-V

Mobile Platforms And Applications: Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues

Text Books:

1. Jochen Schiller, “Mobile Communications”, PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt.Ltd, New Delhi – 2012
3. Rajkamal, “Mobile Computing”, University press publications, 2014.

Suggested Reading :

1. Dharma Prakash Agarval, Qing and An Zeng, “Introduction to Wireless and Mobile systems”, Thomson Asia Pvt Ltd, 2005.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, “Principles of Mobile Computing”, Springer, 2003.
3. William.C.Y.Lee, “Mobile Cellular Telecommunications-Analog and Digital Systems”, Second Edition,TataMcGraw Hill Edition ,2006.
4. C.K.Toh, “AdHoc Mobile Wireless Networks”, First Edition, Pearson Education, 2002.

Online Resources :

1. Android Developers : http://developer.android.com/index.html
2. Apple Developer : https://developer.apple.com/
3. Windows Phone DevCenter : http://developer.windowsphone.com
4. BlackBerry Developer : http://developer.blackberry.com

18CSE16

FREE AND OPEN SOURCE SOFTWARE (FOSS)
(PROFESSIONAL ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:

1. Familiarize the students with Open Source Technologies.
2. Expose students with OSS Projects, Advantages of Open Source.
3. Make the students understand the principles, methodologies, policies, licensing procedures and ethicsof FOSS.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Identify various FOSS tools, platforms, licensing procedures and development models, ethics
2. Describe various FOSS projects, development models and project management
3. Adapt to the usage of FOSS tools and technologies.
4. Distinguish between Proprietary and Open Source tools, development methods
5. Evaluate various Open Source projects like Linux, Apache, GIT
6. Practice Open Source principles, ethics and models.

UNIT - I

Introduction to Open Source: Open Source, need and principles of OSS, Open Source Standards, Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Vs. Proprietary Software, Public Domain software, History of free software, Proprietary Vs Open Source Licensing Model, use of Open Source Software.

UNIT – II

Fault Tolerant Design: **Principles and Open Source Methodology**- History, Open Source Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open Source Software Development, Licenses, Copyright vs. Copy left, Patents, zero marginal cost, income-generation Opportunities, Internationalization.

UNIT – III

Case Studies: Apache, BSD, Linux, Mozilla Firefox, Wikipedia, Git, GNU CC, LibreOffice.

UNIT – IV

Open Source Project: Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Open Source Teaching (OST), Open Source Media

What Is A License, How to create your own Licenses, Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT – V

Open Source Ethics- Open Source Vs. Closed Source, Open Source Government, Ethics of Open Source, Social and Financial Impact of Open Source Technology, Shared Software, Shared Source, Open Source as a Business Strategy.

Text Books:

1. Kailash Vadera, Bhavyesh Gandhi "Open Source Technology", University Science Press, 1st Edition, 2009.
2. Fadi P. Deek and James A. M. McHugh, "Open Source Technology and Policy", Cambridge University Press.

Suggested Reading:

1. Wale Soyinka, "Linux Administration- A beginner's Guide", Tata McGraw Hills.
2. Andrew M. St. Laurent, "Understanding Open Source and Free Software Licensing", O'Reilly Media.
3. Dan Woods, Gautam Guliani, "Open Source for the Enterprise", O'Reilly Media.
4. Bernard Golden, "Succeeding with Open Source", Addison-Wesley Professional.
5. Clay Shirky and Michael Cusumano, "Perspectives on Free and Open Source Software", MIT press.

Online Resources:

1. https://fossee.in/
2. https://opensource.com
3. https://www.gnu.org/

AICTE - Model Curriculum

B.E Syllabus for VII and VIII Semester

With effect from 2021 - 22

Specialization /Branch: Computer Science and Engineering

Chaitanya Bharathi Institute of Technology (A)
Chaitanya Bharathi (P.O), Gandipet
Hyderabad-500075, Telangana State.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
SCHEME OF INSTRUCTION AND EXAMINATION
VII-Semester of B.E Model Curriculum
COMPUTER SCIENCE AND ENGINEERING

SEMESTER-VII

Sl.No	Course Code	Title of the Course	Scheme of Instruction			Scheme of Examination			Credits
			Hours per week			Duration of SEE in Hours	Maximum Marks		
			L	T	P/D		CIE	SEE	
THEORY									
1	18BTO01	Basics of Biology	3	0	0	3	30	70	3
2	18CSC28	Compiler Design	3	0	0	3	30	70	3
3	18CSE XX	Professional Elective-IV	3	0	0	3	30	70	3
4	18CSE XX	Professional Elective-V	3	0	0	3	30	70	3
5	18XX OXX	Open Elective-II	3	0	0	3	30	70	3
PRACTICALS									
7	18CSC29	Compiler Design Lab	0	0	3	3	25	50	1.5
8		Professional Elective-IV Lab	0	0	3	3	25	50	1.5
9	18CSC30	Project : PART-1	0	0	4	-	50	-	2
TOTAL			**15**	**0**	**10**		**250**	**450**	**20**

PROFESSIONAL ELECTIVE-IV	
Course Code	**Title of the Course**
18CSE17	Data Science and Big Data Analytics
18CSE18	Machine Learning
18CSE19	Virtual Reality
18CSE20	Cyber Security

PROFESSIONAL ELECTIVE-V	
Course Code	**Title of the Course**
18CSE21	Software defined Networks
18CSE22	Human Computer Interaction
18CSE23	Neural Networks and Deep Learning
18CSE24	Devops
18CSE25	Nature Inspired Algorithms

OPEN ELECTIVE-II	
Course Code	**Title of the Course**
18ECO 01	Remote Sensing and GIS
18ECO 03	Design of Fault Tolerant Systems
18ECO 04	Basics of DSP
18CEO 02	Disaster Mitigation and Management
18EGO 01	Technical Writing Skills

PROFESSIONAL ELECTIVE-IV LAB	
Course Code	**Title of the Course**
18CSE26	Data Science and Big data Analytics Lab
18CSE27	Machine Learning Lab
18CSE28	Virtual Reality Lab
18CSE29	Cyber Security Lab

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

18BTO01

BASICS OF BIOLOGY
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Course Objectives: The objectives of this course are

1. To understand the milestones reached by human in the field of biology.
2. Understanding the human body and its parts.
3. Understanding the human anatomy and medical devices.
4. To understand types of advanced therapies.
5. To understand the treatment of toxic pollutants in the environment.
6. To understand genome sequencing and NGS.

Course Outcomes: On Successful completion of this course, student will be able to

1. Provides information about how mankind gained knowledge from olden days to modern days.
2. Explain how the body parts working in the human system.
3. Engineer the medical devices.
4. Analyze the types of advanced treatments in the market.
5. Remediate the toxic pollutants.
6. Sequence the genome of different organisms.

UNIT - I

Introduction to Biology: Classical Vs Modern Biology; Importance of Biological Science and Historical developments; Origin of Life, Urey Miller Experiment, Spontaneous Generation Theory; Three Domains of Life; Principle and Applications of Microscope (Light and Electron Microscope), Prokaryotic and Eukaryotic Cell- Structure and their differences.

UNIT - II

Human Anatomy and Functions-I: Human organ systems and their functions; Skeletal System-Bones, Tendon, Ligaments, principle and applications in knee replacement; Nervous System - Structure of Brain, Spinal Cord, Neuron, Neurotransmitters, Synapse, Alzheimer's - a case study, principle and applications of Imaging Techniques (CT & MRI scans); Circulatory System - Heart structure and functions, principle and applications of cardiac devices (Stent and Pacemaker), Artificial heart, blood components and typing, haemocytometer.

UNIT - III

Human Anatomy and Functions-II: Respiratory Systems - Lung structure and function, principle and applications of Peak Flow Meter, ECMO (Extra Corporeal Membrane Oxygenation); Excretory Systems-Kidney structure and function, principle and applications of Dialysis; Prenatal diagnosis; Assisted reproductive techniques- IVF, Surrogacy.

UNIT - IV

Medical Biotechnology and Bioremediation: Cells of Immune System, Etiology of cancer, Cancer treatment (Radiation Therapy); Stem Cells and its Clinical applications; Scaffolds and 3D printing of organs; Bio sensors and their applications; Parts of bioreactor and its types; Bioremediation.

UNIT - V

Bioinformatics: Nucleic acid composition, Genetic Code, Amino acid, Polypeptide, Levels of protein structure, Homolog, Ortholog and Paralog, Phylogenetics, Genome Sequencing, Human Genome Project, Next generation sequencing.

Text Books / Suggested Reading:

1. Champbell, N.A., Reece, J.B., Urry, Lisa, Cain, M,L., Wasserman, S.A., Minorsky, P.V., Jackson, R.B., "Biology: A global approach", Pearson Education Ltd.
2. Shier, David, Butler, Jackie, Lewis, Ricki., "Hole's Human Anatomy & Physiology"., McGraw Hill 2012.
3. Bernard R. Glick, T. L. Delovitch, Cheryl L. Patten, "Medical Biotechnology", ASM Press, 2014.

18CSC28

COMPILER DESIGN

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Pre-requisites: Formal Language and Automata Theory, Data Structures, Algorithms.

Course Objectives: The objectives of this course are

1. To understand and list the different stages in the process of compilation
2. Identify different methods of lexical analysis and design top-down and bottom-up parsers
3. Identify synthesized and inherited attributes Syntax directed translation schemes and develop algorithms to generate code for a target machine

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify the concepts related to translator, tokens, bootstrapping porting and phases of the compiler.
2. Use grammar specifications and implement lexical analyzer by the help of compiler tools.
3. Explore the techniques of Top down, Bottom up Parsers and apply parsing methods for variousgrammars.
4. Implement syntax directed translation schemes and relate Symbol table organization for Blockstructured and non-Block structured languages.
5. Explain the algorithms to generate code for a target machine code and evaluate.
6. Recognize the errors and apply the recovery strategies for the errors identified by the phases of acompiler.

UNIT - I

Introduction: overview and Phases of compilation, Boot strapping Porting, Compiler construction Tools, Applications of Compiler technology, Lexical Analysis: Role of lexical Analyzer, Input Buffering, Specification and Recognition of Tokens, Scanner generator (lex, flex).

UNIT - II

Syntax Analysis: LL(1) grammars and top-down parsing, operator grammars, LR(O), SLR(1), CLR(1), LALR(1) grammars and bottom up parsing, ambiguity and LR parsing, LALR(1) parser generator (YACC, BISON).

UNIT - III

Semantic Analysis: Attribute grammars, syntax directed definition, evaluation and flow of attribute in a syntax tree, applications of SDD. **Symbol Table**: Symbol table structure, attributes and management, Run-time environment: Procedure activation, parameter passing, value return, memory allocation and scope.

UNIT - IV

Intermediate Code Generation: Translation of different language features, different types of intermediate forms. Code Improvement (optimization): Analysis: control-flow, data-flow dependence etc.; Code improvement local optimization, global optimization, loop optimization, peep-hole optimization etc.

UNIT - V

Target Code generation: Factors effecting code generation and Basic blocks, Register allocation and target code generation. Instruction scheduling, loop optimization, code generation using dynamic programming, error recovery strategies in phases of compiler.

Text Books:

1. A.V. Aho, M.S. Lam, R. Sethi, and J.D. Ullman, “Compilers: Principles, Techniques, and Tools”, Pearson Education, 2007 (second ed.).
2. K.D. Cooper, and L. Torczon, “Engineering a Compiler”, Elsevier, 2004.
3. Santanu Chattopadhyay, “Compiler Design”, PHI Learning Pvt. Ltd., 2015.

Suggested Reading:

1. Keith D Cooper & Linda Tarezon, “Engineering a Compiler”, Morgan Kafman, Second edition.
2. K.Muneeswaran, “Compiler Design”, first edition, Oxford University Press, 2012.
3. John R Levine, Tony Mason, Doug Brown, “Lex &YACC”, Shroff Publishers

Online Resources:

1. http://iitmweb.iitm.ac.in/phase2/courses/106108113/

18CSC29

COMPILER DESIGN LAB

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
Continuous Internal Evaluation	25 Marks
Credits	1.5

Pre-requisites: Basics of Data Structures, Algorithms and Automata Theory

Course Objectives: The objectives of this course are:

1. Defines the rules to implement Lexical Analyzer understand the concept behind the working ofcompiler tools Lex, Turbo C, Yacc.
2. Analyze and Apply regular grammar for various source statements expression
3. To implement front end of the compiler by means of generating Intermediate codes, implement code optimization techniques and error handling.

Course Outcomes: On Successful completion of this course, student will be able to

1. Implement the rules for the analysis phase of a compiler.
2. Apply various Syntax analysis techniques on grammars to build the parsers.
3. Generate various intermediate code representations for source code.
4. Explore error recovery strategies and implement Code Optimization, code generation phases.
5. Examine the concepts of compiler tools Lex, Flex Vision, Yacc, Turbo C.

List of Programs:

1. Design Token Separator for the given Expression
2. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.)
3. Implementation of Lexical Analyzer using JLex, flex or other lexical analyzer generating tools.
4. Build Top Down Parser table
5. Demonstration of working of Shift reduce parser
6. a. Implement Program to recognize a valid arithmetic expression that uses operator +, –, * and /.
   b. Program to recognize a valid variable which starts with a letter followed by any Number of letters or digits.
   c. Demonstration of Calculator using LEX and YACC tool
7. Build LR Parser
8. Simulation of Symbol table Management
9. Generation of a code for a given intermediate code
10. Demonstration of Code Optimization Techniques (Constant Folding).

Text Books:

1. Keith D Cooper & Linda Tarezon, “Engineering a Compiler”, Morgan Kafman, Second edition. Lex &Yacc, John R Levine, Tony Mason, Doug Brown, Shroff Publishers.

Suggested Reading:

2. Kenneth C Louden, “Compiler Construction: Principles and Practice”, Cengage Learning. Lex & YACC, John R Levine, Oreilly Publishers.

18CSC30

PROJECT : PART-1

Instruction	4 Hours per week
CIE	50 Marks
Credits	2

The objective of Project Part -1 is to enable the student take up investigative study in the broad field of Engineering / Technology, either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department on an individual basis or two/three students in a group, under the guidance of a supervisor. This is expected to provide a good initiation for the student(s) towards R&D. The work shall include:

1. Survey and study of published literature on the assigned topic;
2. Working out a preliminary Approach to the Problem relating to the assigned topic;
3. Conducting preliminary Analysis/ Modelling / Simulation / Experiment / Design /Feasibility;
4. Preparing a Written Report on the Study conducted for Presentation to the Department;
5. Final Seminar, as oral Presentation before the Department Review Committee.

Course Outcomes: By the end of course, students will be able to:

1. Review the literature related to the problem area / selected topic
2. Undertake problem identification, formulation and solution
3. Prepare synopsis of the selected topic
4. Gather the required data and Set up the environment for the implementation
5. Conduct preliminary analysis/modeling/simulation experiment
6. Communicate the work effectively in both oral and written forms

Guidelines for the award of Marks: Max. Marks: 50

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
Supervisor	20	Project Status / Review
	5	Report
Department Review Committee	5	Relevance of the Topic
	5	PPT Preparation
	5	Presentation
	5	Question and Answers
	5	Report Preparation

18CSE17

DATA SCIENCE AND BIG DATA ANALYTICS
(PROFESSIONAL ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Prerequisites: Probability and Statistics, Data Base Management Systems.

Course Objectives: The objectives of this course are
1. Introduce a data analytics problem solving framework.
2. Develop technical skills in probability modeling and statistical inference for the practical application ofstatistical methods.
3. Use existing and develop new statistical tools for data science problems across different applieddomains.

Course Outcomes: On Successful completion of this course, student will be able to
1. Describe Data Discovery, Data Preparation, Model Planning and Building, communicate results,operationalize phases of data analytics life cycle and Evaluation of data using statistical methods, ANOVA.
2. Predict the approaches for grouping similar objects using Least Squares, Nearest Neighbors andidentify frequent patterns using Apriori algorithm, FP-Growth.
3. Examine Time Series Analysis using ARIMA and representation, processing and analysis of textualdata to derive useful insights using TFIDF.
4. Recall Velocity, variety, volume, veracity of big data. Examples of big data and Risks, Crowd sourcinganalytics of Big data technologies.
5. Outline the Architecture of Apache Hadoop HDFS and Map Reduce operations to perform filtering,Job Tracking and restructuring data.
6. Explain types, benefits of No SQL databases and identify applications of stream data model, query processing and optimization techniques.

UNIT-I
Data Analytics Life cycle: Data Analytics Life cycle Overview, Discovery, Data Preparation, Model Planning, Model Building, Communicate Results, Operationalize. Exploratory Data Analysis, Statistical Methods for Evaluation, ANOVA.

UNIT-II
Overview of Supervised Learning: Variable Types and Terminology, Two Simple Approaches to Prediction: Least Squares and Nearest Neighbors, Model Selection and Bias Variance Tradeoff. Association Analysis: Association rules, Apriori algorithm, FP-Growth Technique.

UNIT-III
Time Series Analysis: Overview of Time Series Analysis, ARIMA Model. Text Analysis: Text Analysis Steps, Stop Word Removal, Tokenization, Stemming and Lemmatization, Representing Text: Term-Document Matrix, Term Frequency--Inverse Document Frequency (TFIDF).

UNIT-IV
Introduction to Big Data: Defining big data, 4 V's of big data, Big data types, Analytics, Examples of big data, Big data and Data Risk, Big data technologies, benefits of big data, Crowd sourcing analytics. Hadoop Distributed File Systems: Architecture of Apache Hadoop HDFS, Other File Systems, HDFS File Blocks, HDFS File Commands.

UNIT-V
No SQL Data Management: Types of NoSQL data bases, Benefits of No SQL. Map Reduce: Introduction, Map reduce example, Job Tracker, Map Operations. Data Stream Mining: The stream data model, streaming applications, continuous query processing and optimization, Distributed query processing.

Text Books:
1. EMC Education Services "Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data" Wiley Publishers, 2012.
2. Hastie, Trevor, et al., "The elements of statistical learning: Data Mining, Inference, and Prediction", Vol. 2. No. 1. New York: Springer, 2009.
3. V.K. Jain, "Big Data & Hadoop", Khanna Publishing House,2017.

Suggested Reading:

1. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press, 2012.
2. Mark Gardener, “Beginning R The statistical Programming Language”, Wiley, 2015.
3. Han, Kamber, and J Pei, “Data Mining Concepts and Techniques”, 3rd edition, Morgan Kaufman, 2012.
4. Big Data Black Book, DT Editorial Services, Wiley India.
5. V.K. Jain, “Data Science & Analytics”, Khanna Publishing House
6. Jeeva Jose, “Beginner’s Guide for Data Analysis using R Programming”, ISBN: 978-93-86173454.
7. Montgomery, Douglas C., and George C. Runger “Applied statistics and probability for engineers”, John Wiley & Sons, 6th edition, 2013.

18CSE18

MACHINE LEARNING
(PROFESSIONAL ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Linear Algebra and Probability theory basics

Course Objectives: The objectives of this course are:

1. Understand the need and elements of Machine Learning
2. Study various machine learning techniques
3. Design solutions for real world problems using machine learning techniques

Course Outcomes: On successful of the course **s**tudent will be able to:

1. Define the basic concepts related to Machine Learning.
2. Recognize the underlying mathematical relationships within and across Machine Learning algorithms and their paradigms.
3. Determine the various applications of Machine Learning.
4. Model the problems using various machine learning techniques.
5. Design and develop solutions to real world problems using Machine Learning Algorithms.
6. Evaluate and interpret the results of the various machine learning technique

UNIT - I

Introduction to Machine Learning: Introduction, Classic and Adaptive machines, learning types, deep learning, bio-inspired adaptive systems, Machine Learning and big data; **Elements of Machine Learning:** Data formats, Learnability, Statistical learning concepts, Class balancing, Elements of Information theory.

UNIT - II

Feature Selection and Feature Engineering: Data sets, Creating training and test sets, managing categorical data, missing features, data scaling and normalization, Withering, Feature selection and filtering, PCA, Visualization of high-dimensional datasets; **Regression Algorithms**: Linear models for regression, Regression types; **Linear Classification Algorithms:** Linear classification, logistic regression, grid search, classification metrics, ROC curve.

UNIT - III

Naïve Bayes and Discriminant Analysis: Bayes theorem, Naïve Bayes classifiers, Discriminant analysis; **Support Vector Machines**: Linear SVM, Kernel-based classification; **Decision Trees and Ensemble Learning**: Binary Decision trees, Introduction to Ensemble Learning-Random Forests, AdaBoost, Gradient Tree Boosting, Voting classifier.

UNIT - IV

Clustering Fundamentals: Basics, k-NN, Gaussian mixture, K-means, Evaluation methods, DBSCAN, Spectral Clustering, Hierarchical Clustering; **Introduction to Neural Networks**: Introduction to deep learning, MLPs with Keras, deep learning model layers, introduction to Tensorflow.

UNIT - V

Machine Learning Architectures: Data collection, Normalization and regularization, Dimensionality reduction, Data augmentation, Modeling/Grid Search/Cross-validation, Visualization, GPU support, Introduction to distributed architectures, Scikit-learn tools for ML architectures, pipelines, Feature unions

Text Books:

1. Giuseppe Bonaccorso, “Machine Learning Algorithms”, 2nd Edition, Packt, 2018,
2. Tom Mitchel “Machine Learning”, Tata McGraW Hill, 2017

Suggested Reading:

1. Abhishek Vijavargia “Machine Learning using Python”, BPB Publications, 1st Edition, 2018
2. ReemaThareja “Python Programming”, Oxford Press, 2017
3. Yuxi Liu, “Python Machine Learning by Example”, 2nd Edition, PACT, 2017

Online Resources:

1. https://www.guru99.com/machine-learning-tutorial.htm
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
3. https://www.geeksforgeeks.org/machine-learning/

18CSE19

VIRTUAL REALITY
(PROFESSIONAL ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Provide detailed understanding of the concepts of Virtual Reality and applications
2. Understand geometric modeling and virtual environment
3. Prepare the students to develop Virtual Reality applications

Course Outcomes: On successful of the course **s**tudent will be able to:

1. List the virtual environment requirements and benefits of virtual reality
2. Familiarize with various VR technologies and models of interactions in VR systems
3. Simulate flight dynamics of an aircraft in virtual environment
4. Identify the virtual hardware and software for modeling real world environments
5. Develop Virtual Reality applications
6. Explore the applications of VR in training, engineering, entertainment and science.

UNIT - I

Introduction to Virtual Reality- Introduction, Computer Graphics, real time computer graphics, flight simulation, virtual environment requirement, benefits of virtual reality, historical development of VR, scientific landmark. **3D Computer Graphics:** Introduction, virtual world space, positioning the virtual observer, perspective projection, human vision, stereo perspective projection, 3D clipping, color theory, simple 3D modelling, illumination models, reflection models, shading algorithms, radiosity, Hidden surface removal, realism0stereographic image.

UNIT - II

Geometric Modeling: Introduction, 2d to 3D, 3D space curves, 3D boundary representation, **Geometric Transformations:** Introduction, frames of reference, modeling transformations, instances, picking, flying, scaling the VE, collision detection; **Generic VR system**: Introduction, virtual environment, computer environment, VR technology, Model of interaction, VR systems.

UNIT - III

Virtual Environment: Introduction, dynamics of numbers, linear and non-linear interpolation, animation of objects, linear and non-linear translation, shape and object in between, free from deformation, particle system, **Physical Simulation:** Introduction, objects falling in a gravitational field, rot rotating wheels, elastic collisions, projectivities, simple pendulum, springs and flight dynamics of an aircraft.

UNIT - IV

VR Hardware and Software: Human factors-eys, ear and somatic senses; **VR Hardware**: Introduction, sensor hardware, hed-coupled displays, acoustic hardware, integrated VR system; **VR Software:** Modeling virtual world, physical simulation, VR toolkits, introduction to VRML.

UNIT - V

VR Applications: Engineering, Entertainment, Science, Training, **Future:** Virtual environment, modes of interaction.

Text Books:

1. John Vince, “Virtual Reality Systems”, Pearson Education Asia, 2007
2. Anad R., “Augmented and Virtual Reality”, Khanna Publishing House, Delhi

Suggested Reading:

1. Adams, “Visualization of Virtual Reality”, Tata McGraw Hill, 2000
2. Grigore C. Burdea, Philippe Coiffet, “Virtual Reality Technology”, Wiley Inter Science, 2nd Edition, 2006
3. William R Sherman, Alan B Craig, “Understanding Virtual Reality: Interface, Applications and Design”, Morgan Kaufman, 2008

Online Resources:

1. www.vresources.org
2. www.vrac.iastate.edu
3. www.w3.org/MarkUp/VRM

18CSE20

CYBER SECURITY
(PROFESSIONAL ELECTIVE-IV)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Operating System, Computer Network, Cryptography

Course Objectives: The objectives of this course are

1. To Identify and present indicators that a cybercrime has occurred and understand methods and tools used in cybercrimes.
2. To collect, Process, Analyze and Present Computer Forensics Evidence.
3. To understand the legal perspectives and Organizational implications of Cyber Security

Course Outcomes: On Successful completion of this course, student will be able to

1. List the different types of cybercrimes and analyze legal frameworks to handle cybercrimes.
2. Identify the Tools and Methods used in cybercrimes.
3. Analyze and resolve cyber security issues and laws governing Cyberspace.
4. Describe the need of Digital Forensics and the importance of digital evidence in prosecution.
5. Interpret the commercial activities in the event of significant information security incidents in the Organization.
6. Discuss the vulnerabilities in networking protocols and their mitigation techniques.

UNIT - I

Introduction to Cyber Crime: Cyber Crime: Definition and Origins of the Word, Cyber crime and Information Security, Classification of Cyber Crimes, Cyber Crime: The Legal Perspective, Cyber Crime: An Indian Perspective, A Global Perspective of Cyber Crime.

UNIT - II

Cyber Offenses: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector. **Tools and Methods Used in Cybercrime:** Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT - III

Cyber Security: The Legal Perspectives**:** Cyber Crime and the Legal Landscape around the World, Need of Cyber laws: the Indian Context, The Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber Law, Technology and Students: The Indian Scenario.

UNIT - IV

Understanding Cyber Forensics: Introduction ,Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Cyber Forensics Investigation, Challenges in Computer Forensics.

UNIT - V

Cyber security: Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Text Books:

1. Sunit Belpre and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt,Ltd,2011
2. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGraw Hill, 2006.

Suggested Reading:

1. Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, "Cyber Security and Cyber Laws", Paperback – 2018.
2. Mark F Grady, Fransesco Parisi, "The Law and Economics of Cyber Security", Cambridge university press, 2006.

Online Resources:

1. https://www.edx.org/learn/cybersecurity
2. https://www.coursera.org/courses?query=cyber%20security
3. https://swayam.gov.in/course/4002-cyber-law

18CSE21

SOFTWARE DEFINED NETWORKS
(PROFESSIONAL ELECTIVE-V)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Fundamentals of Operating Systems, Knowledge of Data Communications and Computer Networks.

Course Objectives: The objectives of this course are

1. To understand the need and fundamentals of Software Defined Networks.
2. To discuss the hardware and software components required by the data centers.
3. To study about the SDN solutions for data centers and Programming.

Course Outcomes: On Successful completion of this course, student will be able to

1. Describe the evolution of modern data centers.
2. Identify the components of Software Defined Networks and their use.
3. Build Software Defined Network solutions for Data Center Network including VLANs, EVPN,VxLAN and NVGRE.
4. Explore the features of Juniper SDN frame work.
5. Evaluate Open SDN API and Hypervisor based overlays.
6. Design and develop solutions for Data Centers using SDN frameworks.

UNIT - I

Introduction: History of Software Defined Networking (SDN) – Modern Data Center – Traditional Switch Architecture – need for SDN – Evolution of SDN – Working of SDNs – Centralized and Distributed Control and Data Planes.

UNIT - II

Open Flow & SDN Controllers: Open Flow Specification – Drawbacks of Open SDN, SDN via APIs, SDN via Hypervisor-Based Overlays – SDN via Opening up the Device – SDN Controllers – General Concepts.

UNIT - III

Data Centers: Multitenant and Virtualized Multitenant Data Center – SDN Solutions for the Data Center Network – VLANs – EVPN – VxLAN – NVGRE.

UNIT - IV

SDN Programming: Programming SDNs: Northbound Application Programming Interface, Current Languages and Tools, Composition of SDNs – Network Functions Virtualization (NFV) and Software Defined Networks: Concepts, Implementation and Applications.

UNIT - V

SDN: Juniper SDN Framework – IETF SDN Framework – Open Daylight Controller – Floodlight Controller – Bandwidth Calendaring – Data Center Orchestration.

Text Books:

1. Paul Goransson and Chuck Black, “Software Defined Networks: A Comprehensive Approach”, First Edition, Morgan Kaufmann, 2014.
2. Thomas D. Nadeau, Ken Gray, “SDN: Software Defined Networks”, O’Reilly Media, 2013.

Suggested Reading:

1. Siamak Azodolmolky, “Software Defined Networking with Open Flow”, Packet Publishing, 2013.
2. Vivek Tiwari, “SDN and Open Flow for Beginners”, Amazon Digital Services, Inc., 2013.
3. Fei Hu, Editor, “Network Innovation through Open Flow and SDN: Principles and Design”, CRC Press, 2014.

18CSE22

HUMAN COMPUTER INTERACTION
(PROFESSIONAL ELECTIVE-V)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are

1. Provide the foundations of Human Computer Interaction.
2. Familiarize with the design technologies for computer interaction.
3. Explore the design strategies, guidelines, models and theories for developing a user friendly interface.

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify Shneiderman, Stone and Nielsen paradigms for interaction between Human and computer.
2. Distinguish the usability of Goals, Measures, Motivations to solve real-time applications.
3. Interpret the command languages and models used in communication and collaboration withinterconnected entities.
4. Outline the Process, Frameworks, Methods, Tools for Designing interactive systems, and Relate theSocial Impact Analysis, Legal Issues.
5. Review user experiences Familiarize with nonanthromorphic design and models of System ResponseTime impacts.
6. Analyze the Extended, Augmented, Mixed and Virtual Reality techniques to deal with real-time applications.

UNIT I –

Foundations: The human, The Computer, The Interaction, Paradigms Usability of Interactive **System:** Introduction, Usability Goals and Measures, Usability Motivations, Goals for Our Profession.

UNIT II –

Expressive Human and Command Languages: Introduction, Speech Recognition, Speech Production, Human Language Technology, Traditional Command Languages.

Communication and Collaboration: Introduction, Models of Collaboration, Specific Goals and Contexts,Design Considerations.

UNIT III –

Design: Introduction, Organizational Support for Design, The Design Process, Design Frameworks, Design Methods, Design Tools, Social Impact Analysis, Legal Issues.

Evaluation and the User Experience: Introduction, Expert Reviews and Heuristics, Usability Testing and Laboratories, Acceptance Tests, Controlled Psychologically Oriented Experiments.

UNIT - IV

Advancing the User Experience: Introduction, Display Design, View (Window) Management, Animation, Webpage Design, Color, Nonanthropomorphic Design, Error Messages.

The Timely User Experience: Introduction, Models of System Response Time (SRT) Impacts, Expectationsand Attitudes ,User Productivity and Variability in SRT, Frustrating Experiences.

UNIT V –

Immersive Virtualization: Introduction, Extended and augmented Reality, Mixed and Virtual Reality,Implications.

Multimodality and Gamification: Introduction, multimodal interfaces and interaction, Haptics, Virtual environments.

Text Books:

1. Jeff Johnson, "Designing with the Mind in Mind – Simple Guide to Understanding", 2nd edition, Elsevier Inc., 2010.
2. Alan Dix, Janet Finlay, Gregory D. Abowd, Russell Beale, "Human Computer Interaction", 3rd edition, Pearson Education Limited, 2004.

Suggested Reading:

1. Ben Shneiderman, Catherine Plaisant, Maxine Cohen, Steven Jacobs, "Designing the User Interface", 5th Edition, Pearson Education Limited, 2013.
2. John Haugeland, "Mind Design II", 2nd Edition, Revised and enlarged edition, The MIT, Press, 1997.

Online Resources:

1. https://www.coursera.org/course?query=human+computer+interaction
2. https://nptel.ac.in/courses/106/106/106106177/
3. https://www.researchgate.net/publication/300673474TeachingHuman-Computer Interaction

18CSE23

NEURAL NETWORKS AND DEEP LEARNING
(PROFESSIONAL ELECTIVE-V)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Neural Networks, Machine Learning.

Course Objectives: The objectives of this course are

1. To learn various types of learning techniques and their applications.
2. To acquire the knowledge of neural network architectures, learning methods and algorithms.
3. To understand Deep learning algorithms and their applications.

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand various learning models.
2. Design and develop various Neural Network Architectures.
3. Understand approximate reasoning using Convolution Neural Networks.
4. Developing deep learning algorithms for various applications.
5. Apply Neural Network and Deep learning techniques to solve different applications.

UNIT - I

Artificial Neural Networks: Fundamental concepts, Evolution of neural networks, Basic models of artificial neural network, important terminologies of ANNs. McCulloch-Pitts neuron, Perceptrons, Perceptron Learning Algorithm. Sigmoid Neurons, Feed forward Neural Networks, Representation Power of Feed forward Neural Networks

UNIT - II

Supervised Learning Neural Networks: Adaptive linear neuron (Adaline), Multiple Adaptive linear neuron (Madaline), Back propagation, Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMS Prop, Adam,

UNIT III –

Unsupervised Learning Neural Networks: Kohonenself organizing networks, Adaptive resonance theory.
Associate Memory Networks: Bidirectional associative memory network, Hopfield networks.
Auto encoders : relation to PCA, Regularization in auto encoders, Denoising auto encoders, Sparse auto encoders, Contractive auto encoders
Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout, Greedy Layer wise Pre-training, Better activation functions, Better weight initialization methods, Batch Normalisation

UNIT - IV

Convolutional Neural Network: The Convolution Operation, Motivation, Pooling, Convolution and Pooling as an Innitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types. LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Back propagation, Deep Dream, Deep Art, Fooling Convolutional Neural Networks

UNIT V –

Recurrent Neural Networks : Back propagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs, Encoder Decoder Models, Attention Mechanism, Attention over images

Text Books:

1. S.N.Sivanandam & S.N.Deepa, “Principles of soft computing”, Wiley publications, 2nd Edition, 2008.
2. Goodfellow. I., Bengio. Y. and Courville. A., “Deep Learning”, MIT Press, 2016.

Suggested Reading:

1. S.Rajasekaran & G.A.Vijayalakshmipai, "Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & Applications", PHI publication, 2008.
2. LiMin Fu, “Neural Networks in Computer Intelligence”, McGraw-Hill edition, 1994.
3. K.L.Du& M.N.S Swamy, "Neural Networks in a Soft Computing Framework", Springer International edition, 2008.
4. Simon Haykins, "Neural Networks a Comprehensive Foundation", PHI, second edition.
5. Bishop C.M., “Pattern Recognition and Machine Learning”, Springer, 2006.

18CSE24

DEVOPS
(PROFESSIONAL ELECTIVE-V)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are to

1. Describe the agile relationship between development and IT operations.
2. Understand the skill sets and high-functioning teams involved in DevOps and related methods to reach a continuous delivery capability
3. Implement automated system update and DevOps lifecycle

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

4. Identify components of Devops environment
5. Describe Software development models and architectures of DevOps
6. Apply different project management, integration, testing and code deployment tool
7. Investigate different DevOps Software development models
8. Assess various Devops practices
9. Collaborate and adopt Devops in real-time projects

UNIT-I

Introduction: Introduction, Agile development model, DevOps, and ITIL. DevOps process and Continuous Delivery, Release management, Scrum, Kanban, delivery pipeline, bottlenecks, examples

UNIT-II

Software development models and DevOps: Waterfall, Spiral, RAD model, Agile Development, 7 C's of DevOps Lifecycle for Business Agility, DevOps, and Continuous Testing.

DevOps influence on Architecture: Introducing software architecture, The monolithic scenario, Architecture rules of thumb, The separation of concerns, Handling database migrations, Microservices, and the data tier, DevOps, architecture, and resilience.

UNIT-III

Introduction to project management: The need for source code control, The history of source codemanagement, Roles and code, source code management system and migrations, Shared authentication, HostedGit servers, Different Git server implementations, Docker intermission, Gerrit, The pull request model, GitLab. **Integrating the system:** Build systems, Jenkins build server, Managing build dependencies, Jenkins plugins,and file system layout, The host server, Build slaves, Software on the host, Triggers, Job chaining and buildpipelines, Build servers and infrastructure as code, Building by dependency order, Build phases, Alternativebuild servers, Collating quality measures.

UNIT-IV

Testing Tools and automation: Various types of testing, Automation of testing Pros and cons, Selenium - Introduction, Selenium features, JavaScript testing, Testing backend integration points, Test-driven development, REPL-driven development

Deployment of the system: Deployment systems, Virtualization stacks, code execution at the client, Puppet master and agents, Ansible, Deployment tools: Chef, SaltStackand Docker

UNIT-V

Code monitoring and Issue Tracking: Code monitoring tools: Nagios, Munin, Ganglia, Log handling. Introduction to issue trackers, Need of issue tracker: Workflows and issues, Problems with issue tracker proliferation, Trackers tools: Bugzilla, GitLab tracker, andJira

Textbooks

1. Joakim Verona. Practical Devops, Second Edition. Ingram short title; 2nd edition (2018). ISBN-10: 1788392574
2. Deepak Gaikwad, Viral Thakkar. DevOps Tools from Practitioner's Viewpoint. Wiley publications. ISBN: 9788126579952

Reference books

1. Len Bass, Ingo Weber, Liming Zhu. DevOps: A Software Architect's Perspective. Addison Wesley;ISBN-10: 9780134049847

18CSE25

NATURE INSPIRED ALGORITHMS
(PROFESSIONAL ELECTIVE-V)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Design and Analysis of Algorithms.

Course Objectives: The objectives of this course are

1. Understand the fundamentals of nature inspired techniques which influence computing
2. Study the Swarm Intelligence and Immuno computing techniques.
3. Familiarize the DNA Computing.

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify the relation between computers (computing) and natural processes.
2. Describe concepts of Evolutionary Computing like Genetic Algorithms to solve engineering optimization problems.
3. Apply Swarm Intelligence like ACO and PSO to Travelling Salesman Problem.
4. Explain Danger theory and its role in various Immuno Computing Models.
5. Solve the SAT problem by using DNA manipulation functions and Filtering Models.
6. Familiarize with test tube programming.

UNIT - I

Introduction: From Nature to Nature Computing, Philosophy, Three Branches: A Brief Overview, Individuals, Entities and agents - Parallelism and Distributivity Interactivity ,Adaptation- Feedback-Self-Organization-Complexity, Emergence and ,Bottom-up Vs Top-Down- Determination, Chaos and Fractals.

UNIT - II

Computing Inspired by Nature: Evolutionary Computing, Hill Climbing and Simulated Annealing, Darwin's Dangerous Idea, Genetics Principles, Standard Evolutionary Algorithm -Genetic Algorithms, Reproduction-Crossover, Mutation, Evolutionary Programming, Genetic Programming.

UNIT - III

Swarm Intelligence: Introduction - Ant Colonies, Ant Foraging Behavior, Ant Colony Optimization, SACO and scope of ACO algorithms, Ant Colony Algorithm (ACA), Swarm Robotics, Foraging for food, Social Adaptation of Knowledge, Particle Swarm Optimization (PSO).

UNIT - IV

Immuno Computing: Introduction- Immune System, Physiology and main components, Pattern Recognition and Binding , Immune Network Theory- Danger Theory, Evaluation Interaction- Immune Algorithms , Introduction – Genetic algorithms, Bone Marrow Models, Forest's Algorithm**,** Artificial Immune Networks.

UNIT – V

Computing With New Natural Materials: DNA Computing: Motivation, DNA Molecule, Adleman's experiment, Test tube programming language, Universal DNA Computers, PAM Model, Splicing Systems, Lipton's Solution to SAT Problem, Scope of DNA Computing, From Classical to DNA Computing.

Text Books:

1. Leandro Nunes de Castro, " Fundamentals of Natural Computing, Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007
2. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008

Suggested Reading:

1. Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006.
2. Marco Dorrigo, Thomas Stutzle, “Ant Colony Optimization”, PHI,2005

18ECO01

REMOTE SENSING AND GIS
(OPEN ELECTIVE-II)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are :

1. Explain the fundamental concepts of remote sensing and digital imaging techniques.
2. Make the students to understand the principles of thermal and microwave remote sensing.
3. Make the students understand the significance of GIS and the process of GIS.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Demonstrate the understanding of basic concepts of remote sensing and interpret energy interactions.
2. Choose an appropriate technique for a given scenario by appreciating the types of remote sensing.
3. Distinguish the principle behind the working of microwave and LiDAR sensing.
4. Apply an appropriate data model from the acquired knowledge of the basics of GIS.
5. Explain the procedure for encoding data and geospatial data analysi

UNIT-I

Concept of Remote Sensing: Remote sensing definition, data, process, EM bands used in remote sensing, Interactions and recording of energy: interaction with atmosphere, interaction with earth surface features (soil, water, vegetation), recording of energy by sensors, Transmission, reception and processing, Image interpretation and analysis, Applications, Advantages and limitations of Remote sensing, Orbits of Remote sensing satellites, Indian remote sensing satellites.

UNIT-II

Digital Imaging: Types of Remote sensing, Sensor resolutions, Digital Image, Sensor components, Principle of a long-track and across-track scanning, Hyperspectral Imaging, Thermal Remote Sensing.

UNIT-III

Microwave Remote Sensing: Active and Passive Microwave Remote Sensing, Radar Imaging: Key components of imaging radar, viewing geometry, spatial resolution, principle of RAR, SAR and their range resolution, Satellite Radar Imaging, Photogrammetry: definition and process, photogrammetry and LIDAR, radargrammetry.

UNIT-IV

Concept of Geographic Information Systems: Key components of GIS, joining spatial and attribute data, functions, advantages and applications of GIS, Spatial data model, Raster data model, Vector data model.

UNIT-V

Process of GIS and Geospatial analysis: Data sources, encoding raster data, encoding vector data, Encoding attribute data, linking spatial and attribute data,Geospatial data analysis methods database query, geospatial measurement, overlay operations, network analysis and surface analysis. Integration of GIS and remote sensing.

Text Books:

1. Basudeb Bhatta, “Remote Sensing and GIS”, Oxford University Press, 2nd Edition, 2012.
2. Lilles and T.M., and Kiefer R.W. “Remote Sensing and Image Interpretation”, John Wiley & Sons, 6thEdition, 2000.

Suggested Reading:

1. James B. Campbell and Randolph H. Wynne, “Introduction to Remote Sensing”, the Guilford Press, 2011.
2. Michael N DeMers, “Fundamentals of GIS”, John Wiley, 2nd Edition, 2008.

18ECO03

DESIGN OF FAULT TOLERANT SYSTEMS
(OPEN ELECTIVE-II)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are

1. The course provides basic concepts of various faults & failures occur in digital systems and test vector generation to identify the faults.
2. To understand concept of redundancy and design of self-checking circuits.
3. To understand built in self-test and its testability into logic circuits.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify various types of faults & failures and analyze reliability of systems
2. Model and evaluate redundancy concept in digital systems
3. Construct fail safe and self-checking circuits
4. Develop testable combinational digital circuits
5. Design of built in self-test for VLSI circuits

UNIT-I

Basic Concepts of Fault Tolerant: Reliability concepts: Failures and faults, Reliability and failure rate, Relation between Reliability & Mean Time Between Failure (MTBF), Maintainability & Availability, reliability of series and parallel systems. Modeling of faults. Introduction to test generation for combinational logic circuits: conventional methods, random testing, transition count testing and signature analysis.

UNIT- II

Fault Tolerant Design: Basic concepts: Static, Dynamic and Hybrid redundancy. NMR, Triple modular redundancy (TMR) system, self purging redundancy, Siftout Modular Redundancy (SMR). Use of error correcting codes, time redundancy, software redundancy.

UNIT- III

Self Checking Circuits and Fail-Safe Logic: Design of totally self checking checkers, checkers using m-out of n-codes, Berger codes and low cost residue code, self-checking sequential machines, partially self-checking circuits. Fail safe Design: Strongly fault secure circuits, fail-safe design of sequential circuits using partition theory and Berger codes, totally self checking PLA design.

UNIT-IV

Design for Testability for Combinational Circuits: Basic concepts of testability, controllability and observability, the Reed Muller's expansion technique, OR-AND-OR design, use of control and syndrome testable design.

UNIT-V

Built In Self-Test: BIST concepts, Built in Digital Circuit Observer (BIDCO), built-in-test of VLSI chips, Design for autonomous self test, designing testability into logic boards, generic offline BIST architecture.

Text Books:

1. Parag K. Lala, "Fault Tolerant & Fault Testable Hardware Design", PHI, 1985
2. Parag K. Lala, "Digital systems Design using PLD's", PHI, 1990.
3. M. Abramovili, M.A. Breues, A. D. Friedman "Digital Systems Testing and Testable Design"Jaico publications, 1979.

Suggested Reading:

1. N.N. Biswas, "Logic Design Theory", PHI, 1993.
2. Konad Chakraborthy, Pinaki Mazumdar, "Fault tolerance and Reliability Techniques for high - density random – access memories" Pearson, 2002.

18ECO04

FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING
(OPEN ELECTIVE-II)

Instruction	3 Hours per week
Duration of SEE	3 Hours
SEE	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are

1. Learn the advantages of DSP over analog signal processing.
2. Analyze discrete-time signals in the frequency domain using DFT and FFT.
3. Learn the theory of digital filters.

Course Outcomes: On Successful completion of the course, students will be able to

1. Understand the concept of Discrete time signals and systems
2. Analyze the frequency domain representation of discrete time sequence using DTFT and DFT.
3. Apply FFT to the given sequence.
4. Implementation of FIR filter for the given specifications
5. Design an IIR filter for the given specifications.

UNIT-I

Digital Signal Processing: Introduction, basic elements of a digital signal processing system, advantages and disadvantages of Digital Signal Processing over Analog signal processing, sampling theorem, analog to digital and digital to analog conversion. **Discrete-Time System:** Mathematical representation of Discrete Time Systems, Concept of Impulse response and Transfer function, Linear and Time invariant systems, Concept of causality and stability.

UNIT-II

Frequency domain Analysis of discrete time sequences: Discrete Time Fourier Transform (DTFT), properties of DTFT, Discrete Fourier Transform(DFT) and its properties, relationship between DFT to the DTFT, circular convolution.

UNIT-III

Fast Fourier Transform (FFT): Introduction**,** Radix-2 Decimation –In- Time (DIT) and Decimation- In- Frequency (DIF) FFT algorithms, Bit reversal order, In-place computation.

UNIT-IV

FIR Filter Design: Characteristics of FIR filters, Linear phase filters, Design of FIR (LPF,HPF, BPF AND BSF) filters using Truncation and Windows, Comparison between FIR and IIR filters.

UNIT-V

IIR Filter Design: Characteristics of IIR filters, Conversion from analog filters to digital filters using Impulse Invariance Method (IIM) and Bi Linear Transformation (BLT) methods, prewarping. Realization diagrams- Direct form I & II.

Text Books:

1. Alan V. Oppenheim & Ronald W. Schafer, “Digital Signal Processing,” PHI, 2/e, 2010.
2. John G. Proakis & Dimtris G. Manolakis, “Digital Signal Processing Principles, Algorithms and Application,” PHI, 4/e, 2012.

Suggested Reading:

1. Sanjit K Mitra, " Digital Signal Processing", Tata Mc Graw Hill, Third edition, 2006
2. Chi_Tsong Chen, "Digtal Signal Processing", Indian edition, 2009.

18CEO02

DISASTER MITIGATION AND MANAGEMENT
(OPEN ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are to

1. Equip the students with the basic knowledge of hazards, disasters, risks and vulnerabilities.
2. Impart knowledge in students about the nature, causes, consequences and mitigation measures of the various Hydro-meteorological disasters.
3. Introduce the concepts of causes, consequences, and mitigation measures of the various Geographical disasters.
4. Enable the students to understand risks, vulnerabilities and human errors associated with human induced disasters.
5. Equip the students with the knowledge of the impacts of disaster, chronological phases in a disaster management cycle and to create awareness about the disaster management framework and legislations in the context of Central and State Level Authorities.

Course Outcomes: On Successful completion of the course, students will be able to

1. Identify and understand the fundamental terminologies in disaster management.
2. Distinguish between the Hydro-meteorological disasters and apply the concepts of structural and non-structural mitigation measures.
3. Categorize different Geographical Disasters and apply the knowledge in utilizing the early warning systems.
4. Analyze various mechanisms and consequences of human induced disasters.
5. Develop an awareness of disaster management phases and formulating effective disaster management plans, ability to understand various participatory roles of stakeholders- Central and State Government bodies at different levels.

UNIT- I

Introduction: Basic definitions- Hazard, Disaster, Vulnerability, Risk, Resilience, Mitigation, Management; classification of types of disaster- Natural and manmade; Introduction to Disaster management cycle; International Decade for natural disaster reduction (IDNDR); International strategy for disaster reduction (ISDR), National disaster management authority (NDMA).

UNIT- II

Natural Disasters: Hydro meteorological disasters: Causes, Early warning systems- monitoring and management, structural and non-structural measures for floods, drought and Tropical cyclones; Applications. Case studies related to various hydro-meteorological disasters.

UNIT- III

Geographical based disasters: Causes, zoning, Early warning systems- monitoring and management, structural and non-structural mitigation measures for earthquakes, tsunami, landslides, avalanches and forest fires. Case studies related to various geographical based disasters.

UNIT- IV

Human Induced Disasters: Chemical disaster- Causes, impacts and mitigation measures for chemical accidents, Risks and control measures in a chemical industry, chemical disaster management; Case studies related to various chemical industrial hazards eg: Bhopal gas leakage; Management of chemical terrorism disasters and biological disasters; Case studies related to power break downs, fire accidents, traffic accidents, oilspills and stampedes, building failure disasters.

UNIT- V

Concept of Disaster Impacts and Management: Disaster impacts- environmental, physical, social, ecological, economical, political, etc.; health, psycho-social issues; demographic aspects, gender, age, special needs; hazard locations; global and national disaster trends; climate change and urban disasters. Disaster management cycle and its phases, risk analysis, vulnerability and capacity assessment; Post-disaster environmental response water, sanitation, food safety, waste management, disease control; Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

Text Books:

1. Pradeep Sahni," Disaster Risk Reduction in South Asia", Prentice Hall, 2003.
2. B. K. Singh," Handbook of Disaster Management: techniques & Guidelines", Rajat Publication, 2008.

Suggested Reading:

1. Ministry of Home Affairs". Government of India, "National disaster management plan, Part I and II".
2. K. K. Ghosh," Disaster Management", APH Publishing Corporation, 2006.
3. Hazards, Disasters and your community: A booklet for students and the community, Ministry of home affairs.
4. Disaster Medical Systems Guidelines, Emergency Medical Services Authority, State of California,EMSA no.214, June 2003.
5. Inter Agency Standing Committee (IASC). IASC Guidelines on Mental Health and PsychosocialSupport in Emergency Settings, Geneva: IASC. (Feb. 2007)

Online Resources:

1. http://www.indiaenvironmentportal.org.in/files/file/disaster_management_india1.pdf
2. http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs)

18EGO01

TECHNICAL WRITING SKILLS
(OPEN ELECTIVE-II)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are

1. Process of communication and channels of communication in general and technical writing.
2. Technical Writing and also contextual use of technology specific words.
3. Business letters and technical articles.
4. Technical reports and technical proposals.
5. Writing agenda, recording minutes of a meeting, drafting memos and making technical presentations.

Course Outcomes: On Successful completion of the course, students will be able to

1. Process of communication and channels of communication in general and technical writing
2. Technical Writing and also contextual use of technology specific words
3. Business letters and technical articles
4. Technical reports and technical proposals.
5. Transferring data from verbal to graphic and vice versa and making technical presentations

UNIT - I

Communication – Nature and process. **Channels of Communication** – Downward, upward and horizontal communication. Barriers to communication. **Technical Communication** – Definition, oral and written communication. Importance and need for Technical communication. Nature of Technical Communication. Aspects and forms of Technical communication. Technical communication Skills – Listening, Speaking, Reading & Writing.

UNIT - II

Technical Writing – Techniques of writing. Selection of words and phrases in technical writing. Differences between technical writing and general writing. Abstract and specific words. Sentence structure and requisites of sentence construction. Paragraph length and structure.

UNIT - III

Business correspondence – Sales letters, letters of Quotation, Claim and Adjustment letters. **Technical Articles** : Nature and significance, types. Journal articles and Conference papers, elements of technical articles.

UNIT - IV

Technical Reports: Types, significance, structure, style and writing of reports. Routine reports, Project reports. **Technical Proposals** : Definition, types, characteristics, structure and significance.

UNIT - V

Mechanics of Meetings: Preparation of agenda, participation, chairing and writing minutes of a meeting. Memorandum. Seminars, workshops and conferences. **Technical Presentations** : Defining purpose, audience and locale, organizing content, preparing an outline, use of Audio Visual Aids, nuances of delivery, importance of body language and voice dynamics.

Text Books:

1. Meenakshi Raman & Sangeeta Sharma, "Technical Communications-Principles and Practice", Oxford University Press, Second Edition, 2012.
2. 1.M Ashraf Rizvi, "Effective Technical Communication", Tata McGraw Hill Education Pvt Ltd, 2012.

Suggested Reading:

1. Kavita Tyagi & Padma Misra, "Basic Technical Communication", PHI Learning Pvt Ltd, 2012.
2. R.C Sharma & Krishna Mohan, "Business Correspondence and Report Writing", Tata McGraw Hill, 2003

Online Resources:

1. https://onlinecourses.nptel.ac.in/noc18_mg13/preview
2. https://www.technical-writing-training-and-certification.com/
3. https://academy.whatfix.com/technical-writing-skills

18CSE26

DATA SCIENCE AND BIG DATA ANALYTICS LAB
(PROFESSIONAL ELECTIVE-IV LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives: The objectives of this course are to:

1. Develop the skills in using data science tools for solving data intensive problems.
2. Explore the fundamental concepts of big data analytics.
3. Understand the applications using Map Reduce Concepts.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Implement and apply data science algorithms to solve problems.
2. Implement various the exploratory data analysis techniques to understand the data.
3. Work with big data platform and explore the big data analytics techniques business applications.
4. Design efficient algorithms for analyzing the data from large volumes.
5. Analyze the HADOOP and Map Reduce technologies associated with big data analytics.

LIST OF EXPERIMENTS:

1. Identification and Installation of required softwares/Technologies (python/modules) (Important modules for statistical methods: Numpy, Scipy, Pandas etc.).
2. Demonstration of Inferential Statistics-sampling, Hypothesis testing-Z/t tests.
3. Demonstration of statistical methods Anova, Correlation and Chi-square. (Important modules for Machine Learning:(ScikitLearn,statsmodels,scipy, NLTK etc.).
4. Demonstration of Sentiment analysis using NLTK.
5. Time Series Forecasting with ARIMA model.
6. Installation of Big data technologies and building a Hadoop cluster.
7. Experiment for data loading from local machine to Hadoop.
8. Demonstration of Map Reduce concept.
9. Experiment for loading data from RDBMS to HDFS by using SQOOP.
10. Demonstration of developing and handling a NOSQL database with HBase.

Text Books / Suggested Reading:

1. Tom White, “Hadoop: The Definitive Guide: Storage and Analysis at Internet Scale”, 4th Edition, O'Reilly Publications, 2015.
2. Samir Madhavan, “Mastering Python for Data Science”, Packt Publishing, 2015.
3. Seema Acharya, Subhasinin Chellappan, “Big Data and Analytics”, Wiley publications.
4. Big Data, Black BookTM, DreamTech Press, 2015 Edition

18CSE27

MACHINE LEARNING LAB
(PROFESSIONAL ELECTIVE-IV LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives: The main objectives of this course are:

1. Make use of Data sets in implementing the machine learning algorithms.
2. Implement the machine learning concepts and algorithms in any suitable language of choice.
3. Make use of real world data to implement machine learning models.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Identify the fundamental issues and challenges of machine learning: data, model selection, model complexity, etc.
2. Identify and utilize modern tools that are useful for data analysis
3. Recognize and implement various ways of selecting suitable model parameters for different machinelearning techniques.
4. Implement and evaluate various Machine Learning approaches
5. Apply Keras and Tensorflow to implement ML techniques
6. Design and develop solutions to real world problems using ML techniques

LIST OF EXPERIMENTS:

1. Identification and Installation of python environment towards the machine learning, installing python modules/Packages Import scikitlearn, keras and tensorflows etc.
2. Demonstration of decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a newsample.
3. Build linear regression model using gradient descent, least squares, polynomial, LASSO and RIDGE approaches also compare all the algorithms and draw a table for all the metrics.
4. Demonstration of Naïve Bayesian classifier for a sample training data set stored as a .CSV file. Calculate the accuracy, precision, and recall for your dataset.
5. Demonstration of Logistic Regression for a sample training data set stored as a .CSV file. Calculate theaccuracy, precision, and recall for your dataset.
6. Demonstration of Clustering algorithms - k-Means, K-Nearest Neighbor a, Agglomerative and DBSCAN to classify for the standard datasets. Print both correct and wrong predictions using Java/Python ML library classes can be used for this problem.
7. Experiment the non-parametric locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graph
8. Demonstration of SVM and use for character recognition task.
9. Build the decision tree classifier compare its performance with ensemble techniques like random forest. Demonstrate it with different decision trees.
10. Case study on supervised learning algorithms.

Text Books:

1. Giuseppe Bonaccorso, “Machine Learning Algorithms”, 2017, Packt Publishing.

18CSE28

VIRTUAL REALITY LAB
(PROFESSIONAL ELECTIVE-IV LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Course Objectives: The objectives of this course are

1. Understand the hardware and software requirements of Virtual Reality.
2. Design and implement solutions for simple real world problems.
3. Simulate Virtual Reality based solutions for the complex problems.

Course Outcomes: On Successful completion of this course, student will be able to

1. Analyse the Hardware and Software requirements for Virtual Reality
2. Apply Virtual Reality based technologies to create virtual components.
3. Design solutions for the simple real world problems.
4. Implement solutions for the simple world problems.
5. Evaluate the benefits and drawbacks of specific VR techniques on the human body.
6. Develop Virtual Reality based solutions for complex real world problems

CO-PO Articulation Matrix:

LIST OF EXPERIMENTS:

1. Developing architecture of a house using Virtual Reality.
2. Perform CRO based experiment using Virtual Reality.
3. Understanding qualitative analysis of Chemistry using Virtual Reality.
4. Carry out assembly/disassembly of an engine using Virtual Reality.
5. Explore human anatomy using Virtual Reality.
6. Simulation of blood circulation in heart.
7. Simulation of Flight/Vehicle/Space Station.
8. Building Electronic circuit using Virtual Reality, given basic electronic circuits.
9. Developing concept of Virtual Reality class room with multiplier.

Text Books:

1. John Vince,"Virtual Reality Systems",Pearson Education, Asia,2007
2. Anand R.,"Augmented and Virtual Reality", Khanna Publishing House, Delhi
3. Steve M Lavalle, "Virtual Reality", Cambridge University Press, 2017

Online Resources:

1. www.vresources.org
2. www.vrac.iastate.edu
3. www.w3.org/MarkUp/VRM

18CSE29

CYBER SECURITY LAB
(PROFESSIONAL ELECTIVE-IV LAB)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	50 Marks
CIE	25 Marks
Credits	1.5

Pre-requisites: Operating System, Computer Network, Cryptography.

Course Objectives: The objectives of this course are to:

1. To know the security vulnerabilities of browsers and Web Application.
2. To identify the threats and the file infected by Virus and indicators for the cybercrime and to deal with all aspects of cyber laws in Email Communication and E-commerce services.
3. To understand the characteristics of any target network and to monitor and troubleshoot network traffic.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Understand the security and privacy features and operation of browsers and websites.
2. Understand the security issues and vulnerability in Email system E-commerce services.
3. Point out the vulnerabilities in TCP/IP Protocols used for communications.
4. Analyze the Network Traffic for any security issues and performing the steps for the identification of Virus.
5. Discuss different types of cybercrimes and describe the laws governing cyberspace.

List of Experiments:

1. Steps to ensure Security of any one web browser (Mozilla Firefox/Google Chrome)
2. Study of different types of vulnerabilities for hacking a websites / Web Applications.
3. Analysis the Security Vulnerabilities of E-commerce services.
4. Analysis the security vulnerabilities of E-Mail Application
5. Port scanning using NMAP
6. Analyze the Network Traffic using Wire shark.
7. Collect the owner's private information using Key logger (Spyware)
8. Identification of Virus infected file using virustotal.com
9. Case Study on Indian IT ACT 2000.
10. Case Study on Cyber Attack/ Cyber Crime.

Text Books:

1. Sunit Belpre and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt,Ltd,2011.
2. Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, "Cyber Security and Cyber Laws", Paperback – 2018.

Online Resources:

1. http://kundanit.blogspot.com/p/cyber-security.html

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY(A)
SCHEME OF INSTRUCTION AND EXAMINATION
VIII-Semester of B.E Model Curriculum
COMPUTER SCIENCE AND ENGINEERING

SEMESTER-VIII

Sl.No	Syllabus Ref. No	SUBJECT	Scheme of Instruction			Scheme of Examination			Credits
			Periods per Week			Duration Credits of SEE in Hours	Maximum Marks		
			L	T	P/ D		CIE	SEE	
THEORY									
1	18CSE 30/31 /32/33	Professional Elective-VI	3	0	0	3	30	70	3
2	18XX O XX	Open Elective-III	3	0	0	3	30	70	3
PRACTICALS									
3	18CSC31	Technical Seminar	0	0	3	-	50	-	1
4	18CSC32	Project : PART-2	0	0	20	-	100	100	10
		TOTAL	**6**	**0**	**23**		**210**	**240**	**17**

PROFESSIONAL ELECTIVE-VI		OPEN ELECTIVE-III	
Course Code	**Title of the Course**	**Course Code**	**Title of the Course**
18CSE30	Bioinformatics	18PYO01	History of Science and Technology
18CSE31	Speech and Natural Language Processing	18MEO01	Robotics
18CSE32	Social Networking and its Impact	18MEO03	Research Methodologies
18CSE33	Blockchain Technology	18MEO04	Entrepreneurship
		18MEO12	3D Printing

L: Lecture T: Tutorial D: Drawing P: Practical
CIE - Continuous Internal Evaluation SEE - Semester End Examination

18CSC31

TECHNICAL SEMINAR

Instruction	3 Hours per week
Duration of End Examination	-
Semester End Examination	-
Continuous Internal Evaluation	50 Marks
Credits	1

The goal of a seminar is to introduce students to critical reading, understanding, summarizing, explaining and preparing report on state of the art topics in a broad area of his/her specialization. Seminar topics may be chosen by the students with advice from the faculty members and the student shall read further relevant articles in the domain.

The seminar must be clearly structured and the power point presentation shall include following aspects:

1. Introduction to the field
2. Literature survey
3. Consolidation of available information
4. Summary and Conclusions
5. References

Each student is required to:

1. Submit a one page synopsis of the seminar talk for display on the notice board.
2. Deliver the seminar for a maximum duration of 30 minutes, where the presentation should be for 20 minutes in PowerPoint, followed by Question and Answers session for 10 minutes.
3. Submit the detailed report of the seminar in spiral bound in a précised format as suggested by the department.

Course Outcomes: At the end of the course, students will be able to:

1. Study research papers for understanding of new field in the absence of a textbook to summarize and review them
2. Identify promising new directions of various cutting edge technologies in Computer Science and Engineering
3. Impart skills in preparing detailed report describing the selected topic/area
4. Acquire skills to write technical papers/articles for publication
5. Effectively communicate by making an oral presentation before an evaluating committee

Seminars are to be scheduled from 3rd week to the last week of the semester and any change in schedule shall be discouraged.

For the award of sessional marks students are judged by three (3) faculty members and are based on oral and written presentations as well as their involvement in the discussions during the oral presentation.

Note: Topic of the seminar shall preferably be from any peer reviewed recent journal publications.

Guidelines for awarding marks		
Sl No.	Description	Max Marks
1.	Contents and relevance	10
2.	Presentation skills	10
3.	Preparation of PPT slides	05
4.	Questions and answers	05
5.	Report in a prescribed format	20

18CSC32

PROJECT : PART-2

Instruction	20 Hours per week
Duration of End Examination	-
Semester End Examination	100 Marks
Continuous Internal Evaluation	100 Marks
Credits	10

The object of 'Project: Part-2' is to enable the student extend further the investigative study taken up, either fully theoretical/practical or involving both theoretical and practical work, under the guidance of a Supervisor from the Department alone or jointly with a Supervisor drawn from R&D laboratory/Industry. This is expected to provide a good training for the student(s) in R&D work and technical leadership. The assignment to normally include:

1. In depth study of the topic assigned;
2. Review and finalization of the Approach to the Problem relating to the assigned topic;
3. Preparing an Action Plan for conducting the investigation, including team work;
4. Detailed Analysis/Modeling/Simulation/Design/Problem Solving/Experiment as needed;
5. Final development of product/process, testing, results, conclusions and future directions;
6. Preparing a paper for Conference presentation/ Publication in Journals, if possible;
7. Preparing a Dissertation in the standard format for being evaluated by the Department.
8. Final Seminar presentation before Department Review Committee.

Course Outcomes: By the end of course, students will be able to:

1. Demonstrate a sound technical knowledge of their selected topic
2. Design engineering solutions to complex problems utilizing a systematic approach
3. Conduct investigations by using research-based knowledge and methods to provide valid conclusions
4. Create/select/use modern tools for the modeling, prediction and understanding the limitation of complex engineering solutions
5. Communicate with engineers and the community at large in written and oral forms
6. Demonstrate the knowledge, skills and attitudes of a professional engineer

Guidelines for the award of marks in CIE: (Max. Marks: 100)

CIE (Continuous Internal Evaluation) Max. Marks: 50

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
Department Review Committee	10	Review 1
	15	Review 2
	25	Submission
Supervisor	10	Regularity and Punctuality
	10	Work Progress
	10	Quality of the work which may lead to publications
	10	Report Preparation
	10	Analytical / Programming / Experimental Skills

Guidelines for awarding marks in SEE: (Max. Marks: 100)

Evaluation by	Max .Marks	Evaluation Criteria / Parameter
External and Internal Examiners together	20	Power Point Presentation
	40	Thesis Evaluation
	20	Quality of the project • Innovations • Applications • Live Research Projects • Scope for future study • Application to society
	20	Viva-Voce

18CSE30

BIOINFORMATICS
(PROFESSIONAL ELECTIVE-VI)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Basic of Biology, computer Networks, Database Management Systems.

Course Objectives: The objectives of this course are

1. Understand the basic concepts, search and visualize information.
2. Learn various bioinformatics algorithms.
3. Understand various data mining and pattern matching techniques.

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify the basics concepts of Bioinformatics and its significance in Biological data analysis**.**
2. Explore the basic algorithms used in pair wise alignment and multiple sequence alignment.
3. Apply various Bioinformatics tools and techniques employed in Biological Sequence Analysis.
4. Analyze computational experiments for training and evaluating machine learning methods such as EM/GEM, HMM, Monte Carlo
5. Choose and apply appropriate data mining methods like classification, clustering for solving complex biological problems.
6. Interpret the algorithms and tools used for simulation in biological processes and in analysis ofbiological data

UNIT-I

Introduction to bioinformatics Introduction, historical overview, definition, applications, major databases,data management & analysis, molecular biology & bioinformatics.

Information search & data retrieval: Introduction, tools for web search, data retrieval tools and data miningof biological databases.

UNIT - II

Pair-wise Sequence Alignment: Introduction, alignment problems, methods of sequence alignments, usingscoring matrices & measuring sequence detection efficiency.

Multiple Sequence Alignment: Introduction, methods of multiple sequence alignment, evaluating multiple alignments, applications of multiple sequence alignment & phylogenetic analysis.

UNIT - III

Tools for similarity searches & sequence alignment: Introduction, working with BLAST, working withFASTA, Filtering and gapped BLAST, FASTA and BLAST algorithms comparison.

Protein Structure Prediction & Visualization: Protein Secondary Structure Prediction, Protein Tertiary Structure Prediction, Prediction of Protein Function, Evaluation of Predicted Structure, Visualization Tools: Rasmol, RasTop&spdbv.

UNIT - IV

Machine Learning in Bioinformatics :EM/ GEM algorithms, Markov chain Monte Carlo methods, simulated annealing.

Hidden Markov Models: Introduction, likelihood & Basic algorithms, Learning algorithms, Protein Applications, Advantages and Limitations of HMM.

UNIT - V

Data Mining- Selection and Sampling, Pre-processing and Cleaning, Transformation and Reduction, Data Mining Methods, Evaluation, Visualization, Designing new queries, Pattern Recognition and Discovery, Text Mining , Tools.

Text Books:

1. Rastogi SC,Mendiratta N and Rastogi P. "Bioinformatics Methods and Applications: Genomics, Protemics and Drug Discovery ", Prentice -Hall of India Pvt. Ltd.3rd edition
2. SorenBrunak, Pierre F Baldi, " Bioinformatics: The Machine Learning approach ", MIT Press, 2001

Suggested Reading:

1. Bryan Bergeron, "Bio Informatics Computing", 2nd Edition, Pearson Education, 2015.
2. Teresa K. Attwood and David J. Parry-Smith " Intriduction to Bioinformatics, Person education". Singapore 2005.
3. JinXiong, "Essential Bio Informatics", Cambridge University Press,2006.

4. Neil C.Jones, PaveA. Pevzner, "An Introduction to, Bioinformatics Algorithms (Computational Molecular Biology)", MIT Press, 2004.

Online Resources:

1. https://nptel.ac.in/courses/102106065/
2. https://www.ncbi.nlm.nih.gov/

18CSE31

SPEECH AND NATURAL LANGUAGE PROCESSING
(PROFESSIONAL ELECTIVE-VI)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Artificial Intelligence, Compiler Construction

Course Objectives: The objectives of this course are

1. To learn the fundamentals of natural language processing.
2. To understand the various Parsing techniques NLP.
3. To understand the role of semantics of sentences and pragmatics and apply the NLP techniques to IR applications.

Course Outcomes: On Successful completion of this course, student will be able to

1. Define the basic concepts of speech sound, phonetics, signals origins and applications of Natural Language processing.
2. Discuss about the language modeling techniques.
3. Identify the basic words, parsers and various levels in processing of natural language.
4. Explain the various semantics discourse and pragmatic levels of NLP.
5. Analyze Natural language Generation and apply machine translation.
6. Implement levels of NLP system using lexical resources to demonstrate Morphology of a language.

UNIT - I

Speech: Phonetics Speech Sounds and Phonetic Transcription. Articulator Phonetics Phonological categories and Pronunciation Variation Acoustic phonetics and signals. Automatic Speech Recognition Architecture. **Overview and Language Modeling:** OVERVIEW: Origins and challenges of NLP-Language and Grammar- Processing Indian Languages-NLP Applications-Information Retrieval.

UNIT - II

Language Modeling: Introduction-Various Grammar-based Language Models-Statistical Language Model. **Word Level Analysis**: Introduction Morphological Parsing-Spelling Error Detection and correction-Words and Word classes-Part-of Speech Tagging. PARSING: Constituency Parsing-Probabilistic Parsing.

UNIT - III

Semantic Analysis: Introduction- Meaning Representation-Lexical Semantics Ambiguity-Word Sense Disambiguation. **Discourse Processing:** Introduction- cohesion-Reference Resolution Discourse Coherence and Structure.

UNIT - IV

Natural Language Generation and Machine Translation: Architecture of NLG Systems Generation Tasks and Representations-Application of NLG. Problems in Machine, Translation, Characteristics of Indian Languages-Machine Translation Approaches-Translation involving Indian Languages.

UNIT - V

Applications and Lexical Resources: Information Extraction, Automatic Text Categorization and Text Summarization, Question-Answering System.

Text Books:

1. Daniel Jurafsky and James H Martin, “Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition”, Prentice Hall, 2nd Edition, 2008.
2. Tanveer Siddiqui, U.S. Tiwary, “Natural Language Processing and Information Retrieval”, Oxford University Press, 2008.

Suggested Reading:

1. James Allen, Bejamin/ cummings, “Natural Language Understanding”, 2nd edition, 1995.

Online Resources:

1. https://nptel.ac.in/courses/106101007/
2. http://www.cs.colorado.edu/~martin/sp2.html
3. https://web.standford.edu/~jurafsky/sp3/

18CSE32

SOCIAL NETWORKING AND ITS IMPACT
(PROFESSIONAL ELECTIVE-VI)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are

1. Familiarize the students with social networks and their representation.
2. Understand the impact of social networks on society.
3. Study and Analyze the social network search models.

Course Outcomes: On Successful completion of this course, student will be able to

1. Identify the significance of social networks, representation, ranking techniques and challenges.
2. Understand a broad range of social networks concepts and theories.
3. Ascertain the network analysis knowledge in a diversified aspect of society.
4. Analyze social network links and web search.
5. Differentiate between centralized and decentralized search models.
6. Generate and Communicate the analysis results and impact of social networks.

UNIT - I

Introduction: to Social Networks: Introduction to Social Networks, Challenges, Google page rank, Searching on network, link prediction, contagious, marketing on social networks.

Graphs: Basic definitions, paths and connectivity, distance and breadth first search, network datasets. **Strong and Weak Ties**: Triadic closure, strength of weak Ties, Tie strength and network structure in large-scale data, Tie strength, social media and passive engagement, closure, structured holes and social capital.

UNIT - II

Networks in surrounding contexts: Homophily, selection and social influence, affiliation, tracking link formation in online data, spatial model of segregation. **Positive and negative relationships**: Structural balance, characterizing the structure of balanced networks, applications of structured balance.

UNIT - III

Link analysis and Web search: Searching the web, ranking, link analysis using hubs and authorities, page rank, link analysis in modern web search, applications beyond web.

Cascading behavior in networks: Diffusion in networks, modeling diffusion, cascades and clusters, diffusion, thresholds and role of weak Ties, extensions of cascade model, knowledge, thresholds and collective actions.

UNIT - IV

Power Laws and Rich-get-Richer Phenomena: Popularity as a network phenomenon, power laws, rich-get-richer models, unpredictability of rich-get-richer effects, effects of search tools and recommender systems, analysis of rich-get-richer processes. Pseudo core- how to go viral on the web.

UNIT - V

Small world phenomenon: Six degrees of separation, structured and randomness, decentralized search, modeling the process of decentralization search, empirical analysis and generalized models, core-peiphery structures and difficulties in decentralized search, analysis of decentralized search.

Text Books :

1. David Eas ley, Jon Kleinberg, “Networks, Crowds and Markets”, Cambridge Press, 2010 (available for free download).
2. Mathew O Jackson “Social and Economic Networks”, Princeton University, 2010.

Suggested Reading:

1. Stephen P Borgatti, Martin G. Everett , Jeffrey C. Johnson, "Analyzing Social Networks", 2018, Second edition, SAGE Publications Ltd.
2. Krishna Raj P.M., Ankith Mohan, K.G. Srinivasa, "Practical Social Network Analysis with Python", Computer Communications and Networks, Springer; 1st ed. 2018 edition, ISBN-10: 9783319967455.

Online Resources:

1. https://nptel.ac.in/downloads/106106169/

18CSE33

BLOCKCHAIN TECHNOLOGY
(PROFESSIONAL ELECTIVE-VI)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Computer Networks, Network Security

Course Objectives: The objectives of this course are

1. Understand the basic concepts and architecture of block chain.
2. Interpret working of Hyper ledger Fabric.
3. Applications of block chain in various domains.

Course Outcomes: On Successful completion of this course, student will be able to

1. State the basic concepts and design primitives of blockchain.
2. Understand the significance of Consensus mechanisms.
3. Interpret the working of Hyperledger Fabric, SDK composer tool.
4. Demonstrate the significance of blockchain in financial, supply chain and government sector based usecases.
5. Analyze the need of blockchain mechanisms in Cryptography.

UNIT-I

Introduction: History: Digital Money to Distributed Ledgers - Design Primitives: Protocols, Security, Consensus, Permissions, Privacy: Blockchain Architecture and Design-Basic crypto primitives: Hash, Signature-Hashchain to Blockchain-Basic consensus mechanisms.

UNIT-II

Consensus: Requirements for the consensus protocols-Proof of Work (PoW)-Scalability aspects of Blockchain consensus protocols**:** Permissioned Blockchains-Design goals-Consensus protocols for Permissioned Blockchains.

UNIT-III

Hyperledger Fabric: Decomposing the consensus process-Hyperledger fabric components-Chaincode Design and Implementation: Hyperledger Fabric II:-Beyond Chaincode: fabric SDK and Front End-Hyperledger composer tool.

UNIT-IV

Use Case I: Blockchain in Financial Software and Systems (FSS): -Settlements, -KYC, -Capital markets-Insurance. **Use case II:** Blockchain in trade/supply chain: Provenance of goods, visibility, trade/supply chain finance, invoice management/discounting.

UNIT-V

Use Case III: Blockchain for Government: Digital identity, land records and other kinds of record keeping between government entities, public distribution system / social welfare systems :Blockchain Cryptography : Privacy and Security on Blockchain.

Text Books:

1. Mark Gates, “Blockchain: Ultimate guide to understanding blockchain, bitcoin, cryptocurrencies, smart contracts and the future of money”, Wise Fox Publishing and Mark Gates, 2017.
2. Salman Baset, Luc Desrosiers, Nitin Gaur, Petr Novotny, Anthony O'Dowd, Venkatraman Ramakrishna, “Hands-On Blockchain with Hyperledger: Building decentralized applications with Hyperledger Fabric and Composer”, 2018.
3. Arshdeep Bahga, Vijay Madisetti, “Blockchain Applications: A Hands-On Approach”, Arshdeep Bahga, Vijay Madisetti publishers 2017.

Suggested Reading:

1. Andreas Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”, O'Reilly Media, Inc., 2014.
2. Melanie Swa, “Blockchain ”,O'Reilly Media, 2014

Online Resources:

1. Blockchain Applications- https://www.blockchain-books.com
2. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
3. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, David Smits,2017 –
4. https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.htm
5. https://onlinecourses.nptel.ac.in/noc18_cs47/preview
6. https://www.udemy.com/blockchain-and-bitcoin-fundamentals/

18PYO01

HISTORY OF SCIENCE AND TECHNOLOGY
(OPEN ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are:

1. Gains the knowledge about origin of science in the Stone Age and its progress during Antiquity period.
2. Familiar with scientific views in the Medieval period and during the Industrial revolution.
3. Aware of modern scientific developments from 19th century onwards.

Course Outcomes: On successful of this course **s**tudent will be able to:

1. Demonstrate the process of beginning of science and civilization, knowledge acquisition andphilosophical approach of science and its advancements in the Stone Ages and Antiquity period.
2. Illustrate the advancements in science and technology in the medieval period across Asia and Arabcountries and decline and revival of science in Europe.
3. Explain the scientific approach and its advances of the Europeans and how the role of engineer duringthe industrial revolution and the major advancements.
4. Make use of the advancements in the field of science and technology by adopting new philosophies of19th and first half of 20th century in finding ethical solutions to the societal problems.
5. Interpret the changes in specializations of science and the technology and build the relation between information and society from second half of 20th century onwards.

UNIT - I

Science - The Beginning (through 599 BCE): The Stone Ages, Knowledge among hunter gatherers, Agricultural Revolution and other revolutions, Civilization, Major advances.

Science in Antiquity (600 BCE- 529 CE): Philosophy- a precursor to science, Hellenistic world and the Roman Empire, Other cultures of the period, Major advances.

UNIT - II

Medieval Science (530 CE - 1452 CE): The decline of science in Europe, Science in China, Science and mathematics in India, Arab science, Revival of science in Europe, Technology revolution of the Middle ages, Major advances.

The Renaissance and the Scientific Revolution (1453 CE 1659 CE): Renaissance, Scientific Revolution, Technology, Major advances.

UNIT - III

Scientific Method: Measurement and Communication (1660 CE 1734 CE): European domination, The scientific method, Major advances.

The Industrial Revolution (1735 CE 1819 CE): Industrial Revolution, Rise of the engineer, Major Advances.

UNIT - IV

Science and Technology in the 19th Century (1820 CE 1894 CE): Philosophical basis of 19th-century science, Science and the public, Science and technology, Major advances.

Rise of Modern Science and Technology (1895 CE 1945 CE): The growth of 20thcentury science, New philosophies, Quantum reality, Energy sources, Electricity: a revolution in technology, Major advances.

UNIT - V

Big Science and the Post-Industrial Society (1946 CE 1972 CE): Big science, Specialization and changing categories, Technology changes society, Major advances.

The Information Age (1973 CE 2015 CE): Information and society, Globalization, The post-industrial society, Problems of the Information age, Major Advances

Text Books:

1. Bryan and Alexander Hellemans, "The History of Science and Technology", Houghton Mifflin Company, 2004.
2. JD Bernal, "Science in History", 4 volumes, Kindle Edition.

Suggested Readings:

1. "The 100 Most Influential Scientists of All Time", Edited by Kara Rogers, Britannica Educational Publishing, 2010
2. Alberto Hernandez, "A Visual History of Science and Technology", The Rosen Publishing Group, 2016

18MEO01

ROBOTICS
(OPEN ELECTIVE-III)

Instruction	3Hours per week
Duration of Semester End Examination	3Hours
Semester End Examination	70 Marks
CIE	30Marks
Credits	3

Course Objectives: The objectives of this course are

1. Principle of working of a robot, types and specifications, configuration, work envelop and motioncontrols and applications.
2. Transformations, kinematics and dynamics of robots.
3. Singularities, Jacobian and trajectory planning of a robot to prepare the robot for various tasks.
4. Design of end effectors, drives, working of sensors and controllers for finding position andorientation.
5. Robot vision for image acquisition and processing and plan for various tasks and various Languagesand Programming methods of robot.

Course Outcomes: On Successful completion of the course, students will be able to

1. Describe the basic components, specifications and applications of the robots.
2. Understand transformations, direct and inverse kinematics of robots.
3. Calculate forces in links and joints of a robot and find the singularities, Jacobian andtrajectory planning of a robot for various tasks.
4. Classify drives, sensors and grippers for various applications.
5. Program a robot to predict motions for a given task with machine vision and sensors.

UNIT - I

Introduction to robotics: History and evolution of robots, basic configuration, degree of freedom, work envelope, motion control methods, various applications in industry, material handling, loading & unloading, processing, welding & painting, assembly, and inspection, requirements and specifications of robots.

UNIT - II

Rigid motions and homogeneous transformations: Rotation matrix, homogenous transformation matrix, Denavit- Hartenberg convention, Euler angles, RPY representation, direct and inverse kinematics for industrial robots for position and orientation.

UNIT - III

Velocity kinematics the manipulator Jacobian: joint, end effect or velocity, direct and inverse velocity analysis. **Trajectory planning:** Interpolation, cubic polynomial, linear segments with parabolic blending, static force and moment transformation, solvability, stiffness, singularities.

UNIT - IV

Robot dynamics: Lagrangian Formulation for link inertia tensor and manipulator inertia tensor, Newton-Euler formulation for RR & RP manipulators. **Control:** Individual, joint and computed torque.

UNIT - V

End effectors**:** Position and velocity measurement. **Sensors:** Proximity and range, tactile, force and torque, **Drives for Robots:** Electrical, Hydraulic and Pneumatic. **Robot vision:** Introduction to technique, image acquisition and processing, introduction to robot programming languages.

Text Books:

1. Spong and Vidyasagar, “Robot Dynamics and Control”, John Wile and Sons, 1990
2. R.K. Mittal, I.J. Nagrath, “Robotics and control”, Tata Mcgraw-Hill Publishing Company Ltd. 2003
3. Groover, “Industrial Robotics”, Mcgraw-Hill Publishing Company Ltd. 2003

Suggested Reading:

1. Asada and Slotine, “Robot analysis and Intelligence”, Wiley Interscience, 1986
2. K.S. Fu Gon ZalezRC., lEEc.S.G., “Robotics, Control Sensing Vision and Intelligence”, McGraw Hill, Int. Ed., 1987

18MEO03

RESEARCH METHODOLOGIES
(OPEN ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are

1. To make the students to formulate the research problem
2. To identify various sources for literature review and data collection.
3. To prepare the research design
4. To equip the students with good methods to analyze the collected data
5. To explain how to interpret the results and report writing

Course Outcomes: On Successful completion of the course, students will be able to

1. Define research problem.
2. Review and assess the quality of literature from various sources.
3. Understand and develop various research designs.
4. Analyze problem by statistical techniques: ANOVA,F-test, Chi-square.
5. Improve the style and format of writing a report for technical paper/Journal report.

UNIT I –

Research methodology: Objectives and motivation of research, types of research- descriptive vs. analytical, applied vs. fundamental, quantitative vs. qualitative, conceptual vs. empirical, research approaches, significance of research, research methods vs. methodology, research process, criteria of good research, problems encountered by researchers in India, technique involved in defining a problem.

UNIT II –

Literature survey: Importance of literature survey, sources of information-primary, secondary, tertiary, assessment of quality of journals and articles, information through internet.

UNIT III –

Research design: Meaning of research design, need of research design, feature of a good design important concepts related to research design, different research designs, basic principles of experimental design, steps in sample design.

UNIT IV –

Data collection: Collection of primary data, Secondary data, measures of central tendency-mean, mode, median, measures of dispersion- range, mean deviation, standard deviation, measures of asymmetry (skewness), important parametric tests -z, t, F, Chi-Square, ANOVA significance.

UNIT V –

Research report formulation and presentation: Synopsis, dissertation, technical paper and journal paper, writing research grant proposal, making presentation with the use of visual aids, writing a proposal for research grant.

Text Books:

1. C.R Kothari, “Research Methodology, Methods & Technique”, New Age International Publishers, 2004.
2. R. Ganesan, “Research Methodology for Engineers”, MJP Publishers, 2011
3. Vijay Upagade and Aravind Shende, “Research Methodology”, S. Chand & Company Ltd., New Delhi, 2009

Suggested Reading / Online Resources:

1. G. Nageswara Rao, “Research Methodology and Quantitative methods”, BS Publications, Hyderabad, 2012.
2. Naval Bajjai, “Business Research Methods”, Pearson 2011.

18MEO04

ENTREPRENEURSHIP
(OPEN ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are

1. The environment of industry and related opportunities and challenges
2. Concept and procedure of idea generation
3. Elements of business plan and its procedure
4. Project management and its techniques
5. Behavioral issues and Time management

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand the concept and essence of entrepreneurship.
2. Identify business opportunities and nature of enterprise.
3. Analyze the feasibility of new business plan.
4. Apply project management techniques like PERT and CPM for effective planning and execution of projects.
5. Use behavioral, leadership and time management aspects in entrepreneurial journey.

UNIT - I

Entrepreneurship: Definition, functions of entrepreneurship, qualities of entrepreneurs, identification and characteristics of entrepreneurs, entrepreneur vs. intrapreneur, first generation entrepreneurs, women entrepreneurs, conception and evaluation of ideas and their sources.

UNIT - II

Indian industrial environment: Competence, opportunities and challenges, entrepreneurship and economic growth, small scale industry in India, objectives, linkage among small, medium and heavy industries, types of enterprises, corporate social responsibility.

UNIT - III

Business plan: Introduction, elements of business plan and its salient features, business model canvas, technical analysis, profitability and financial analysis, marketing analysis, feasibility studies, executive summary, selection of technology and collaborative interactions.

UNIT - IV

Project management: During construction phase, project organization, project planning and control usingCPM, PERT techniques, human aspects of project management, assessment of tax burden.

UNIT - V

Behavioural aspects of entrepreneurs: Personality, determinants, attributes and models, leadership concepts and models, values and attitudes, motivation aspects, time management: approaches of time management, theirstrengths and weaknesses. time management matrix and the urgency addiction.

Text Books:

1. Vasant Desai, “Dynamics of Entrepreneurial Development and Management”, Himalaya Publishing House, 1997.
2. Prasanna Chandra, “Project-Planning, Analysis, Selection, Implementation and Review”, Tata Mcgraw-Hill Publishing Company Ltd. 1995.
3. S.S. Khanka, “Entrepreneurial Development”, S. Chand & Co. Pvt. Ltd., New Delhi

Suggested Reading:

1. Robert D. Hisrich, Michael P. Peters, “Entrepreneurship”, 5/e, Tata Me Graw Hill Publishing Company Ltd., 2005.
2. Stephen R. Covey and A. Roger Merrill, “First Things First”, Simon and Schuster Publication, 1994.

18MEO12

3D PRINTING
(OPEN ELECTIVE-III)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The objectives of this course are

1. To make students understand the basic concept of digital manufacturing.
2. To teach different processes involved in digital fabrication of products.
3. To demonstrate the STL file generation and manipulations.
4. To demonstrate various post processing techniques
5. To demonstrate the applications of RP in different fields of engineering

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand the concept of 3D printing processes, advantages and limitations.
2. Evaluate real-life scenarios and recommend the appropriate 3D printing technology.
3. Analyze various pre-processing and post processing techniques.
4. Explain current and emerging 3D printing technologies in diversified applications.
5. Identify components required in construction of 3D printer.

UNIT - I

Introduction to 3D Printing: Introduction to 3D printing, evolution, distinction between 3D printing & CNC machining. **Design considerations:** Materials, size, resolution, mass customization. additive vs. subtractive manufacturing, its advantages and limitations.

UNIT - II

Photo polymerization processes: Photo polymerization, Stereo lithography Apparatus (SLA), Applications, advantages and disadvantages. **Powder bed fusion processes:** Introduction, Selective laser Sintering (SLS), Materials, Applications, advantages and disadvantages.

Extrusion-based systems: Fused deposition modelling (FDM), laminated object manufacturing (LOM), Principles, Materials, Process Benefits and Drawbacks. **Material Jetting AM Processes:** Evolution of Printing as an Additive Manufacturing Process, Materials, Process Benefits and Drawbacks, Applications of Material Jetting Processes.

UNIT - III

Pre processing in AM: Modelling and viewing - 3D scanning; Model preparation- STL conversion, STL error diagnostics, STL file Repairs, generic solution, slicing, newlyproposed file formats.

Post processing in AM: Support material removal, surface texture improvement, accuracy improvement, aesthetic improvement, preparation for use as a pattern, property enhancements using non thermal and thermal techniques.

UNIT - IV

Construction of basic 3D printer: Construction of 3D printing machine -axes, linear motion guide ways, ball screws, motors, bearings, encoders, process chamber, safety interlocks, sensors.

UNIT - V

Applications of AM: Application in aerospace industry, automotive industry, jewelry industry, coin industry. medical and bioengineering applications: planning and simulation of complex surgery, forensic science

Text Books:

1. Gibson, DW. Rosen and B.Stucker; "Additive manufacturing methodologies: Rapid prototyping to direct digital manufacturing ", Springer, 2010.
2. Chee Kai Chua, Kah Fai Leong, "3D printing and additive manufacturing : principles and application" , 4/e of rapid prototyping.
3. PK. Venuvinod, "Rapid prototyping – Laser based and other technologies", Kluwer, 2004.

Suggested Reading:

1. Jacob, Paul, "Rapid tooling : Technologies and industrial applications"
2. Alain Brnard, Georges Talliander, "Additive Manufacturing", Wiley, 2014.

CHAITANYA BHARATHI INSTITUTE OF TECHNOLOGY (AUTONOMOUS)
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
(MODEL CURRICULUM)

OPEN ELECTIVE FOR OTHER PROGRAMME

S.NO.	SUBJECT CODE	SUBJECT NAME
1	18CSO 01	Python for Bioinformatics
2	18CSO 02	JAVA Programming and Bio-Java
3	18CSO 03	IOT and Applications
4	18CSO 04	Basics of Data Science using R
5	18CSO 05	Fundamentals of Virtual Reality
6	18CSO 06	Fundamentals of DBMS
7	18CSO 07	Basics of Cyber Security
8	18CSO 08	Open Source Technologies
9	18CSO 09	Basics of Artificial Intelligence
10	18CSO 10	Machine Learning Using Python
11	18CSO 11	Computer Graphics and Its Applications
12	18CSO 12	Fundamentals of Software Engineering
13	18CSO 13	Fundamentals of Blockchain Technology

18CSO 01

PYTHON FOR BIOINFORMATICS
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. Introduce Python with reference to bioinformatics.
2. Understanding of various algorithms useful for biological sequences.
3. Identification Python modules useful to analyze gene and Biological sequences

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand the basics of Python Programming.
2. Develop applications using Python to solve problems.
3. Identify and use Python modules related to Biology.
4. Analyse biological and gene sequences using Python.
5. Understand advanced analysis techniques.
6. Formulate step-wise implementation of a python script for a given problem in bioinformatics

UNIT - I

Introduction to Python: Basics of Python, Python IDEs, Running Python programs, types and operations, Functions, modules, classes, Exceptions.

UNIT - II

Object-Oriented Programming, Modules: Object Oriented Programming, Threads, process, synchronization, databases and persistence, NumPy, SciPy, Image manipulation, Akando and Dancer modules.

UNIT - III

Biological Sequence Analysis: Biopython: Parsing DNA data files, Sequence Analysis, Dynamic Programming, Hidden Markov Model, Genetic Algorithms, Multiple Sequence Alignment, gapped alignment.

UNIT - IV

Advanced Analysis Techniques: Trees, Text Mining, Clustering, Self-Organizing Map, Principal Component Analysis and Numerical Sequence Alignment.

UNIT - V

Expression Analysis: Gene expression array analysis, Spot finding and Measurement, Spreadsheet Arrays and Data Displays, Applications with expression Alignment.

Text Books:

1. Jason Kinser, “Python for Bioinformatics”, Jones & Bartlett Publishers, 2nd Edition, 2013.
2. ReemaThareja “Python Programming”, Oxford Press, 2017.

Suggested Reading:

1. Mark Lutz, “Learning Python”, 3rd edition, O’Reilly, 2007.
2. Alex Martelli, David Ascher, “Python cookbook”, O’Reilly, 2002.

Online Resources:

1. http://www.biopython.org

18CSO 02

JAVA PROGRAMMING AND BIO-JAVA
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Basics of any programming language.

Course Objectives: The main objectives of this course are:
1. To introduce the concepts of Object-Oriented programming.
2. Prepare the students to develop solutions using OOPs concepts.
3. Design and develop Biotechnology related solutions using Java and Java class libraries.

Course Outcomes: On Successful completion of this course, student will be able to
1. Illustrate the concepts of object-oriented programming to understand the structure and model of Java Programming.
2. Evaluate object oriented design using Inheritance and polymorphism to solve real world problems
3. Demonstrate Java application programs to Handle Exceptions, Files and I/O Streams.
4. Identify the concepts of Interfaces and packages to write java applications.
5. Apply Windows, Containers, GUI components in Java to Build GUI-based applications using AWTand Applets.
6. Develop programs related to Biotechnology problems.

UNIT - I
Java Essentials: Features of Java, OOPs concepts in Java, Elements of java program, Variables, and Literals, Data Types, variables and arrays, Operators, arrays Control structures: if, if-else, nested if, if-else-if, switch, while, do-while, for, break and continue statements.

UNIT - II
Classes and Objects: Introduction to classes and methods, typecasting, access specifiers and modifiers, modifiers, passing arguments, Constructors. Inheritance: Basics of inheritance, types of inheritance, polymorphism.

UNIT - III
Interfaces and Packages: Basics of interfaces, Packages, Exception handling: Types of exceptions and Errors, exception handling, Multithreading concepts. Files and I/O Streams: File Class, Streams, Byte Streams.

UNIT - IV
AWT and Applets: Applets, GUI, Window class hierarchy, Dialog Boxes,, Layout managers, Swing Component Classes, Event-Handling, AWT Graphics classes and Swing Controls.

UNIT - V
StrBio Lib: Molecular Biology Classes, Interfaces to Bioinformatics tools and Databases, General purpose tools, applications. Writing simple Java programs for Biotechnology related problems.

Text Books:
1. Sagayaraj, Denis, KArthik and Gajalaxmi, “Java Programming”, for Core and Adanced Learners”, University Press, Pvt. Ltd, 2018.
2. Johan-Marc Chandonia, StrBioLib: a Java Library for Development of Custom Computations Structural Biology Applications”, BIO-INFO ALPPLICATIONS NOTE, Vol. 23, No. 15,2007, PP2018-2020 (https:// academic.oup.com/bioinformatics/article-abstract/23/15/2018/203542)

Suggested Reading:
1. Herbert Schildt, “ The complete reference Java 2”, TMH
2. Internet World 60 minute Java by Ed Tittel

Online Resources:
1. https://www.tutorialspoint.com/java/index.htm

18CSO 03

IOT AND APPLICATIONS
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Programming Basics.

Course Objectives: The main objectives of this course are:

1. Impart necessary and practical knowledge of components in Internet of Things.
2. Understand working of IoT Systems.
3. Develop skills required to build IoT based systems.

Course Outcomes: On Successful completion of this course, student will be able to

1. Understand Internet of Things and its hardware and software components.
2. Interface I/O devices, sensors & communication module.
3. Remotely monitor data and control devices.
4. Hypothesizing real time IoT based projects.
5. Advance towards research based IoT in the field of biotechnology.

UNIT I –
Introduction to IoT: Sensors, Types of sensors and Transducers, Actuators and Types of Actuators.

UNIT II –
Basics of Networking: Functional Components of IoT, IoT interdependencies, IoT Service oriented architecture, IoT categories, IoT gateways, IoT and associated technologies, Key technologies for IoT, IoT challenges.

UNIT III –
IoT Hardware Components: Computing (Arduino/RaspberryPi), Communication, Sensors, Actuators, I/0interfaces, Programming (for Arduino/Raspberry Pi). APIs

UNIT IV –
IoT Application Development: Solution framework for IoT applications- Implementation of Device integration ,Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, Authorization of devices

UNIT V –
IoT Systems and Applications: Smart Lighting, Weather Monitoring System, Weather Reporting Bot, Forest Fire Detection, Alcohol Detection System, Smart Parking Environment.**,** Drip-irrigation, Biological water treatment system**,** Work flow Automation in Industries, Smart Intrusion Detection System, monitoring space risks and hazardous conditions in industrial regions like underground tanks , trap door margins.

Text Books:

1. Raj and Anupama C. Raman,"The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, 2017.
2. Jeeva Jose, "Internet of Things", Khanna Publishing House, Delhi, 2018.
3. Arshdeep Bahga and Vijay Madisetti, "Internet of Things: A Hands-on Approach", Universities Press, 2014.

Suggested Reading:

1. Dr. SRN Reddy, Rachit Tirnkral and Manasi Mishra, "Introduction to Internet of Things: A practical Approach", ETI Labs, 2018.
2. Adrian McEwen, "Designing the Internet of Things", Wiley, 2013.
3. Raj Kamal, “Internet of Things:Architecture and Design”, McGraw Hill, 2017.
4. Cuno Pfister, "Getting Started with the Internet of Things", 0 Reilly Media, 2011.
5. O. Vermesan, P. Friess**, “**Internet of Things – Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publishers, Series in Communications, 2013.

Online Resources / Weblinks / NPTEL Courses:

1. Li Da Xu, Wu He, and Shancang Li, “Internet of Things in Industries: A Survey “, IEEE Transactions on Industrial Informatics, Vol. 10, No. 4, Nov. 2014.
2. Gotovtsev, Pavel M., and Andrey V. Dyakov. "Biotechnology and Internet of Things for green smart city application." 2016 IEEE 3rd World Forum on Internet of Things (WF-IoT). IEEE, 2016.
3. Yanjing, Sun, et al. "Research and design of agriculture informatization system based on IOT." Journal of Computer Research and Development 48 (2011): 316-331.
4. Somov, Andrey, et al. "Bacteria to power the smart sensor applications: Biofuel cell for low-power IoT devices." 2018 IEEE 4th World Forum on Internet of Things (WF-IoT). IEEE, 2018.
5. Han, Shuqing, et al. "Analysis of the frontier technology of agricultural IoT and its predication research." IOP Conference Series: Materials Science and Engineering. Vol. 231. No. 1. IOP Publishing, 2017.

18CSO 04

BASICS OF DATA SCIENCE USING R
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Probability and Statistics, basics of programming languages.

Course Objectives: The main objectives of this course are:

1. Understand R programming language.
2. Explore the programming skills needed to use R tool for statistical analysis of Biological data.
3. Analyze biological data.

Course Outcomes: On Successful completion of this course, student will be able to

1. Summarize the basics of R and in-built data visualization packages.
2. Describe the data analysis using Bayesian and stochastic modelling.
3. Relate gibbs, Z- sampling distributions and compare the binomial, chi-square, wilcoxon and Fisher's exact tests in hypothesis testing.
4. Explore the ANOVA in Regression analysis and classify the multivariate data.
5. Experiment with the biological data using R tool and apply clustering algorithms to biological data.
6. Identify R commands for data manipulation and database technologies for datasets of bioinformatics.

UNIT - I

Basics of R: Introduction, R features, setting up and exploring R environment, loading packages, types of data objects in R, working with R data objects, Controlling work space, importing files. Programming with R: Variables and assignment, operators, control structures, Functions-built-in, writing own functions, package creation.

UNIT - II

Data Analysis and Graphics: Data summary functions in R, Graphics technology in R, saving graphics, additional graphics packages. Bayesian Data Analysis: Need of Bayesian approach, Application of Bayes rule, Priors, Likelyhood functions, evaluating the posterior, Applications of Bayesial Statistics in Bioinformatics. Stochastic Modeling: Stochastic process and Markov Processes, Classification of Stochastic processes, modeling a DNA sequence with Markov Chain, Characteristics of Markov Chain.

UNIT - III

MCMC using Brugs: ABO blood type example. Gibbs sampling. Statistical Inference: Sampling distributions, Parameter estimation, interval estimation, bootstrapping, R packages for bootstrapping. Hypothesis Testing: Package ctest, Binomial test, comparing variances, Wilcoxon tests, Chi-Square Exact tests, Fisher's Likelihood Ratio tests.

UNIT - IV

ANOVA and Regression: ANOVA table, perforating ANOVA using R, graphical analysis of ANOVA comparison, Regression: Correlations, linear regression model, fitting and testing of regression model, generalization of the model. Working with Multivariate Data: Multivariate data, sample statistics, display of multivariate data, outliers and principal components. Classification of discriminate analysis- classification with two population and more than two populations, cross validation classification trees.

UNIT - V

Clustering methods: measures of dissimilarities, K-means clustering, K-Medoid clustering, Hierarchical clustering-Agglomerate and divisive. R Packages: Bio-conductor and Seqin R.
Data Technologies: R for Data manipulation, example, Database technologies, Bioinformatics resources on the WWW.

Text Books:

1. Kim Seefeld, Ernest Linder, "Statistics using R with Biological examples", 2007 (https://cran.r-project.org/doc/contrib/Seefeld_StatsRBio.pdf).
2. Robert Gentleman, "R Programming for Bioinformatics", 1st Edition, CRC Press, 2008.

Suggested Reading:

1. Arvil Cohhlan "A Little Book of R for Bioinformatics", Release 1.0, CC ver 3.0

Online Resources:

1. https://epdf.tips/r-programming-for-bioinformatics.html
2. https://epdf.tips/r-programming-for-bioinformatics.htmlhttps://www.cyclismo.org/tutorial/R/objectOriented.html
3. https://www.w3schools.in/r/object-oriented/

18CSO 05

FUNDAMENTALS OF VIRTUAL REALITY
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To introduce hardware and software components of virtual reality.
2. To provide knowledge about geometry of virtual worlds
3. To give an overview of visual physiology, perception and audio in VR
4. To explore the applications of VR in areas like defense and telerobotics.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Define Virtual Reality and describe the components of a VR system
2. Describe input and output devices of virtual reality systems
3. Apply geometric modeling to model real world scenarios
4. Develop interfaces by using visual physiology, visual perception and audio
5. Evaluate virtual reality systems for usability
6. Explore the applications of VR systems in defense, education and telerobotics

UNIT - I

Introduction: The three I's of virtual reality, commercial VR technology and the five classic components of a VR system.

Input Devices: Trackers, Navigation and Gesture Interfaces: Three-dimensional position trackers, navigationand manipulation interfaces, Gesture interfaces.

Output Devices: Graphics displays, sound displays and haptic feedback.

UNIT II –

Modeling: Geometric modeling, kinematics modeling, physical modeling, behaviour modeling, model management.

Human Factors: Methodology and terminology, user performance studies, VR health and safety issues, VR and Society.

UNIT - III

Light and Optics: Basic Behaviour of light, Lenses, Optical aberrations, The Human eye, Cameras, Displays.

Physiology of Human Vision: From the Cornea toPhotoreceptors, From Photoreceptors to the Visual Cortex,Eye movements, Implications for VR. **Visual Perception:** Depth perception, Motion perception, ColorPerception.

UNIT - IV

Audio: The Physics of Sound, The Physiology of Human Hearing, Auditory Perception, Auditory Rendering.

Evaluating VR Systems and Experiences: Perceptual Training, Recommendations for Developers, Comfortand VR Sickness, Experiments on Human Subjects.

UNIT V –

Applications of Augmented and Virtual Reality: Gaming and Entertainment, Architecture and Construction, Science and Engineering, Health and Medicine, Aerospace and Defense, Education, Information control and BigData Visualization, Telerobotics and Telepresence. Human Factors Considerations, Legal and Social Considerations, The Future: Short-term Outlook and Long-term Outlook

Text Books:

1. Gregory C. Burdea and Philippe Coiffet, " Virutal Reality Technology", Second Edition, John Wiley & Sons Inc., 2003
2. Steven M.Lavelle . " Virtual reality" Cambridge University press., 2019
3. Steven Anukstakins, "practical Augmented Reality", Addison Wisley, 2016

Suggested Reading:

1. George Mather, "Foundations of Sensation and Perception : Psychology", Press; 2 edition, 2009.
2. Peter Shirley, Michael Ashikhmin, and Steve Marschner, "Fundamentals of Computer Graphics", A K Peters/CRC Press; 3 edition, 2009.
3. K.S. Hale and K.M. Stanney, " Handbook on Vitual Environment", 2nd edition, CRC press, 2015.

Online Resources:

1. http://msl.cs.uiuc.edu/vr/

18CSO 06

FUNDAMENTALS OF DBMS
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: File Structures.

Course Objectives: The main objectives of this course are:

1. To learn data models, conceptualize and depict a database system using E-R diagram.
2. To understand the internal storage structures in a physical DB design.
3. To know the fundamental concepts of transaction processing techniques.

Course Outcomes: On Successful completion of this course, student will be able to:

1. Classify the difference between FMS and DBMS; describe the roles of different users and the structure of the DBMS .Design the database logically using ER modeling.
2. Outline the schema of the relational database and key constraints. Develop queries using DDL, DML and DCL of SQL
3. Identify the inference rules for functional dependencies and apply the principles of normal forms to decompose the relations in a database .
4. Summarize the concepts of dense ,sparse ,ISAM and B+ tree indexing and get familiar with states and properties of transactions.
5. Interpret the locking, time stamp, graph and validation based protocols for concurrency control.
6. Summarize log based recovery techniques to increase the robustness of the database, identify to resolve the deadlocks in the transactions .

UNIT - I

Introduction: Database System Applications, Purpose of Database Systems, View of Data, Database Languages, Database Users and Administrators Database System Architecture, Application Architectures. Database Design and E-R Model: Basic concepts, Constraints, E-R Diagrams, E-R Design Issues, Extended E-R Features, Specialization and Generalization.

UNIT - II

Relational Model: Structure of Relational Databases, Database Schema, Keys. Structured Query Language: Overviews, SQL Data Types, SQL Queries, Data Manipulation Language Set Operations, Aggregate Functions, Data Definition Language, Integrity Constraints, Null Values, Views, Join Expression. Index Definition in SQL.

UNIT - III

Relational Database Design: Undesirable Properties in Relational Database Design, Functional Dependencies, Trivial and Nontrivial Dependencies, Closure of Set of Functional Dependencies, Closure of Set of Attributes, Irreducible Set of Functional Dependencies, Normalization 1NF, 2NF, and 3NF, Dependency Preservation, BCNF, Comparison of BCNF and 3NF.

UNIT - IV

Indexing: Basic concepts, Dense and Sparse Indices, Secondary Indices, Tree-Structured Indexing, Indexed Sequential Access Method (ISAM), B+ Tree Index Files. Transaction Management: Transaction Concept ACID Properties, States of Transaction, Implementation of Atomicity and Durability, Serializability, Recoverability.

UNIT - V

Concurrency Control: Lock-Based Protocols, Timestamp-Based Protocols, Validation-Based Protocols, Deadlocks Handling: Deadlock Prevention, Deadlock Detection and Recovery, Recovery System: Failure Classification, Storage Structure, Recovery and Atomicity, Log-Based Recovery.

Text Books:

1. Abraham Silberschatz, Henry F Korth, S Sudarshan, "Database System Concepts", Sixth Edition, McGraw-Hill International Edition, 2011.
2. Date CJ, Kannan A, Swamynathan S, "An Introduction to Database Systems", Eight Edition, Pearson Education, 2006.

Suggested Reading:

1. Raghu Ramakrishnan, Johnnes Gehrke, "Database Management Systems", Third Edition, McGraw Hill, 2003.
2. Ramez Elmasri, Durvasul VLN Somayazulu, Shamkant B Navathe, Shyam K Gupta, "Fundamentals of Database Systems", Fourth Edition, Pearson Education,2006.

18CSO 07

BASICS OF CYBER SECURITY
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Operating System, Computer Network, Cryptography.

Course Objectives: The main objectives of this course are:
1. To Identify and present indicators that a cybercrime has occurred and understand methods and tools used in cybercrimes.
2. To collect, Process, Analyze and Present Computer Forensics Evidence.
3. To understand the legal perspectives and Organizational implications of Cyber Security

Course Outcomes: On Successful completion of this course, student will be able to
1. List the different types of cybercrimes and analyze legal frameworks to handle cybercrimes.
2. Identify the Tools and Methods used in cybercrimes.
3. Analyze and resolve cyber security issues and laws governing Cyberspace.
4. Describe the need of Digital Forensics and the importance of digital evidence in prosecution.
5. Interpret the commercial activities in the event of significant information security incidents in the Organization.
6. Discuss the vulnerabilities in networking protocols and their mitigation techniques.

UNIT - I
Introduction to Cyber Crime: Cyber Crime: Definition and Origins of the Word, Cyber crime and Information Security, Classification of Cyber Crimes, Cyber Crime: The Legal Perspective, Cyber Crime: An Indian Perspective, A Global Perspective of Cyber Crime.

UNIT - II
Cyber Offenses: Introduction, How Criminals plan the Attacks, Social Engineering, Cyber stalking, Cyber cafe and Cybercrimes, Botnets: The Fuel for Cybercrime, Attack Vector.
Tools and Methods Used in Cybercrime: Introduction, Proxy Servers and Anonymizers, Phishing, Password Cracking, Keyloggers and Spywares, Virus and Worms, Trojan Horse and Backdoors, Steganography, DoS and DDoS attacks, SQL Injection, Buffer Overflow.

UNIT - III
Cyber Security: The Legal Perspectives: Cyber Crime and the Legal Landscape around the World, Need of Cyber laws: the Indian Context, The Indian IT Act, Challenges to Indian Law and Cyber Crime Scenario in India, Digital Signatures and the Indian IT Act, Cyber Crime and Punishment, Cyber Law, Technology and Students: The Indian Scenario.

UNIT - IV
Understanding Cyber Forensics: Introduction ,Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Forensics Analysis of Email, Digital Forensics Life Cycle, Chain of Custody Concept, Network Forensics, Approaching a Cyber Forensics Investigation, Challenges in Computer Forensics.

UNIT - V
Cyber Security: Organizational Implications: Introduction, Cost of Cybercrimes and IPR issues, Web threats for Organizations, Security and Privacy Implications, Social media marketing: Security Risks and Perils for Organizations, Social Computing and the associated challenges for Organizations.

Text Books:
1. Sunit Belpre and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt.Ltd, 2011.
2. Kevin Mandia, Chris Prosise, "Incident Response and computer forensics", Tata McGraw Hill, 2006.

Suggested Reading:
1. Alfred Basta, Nadine Basta, Mary Brown, Ravinder Kumar, "Cyber Security and Cyber Laws", Paperback – 2018.
2. Mark F Grady, Fransesco Parisi, "The Law and Economics of Cyber Security", Cambridge university press, 2006.

Online Resources:
1. https://www.edx.org/learn/cybersecurity
2. https://www.coursera.org/courses?query=cyber%20security
3. https://swayam.gov.in/course/4002-cyber-law

18CSO 08

OPEN SOURCE TECHNOLOGIES
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:
1. Familiarity with Open Source Technologies.
2. Examples of OSS Projects, Advantages of Open Source.
3. Understand the principles, methodologies of OSS.
4. Understand the policies, licensing procedures and ethics of OSS.

Course Outcomes: On Successful completion of this course, student will be able to
1. Able to differentiate between Open Source and Proprietary software and Licensing.
2. Recognize the applications, benefits and features of Open Source Technologies.
3. Understand and demonstrate Version Control System along with its commands.
4. Gain knowledge to start, manage open source projects.
5. Understand and practice the Open Source Ethics.

UNIT I –

Introduction to Open Source: Open Source, need of Open Source, Open Source Principles, Open Source Standards Requirements for Software, OSS success, Free Software, Examples, Licensing, Free Software Vs. Proprietary Software, Public Domain software, History of free software, Proprietary Vs Open Source Licensing Model, use of Open Source Software.

UNIT II –

Fault Tolerant Design: Principles and Open Source Methodology- History, Open Source Initiatives, Open Standards Principles, Methodologies, Philosophy, Software freedom, Open Source Software Development, Licenses, Copyright vs. Copyleft, Patents, zero marginal cost, income-generation Opportunities, Internationalization.

UNIT III –

Case Studies: Apache, BSD, Linux, Mozilla Firefox, Wikipedia, Git, GNU CC, Libre Office.

UNIT IV –

Open Source Project: Starting and Maintaining an Open Source Project, Open Source Hardware, Open Source Design, Open Source Teaching (OST), Open Source Media, What Is A License, How to create your own Licenses. Important FOSS Licenses (Apache, BSD, PL, LGPL), copyrights and copy lefts, Patent.

UNIT V –

Open Source Ethics- Open Source Vs. Closed Source, Open Source Government, Ethics of Open Source, Social and Financial Impact of Open Source Technology, Shared Software, Shared Source, Open Source as a Business Strategy.

Text Books:
1. Kailash Vadera, Bjhavesh Gandhi "Open Source Technology", University Science Press, 1st Edition, 2009.
2. Fadi P. Deek and James A. M. McHugh, "Open Source Technology and Policy", Cambridge University Press.

Suggested Reading:
1. Wale Soyinka, "Linux Administration- A beginner's Guide", Tata McGraw Hills.
2. Andrew M. St. Laurent, "Understanding Open Source and Free Software Licensing", O'Reilly Media.
3. Dan Woods, Gautam Guliani, "Open Source for the Enterprise", O'Reilly Media.
4. Bernard Golden, "Succeeding with Open Source", Addison-Wesley Professional.
5. Clay Shirky and Michael Cusumano, "Perspectives on Free and Open Source Software", MIT press.

18CSO 09

BASICS OF ARTIFICIAL INTELLIGENCE
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Pre-requisites: Basic Mathematics.

Course Objectives: The main objectives of this course are:
1. Provide a strong foundation of fundamental concepts in Artificial Intelligence.
2. Discuss the various paradigms involved in solving an AI problems which involve perception, reasoning and learning
3. Apply the AI concepts to build an expert system to solve the real-world problems.

Course Outcomes: On Successful completion of this course, student will be able to
1. Identify various search strategies to solve problems.
2. Compare and contrast knowledge representation schemes.
3. Apply Bayesian Networks and Dempster Shafer theory for reasoning
4. Explain the role of agents and interaction with the environment
5. Determine different learning paradigms.
6. Explain robotic architectures and expert systems.

UNIT - I

Introduction: Definition, history, applications. Problem Solving: AI problems, AI Technique, Defining problem as a State-Space Search, Problem Characteristics. Heuristic Search Techniques: Generate and test, Hill Climbing, Constraint Satisfaction.

UNIT - II

Knowledge Representation (Logic): Representing facts in logic, proposition logic, predicate logic, resolution and unification. Knowledge Representation (Structured): Declarative representation, Semantic nets, procedural representation, frames.

UNIT - III

Reasoning: Probability and Bayes theorem, Certainty factors and Rule based systems, Bayesian Networks, Dempster-Shafer Theory. Planning: Components, goal stack planning, nonlinear planning, hierarchical planning.

UNIT - IV

Learning: Introduction, Rote learning, learning by taking advice, learning in problem solving and learning from examples: Decision tree. Intelligent Agents: Classification, Working of an agent, single agent and multi agent systems, multi agent application.

UNIT - V

Expert System: Representing and Using Domain Knowledge, Expert systems shells, Explanation, Knowledge Acquisition. Perception and Action: Real Time Search, Vision, Speech Recognition, ACTION: Navigation, Manipulation, Robot architectures.

Text Books:
1. Elaine Rich, Kevin Night, Shivashankar B Nair, “Artificial Intelligence”, 3rd Edition, 2008
2. Russell Norvig, “Artificial Intelligence-Modern Approach”, 3rd edition, 2010.

Suggested Reading:
1. Saroj Kaushik, “Artificial Intelligence”, Cengage Learning India, 2012.
2. Nelson M. Mattos, “An Approach to Knowledge Base Management”, Springer Berlin Heidelberg, 1991.

Online Resources:
1. http://nptel.ac.in/courses/106106126/
2. http://nptel.ac.in/courses/106105077/

18CSO 10

MACHINE LEARNING USING PYTHON
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:
1. Get an idea of Machine Learning algorithms to solve real world problems.
2. Study various machine learning algorithms.
3. Analyze data using machine learning techniques.

Course Outcomes: On Successful completion of this course, student will be able to
1. Define the basic concepts related to Python and Machine Learning.
2. Describe the feature engineering methods, regression techniques and classification methods.
3. Apply Python packages for data visualization. text and time series data analysis using NLP toolkit.
4. Evaluate and interpret the results of the various machine learning techniques.
5. Identify different clustering algorithms.
6. Solve real world problems using deep learning framework.

UNIT - I

Introduction to Machine Learning: Introduction, Machine Learning process. Introduction to Python: Features, sources and installation of Python, IDEs, Basics of Python, Data Structures and loops.

UNIT - II

Feature Engineering: Introduction to Features and need of feature Engineering, Feature extraction and selection, Feature Engineering Methods, Feature Engineering with Python. Data Visualization: Various charts, histograms, plots.

UNIT - III

Regression: Simple and multiple regressions, Model assessment, various types of errors, errors, ridge regression, Lasso regression, non-parameter regression. Classification: Linear classification, logistic regression, Decision Trees, Random Forest, Naïve Bayes.

UNIT - IV

Unsupervised Learning: Clustering, K-Means clustering, Hierarchical clustering. Text Analysis: Basic text analysis with Python, regular expressions, NLP, text classification. Time Series Analysis: Date and time handling, window functions, correlation, time series forecasting.

UNIT - V

Neural Network and Deep Learning: Neural network- gradient descent, activation functions, parameter initialization, optimizer, loss function, deep learning, deep learning architecture, memory, deep learning framework. Recommender System: Recommendation engines, collaborative filtering.

Text Books:

1. Abhishek Vijavargia “Machine Learning using Python”, BPB Publications, 1st Edition, 2018
2. Tom Mitchel “Machine Learning”, Tata McGraWHill, 2017
3. Reema Thareja “Python Programming”, Oxford Press, 2017.

Suggested Reading:

1. Yuxi Liu, “Python Machine Learning by Example”, 2nd Edition, PACT, 2017

Online Resources:

1. https://www.guru99.com/machine-learning-tutorial.html
2. https://www.tutorialspoint.com/machine_learning_with_python/index.htm
3. https://www.tutorialspoint.com/python/
4. https://docs.python.org/3/tutorial/
5. https://www.geeksforgeeks.org/machine-learning/

18CSO 11

COMPUTER GRAPHICS AND ITS APPLICATIONS
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:

1. To introduce the use of the components of a graphics system and become familiar with building approach of graphics system components and algorithms related with them.
2. To learn the basic principles of computer graphics.
3. Provide an understanding of how to scan convert the basic geometrical primitives, how to transform the shapes to fit them as per the picture definition.

Course Outcomes: On Successful completion of this course, student will be able to

1. List the basic concepts used in computer graphics.
2. Implement various algorithms to scan, convert the basic geometrical primitives, transformations, Area filling, clipping.
3. Describe the importance of viewing and projections.
4. Define the fundamentals of animation, virtual reality and its related technologies.
5. Enumerate a typical graphics pipeline.
6. Apply various computer graphics algorithms for real world problems.

UNIT - I

Graphics Systems and Models: Graphics system; Images; Physical and synthetic; Imaging system; synthetic camera model; programming interface; graphics architectures Programmable pipelines; performance characteristics. Graphics Programming: Programming two-dimensional applications; OpenGL API; Primitives and attributes; color; viewing, control functions.

UNIT - II

Input and Interaction: Input device; clients and servers; displays lists; display lists and modeling; programming event driven input; picking ; building interactive models; animating Interactive programs; logic operations. Geometrics Objects: Three - dimensional primitives; coordinates systems and frames; frames in OpenGL; Modeling colored cube.

UNIT - III

Transformations: Affine Transformations; Transformations in homogenous coordinates; concatenation of Transformations; OpenGL transformation matrices; Viewing: Classical and Computer views; Viewing with a computer; Positioning of camera; Simple projections; Projections in OpenGL; Hidden surface removal; Parallel- projection matrices; Perspective projection matrices.

UNIT - IV

Lighting and Shading: Light sources; The Phong lighting model; Computational vectors; Polygonal shading; Light sources in OpenGL; Specification of matrices in OpenGL; Global illumination; From Vertices To Frames: Basic implementation strategies; line-segment clipping; polygon clipping; clipping of other primitives; clipping in three dimensions; Rasterization ; Bresenham's algorithm; Polygon Rasterization ; Hidden surface removal; anti-aliasing; display considerations

UNIT - V

Modelling & Hierarchy: Hierarchal models; trees and traversal; use of tree data structure; animation; Graphical objects; Scene graphs; Simple scene graph API; Open Scene graph; other tree structures; Curves and Surfaces: Representation of curves and surfaces; design criteria; Bezier curves and surfaces; Cubic Bsplines;
General B-splines; rendering curves and surfaces; curves and surfaces in OpenGL.

Text Books / Suggested Reading:

1. Edward Angel, "Computer Graphics A Top-Down Approach Using OpenGL", Peasrson Education, 5th edition - 2009.
2. Fransis S Hill Jr., Stephen M Kelley, "Computer Graphics Using OpenGL", Prentice-Hall Inc., 3rd edition , 2007.
3. Jim X. Chen, "Foundation of 3D Graphics Programming Using JOGL and Java3D", Springe Verlag, 2006.
4. Hearn Donald, Pauline Baker M, "Computer Graphics", 2nd edition , 1995.

18CSO 12

FUNDAMENTALS OF SOFTWARE ENGINEERING
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
CIE	30 Marks
Credits	3

Course Objectives: The main objectives of this course are:
1. To introduce the basic concepts of software development.
2. To impart knowledge on various phases, approaches and practices of software development.
3. To make the student industry ready with study of different techniques and tools.

Course Outcomes: On Successful completion of this course, student will be able to
1. State the software process and the perspective process models and agile process models.
2. Interpret the Requirements of Software Product and demonstrate the skills necessary to specify the requirements of software product.
3. Recall the software architecture and design principles of software product.
4. Construct a product using coding principles and Outline the testing strategies for Conventional and O-O Software.
5. Apply software testing methods like White Box, Black box and explore the corrective, adaptive, and enhancive software maintenance categories.
6. Classify and relate the requirements, design principles and testing strategies to develop a software product.

UNIT - I

The Software Problem, Software Processes- Process and Project, Components of software Processes. **Software Development Process Models**: Waterfall, Prototyping, Iterative Development, RUP, Time Boxing Model. **Agile Process**: Agility, Agile Process Model – Extreme Programming, Using Process Models in a Project.

UNIT - II

Software Requirements Analysis Specification: Value of a Good SRS, Requirements Process, Requirements Specification, Functional Specification with Use-cases, other approaches for Analysis- DFD, E-R. **Planning a Software Project**: Project schedule and staffing, Quality Planning, Risk Management Planning, Project Monitoring Planning.

UNIT - III

Software Architecture: Architecture views, Component and Connector views, Architecture Styles for C&C views. **Design**: Design Concepts, Function Oriented Design, Object Oriented Design, Detailed Design.

UNIT - IV

Coding: Programming Principles and Guidelines, Incrementally developing code, Managing Evolving code, Unit Testing, Code Inspection. **Testing Concepts**: Test case, Test Suite, Test Harness, Levels of Testing.

UNIT - V

Test Process: Test Plan, Test Case Design, Black – Box Testing, White – Box Testing, Metrics.

Text Books:

1. Pankaj Jalote, "A concise introduction to software Engineering", Springer, 2008.
2. Nasib Singh Gill, "Software Engineering", Khanna Publishing House, 2007.

Suggested Reading:

1. Roger S.Pressman, "Software Engineering: A Practitioner's Approach", 7th Edition, McGraw Hill, 2009.
2. Ali Behforooz and Frederick J.Hudson, "Software Engineering Fundamentals", Oxford University Press, 1996.

Online Resources:

1. https://nptel.ac.in/courses/106101061/

18CSO 13

FUNDAMENTALS OF BLOCKCHAIN TECHNOLOGY
(Open Elective)

Instruction	3 Hours per week
Duration of End Examination	3 Hours
Semester End Examination	70 Marks
Continuous Internal Evaluation	30 Marks
Credits	3

Course Objectives: The objectives of this course are

1. Provide the basic concepts and architecture of blockchain.
2. Interpret the working of Ethereum and Hyperledger Fabric.
3. Explore the applications of blockchain in Science and Healthcare domains.

Course outcomes: On Successful completion of the course, students will be able to

1. Understand the concepts of distributed systems and blockchain properties.
2. Learn about the significance of bitcoin ecosystem.
3. Understand consensus mechanisms and technologies that support ethereum.
4. Learn about Hyperledger Fabric and its architecture.
5. Analyze blockchain use cases in Science and Healthcare domains.

Unit I:

Introduction: Overview of distributed systems; Introduction to Blockchain; Properties of Blockchain; Evolution of Blockchain.

Cryptocurrency And Blockchain : Anonymity and Pseudonymity in Cryptocurrency; Programmable Money; Hash Functions and Merkle Trees; Components of Blockchain Ecosystem; Cryptography and Consensus Algorithms; Types of Blockchain; Blockchain Platforms.

Unit II:

Bitcoin Platform: Bitcoin and its uses; Bitcoin Trading: Buying, selling and storing Bitcoins; Bitcoin Ecosystem; Structure of a Bitcoin Transaction; Nodes in a Bitcoin Network; Bitcoin Mining, Bitcoin Economics; Types of bitcoin Mining; Consensus mechanism in bitcoin.

Unit III:

Introduction To Ethereum: What is Ethereum; Introducing Smart Contracts; Cryptocurrency in Ethereum; Mining in Ethereum; Consensus mechanism in Ethereum; Technologies that support Ethereum; Ethereum Programming Language; Ethereum Test Networks.

Unit IV:

Hyperledger Fabric: Introduction to Hyperledger Fabric; Hyperledger Fabric architecture; Consensus in Hyperledger Fabric; Hyperledger API and Application Model; Setting up Development Environment using Hyperledger Composer tool.

Unit V:

Blockchain in Science: Reproducibility Crisis; Clinical Trials; Pharmaceutical Drug Tracking-Prediction Markets and Augar.

Blockchain in Health Care: Patient-Payer-Providers Model; EHR operability: Ark Invest and Gem.

Text Books:

1. Mastering Bitcoin. Programming the Open Blockchain; Andreas M. Antonopoulos; O'Reilly, 2017
2. Bitcoin and Blockchain Security**;** Ghassan Karame, Elli Androulaki; Artech House, 2016.
3. Blockchain and Clinical Trial; Hamid Jahankhani et.al.; Springer (2019)
4. Blockchain Enabled Applications; Vikram Dhillon et al, Apress (2019)

Suggested Reading:

1. Mark Gates, "Blockchain: Ultimate guide to understanding blockchain, bitcoin, cryptocurrencies, smart contracts and the future of money", Wise Fox Publishing and Mark Gates, 2017.
2. Melanie Swa, "Blockchain ",O'Reilly Media, 2014

Online Resources:

1. Blockchain Applications- https://www.blockchain-books.com
2. Hyperledger Fabric - https://www.hyperledger.org/projects/fabric
3. Zero to Blockchain - An IBM Redbooks course, by Bob Dill, DavidSmits, 2017(https://www.redbooks.ibm.com/Redbooks.nsf/RedbookAbstracts/crse0401.html)
4. https://onlinecourses.nptel.ac.in/noc18_cs47/preview
5. https://www.udemy.com/blockchain-and-bitcoin-fundamentals/