



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

(Approved by AICTE | NAAC Accreditation with 'A' Grade | Accredited by NBA | Affiliated to JNTUH)

Dundigal, Hyderabad - 500 043, Telangana

**OUTCOME BASED EDUCATION
WITH
CHOICE BASED CREDIT SYSTEM**

**MASTER OF TECHNOLOGY
COMPUTER SCIENCE AND ENGINEERING**

**ACADEMIC REGULATIONS, COURSE STRUCTURE AND SYLLABI
(Based on AICTE Model Curriculum)**

IARE - R18

**M.Tech Regular Two Year Degree Program
(for the batches admitted from the academic year 2018 - 2019)**

**FAILURE TO READ AND UNDERSTAND THE REGULATIONS
IS NOT AN EXCUSE**

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“Take up one idea.

Make that one idea you’re life-think of it, dream of it, and live on that idea. Let the brain muscles, nerves, every part of your body be full of that idea and just leave every other idea alone.

This is the way to success” Swami Vivekananda

PRELIMINARY DEFINITIONS AND NOMENCLATURES

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

Academic Autonomy: Means freedom to an institute in all aspects of conducting its academic programs, granted by UGC for Promoting Excellence.

Academic Year: It is the period necessary to complete an actual course of study within a year. It comprises two consecutive semesters i.e., Even and Odd semester.

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

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

Backlog Course: A course is considered to be a backlog course if the student has obtained a failure grade (F) in that course.

Basic Sciences: The courses offered in the areas of Mathematics, Physics, Chemistry, Biology etc., are considered to be foundational in nature.

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

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

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

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

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

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

Continuous Internal Examination: It is an examination conducted towards internal assessment.

Course: A course is a subject offered by the University for learning in a particular semester.

Course Outcomes: The essential skills that need to be acquired by every student through a course.

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

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

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

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

Degree with Specialization: A student who fulfills all the program requirements of her/his discipline and successfully completes a specified set of professional elective courses in a specialized area is eligible to receive a degree with specialization like Structural Engineering, Embedded Systems, CSE, etc.

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

Detention in a course: Student who does not obtain minimum prescribed attendance in a course shall be detained in that particular course.

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

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

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

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

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

Institute: Means Institute of Aeronautical Engineering, Hyderabad unless indicated otherwise by the context.

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

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

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

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

Program: Means, Master of Technology (M.Tech) degree program / UG degree program: B.Tech.

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

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

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

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

Regulations: The regulations, common to all M.Tech programs offered by Institute are designated as "IARE-R18" and are binding on all the stakeholders.

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

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

S/he: Means "she" and "he" both.

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

University: Means the Jawaharlal Nehru Technological University Hyderabad, Hyderabad.

Withdraw from a Course: Withdrawing from a course means that a student can drop from a course within the first two weeks of the odd or even semester (deadlines are different for summer sessions). However s/he can choose a substitute course in place of it by exercising the option within 5 working days from the date of withdrawal.

Words 'he', 'him', 'his', occur, they imply 'she', 'her', 'hers' also.

FOREWORD

The autonomy is conferred to Institute of Aeronautical Engineering (IARE), Hyderabad by University Grants Commission (UGC), New Delhi based on its performance as well as future commitment and competency to impart quality education. It is a mark of its ability to function independently in accordance with the set norms of the monitoring bodies like J N T University Hyderabad (JNTUH), Hyderabad and AICTE. It reflects the confidence of the affiliating University in the autonomous institution to uphold and maintain standards it expects to deliver on its own behalf and thus awards degrees on behalf of the college. Thus, an autonomous institution is given the freedom to have its own **curriculum, examination system and monitoring mechanism**, independent of the affiliating University but under its observance.

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

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

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

PRINCIPAL



INSTITUTE OF AERONAUTICAL ENGINEERING (Autonomous)

ACADEMIC REGULATIONS

M.Tech. Regular Two Year Degree Program (for the batches admitted from the academic year 2018 - 20)

For pursuing two year postgraduate Master Degree program of study in Engineering (M.Tech) offered by Institute of Aeronautical Engineering under Autonomous status and herein after referred to as IARE.

1.0 CHOICE BASED CREDIT SYSTEM

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

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

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

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

The CBCS permits students to:

1. Choose electives from a wide range of elective courses offered by the departments of the Institute.
2. Undergo additional courses of interest.
3. Adopt an inter-disciplinary approach in learning.
4. Make the best use of expertise of the available faculty.

2.0 MEDIUM OF INSTRUCTION

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

3.0 ELIGIBILITY FOR ADMISSION

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

- a) Under Category A: 70% of the seats are filled based on GATE/PGECET ranks.
- b) Under Category B: 30% seats are filled on merit basis as per guidelines of TSCHE.

4.0 UNIQUE COURSE IDENTIFICATION CODE

Every specialization of the M.Tech programme will be placed in one of the groups as listed in the Table 1.

Table 1: Group of Courses

S. No	Specialization	Offering Department	Code
1	Structural Engineering	Civil Engineering	ST
2	Electrical Power Systems	Electrical and Electronics Engineering	EPS
3	CAD / CAM	Mechanical Engineering	CC
4	Embedded Systems	Electronics and Communication Engineering	ES
5	Computer Science and Engineering	Computer Science and Engineering	CS
6	Aerospace Engineering	Aeronautical Engineering	AE

5.0 TYPES OF COURSES

Courses in a programme may be of four kinds: **Core, Elective, Open and Audit.**

5.1 Core Course:

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

5.2 Elective Course:

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

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

There shall be five professional core elective groups out of which students can choose not more than two courses from each group. Overall, students can opt for four professional elective courses which suit their project work in consultation with the faculty advisor/mentor. In addition, one course from each of the two open electives has to be selected. A student may also opt for more elective courses in his/her area of interest.

5.3 Open Elective Course:

An elective may be discipline centric focusing on those courses which add generic proficiency to the students or may be chosen from supportive/general discipline called as "Open Elective".

5.4 Audit Course:

The value added courses are audit courses offered through joint ventures with various organizations providing ample Scope for the students as well as faculty to keep pace with the latest technologies pertaining to their chosen fields of study. A plenty of value added programs will be proposed by the departments one week before the commencement of class work. The students are given the option to choose the courses according to their desires and inclinations as they choose the desired items in a cafeteria. The expertise gained through the value added programs should enable them to face the formidable challenges of the future and also assist them in exploring new opportunities. Its result shall be declared with "Satisfactory" or "Not Satisfactory" performance.

6.0 SEMESTER STRUCTURE

The institute shall follow semester pattern. An academic year shall consist of a first semester and a second semester and the summer term. Each semester shall be of 23 weeks (Table 2) duration and this period includes time for course work, examination preparation and conduct of examinations. Each main semester shall have a minimum of 90 working days; out of which number of contact days for teaching / practical shall be 75 and 15 days shall be for examination preparation. The duration for each semester shall be a minimum of 17 weeks of instruction. The Academic Calendar is declared at the beginning of the academic year as given in Table2.

Table 2: Academic Calendar

FIRST SEMESTER (23 weeks)	I Spell Instruction Period	9 weeks	21 weeks	
	I Mid Examinations	1 week		
	II Spell Instruction Period	8 weeks		
	II Mid Examinations	1 week		
	Preparation and Practical Examinations	2 weeks		
	Semester End Examinations	2 weeks		
Semester Break and Supplementary Exams			2 weeks	
SECOND SEMESTER (23 weeks)	I Spell Instruction Period	9 weeks	21 weeks	
	I Mid Examinations	1 week		
	II Spell Instruction Period	8 weeks		
	II Mid Examinations	1 Week		
	Preparation & Practical Examinations	2 weeks		
	Semester End Examinations	2 weeks		
Summer Vacation and Supplementary Exams			4 weeks	
THIRD SEMESTER	I Spell Instruction Period	9 weeks	18 weeks	
	I Mid Examinations	1 week		
	II Spell Instruction Period	8 weeks		
	II Mid Examinations	1 week		
	Project Work Phase – I			
	Semester End Examinations	1 week		
FOURTH SEMESTER	Project Work Phase - II	18 eeks		

7.0 PROGRAM DURATION

A student shall be declared eligible for the award of M.Tech degree, if he/she pursues a course of study and completes it successfully in not less than two academic years and not more than four academic years. A student, who fails to fulfill all the academic requirements for the award of the degree within four academic years from the year of his/her admission, shall forfeit his/her seat in M.Tech course.

- A student will be eligible for the award of M.Tech degree on securing a minimum of 5.0/10.0 CGPA.
- In the event of non-completion of project work and/or non-submission of the project report by the end of the fourth semester, the candidate shall re-register by paying the semester fee for the project. In such a case, the candidate will not be permitted to submit the report earlier than three months and not later than six months from the date of registration.

8.0 CURRICULUM AND COURSE STRUCTURE

The curriculum shall comprise Core Courses, Elective Core Courses, Laboratory Course, Mini Project with Seminar, Internship, Project Work-1 and Project Work-2.

Each Theory and Laboratory course carries credits based on the number of hours / week as follows:

- **Lecture Hours (Theory):** 1 credit per lecture hour per week.
- **Laboratory Hours (Practical):** 1 credit for 2 practical hours, 2 credits for 3 or 4 practical hours per week.
- **Project Work:** 1 credit for 2 hours of project work per week.

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

Table 3: Credit distribution

S. No	Course	Hours	Credits
1	Core Courses	3	3
2	Professional Core Elective Courses	3	3
3	Audit Courses	2	0
4	Laboratory Courses	4	2
5	Open Elective Courses	3	3
6	Mini Project with Seminar	2	2
7	Project Work-1 Dissertation	20	10
8	Project Work-2 Dissertation	32	16

8.2 Course wise break-up for the total credits:

Total Theory Courses (12) Core Courses (04)+Professional Core Electives (05) + Open Electives (01)	04@3credits + 05 @ 3 credits + 01@3 credits	30
Total Laboratory Courses (03)	04@2credits	08
Mini Project with Seminar(01)	1 @2credit	02
Research Methodology and IPR	1 @2 credit	02
Project Work-1	1 @10credit	10
Project Work-2	1 @16credits	16
TOTAL CREDITS		68

9.0 EVALUATION METHODOLOGY

9.1 Theory Course:

Each theory course will be evaluated for a total of 100 marks, with 30 marks for Continuous Internal Assessment (CIA) and 70 marks for Semester End Examination (SEE). Out of 30 marks allotted for CIE during the semester, marks are awarded by taking average of two sessional examinations.

9.1.1 Semester End Examination (SEE):

The SEE shall be conducted for 70 marks of 3 hours duration. The syllabus for the theory courses shall be divided into FIVE units and each unit carries equal weightage in terms of marks distribution.

The question paper pattern shall be as defined below. Two full questions with ‘either’ ‘or’ choice will be drawn from each unit. Each question carries 14 marks. There could be a maximum of three sub divisions in a question.

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

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

9.1.2 Continuous Internal Assessment (CIA):

For each theory course the CIA shall be conducted by the faculty/teacher handling the course as given in Table 4. CIA is conducted for a total of 30 marks, with 25 marks for Continuous Internal Examination (CIE) and 05 marks for Technical Seminar and Term Paper.

Table 4: Assessment pattern for Theory Courses

COMPONENT	THEORY		TOTAL MARKS
	CIE Exam (Sessional)	Technical Seminar and Term Paper	
Max. CIA	25	5	30

Continuous Internal Examination (CIE):

Two CIE exams shall be conducted at the end of the 9th and 17th week of the semester respectively. The CIE exam is conducted for 25 marks of 2 hours duration, consisting of 5 one mark compulsory questions in part-A and 4 questions in part-B. The student has to answer any 4 questions out of five questions, each carrying 5 marks. Marks are awarded by taking average of marks scored in two CIE exams.

Technical Seminar and Term Paper:

Two seminar presentations are conducted during I year I semester and II semester. For seminar, a student under the supervision of a concerned faculty member, shall identify a topic in each course and prepare the term paper with overview of topic. The evaluation of Technical seminar and term paper is for maximum of 5 marks. Marks are awarded by taking average of marks scored in two Seminar Evaluations.

9.2 Laboratory Course:

Each lab will be evaluated for a total of 100 marks consisting of 30 marks for internal assessment and 70 marks for semester end lab examination. Out of 30 marks of internal assessment, continuous lab assessment will be done for 20 marks for the day to day performance and 10 marks for the final internal lab assessment. The semester end lab examination for 70 marks shall be conducted by two examiners, one of them being a internal examiner and another is external examiner, both nominated by the Principal from the panel of experts recommended by Chairman, BOS.

All the drawing related courses are evaluated in line with lab courses. The distribution shall be 30 marks for internal evaluation (20 marks for day-to-day work, and 10 marks for internal tests) and 70 marks for semester end lab examination. There shall be ONE internal test for 10 marks each in a semester.

9.3 Project work

Normally, the project work should be carried out at Host Institute (Institute of Aeronautical Engineering). However, it can also be carried out in any of the recognized Educational Institutions, National Laboratories, Research Institutions, Industrial Organizations, Service Organizations or Government Organizations with the prior permission from the guide and concerned Head of the Department. A student shall submit the outcome of the project work in the form of a dissertation.

- 9.3.1 The student shall submit the project work synopsis at the end of III semester for Phase-I of project evaluation. The Phase-I of project work shall be evaluated by Project Review Committee (PRC) at the end of the third semester for a maximum of 100 marks. Head of the Department (HOD) shall constitute a PRC comprising of senior faculty of the specialization, Guide and Head of the Department.
- 9.3.2 The first phase of project work is to be carried out in IV semester for Phase –II of Project work. The student will be allowed to appear for final viva voce examination at the end of IV semester only if s/he has submitted s/he project work in the form of paper for presentation/ publication in a conference/journal and produce the proof of acceptance of the paper from the organizers/publishers.
- 9.3.3 The student shall submit the project work in the form of dissertation at least four weeks ahead of the completion of the program. Head of the Department shall constitute an Internal Evaluation Committee (IEC) comprising of the Chairman BOS (PG), HOD and Guide. As per convenes of all meeting for open pre-submission seminar evaluation of the student. If the open pre-submission seminar by a student is not satisfactory, another seminar shall be scheduled within two weeks.

The evaluation of the project work and the marks allotted are as under:

S. No	Project Phases	Mode	Evaluation Committee	Marks
1	Phase - I	Continuous evaluation at the end of III Semester	Guide	30
2		Evaluation at the end of III Semester	Project Review Committee (PRC) comprising of senior faculty of the specialization, guide and HOD.	70
Total (Phase – I)				100
3	Phase - II	An open pre-submission seminar by the student	The Internal Evaluation Committee (IEC) comprising of the Chairman, BOS (PG), HOD and guide wherein the HOD convenes its meeting.	30
4		End Semester Examination (An open seminar followed by viva-voce)	The External Evaluation Committee (EEC) comprising of External Examiner, HOD and guide wherein the HOD shall be the chairman of the committee.	70
Total (Phase-II)				100

9.3.4 As soon as a student submits his project work, Principal shall appoint the External Examiner among the panel of examiners recommended by the Chairman, BOS (PG).

9.3.5 The Principal shall schedule the End Semester Examination in project work soon after the completion of the study of program and a student can appear for the same provided s/he has earned

successfully all the requisite credits. The student shall produce the dissertation duly certified by the guide and HOD during the Examination.

- 9.3.6 The project reports of M.Tech students who have not completed their course work successfully will be evaluated in that semester itself and the result sent confidentially to the Controller of Examinations. The results of the project work evaluation will be declared by the Controller of Examinations only after the successful completion of the courses by those students.

10.0 ATTENDANCE REQUIREMENTS AND DETENTION POLICY

- 10.1 It is desirable for a candidate to put on 100% attendance in each course. In every course (theory/laboratory), student has to maintain a minimum of 80% attendance including the days of attendance in sports, games, NCC and NSS activities to be eligible for appearing in Semester End Examination of the course.
- 10.2 For cases of medical issues, deficiency of attendance in each course to the extent of 15% may be condoned by the College Academic Committee (CAC) on the recommendation of Head of the Department if his/her attendance is between 80% to 65% in every course, subjected to submission of medical certificate and other needful documents to the concerned department.
- 10.3 The basis for the calculation of the attendance shall be the period prescribed by the institute by its calendar of events. For late admission, attendance is reckoned from the date of admission to the program.
- 10.4 However, in case of a student having less than 65% attendance in any course, s/he shall be detained in the course and in no case such process will be relaxed.
- 10.5 Students whose shortage of attendance is not condoned in any subject are not eligible to write their semester end examination of that courses and their registration shall stand cancelled.
- 10.6 A prescribed fee shall be payable towards Condonation of shortage of attendance.
- 10.7 A candidate shall put in a minimum required attendance at least in three (3) theory courses for getting promoted to next higher class / semester. Otherwise, s/he shall be declared detained and has to repeat semester.
- 10.8 A student shall not be promoted to the next semester unless he satisfies the attendance requirement of the present semester, as applicable. They may seek readmission into that semester when offered next. If any candidate fulfills the attendance requirement in the present semester, s/he shall not be eligible for readmission into the same class.

11.0 CONDUCT OF SEMESTER END EXAMINATIONS AND EVALUATION

- 11.1 Semester end examination shall be conducted by the Controller of Examinations (COE) by inviting Question Papers from the External Examiners.
- 11.2 Question papers may be moderated for the coverage of syllabus, pattern of questions by Semester End Examination Committee chaired by Head of the Department one day before the commencement of semester end examinations.
- 11.3 Internal Examiner shall prepare a detailed scheme of valuation.
- 11.4 The answer papers of semester end examination should be evaluated by the internal examiner immediately after the completion of exam and the award sheet should be submitted to COE in a sealed cover before the same papers are kept for second evaluation by external examiner.
- 11.5 In case of difference is more than 15% of marks, the answer paper shall be re-evaluated by a third examiner appointed by the Examination Committee and marks awarded by him shall be taken as final.

11.6 HOD shall invite 3-9 external examiners to evaluate all the end semester answer scripts on a prescribed date(s). Practical laboratory exams are conducted involving external examiners.

11.7 Examination Control Committee shall consolidate the marks awarded by internal and external examiners to award grades.

12.0 SCHEME FOR THE AWARD OF GRADE

12.1 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each theory course, if s/he secures:

- i. Not less than 40% marks for each theory course in the semester end examination, and
- ii. A minimum of 50% marks for each theory course considering both CIA and SEE

12.2 A student shall be deemed to have satisfied the minimum academic requirements and earn the credits for each Laboratory / Seminar and Technical Writing / Project, if s/he secures

- i. Not less than 40% marks for each Laboratory / Seminar / Project course in the semester end examination,
- ii. A minimum of 50% marks for each Laboratory / Mini project with Seminar / Project course considering both internal and semester end examination.

12.3 If a candidate fails to secure a pass in a particular course, it is mandatory that s/he shall register and reappear for the examination in that course during the next semester when examination is conducted in that course. It is mandatory that s/he should continue to register and reappear for the examination till s/he secures a pass.

13.0 LETTER GRADES AND GRADE POINTS

13.1 Performances of students in each course are expressed in terms of marks as well as in Letter Grades based on absolute grading system. The UGC recommends a 10point grading system with the following letter grades as given below:

Range of Marks	Grade Point	Letter Grade
100 - 80	10	S (Superior)
70 – 79	9	A+ (Excellent)
60 – 69	8	A (Very Good)
55 – 59	7	B+ (Good)
50 – 54	6	B (Average)
Below 50	0	F (Fail)
Absent	0	Ab (Absent)
Authorized Break of Study	0	ABS

13.2 A student is deemed to have passed and acquired to correspondent credits in particular course if s/he obtains any one of the following grades: “S”, “A+”, “A”, “B+”, “B”.

13.3 A student obtaining Grade “F” shall be considered Failed and will be required to reappear in the examination.

13.4 “SA” denotes shortage of attendance (as per item 10) and hence prevention from writing Semester End Examination.

13.5 At the end of each semester, the institute issues grade sheet indicating the SGPA and CGPA of the student. However, grade sheet will not be issued to the student if s/he has any outstanding dues.

14.0 COMPUTATION OF SGPA AND CGPA

The UGC recommends to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA). The credit points earned by a student are used for calculating the Semester Grade Point Average (SGPA) and the Cumulative Grade Point Average (CGPA), both of which are important performance indices of the student. SGPA is equal to the sum of all the total points earned by the student in a given semester divided by the number of credits registered by the student in that semester. CGPA gives the sum of all the total points earned in all the previous semesters and the current semester divided by the number of credits registered in all these semesters. Thus,

$$SGPA = \frac{\sum_{i=1}^n (C_i G_i)}{\sum_{i=1}^n C_i}$$

Where, C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course and n represent the number of courses in which a student's is registered in the concerned semester.

$$CGPA = \frac{\sum_{j=1}^m (C_j S_j)}{\sum_{j=1}^m C_j}$$

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

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

15.0 ILLUSTRATION OF COMPUTATION OF SGPA AND CGPA

15.1 Illustration for SGPA

Course Name	Course Credits	Grade letter	Grade point	Credit Point (Credit x Grade)
Course 1	3	A	8	3 x 8 = 24
Course 2	4	B+	7	4 x 7 = 28
Course 3	3	B	6	3 x 6 = 18
Course 4	3	S	10	3 x 10 = 30
Course 5	3	C	5	3 x 5 = 15
Course 6	4	B	6	4 x 6 = 24
	20			139

Thus, $SGPA = 139 / 20 = 6.95$

15.2 Illustration for CGPA

Semester 1	Semester 2	Semester 3	Semester 4
Credit: 20 SGPA: 6.9	Credit: 22 SGPA: 7.8	Credit: 25 SGPA: 5.6	Credit: 26 SGPA: 6.0

Thus, $CGPA = \frac{20 \times 6.9 + 22 \times 7.8 + 25 \times 5.6 + 26 \times 6.0}{93} = 6.51$

16.0 PHOTOCOPY / REVALUATION

A student, who seeks the revaluation of the answer script, is directed to apply for the photocopy of his/her semester examination answer paper(s) in the theory course(s) within 2 working days from the declaration of results in the prescribed format to the Controller of Examinations through the Head of the Department. On receiving the photocopy, the student can consult with a competent member of faculty and seek the opinion for revaluation. Based on the recommendations, the student can register for the revaluation with prescribed fee. The Controller of Examinations shall arrange for the revaluation and declare the results. Revaluation is not permitted to the courses other than theory courses.

17.0 GRADUATION REQUIREMENTS

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

17.1 Student shall register and acquire minimum attendance in all courses and secure 68 credits.

17.2 A student who fails to earn 68 credits within four consecutive academic years from the year of his/her admission with a minimum CGPA of 5.0, shall forfeit his/her degree and his/her admission stands cancelled.

18.0 AWARD OF DEGREE

Classification of degree will be as follows:

CGPA \geq 7.5	CGPA \geq 6.5 and < 7.5	CGPA \geq 5.5 and < 6.5	CGPA \geq 5.0 and < 5.5	CGPA < 5.0
First Class with Distinction	First Class	Second Class	Pass Class	Fail

- In case a student takes more than one attempt in clearing a course, the final marks secured shall be indicated by * mark in the marks memo.
- All the candidates who register for the semester end examination will be issued grade sheet by the Institute. Apart from the semester wise marks memos, the institute will issue the provisional certificate subject to the fulfillment of all the academic requirements.

19.0 IMPROVEMENT OF GRADE:

A candidate, after becoming eligible for the award of the degree, may reappear for the final examination in any of the theory courses as and when conducted for the purpose of improving the aggregate and the grade. But this reappearance shall be within a period of two academic years after becoming eligible for the award of the degree.

However, this facility shall not be availed of by a candidate who has taken the Original Degree Certificate. Candidates shall not be permitted to reappear either for CIE in any course or for Semester End Examination (SEE) in laboratory courses (including Project Viva-voce) for the purpose of improvement.

20.0 TERMINATION FROM THE PROGRAM

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

- The student fails to satisfy the requirements of the program within the maximum period stipulated for that program.
- The student fails to satisfy the norms of discipline specified by the institute from time to time.

21.0 WITH-HOLDING OF RESULTS

If the candidate has not paid any dues to the college / if any case of indiscipline / malpractice is pending against him/her, the results of the candidate will be withheld. The issue of the degree is liable to be withheld in such cases.

22.0 GRADUATION DAY

The institute shall have its own annual Graduation Day for the award of Degrees to students completing the prescribed academic requirements in each case, in consultation with the University and by following the provisions in the Statute.

The college shall institute prizes and medals to meritorious students annually on Graduation Day. This will greatly encourage the students to strive for excellence in their academic work.

23.0 DISCIPLINE

Every student is required to observe discipline and decorum both inside and outside the institute and not to indulge in any activity which will tend to bring down the honor of the institute. If a student indulges in malpractice in any of the theory / practical examination, continuous assessment examinations he/she shall be liable for punitive action as prescribed by the Institute from time to time.

24.0 GRIEVANCE REDRESSAL COMMITTEE

The institute shall form a Grievance Redressal Committee for each course in each department with the Course Teacher and the HOD as the members. This Committee shall solve all grievances related to the course under consideration.

25.0 TRANSITORY REGULATIONS

25.1 A student who has been detained in any semester of previous regulations for not satisfying the attendance requirements shall be permitted to join in the corresponding semester of this regulation.

25.2 Semester End Examination in each course under the regulations that precede immediately these regulations shall be conducted three times after the conduct of last regular examination under those regulations. Thereafter, the failed students, if any, shall take examination in the equivalent papers of these regulations as suggested by the Chairman, BOS concerned.

26.0 REVISION OF REGULATIONS AND CURRICULUM

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

**FAILURE TO READ AND UNDERSTAND
THE REGULATIONS IS NOT AN EXCUSE**



INSTITUTE OF AERONAUTICAL ENGINEERING (AUTONOMOUS)

COMPUTER SCIENCE AND ENGINEERING

COURSE STRUCTURE

I SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
BCSB01	Mathematical Foundations of Computer Science	PCC	Core	3	0	0	3	30	70	100
BCSB02	Advanced Data Structures	PCC	Core	3	0	0	3	30	70	100
	Professional Core Elective-I	PEC	Elective	3	0	0	3	30	70	100
	Professional Core Elective-II	PEC	Elective	3	0	0	3	30	70	100
	Audit Course – I	Audit - I	Audit	2	0	0	0	30	70	100
PRACTICAL										
BCSB09	Advanced Data Structures Laboratory	PCC	Core	0	0	4	2	30	70	100
BCSB10	Data Science Laboratory	PCC	Core	0	0	4	2	30	70	100
TOTAL				14	00	08	16	210	490	700

II SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
BCSB11	Cyber Security	PCC	Core	3	0	0	3	30	70	100
BCSB12	Soft Computing	PCC	Core	3	0	0	3	30	70	100
	Professional Core Elective-III	PEC	Elective	3	0	0	3	30	70	100
	Professional Core Elective-IV	PEC	Elective	3	0	0	3	30	70	100
	Audit Course - II	Audit - II	Audit	2	0	0	0	30	70	100
PRACTICAL										
BCSB19	Soft Computing Laboratory	PCC	Core	0	0	4	2	30	70	100
BCSB20	Data Preparation and Analysis Laboratory	PCC	Core	0	0	4	2	30	70	100
BCSB21	Mini Project with Seminar	PCC	Core	2	0	0	2	30	70	100
TOTAL				16	00	08	18	240	560	800

III SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
THEORY										
BCSB31	Research Methodology and IPR	PCC	Core	2	0	0	2	30	70	100
	Professional Core Elective – V	PEC	Elective	3	0	0	3	30	70	100
	Open Elective	OE	Elective	3	0	0	3	30	70	100
PRACTICAL										
BCSB40	Phase-I Dissertation	Major Project	Core	0	0	20	10	30	70	100
TOTAL				08	00	20	18	120	280	400

IV SEMESTER

Course Code	Course Name	Subject Area	Category	Periods per week			Credits	Scheme of Examination Max. Marks		
				L	T	P		CIA	SEE	Total
BCSB41	Phase-II Dissertation	Major Project	Core	0	0	32	16	30	70	100
TOTAL				00	00	32	16	30	70	100

PROFESSIONAL CORE ELECTIVE COURSES

PROFESSIONAL CORE ELECTIVE – I

Course Code	Course Title
BCSB03	Machine Learning
BCSB04	Wireless Sensor Networks
BCSB05	Introduction to Intelligent Systems

PROFESSIONAL CORE ELECTIVE – II

Course Code	Course Title
BCSB06	Data Science
BCSB07	Distributed Systems
BCSB08	Advanced Wireless and Mobile Networks

PROFESSIONAL CORE ELECTIVE – III

Course Code	Course Title
BCSB13	Data Preparation and Analysis
BCSB14	Secure Software Design & Enterprise Computing
BCSB15	Computer Vision

PROFESSIONAL CORE ELECTIVE – IV

Course Code	Course Title
BCSB16	Human and Computer Interaction
BCSB17	GPU Computing
BCSB18	Digital Forensics

PROFESSIONAL CORE ELECTIVE – V

Course Code	Course Title
BCSB22	Mobile Applications and Services
BCSB23	Compiler for HPC
BCSB24	Optimization Techniques

OPEN ELECTIVE COURSES

Course Code	Course Title
BCSB25	Business Analytics
BCSB26	Industrial Safety
BCSB27	Operations Research
BCSB28	Cost Management of Engineering Projects
BCSB29	Composite Materials
BCSB30	Waste to Energy

AUDIT COURSES

Course Code	Course Title
BCSB32	English for Research Paper Writing
BCSB33	Disaster Management
BCSB34	Sanskrit for Technical Knowledge
BCSB35	Value Education
BCSB36	Constitution of India
BCSB37	Pedagogy Studies
BCSB38	Stress Management by Yoga
BCSB39	Personality Development through Life Enlightenment Skills

SYLLABUS

(I – IV SEM)

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

I Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB01	Core	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45		Total Tutorials: Nil		Total Practical Classes: Nil			Total Classes: 45	
OBJECTIVES:								
The course should enable the students to:								
I. Understand the mathematical fundamentals that is prerequisites for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.								
II. Understand and apply the mathematical logics to many modern techniques in information technology like machine learning, programming language design, and concurrency.								
III. Studying of various sampling and classification problems.								
UNIT-I	INTRODUCTION							Classes: 10
Probability mass, density, and cumulative distribution functions, Parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains								
UNIT-II	RANDOM SAMPLES							Classes: 10
Random samples, sampling distributions of estimators, Methods of Moments and Maximum Likelihood								
UNIT-III	STATISTICAL INTERFACE							Classes: 08
Statistical inference, Introduction to multivariate statistical models: regression and classification problems, principal components analysis, The problem of over fitting model assessment.								
UNIT-IV	GRAPH THEORY							Classes: 09
Graph Theory: Isomorphism, Planar graphs, graph coloring, Hamilton circuits and Euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems.								
UNIT-V	COMPUTER SCIENCE AND ENGINEERING APPLICATIONS							Classes: 08
Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, Machine learning.								
Text Books:								
1. John Vince, "Foundation Mathematics for Computer Science", Springer.								
2. K. Trivedi. "Probability and Statistics with Reliability, Queuing, and Computer Science Applications". Wiley.								
3. M. Mitzenmacher and E. Upfal." Probability and Computing: Randomized Algorithms and Probabilistic Analysis". Wiley								
4. Alan Tucker, "Applied Combinatorics", Wiley								

Web References:

1. <http://www.tutorialspoint.com/r/>
2. https://en.wikipedia.org/wiki/R_programming_language.
3. <http://www.r-bloggers.com/how-to-learn-r-2/#h.obx6jyuc9j7t>.

E-Text Books:

1. <https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf>
2. <https://www.cs.bris.ac.uk/~flach/mlbook/>.
3. <http://mylovelibrabry.com/emylibraryus/free.php?asin=1466583282>.

ADVANCE DATA STRUCTURES

I Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB02	Core	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to :								
I. Understand the data structures and techniques of algorithm analysis.								
II. Solve problems using different data structures and compare their performance and tradeoffs.								
III. Illustrate the implementation of linked data structures such as linked lists and binary trees.								
IV. Understand graph algorithms such as shortest path and minimum spanning tree.								
V. Learn advanced data structures such as balanced search trees, hash tables, priority queues								
UNIT-I	OVERVIEW OF DATA STRUCTURES						Classes: 09	
Algorithm analysis: Algorithms; Performance analysis: Time complexity and space complexity, asymptotic notation: Big Oh, omega and theta notations, complexity analysis examples; Data structures: Linear and non linear data structures, ADT concept, linear list ADT, stack and queue ADTs, array and linked list representations; Circular queue: Insertion and deletion, de queue ADT, priority queue ADT, implementation using heaps, insertion into a max heap, deletion from a max heap, singly linked lists, doubly linked lists, circular linked list.								
UNIT-II	DICTIONARIES, HASH TABLES						Classes: 09	
Dictionaries: Linear list representation, operations insertion, deletion and searching, hash table representation, hash functions, collision resolution, separate chaining, open addressing, linear probing, quadratic probing, double hashing, rehashing, extendible hashing.								
UNIT-III	TREES AND GRAPHS						Classes: 09	
Trees: Ordinary and binary trees terminology, properties of binary trees, binary tree ADT, representations, recursive and non recursive traversals, threaded binary trees.								
Graphs: Graphs terminology, graph ADT, representations, graph traversals; Search methods: DFS and BFS; Applications of Graphs: Minimum cost spanning tree using Kruskal's algorithm, Dijkstra's algorithm for single source shortest path problem.								
UNIT-IV	SEARCH TREES I						Classes: 09	
Binary search tree: Binary search tree ADT, insertion, deletion and searching operations, finding the parent of a given node, attaining a reference to a node, finding the smallest and largest values in the binary search tree; Balanced search trees: AVL trees, definition, height of an AVL tree; Operations : Insertion, deletion and searching.								

UNIT-V	SEARCH TREES II	Classes: 09
<p>Red-Black and Splay Trees; B trees: Definition, operations and applications; R trees: Nearest neighbor query, join and range queries; Comparison of search trees; Text compression: Huffman coding and decoding; Pattern matching: KMP algorithm.</p>		
Text Books:		
<ol style="list-style-type: none"> 1. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press Private Limited, India, 2nd Edition, 2008. 2. G.A. V.Pai, "Data Structures and Algorithms", Tata McGraw Hill, New Delhi, 1st Edition, 2008. 3. M. A. Weiss, Addison Wesley, "Data Structures and Algorithm Analysis in Java", Pearson Education, 2nd Edition, 2005. 		
Reference Books:		
<ol style="list-style-type: none"> 1. D. Samanta, "Classic Data Structures", Prentice Hall of India Private Limited, 2nd Edition, 2003. 2. Aho, Hop craft, Ullman, "Design and Analysis of Computer Algorithms", Pearson Education India, 1st Edition, 1998. 3. Goodman, Hedetniemi, "Introduction to the Design and Analysis of Algorithms", Tata McGraw Hill, New Delhi, India, 1st Edition, 2002. 4. Adam Drozdek, "Data Structures and Algorithms in C++", Thomson Course Technology, 3rd Edition, 2005. 5. M. T. Goodrich, R. Tomassia, "Data structures and Algorithms in Java", Wiley India, 3rd Edition, 2011. 		
Web References:		
<ol style="list-style-type: none"> 1. http://www.tutorialspoint.com/data_structures_algorithms/data_structures_basics.htm 2. http://www.geeksforgeeks.org/b-tree-set-1-introduction-2/ 3. http://www.nptelvideos.in/2012/11/data-structures-and-algorithms.html 		
E-Text Books:		
https://comsciens.files.wordpress.com/2015/12/horowitz-of-computer-algorithms-2nd-edition.pdf		

MACHINE LEARNING

I Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB03	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45		Total Tutorials: Nil		Total Practical Classes: Nil		Total Classes: 45		
OBJECTIVES:								
The course should enable the students to:								
<ul style="list-style-type: none"> I. Learn the concept of how to learn patterns and concepts from data without being explicitly programmed in various IOT nodes. II. Design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances. III. Explore supervised and unsupervised learning paradigms of machine learning. IV. Explore Deep learning technique and various feature extraction strategies. 								
UNIT-I	SUPERVISED LEARNING (REGRESSION/CLASSIFICATION)						Classes: 10	
Basic methods: Distance-based methods, Nearest- Neighbors, Decision Trees, Naive Bayes, Linear models: Linear Regression, Logistic Regression, Generalized Linear Models, Support Vector Machines, Nonlinearity and Kernel Methods, Beyond Binary Classification: Multi-class/Structured Outputs, Ranking.								
UNIT-II	UNSUPERVISED LEARNING						Classes: 10	
Clustering: K-means/Kernel K-means, Dimensionality Reduction: PCA and kernel PCA, Matrix Factorization and Matrix Completion, Generative Models (mixture models and latent factor models).								
UNIT-III	MACHINE LEARNING						Classes: 08	
Evaluating Machine Learning algorithms and Model Selection, Introduction to Statistical Learning Theory, Ensemble Methods (Boosting, Bagging, Random Forests).								
UNIT-IV	MODELLING TECHNIQUES						Classes: 09	
Sparse Modelling and Estimation, Modelling Sequence/Time-Series Data, Deep Learning and Feature Representation Learning.								
UNIT-V	SCALABLE MACHINE LEARNING						Classes: 08	
A selection from some other advanced topics, e.g., Semi-supervised Learning, Active Learning, Reinforcement Learning, Inference in Graphical Models, Introduction to Bayesian Learning and Inference.								
Text Books:								
<ol style="list-style-type: none"> 1. Kevin Murphy, Machine Learning: “A Probabilistic Perspective”, MIT Press, 2012 2. Trevor Hastie, Robert Tibshirani, Jerome Friedman, “The Elements of Statistical Learning”, Springer 2009 (freely available to online) 3. Christopher Bishop, “Pattern Recognition and Machine Learning”, Springer, 2007. 								

Web References:

1. <http://www.tutorialspoint.com/r/>
2. https://en.wikipedia.org/wiki/R_programming_language.
3. <http://www.r-bloggers.com/how-to-learn-r-2/#h.obx6jyuc9j7t>.

E-Text Books:

1. <https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf>
2. <https://www.cs.bris.ac.uk/~flach/mlbook/>.
3. <http://mylovelibrabry.com/emylibraryus/free.php?asin=1466583282>.

WIRELESS SENSOR NETWORKS

I Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB04	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45		Total Tutorials: Nil		Total Practical Classes: Nil			Total Classes: 45	
<p>OBJECTIVES: The course should enable the students to:</p> <ol style="list-style-type: none"> Architect sensor networks for various application setups. Devise appropriate data dissemination protocols and model links cost. Understandings of the fundamental concepts of wireless sensor networks and have a basic knowledge of the various protocols at various layers. Evaluate the performance of sensor networks and identify bottlenecks. 								
UNIT-I	INTRODUCTION TO WIRELESS SENSOR NETWORKING						Classes: 09	
<p>Course Information, Introduction to Wireless Sensor Networks: Motivations, Applications, Performance metrics, History and Design factors. Network Architecture: Traditional layered stack, Cross-layer designs, Sensor Network Architecture. Hardware Platforms: Motes, Hardware parameters.</p>								
UNIT-II	INTRODUCTION TO NS-3						Classes: 09	
<p>Introduction to Network Simulator 3 (ns-3), Description of the ns-3 core module and simulation.</p>								
UNIT-III	MEDIUM ACCESS CONTROL PROTOCOL DESIGN						Classes: 09	
<p>Fixed Access, Random Access, WSN protocols: synchronized, duty-cycled Introduction to Markov Chain: Discrete time Markov Chain definition, properties, classification and analysis MAC Protocol Analysis: Asynchronous duty-cycled. X-MAC Analysis (Markov Chain)</p>								
UNIT-IV	SECURITY						Classes: 09	
<p>Possible attacks, countermeasures, SPINS, Static and dynamic key distribution.</p>								
UNIT-V	ROUTING PROTOCOLS						Classes: 09	
<p>Routing protocols: Introduction, MANET protocols Routing protocols for WSN: Resource-aware routing, Data-centric, Geographic Routing, Broadcast, Multicast Opportunistic Routing Analysis: Analysis of opportunistic routing (Markov Chain) Advanced topics in wireless sensor networks.</p>								

Text Books:

1. W. Dargie and C. Poellabauer, “Fundamentals of Wireless Sensor Networks –Theory and Practice”, Wiley 2010.
2. Kazem Sohraby, Daniel Minoli and TaiebZnati, “wireless sensor networks -Technology, Protocols, and Applications”, Wiley Interscience, 2007.
3. Takahiro Hara, Vladimir I. Zadorozhny, and Erik Buchmann, “Wireless Sensor Network Technologies for the Information Explosion Era”, springer, 2010.

Reference Books:

1. Kamilo Feher, “Wireless Digital Communications”, PHI, 1st Edition, 1999.
2. Kaveh PahLaven, P. Krishna Murthy, “Principles of Wireless Networks”, Prentice Hall PTR, 1st Edition, 2002
3. AndrewsF. Molisch, “Wireless Communications”, Wiley India, 2nd Edition, 2006.

Web References:

1. [http://www.yiritech.com/en/products/71.html? .](http://www.yiritech.com/en/products/71.html?)
2. [https://www.pearsonhighered.com/product/Stallings-Wireless-Communications-Networks-2ndEdition.](https://www.pearsonhighered.com/product/Stallings-Wireless-Communications-Networks-2ndEdition)
3. <http://nptel.ac.in/video.php?subjectId=117102062>

E-Text Books:

1. [http://www.cwins.wpi.edu/publications/pown/.](http://www.cwins.wpi.edu/publications/pown/)
2. http://keshi.ubiwna.org/2015IotComm/Wireless_Communications_&_Networking_Stallings_2nd.pdf

INTRODUCTION TO INTELLIGENT SYSTEMS

I Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB05	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45		Total Tutorials: Nil			Total Practical Classes: Nil		Total Classes: 45	
<p>OBJECTIVES:</p> <p>The course should enable the students to:</p> <p>I. The aim of the course is to introduce to the field of Artificial Intelligence (AI) with emphasis on its use to solve real world problems for which solutions are difficult to express using the traditional algorithmic approach.</p> <p>II. It explores the essential theory behind methodologies for developing systems that demonstrate intelligent behavior including dealing with uncertainty, learning from experience and following problem solving strategies found in nature.</p>								
UNIT-I	INTRODUCTION							Classes: 09
Biological foundations to intelligent systems I: Artificial neural networks, Back propagation networks, Radial basis function networks, and recurrent networks.								
UNIT-II	FUZZY LOGIC							Classes: 09
Biological foundations to intelligent systems II: Fuzzy logic, knowledge Representation and inference mechanism, genetic algorithm, and fuzzy neural networks.								
UNIT-III	SEARCH METHODS							Classes: 09
Search Methods Basic concepts of graph and tree search. Three simple search methods: breadth first search, depth-first search, iterative deepening search. <p>Heuristic search methods: best-first search, admissible evaluation functions, hill climbing search. Optimisation and search such as stochastic annealing and genetic algorithm.</p>								
UNIT-IV	KNOWLEDGE REPRESENTATION							Classes: 09
Knowledge representation and logical inference Issues in knowledge representation. Structured representation, such as frames, and scripts, semantic networks and conceptual graphs. Formal logic and logical inference. Knowledge-based systems structures, its basic components. Ideas of Blackboard architectures.								
UNIT-V	REASONING AND LEARNING TECHNIQUES							Classes: 09
Reasoning under uncertainty and Learning Techniques on uncertainty reasoning such as Bayesian reasoning, Certainty factors and Dempster-Shafer Theory of Evidential reasoning, A study of different learning and evolutionary algorithms, such as statistical learning and induction learning.								

Text Books:

1. Luger G.F. and Stubblefield W.A. (2008). Artificial Intelligence: Structures and strategies for Complex Problem Solving. Addison Wesley, 6th Edition 2010.
2. Russell S. and Norvig P. (2009). Artificial Intelligence: A Modern Approach. Prentice-Hall, 3rd Edition 2010.

Web References:

1. [http://www.yiritech.com/en/products/71.html? .](http://www.yiritech.com/en/products/71.html?)
2. [https://www.pearsonhighered.com/product/Stallings-Wireless-Communications-Networks-2ndEdition.](https://www.pearsonhighered.com/product/Stallings-Wireless-Communications-Networks-2ndEdition)
3. <http://nptel.ac.in/video.php?subjectId=117102062>

E-Text Books:

1. [http://www.cwins.wpi.edu/publications/pown/.](http://www.cwins.wpi.edu/publications/pown/)
2. http://keshi.ubiwna.org/2015IotComm/Wireless_Communications_&_Networking_Stallings_2nd.pdf

DATA SCIENCE

I Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB06	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45		Total Tutorials: Nil		Total Practical Classes: Nil			Total Classes: 45	
OBJECTIVES:								
The course should enable the students to:								
I. Summarize the fundamental knowledge on basics of data science and R programming.								
II. Develop programs in R language for understanding and visualization of data using statistical functions and plots.								
III. Learn to apply hypotheses and data into actionable predictions.								
IV. Understand a range of machine learning algorithms along with their strengths and weaknesses.								
V. Able to document and transfer the results and effectively communicate the findings using visualization techniques.								
UNIT-I	INTRODUCTION							Classes: 10
Data science process, roles, stages in data science project, working with data from files, working with relational databases, exploring data, managing data, cleaning and sampling for modeling; Introduction to R: Introduction to various data types, numeric, character, date, data frame, array, matrix etc., reading and writing datasets, working with different file types .txt, .csv, outliers, R functions and loops; Summary statistics: Summary, str, aggregate, subset, head, tail; Probability distribution.								
UNIT-II	SQL, NOSQL AND DATA ANALYSIS							Classes: 10
SQL using R, excel and R, introduction to No SQL, connecting R to No SQL databases, R with XML, JSON; Correlation analysis; Covariance analysis, ANOVA, forecasting, heteroscedasticity, autocorrelation; Regression analysis: Regression modeling, multiple regression.								
UNIT-III	DATA MODELS							Classes: 08
Choosing and evaluating models, mapping problems to machine learning, evaluating clustering models, validating models.								
Cluster analysis: K-means algorithm, Naive Bayes memorization methods, unsupervised methods.								
UNIT-IV	ARTIFICIAL NEURAL NETWORKS							Classes: 09
Artificial neural networks: Introduction, neural network representation, appropriate problems for neural network learning, perceptions, multilayer networks and the back propagation algorithm, remarks on the back propagation algorithm; Evaluation hypotheses: Motivation, estimation hypothesis accuracy, basics of sampling theory, a general approach for deriving confidence intervals, difference in error of two hypotheses, comparing learning algorithms.								

UNIT-V	DELIVERING RESULTS	Classes: 08
Documentation and deployment, producing effective presentations, introduction to graphical analysis, plot() function, displaying multivariate data, matrix plots, multiple plots in one window, exporting graph, using graphics parameters, case studies.		
Text Books:		
<ol style="list-style-type: none"> 1. Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications, 1st Edition, 2014. 2. William N. Venables, David M. Smith, “An Introduction to R”, Network Theory Limited, 2nd Edition, 2009. 3. Stephen Marsland, “Machine Learning: An Algorithmic Perspective”, Taylor & Francis CRC Press, 2nd Edition, 2011. 		
Reference Books:		
<ol style="list-style-type: none"> 1. G. Jay Kerns, “Introduction to Probability and Statistics Using R”, Youngstown State University, USA, 1st Edition, 2011. 2. William W Hsieh, “Machine Learning Methods in the Environmental Sciences”, Neural Networks, Cambridge University Press, 1st Edition, 2009. 3. Chris Bishop, “Neural Networks for Pattern Recognition”, Oxford University Press, 1st Edition, 1995. 4. Peter Flach, “Machine Learning”, Cambridge University Press, 1st Edition, 2012. 		
Web References:		
<ol style="list-style-type: none"> 1. http://www.tutorialspoint.com/r/ 2. https://en.wikipedia.org/wiki/R_programming_language. 3. http://www.r-bloggers.com/how-to-learn-r-2/#h.obx6jyuc9j7t. 		
E-Text Books:		
<ol style="list-style-type: none"> 1. https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf 2. https://www.cs.bris.ac.uk/~flach/mlbook/. 3. http://mylovelibrabry.com/emylibraryus/free.php?asin=1466583282. 		

DISTRIBUTED SYSTEMS

I Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB07	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. Introduce the fundamental concepts and issues of managing large volume of shared data in a parallel and distributed environment								
II. Provide insight into related research problems.								
UNIT-I	INTRODUCTION							Classes: 10
Distributed data processing; What is a DDBS; Advantages and disadvantages of DDBS; Problem areas; Overview of database and computer network concepts.								
DISTRIBUTED DATABASE MANAGEMENT SYSTEM ARCHITECTURE								
Transparencies in a distributed DBMS; Distributed DBMS architecture; Global directory issues.								
UNIT-II	DISTRIBUTED DATABASE DESIGN							Classes: 10
Alternative design strategies; Distributed design issues; Fragmentation; Data allocation.								
SEMANTICS DATA CONTROL								
View management; Data security; Semantic Integrity Control.								
QUERY PROCESSING ISSUES								
Objectives of query processing; Characterization of query processors; Layers of query processing; Query decomposition; Localization of distributed data.								
UNIT-III	DISTRIBUTED QUERY OPTIMIZATION							Classes: 08
Factors governing query optimization; Centralized query optimization; Ordering of fragment queries; Distributed query optimization algorithms.								
TRANSACTION MANAGEMENT								
The transaction concept; Goals of transaction management; Characteristics of transactions; Taxonomy of transaction models.								
CONCURRENCY CONTROL								
Concurrency control in centralized database systems; Concurrency control in DDBSs; Distributed concurrency control algorithms; Deadlock management.								
UNIT-IV	RELIABILITY							Classes: 09
Reliability issues in DDBSs; Types of failures; Reliability techniques; Commit protocols; Recovery protocols.								
UNIT-V	PARALLEL DATABASE SYSTEMS							Classes: 08
Parallel architectures; parallel query processing and optimization; load balancing								

Text Books:

1. M.T. Ozsu and P. Valduriez , “Principles of Distributed Database Systems”, Prentice-Hall, 1991.
2. D. Bell and J. Grimson ,”Distributed Database Systems”, Addison-Wesley, 1992.

Web References:

1. <http://www.tutorialspoint.com/r/>
2. https://en.wikipedia.org/wiki/R_programming_language.
3. <http://www.r-bloggers.com/how-to-learn-r-2/#h.obx6jyuc9j7t>.

E-Text Books:

1. <https://cran.r-project.org/doc/manuals/r-release/R-intro.pdf>
2. <https://www.cs.bris.ac.uk/~flach/mlbook/>.
3. <http://mylovelibrary.com/emylibraryus/free.php?asin=1466583282>.

ADVANCE WIRELESS AND MOBILE NETWORKS

I Semester :CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB08	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45		Total Tutorials: Nil		Total Practical Classes: Nil		Total Classes: 45		
OBJECTIVES:								
The course should enable the students to:								
I. Understand the examples of wireless communication systems, paging systems, cordless telephone systems.								
II. Study the different generations of mobile networks, WAN and PAN.								
III. Illustrate the concepts of basic cellular system, frequency reuse, channel assignment strategies, hand off strategies.								
IV. Understand the mobile communication protocols.								
V. Evaluate the WAN industry, wireless home networking IEEE 802.11 the physical layer.								
UNIT-I	INTRODUCTION TO WIRELESS NETWORKING						Classes: 09	
Introduction to wireless networking: Introduction to wireless networks, difference between wireless and fixed telephone networks, development of wireless networks, traffic routing in wireless networks, examples of wireless communication systems, paging systems, cordless telephone systems, compression of various wireless systems.								
UNIT-II	MOBILE WIRELESS COMMUNICATION SYSTEMS						Classes: 09	
Mobile wireless communication systems: Evaluation of mobile radio communications second generation cellular networks, third generation wireless networks, wireless in local loop, wireless local area networks; Multiple access techniques for wireless communication: Introduction to multiple accesses, FDMA, TDMA, spread spectrum, multiple accesses, SDMA, packet radio, packet radio protocols, CSMA protocols, reservation protocols.								
UNIT-III	WIRELESS DATA SERVICES						Classes: 09	
Wireless data services: CDPD, ARDIS, RMD, common channel signaling, ISDN, BISDN and ATM, SS7, SS7 user part, signaling traffic in SS7.								
Mobile IP and wireless access protocol: Mobile IP operation of mobile IP, collocated address, registration, tunneling, WAP architecture, overview, WML scripts, WAP service, WAP session protocol, wireless transaction, wireless datagram protocol.								
UNIT-IV	WIRELESS LAN						Classes: 09	
Wireless LAN technology: Infrared LANS, spread spectrum LANS, narrow bank microwave LANS, blue tooth overview, radio specification, base band specification, links manager specification, and logical link control and adaptation protocol, introduction to WLL technology; Wireless land: Historical overviews of the land industry, evolution of the wan industry, wireless home networking IEEE 802.11 the physical layer, MAC layer wireless ATM, hyperlink, hyperlan-2.								

UNIT-V	INFORMATION EXTRACTION AND MACHINE TRANSLATION	Classes: 09
<p>Wireless WAN: Mechanism to support at mobile environment, communication in the infrastructure , IS95 CDMA forward channel, IS95 CDMA risers channel, packet and frame formats in IS95, IMT-20000, forward channel in W-CDMA and CDMA 2000, reverse channels in W-CDMA and CDMA - 2000 GPRS and higher data rates, short messaging service in GPRS mobile application protocols.</p>		
<p>Text Books:</p>		
<ol style="list-style-type: none"> 1. Theodore, S. Rappaport, “Wireless Communications, Principles, Practice”, PHI, 2nd Edition, 2002. 2. William Stallings, “Wireless Communication and Networking”, PHI, 2nd Edition, 2003. 		
<p>Reference Books:</p>		
<ol style="list-style-type: none"> 1. Kamilo Feher, “Wireless Digital Communications”, PHI, 1st Edition, 1999. 2. Kaveh PahLaven, P. Krishna Murthy, “Principles of Wireless Networks”, Prentice Hall PTR, 1st Edition, 2002 3. Andreaws F. Molisch, “Wireless Communications”, Wiley India, 2nd Edition, 2006. 		
<p>Web References:</p>		
<ol style="list-style-type: none"> 1. http://www.yiritech.com/en/products/71.html? . 2. https://www.pearsonhighered.com/product/Stallings-Wireless-Communications-Networks-2ndEdition. 3. http://nptel.ac.in/video.php?subjectId=117102062 		
<p>E-Text Books:</p>		
<ol style="list-style-type: none"> 1. http://www.cwins.wpi.edu/publications/pown/. 2. http://keshi.ubiwna.org/2015IotComm/Wireless_&_Networking_Stallings_2nd.pdf 		

ADVANCED DATA STRUCTURES LABORATORY

I Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB09	Core	L	T	P	C	CIA	SEE	Total
		0	0	4	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36			Total Classes:36			
OBJECTIVES:								
<p>The course should enable the students to:</p> <ol style="list-style-type: none"> Implement linear and non linear data structures. Analyze various algorithms based on their time complexity. Choose appropriate data structure and algorithm design method for a specific application. Identify suitable data structure to solve various computing problems. 								
LIST OF EXPERIMENTS								
Week-1	DIVIDE AND CONQUER - 1							
<ol style="list-style-type: none"> Implement Quick Sort on 1D array of Student structure (contains student name, student_roll_no, total_marks), with key as student_roll_no and count the number of swap performed. Implement Merge Sort on 1D array of Student structure (contains student_name, student_roll_no, total_marks), with key as student_roll_no and count the number of swap performed. 								
Week-2	DIVIDE AND CONQUER - 2							
<ol style="list-style-type: none"> Design and analyze a divide and conquer algorithm for following maximum sub-array sum problem: given an array of integer's find a sub-array [a contagious portion of the array] which gives the maximum sum. Design a binary search on 1D array of Employee structure (contains employee_name, emp_no, emp_salary), with key as emp_no and count the number of comparison happened. 								
Week-3	IMPLEMENTATION OF STACK AND QUEUE							
<ol style="list-style-type: none"> Implement 3-stacks of size 'm' in an array of size 'n' with all the basic operations such as Is Empty(i), Push(i), Pop(i), IsFull(i) where 'i' denotes the stack number (1,2,3), Stacks are not overlapping each other. Design and implement Queue and its operations using Arrays 								
Week-4	HASHING TECHNIQUES							
<p>Write a program to store k keys into an array of size n at the location computed using a hash function, $loc = key \% n$, where $k \leq n$ and k takes values from [1 to m], $m > n$. To handle the collisions use the following collision resolution techniques</p> <ol style="list-style-type: none"> Linear probing Quadratic probing Random probing Double hashing/rehashing 								

Week-5	APPLICATIONS OF STACK
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Write C programs for the following:

- Uses Stack operations to convert infix expression into post fix expression.
- Uses Stack operations for evaluating the post fix expression.

Week-6	BINARY SEARCH TREE
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Write a program for Binary Search Tree to implement following operations:

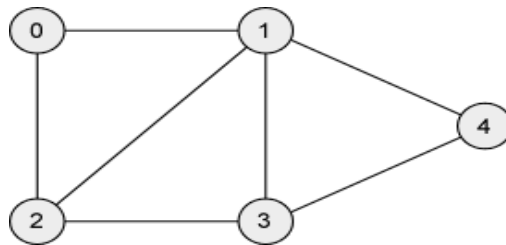
- Insertion
- Deletion
 - Delete node with only child
 - Delete node with both children
- Finding an element
- Finding Min element
- Finding Max element
- Left child of the given node
- Right child of the given node
- Finding the number of nodes, leaves nodes, full nodes, ancestors, descendants.

Week-7	DISJOINT SET OPERATIONS
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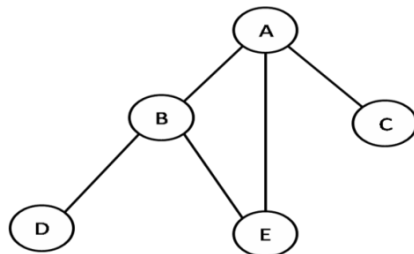
- Write a program to implement Make_Set, Find_Set and Union functions for Disjoint Set Data Structure for a given undirected graph $G(V,E)$ using the linked list representation with simple implementation of Union operation.
- Write a program to implement Make_Set, Find_Set and Union functions for Disjoint Set Data Structure for a given undirected graph $G(V,E)$ using the linked list representation with weighted-union heuristic approach.

Week-8	GRAPH TRAVERSAL TECHNIQUES
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a. Print all the nodes reachable from a given starting node in a digraph using BFS method.



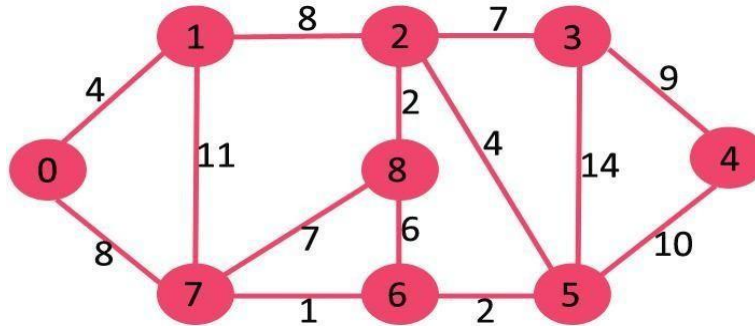
b. Check whether a given graph is connected or not using DFS method.



Week-9

SHORTEST PATHS ALGORITHM

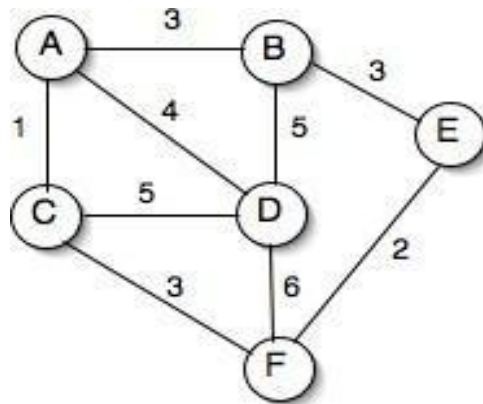
From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.



Week-10

MINIMUM COST SPANNING TREE

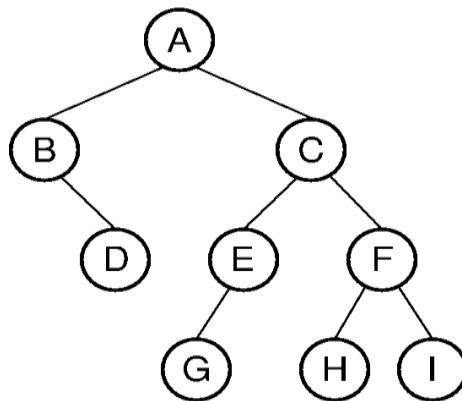
Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.



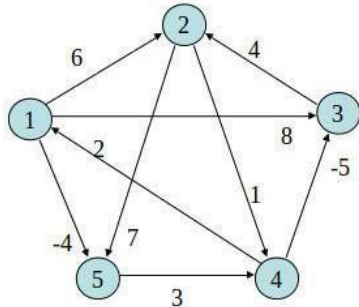
Week-11

TREE TRAVERSALS

Perform various tree traversal algorithms for a given tree.



Implement All-Pairs Shortest Paths Problem using Floyd's algorithm.



	1	2	3	4	5
1	0	6	8	∞	-4
2	∞	0	∞	1	7
3	∞	4	0	∞	∞
4	2	∞	-5	0	∞
5	∞	∞	∞	3	0

Reference Books:

1. Kernighan Brian W, Dennis M. Ritchie, "The C Programming Language", Prentice Hall of India, Re-Print, 2008.
2. Balagurusamy E, "Programming in ANSIC", Tata McGraw Hill, 6th Edition, 2008.
3. Gottfried Byron, "Schaum's Outline of Programming with C", Tata McGraw Hill, 1st Edition, 2010.
4. Lipschutz Seymour, "Data Structures Schaum's Outlines Series", Tata McGraw Hill, 3rd Edition, 2014.
5. Horowitz Ellis, Satraj Sahni, Susan Anderson, Freed, "Fundamentals of Data Structures in C", W. H. Freeman Company, 2nd Edition, 2011.

Web References:

1. http://www.tutorialspoint.com/data_structures_algorithms
2. <http://www.geeksforgeeks.org/data-structures/>
3. <http://www.studytonight.com/data-structures/>
4. <http://www.coursera.org/specializations/data-structures-algorithms>

DATA SCIENCE LABORATORY

I Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB10	Core	L	T	P	C	CIA	SEE	Total
		0	0	4	2	30	70	100
Contact Classes: Nil	Total Tutorials: Nil	Total Practical Classes: 36			Total Classes: 36			
OBJECTIVES:								
The course should enable the students to:								
I. Illustrate R objects.								
II. Make use of different types of datasets for analysis in R.								
III. Define relations among variables using correlation and covariance analysis.								
IV. Analyze and differentiate the data models for predictions using R.								
LIST OF EXPERIMENTS								
Week-1	R AS CALCULATOR APPLICATION							
a. Using with and without R objects on console								
b. Using mathematical functions on console								
c. Write an R script, to create R objects for calculator application and save in a specified location in disk								
Week-2	DESCRIPTIVE STATISTICS IN R							
a. Write an R script to find basic descriptive statistics using summary, str, quartile function on mtcars& cars datasets.								
b. Write an R script to find subset of dataset by using subset (), aggregate () functions on iris dataset.								
Week-3	READING AND WRITING DIFFERENT TYPES OF DATASETS							
a. Reading different types of data sets (.txt, .csv) from web and disk and writing in file in specific disk location.								
b. Reading Excel data sheet in R.								
c. Reading XML dataset in R.								
Week-4	VISUALIZATIONS							
a. Find the data distributions using box and scatter plot.								
b. Find the outliers using plot.								
c. Plot the histogram, bar chart and pie chart on sample data.								

Week-5	CORRELATION AND COVARIANCE
<ul style="list-style-type: none"> a. Find the correlation matrix. b. Plot the correlation plot on dataset and visualize giving an overview of relationships among data on iris data. c. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data. 	
Week-6	REGRESSION MODEL
<p>Import a data from web storage. Name the dataset and now do Logistic Regression to find out relation between variables that are affecting the admission of a student in a institute based on his or her GRE score, GPA obtained and rank of the student. Also check the model is fit or not. require (foreign), require(MASS).</p>	
Week-7	MULTIPLE REGRESSION MODEL
<p>Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset.</p>	
Week-8	REGRESSION MODEL FOR PREDICTION
<p>Apply regression Model techniques to predict the data on above dataset.</p>	
Week-9	CLASSIFICATION MODEL
<ul style="list-style-type: none"> a. Install relevant package for classification. b. Choose classifier for classification problem. c. Evaluate the performance of classifier. 	
Week-10	CLUSTERING MODEL
<ul style="list-style-type: none"> a. Clustering algorithms for unsupervised classification. b. Plot the cluster data using R visualizations. 	
Reference Books:	
<p>Yanchang Zhao, "R and Data Mining: Examples and Case Studies", Elsevier, 1st Edition, 2012.</p>	
Web References:	
<ol style="list-style-type: none"> 1. http://www.r-bloggers.com/how-to-perform-a-logistic-regression-in-r/ 2. http://www.ats.ucla.edu/stat/r/dae/rreg.htm 3. http://www.coastal.edu/kingw/statistics/R-tutorials/logistic.html 4. http://www.ats.ucla.edu/stat/r/data/binary.csv 	
SOFTWARE AND HARDWARE REQUIREMENTS FOR 18 STUDENTS:	
SOFTWARE: R Software , R Studio Software	
HARDWARE: 18 numbers of Intel Desktop Computers with 4 GB RAM	

CYBER SECURITY

II Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB11	Core	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45		Total Tutorials: Nil		Total Practical Classes: Nil		Total Classes: 45		
OBJECTIVES:								
The course should enable the students to:								
I. Explain the core information assurance principles.								
II. Identify the key components of cyber security network architecture.								
III. Apply cyber security architecture principles.								
IV. Describe risk management processes and practices.								
UNIT-I	INTRODUCTION						Classes: 09	
A web security forensic lesson, web languages, introduction to different web attacks, overview of n-tier web applications; Web servers: Apache, IIS, database servers, introduction and overview of cybercrime, nature and scope of cybercrime, types of cybercrime: social engineering, categories of cybercrime, property cybercrime.								
UNIT-II	REVIEW OF COMPUTER SECURITY AND CYBER CRIME ISSUES						Classes: 09	
Public key cryptography, RSA, online shopping, payment gateways, unauthorized access to computers, computer intrusions, white collar crimes, viruses and malicious code, internet hacking and cracking, virus attacks, pornography, software piracy, intellectual property, mail bombs, exploitation, stalking and obscenity in internet, digital laws and legislation, law enforcement roles and responses.								
UNIT-III	WEB HACKING BASICS AND INVESTIGATION						Classes: 09	
Web hacking basics HTTP and HTTPS URL, web under the cover overview of java security reading the HTML source, applet security, servlets security, symmetric and asymmetric encryptions, network security basics, firewalls and IDS.								
Investigation: Introduction to cybercrime investigation, investigation tools, e-discovery, digital evidence collection, evidence preservation, e-mail investigation, e-mail tracking, IP tracking, e-mail recovery, hands on case studies; Encryption and Decryption methods, search and seizure of computers, recovering deleted evidences, password cracking.								
UNIT-IV	DIGITAL CERTIFICATES AND DIGITAL FORENSICS						Classes: 09	
Digital certificates, hashing, message digest, and digital signatures; Digital forensics: Introduction to digital forensics, forensic software and hardware, analysis and advanced tools, forensic technology and practices, forensic ballistics and photography, face, iris and fingerprint recognition, audio video analysis, windows system forensics, Linux system forensics, network forensics.								

UNIT-V	SECURING DATABASES, LAWS AND ACTS	Classes: 09
<p>Basics, secure JDBC, securing large applications, cyber graffiti; Laws and acts: Laws and ethics, digital evidence controls, evidence handling procedures, basics of Indian Evidence Act IPC and CrPC, electronic communication privacy act, legal policies.</p>		
<p>Text Books:</p>		
<ol style="list-style-type: none"> 1. Mc Clure, Stuart, Saumil Shah, Shreeraj Shah, “Web Hacking: Attacks and Defense”, Addison-Wesley Professional, Illustrated Edition, 2003. 2. Garms, Jess, Daniel Somerfield, “Professional Java Security”, Wrox Press, Illustrated Edition, 2001. 		
<p>Reference Books:</p>		
<ol style="list-style-type: none"> 1. Nelson Phillips, EnfingerSteuart, “Computer Forensics and Investigations”, Cengage Learning, New Delhi, 2009. 2. Kevin Mandia, Chris Prorise, Matt Pepe, “Incident Response and Computer Forensics “, Tata McGraw Hill, 2009 3. Robert M Slade, “Software Forensics”, Tata McGraw Hill, New Delhi, 1st Edition, 2005. 		
<p>Web References:</p>		
<ol style="list-style-type: none"> 1. http://www.mail.nih.gov/user/faq/tlssl.htm 2. http://www.openssl.org/ 3. http://www.ntsecurity.net/ 		
<p>E-Text Books:</p>		
<ol style="list-style-type: none"> 1. https://www.mitre.org/sites/.../pr-13-1028-mitre-10-strategies-cyber-ops-center.pdf 2. https://www.coursera.org/specializations/cyber-security 3. https://www.ccdcoe.org/publications/books/NationalCyberSecurityFrameworkManual.pdf 		

SOFT COMPUTING

II Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB12	Core	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. Familiarize with soft computing concepts.								
II. Understand supervised learning and unsupervised learning networks.								
III. Introduce the ideas of neural networks, fuzzy logic.								
UNIT-I	INTRODUCTION TO NEURAL NETWORKS						Classes: 09	
Introduction: Fundamental concept, evolution of neural networks, models of artificial neural networks, important technologies, applications, McCulloch, Pitts Neuron, linear separability, Hebb network; Supervised learning network: Perception networks, adaptive linear neuron, multiple adaptive linear neurons, back propagation network, radial basis function network.								
UNIT-II	ASSOCIATIVE MEMORY AND UNSUPERVISED LEARNING NETWORKS						Classes: 09	
Associative memory networks: Training algorithms for pattern association, auto associative memory network, hetero associative memory network, bidirectional associative memory, Hopfield networks, iterative auto associative memory network, temporal associative memory network; Unsupervised learning networks: Kohonenself-organizing feature maps, learning vector quantization, counter propagation networks, adaptive resonance theory network.								
UNIT-III	FUZZY LOGIC						Classes: 09	
Fuzzy logic: Introduction to classical/crisp sets and fuzzy sets, classical/crisp relations and fuzzy relations, tolerance and equivalence relations, non-iterative fuzzysets.								
Membership functions: Fuzzification, methods of membership value assignments, defuzzification, and Lambda cuts for fuzzy sets and fuzzy relations, defuzzification methods.								
UNIT-IV	FUZZY ARITHMETIC						Classes: 09	
Fuzzy arithmetic and fuzzy measures: Fuzzy rule base and approximate reasoning, truth values and tables in fuzzy logic, fuzzy propositions, formation of rules, decomposition and aggregation of rules, fuzzy reasoning, fuzzy inference systems, fuzzy decision making, fuzzy logic control systems, fuzzy expert systems.								
UNIT-V	GENETIC ALGORITHMS						Classes: 09	
Genetic algorithm and search space, general genetic algorithm, operators, generational cycle, stopping condition, constraints, classification, genetic programming, multilevel optimization; Applications: A fusion approach of multispectral images with SAR image for flood area analysis, optimization of travelling salesman problem using genetic algorithm approach, and genetic algorithm based internet search technique, soft computing based hybrid fuzzycontrollers.								

Text Books:

1. J. S. R. Jang, C. T. Sun, E. Mizutani, Neuro, “Fuzzy and Soft Computing”, PHI, Pearson Education, 1st Edition, 2004.
2. S. N. Sivanandan, S. N. Deepa, “Principles of Soft Computing”, Wiley India, 2nd Edition, 2007.

Reference Books:

1. S. Rajasekaran, G. A. V. Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 1st Edition, 2003.
2. Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, Mc Graw Hill, 3rd Edition, 1997.
3. Stamatios V. Kartalopoulos “Understanding Neural Networks and Fuzzy Logic Basic Concepts and Applications”, IEEE Press, PHI, New Delhi, 2004.

Web References:

1. <http://www.sctie.iitkgp.ernet.in/>
2. <http://www.rkala.in/softcomputingvideos.php>
3. <http://www.sharbani.org/home2/soft-computing-1>
4. http://www.myreaders.info/html/soft_computing.html

E-Text Books:

1. <https://www.books.google.co.in/books?id=bVbj9nhvHd4C>
2. <https://www.books.google.co.in/books?id=GrZHPgAACAAJ&dq=1.+J.S.R.Jang,+C.T.Sun+and+E.Mizutani,+Neuro,+Fuzzy+and+Soft+Computing,+PHI,+2004,Pearson+Education.>

DATA PREPARATION AND ANALYSIS

II Semester: CSE									
Course Code	Category	Hours / Week			Credits	Maximum Marks			
		L	T	P		C	CIA	SEE	Total
BCSB13	Elective	3	0	0	3	30	70	100	
		Contact Classes: 45		Total Tutorials: Nil		Total Practical Classes: Nil		Total Classes: 45	
OBJECTIVES:									
The course should enable the students to:									
I. Convert the data for analysis and develop meaningful Data Visualizations									
UNIT-I	DATA GATHERING AND PREPARATION							Classes: 09	
Data formats, parsing and transformation, Scalability and real-time issues									
UNIT-II	DATA CLEANING							Classes: 09	
Consistency checking, Heterogeneous and missing data, Data Transformation and segmentation									
UNIT-III	EXPLORATORY ANALYSIS							Classes: 09	
Descriptive and comparative statistics, Clustering and association, Hypothesis generation									
UNIT-IV	VISUALIZATION -1							Classes: 09	
Designing visualizations, Time series, Geo located data, Correlations and connections									
UNIT-V	VISUALIZATION -2							Classes: 09	
Hierarchies and networks, interactivity.									
Text Books:									
1. Making sense of Data : A practical Guide to Exploratory Data Analysis and Data Mining, by Glenn J. Myatt									
Web References:									
1. http://www.sctie.iitkgp.ernet.in/ 2. http://www.rkala.in/softcomputingvideos.php 3. http://www.sharbani.org/home2/soft-computing-1 4. http://www.myreaders.info/html/soft_computing.html									
E-Text Books:									
1. https://www.books.google.co.in/books?id=bVbj9nhvHd4C 2. https://www.books.google.co.in/books?id=GrZHPgAACAAJ&dq=1.+J.S.R.Jang,+C.T.Sun+and+E.Mizutani,+Neuro,+Fuzzy+and+Soft+Computing,+PHI,+2004,Pearson+Education.									

SECURE SOFTWARE DESIGN AND ENTERPRISE COMPUTING

II Semester: CSE									
Course Code	Category	Hours / Week			Credits	Maximum Marks			
		L	T	P	C	CIA	SEE	Total	
BCSB14	Elective	3	0	0	3	30	70	100	
		Contact Classes: 45		Total Tutorials: Nil		Total Practical Classes: Nil		Total Classes: 45	
OBJECTIVES:									
The course should enable the students to:									
I. To fix software flaws and bugs in various software.									
II. To make students aware of various issues like weak random number generation, information leakage, poor usability, and weak or no encryption on data traffic									
III. Techniques for successfully implementing and supporting network services on an enterprise scale and heterogeneous systems environment.									
IV. Methodologies and tools to design and develop secure software containing minimum vulnerabilities and flaws.									
UNIT-I	SECURE SOFTWARE DESIGN							Classes: 09	
Identify software vulnerabilities and perform software security analysis, Master security programming practices, Master fundamental software security design concepts, Perform security testing and quality assurance.									
UNIT-II	ENTERPRISE APPLICATION DEVELOPMENT							Classes: 09	
Describe the nature and scope of enterprise software applications, Design distributed N-tier software application, Research technologies available for the presentation, business and data tiers of an enterprise software application, Design and build a database using an enterprise database system, Develop components at the different tiers in an enterprise system, Design and develop a multi-tier solution to a problem using technologies used in enterprise system, Present software solution.									
UNIT-III	ENTERPRISE SYSTEMS ADMINISTRATION							Classes: 09	
Design, implement and maintain a directory-based server infrastructure in a heterogeneous systems environment, Monitor server resource utilization for system reliability and availability, Install and administer network services (DNS/DHCP/Terminal Services/Clustering/Web/Email).									
UNIT-IV	TROUBLESHOOTING							Classes: 09	
Obtain the ability to manage and troubleshoot a network running multiple services, Understand the requirements of an enterprise network and how to go about managing them.									
UNIT-V	SOFTWARE EXCEPTIONS							Classes: 09	
Handle insecure exceptions and command/SQL injection, Defend web and mobile applications against attackers, software containing minimum vulnerabilities and flaws.									

Text Books:

1. Theodor Richardson, Charles N Thies, Secure Software Design, Jones & Bartlett
2. Kenneth R. van Wyk, Mark G. Graff, Dan S. Peters, Diana L. Burley, Enterprise Software Security, Addison Wesley.

Web References:

1. <http://www.sctie.iitkgp.ernet.in/>
2. <http://www.rkala.in/softcomputingvideos.php>
3. <http://www.sharbani.org/home2/soft-computing-1>
4. http://www.myreaders.info/html/soft_computing.html

E-Text Books:

1. <https://www.books.google.co.in/books?id=bVbj9nhvHd4C>
2. <https://www.books.google.co.in/books?id=GrZHPgAACAAJ&dq=1.+J.S.R.Jang,+C.T.Sun+and+E.Mizutani,+Neuro,+Fuzzy+and+Soft+Computing,+PHI,+2004,Pearson+Education.>

COMPUTER VISION

II Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB15	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45		Total Tutorials: Nil		Total Practical Classes: Nil		Total Classes: 45		
OBJECTIVES:								
The course should enable the students to:								
<ol style="list-style-type: none"> 1. Understand and familiar with both the theoretical and practical aspects of computing with images. 2. Describe the foundation of image formation, measurement, and analysis. 3. Understand the geometric relationships between 2D images and the 3D world. 4. Grasp the principles of state-of-the-art deep neural networks. 								
UNIT-I	INTRODUCTION						Classes: 08	
Overview, computer imaging systems, lenses, Image formation and sensing, Image analysis, pre-processing and Binary image analysis.								
UNIT-II	EDGE DETECTION TECHNIQUES						Classes: 09	
Edge detection, Edge detection performance, Hough transform, corner detection.								
UNIT-III	SEGMENTATION						Classes: 08	
Segmentation, Morphological filtering, Fourier transform.								
UNIT-IV	FEATURE EXTRACTION						Classes: 10	
Feature extraction, shape, histogram, color, spectral, texture, using CVIP tools, Feature analysis, feature vectors, distance /similarity measures, data pre processing.								
UNIT-V	ANALYSIS						Classes: 10	
Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians. Classification: Discriminant Function, Supervised, Un-supervised, Semi supervised. Classifiers: Bayes, KNN, ANN models; Dimensionality Reduction: PCA, LDA, ICA, and Non-parametric methods.								
Text Books:								
<ol style="list-style-type: none"> 1. Computer Vision: Algorithms and Applications by Richard Szeliski. 2. Deep Learning, by Good fellow, Bengio, and Courville. 3. Dictionary of Computer Vision and Image Processing, by Fisher et al. 								

Web References:

1. <http://www.sctie.iitkgp.ernet.in/>
2. <http://www.rkala.in/softcomputingvideos.php>
3. <http://www.sharbani.org/home2/soft-computing-1>
4. http://www.myreaders.info/html/soft_computing.html

E-Text Books:

1. <https://www.books.google.co.in/books?id=bVbj9nhvHd4C>
2. <https://www.books.google.co.in/books?id=GrZHPgAACAAJ&dq=1.+J.S.R.Jang,+C.T.Sun+and+E.Mizutani,+Neuro,+Fuzzy+and+Soft+Computing,+PHI,+2004,Pearson+Education.>

HUMAN AND COMPUTER INTERACTION

II Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB16	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45		Total Tutorials: Nil		Total Practical Classes: Nil		Total Classes: 45		
OBJECTIVES:								
The course should enable the students to:								
<ol style="list-style-type: none"> 1. Learn the foundations of Human Computer Interaction 2. Familiar with the design technologies for individuals and persons with disabilities 3. Aware of mobile Human Computer interaction. 4. Learn the guidelines for user interface. 								
UNIT-I	INTRODUCTION							Classes: 08
Human: I/O channels – Memory – Reasoning and problem solving; The computer: Devices – Memory – processing and networks; Interaction: Models – frameworks – Ergonomics – styles – elements – interactivity- Paradigms.								
UNIT-II	INTERACTIVE DESIGN							Classes: 09
Interactive Design basics – process – scenarios – navigation – screen design – Iteration and prototyping. HCI in software process – software life cycle – usability engineering – Prototyping in practice – design rationale. Design rules – principles, standards, guidelines, rules. Evaluation Techniques – Universal Design.								
UNIT-III	COGNITIVE MODELS							Classes: 08
Cognitive models –Socio-Organizational issues and stake holder requirements –Communication and collaboration models-Hypertext, Multimedia and WWW.								
UNIT-IV	MOBILE ECOSYSTEM							Classes: 10
Mobile Ecosystem: Platforms, Application frameworks- Types of Mobile Applications: Widgets, Applications, Games- Mobile Information Architecture, Mobile 2.0, Mobile Design: Elements of Mobile Design, Tools.								
UNIT-V	WEB INTERFACES							Classes: 10
Designing Web Interfaces – Drag & Drop, Direct Selection, Contextual Tools, Overlays, Inlays and Virtual Pages, Process Flow. Case Studies.								
Text Books:								
<ol style="list-style-type: none"> 1. Alan Dix, Janet Finlay, Gregory Abowd, Russell Beale, “Human Computer Interaction”, Pearson Education, 3rd Edition, 2004. 2. Brian Fling, “Mobile Design and Development”, O Reilly Media Inc., 1st Edition , 2009 3. Bill Scott and Theresa Neil, “Designing Web Interfaces”, O Reilly, 1st Edition, 2009. 								

Web References:

1. <http://www.sctie.iitkgp.ernet.in/>
2. <http://www.rkala.in/softcomputingvideos.php>
3. <http://www.sharbani.org/home2/soft-computing-1>
4. http://www.myreaders.info/html/soft_computing.html

E-Text Books:

1. <https://www.books.google.co.in/books?id=bVbj9nhvHd4C>
2. <https://www.books.google.co.in/books?id=GrZHPgAACAAJ&dq=1.+J.S.R.Jang,+C.T.Sun+and+E.Mizutani,+Neuro,+Fuzzy+and+Soft+Computing,+PHI,+2004,Pearson+Education.>

GPU COMPUTING

II Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB17	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45		Total Tutorials: Nil		Total Practical Classes: Nil		Total Classes: 45		
OBJECTIVES:								
<p>The course should enable the students to: To learn parallel programming with Graphics Processing Units (GPUs).</p>								
UNIT-I	INTRODUCTION							Classes: 13
<p>History, Graphics Processors, Graphics Processing Units, GPGPUs. Clock speeds, CPU / GPU comparisons, Heterogeneity, Accelerators, Parallel programming, CUDA Open CL / Open ACC, Hello World Computation Kernels, Launch parameters, Thread hierarchy, Warps / Wave fronts, Thread blocks / Workgroups, Streaming multiprocessors, 1D / 2D / 3D thread mapping, Device properties, Simple Programs</p>								
UNIT-II	MEMORY							Classes: 08
<p>Memory hierarchy, DRAM / global, local / shared, private / local, textures, Constant Memory, Pointers, Parameter Passing, Arrays and dynamic Memory, Multi-dimensional Arrays, Memory Allocation, Memory copying across devices, Programs with matrices, Performance evaluation with different memories</p>								
UNIT-III	SYNCHRONIZATION							Classes: 08
<p>Memory Consistency, Barriers (local versus global), Atomics, Memory fence. Prefix sum, Reduction. Programs for concurrent Data Structures such as Work lists, Linked-lists. Synchronization across CPU and GPU</p> <p>Functions: Device functions, Host functions, Kernels functions, Using libraries (such as Thrust), and developing libraries.</p>								
UNIT-IV	SUPPORT AND STREAMS							Classes: 09
<p>Debugging GPU Programs. Profiling, Profile tools, Performance aspects Asynchronous processing, tasks, Task-dependence, Overlapped data transfers, Default Stream, Synchronization with streams. Events, Event-based- Synchronization - Overlapping data transfer and kernel execution, pitfalls.</p>								
UNIT-V	CASE STUDIES							Classes: 5
<p>Image Processing, Graph algorithms, Simulations, Deep Learning</p>								
Text Books:								
<ol style="list-style-type: none"> 1. David Kirk, Wen-meiHwu, Morgan Kaufman, “Programming Massively Parallel Processors: A Hands-on Approach”, 2010 (ISBN: 978-0123814722) 2. Shane Cook, Morgan Kaufman “CUDA Programming: A Developer's Guide to Parallel Computing with GPUs”, 2012 (ISBN: 978-0124159334) 								

Web References:

1. <http://www.sctie.iitkgp.ernet.in/>
2. <http://www.rkala.in/softcomputingvideos.php>
3. <http://www.sharbani.org/home2/soft-computing-1>
4. http://www.myreaders.info/html/soft_computing.html

E-Text Books:

1. <https://www.books.google.co.in/books?id=bVbj9nhvHd4C>
2. <https://www.books.google.co.in/books?id=GrZHPgAACAAJ&dq=1.+J.S.R.Jang,+C.T.Sun+and+E.Mizutani,+Neuro,+Fuzzy+and+Soft+Computing,+PHI,+2004,Pearson+Education.>

DIGITAL FORENSICS

II Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
BCSB18	Elective	3	0	0	3	30	70	100
		Contact Classes: 45		Total Tutorials: Nil	Total Practical Classes: Nil	Total Classes: 45		
OBJECTIVES:								
The course should enable the students to :								
I. Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.								
II. Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools								
III. E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics								
UNIT-I	DIGITAL FORENSICS SCIENCE AND COMPUTER CRIME						Classes: 09	
Digital Forensics Science: Forensics science, computer forensics, and digital forensics.								
Computer Crime: Criminalistics as it relates to the investigative process, analysis of cyber-criminalistics area, holistic approach to cyber-forensics.								
UNIT-II	CYBER CRIME SCENE ANALYSIS						Classes: 09	
Cyber Crime Scene Analysis: Discuss the various court orders etc., methods to search and seizure electronic evidence, retrieved and un-retrieved communications, Discuss the importance of understanding what court documents would be required for a criminal investigation.								
UNIT-III	EVIDENCE MANAGEMENT & PRESENTATION						Classes: 09	
Evidence Management & Presentation: Create and manage shared folders using operating system, importance of the forensic mindset, define the workload of law enforcement, Explain what the normal case would look like, Define who should be notified of a crime, parts of gathering evidence, Define and apply probable cause.								
UNIT-IV	COMPUTER FORENSICS AND NETWORK FORENSICS						Classes: 09	
Computer Forensics: Prepare a case, Begin an investigation, Understand computer forensics workstations and software, Conduct an investigation, Complete a case, Critique a case,								
Network Forensics: open-source security tools for network forensic analysis, requirements for preservation of network data.								
UNIT-V	MOBILE FORENSICS AND LEGAL ASPECTS OF DIGITAL FORENSICS						Classes: 09	
Mobile Forensics: mobile forensics techniques, mobile forensics tools.								
Legal Aspects of Digital Forensics: IT Act 2000, amendment of IT Act 2008, Recent trends in mobile forensic technique and methods to search and seizure electronic evidence.								

Text Books:

1. John Sammons, "The Basics of Digital Forensics", Elsevier.
2. John Vacca, "Computer Forensics: Computer Crime Scene Investigation", Laxmi Publications.

Reference Books:

1. John Sammons, "The Basics of Digital Forensics", Elsevier.
2. John Vacca, "Computer Forensics: Computer Crime Scene Investigation", Laxmi Publications.

Web References:

1. <http://www.sctie.iitkgp.ernet.in/>
2. <http://www.rkala.in/softcomputingvideos.php>
3. <http://www.sharbani.org/home2/soft-computing-1>
4. http://www.myreaders.info/html/soft_computing.html

E-Text Books:

1. <https://www.books.google.co.in/books?id=bVbj9nhvHd4C>
2. <https://www.books.google.co.in/books?id=GrZHPgAACAAJ&dq=1.+J.S.R.Jang,+C.T.Sun+and+E.Mizutani,+Neuro,+Fuzzy+and+Soft+Computing,+PHI,+2004,Pearson+Education>

SOFT COMPUTING LABORATORY

II Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB19	Core	L	T	P	C	CIA	SEE	Total
		0	0	4	2	30	70	100
Contact Classes: Nil	Total Tutorials: Nil	Total Practical Classes: 36			Total Classes: 36			
OBJECTIVES:								
The course should enable the students to:								
I. Understand Fuzzy concepts								
II. Learn neural networks with back propagation and without preparation								
III. Learn the operators of genetic algorithms								
IV. Practice on crisp partitions								
LIST OF EXPERIMENTS								
Week-1	PERCEPTRON							
Create a perceptron with appropriate number of inputs and outputs. Train it using fixed increment learning algorithm until no change in weights is required. Output the final weights								
Week-2	ARTIFICIAL NEURAL NETWORKS							
Write a program to implement artificial neural network without back propagation. Write a program to implement artificial neural network with back propagation.								
Week-3	FUZZY SETS							
Implement Union, Intersection, Complement and Difference operations on fuzzy sets. Also create fuzzy relation by Cartesian product of any two fuzzy sets and perform max-min composition on any two fuzzy relations.								
Week-4	GENETIC ALGORITHMS							
Implement travelling sales person problem (TSP) using genetic algorithms.								
Week-5	COVARIANCE							
Plot the correlation plot on dataset and visualize giving an overview of relationships among data on soya bins data. Analysis of covariance: variance (ANOVA), if data have categorical variables on iris data.								
Week-6	DATA FITTING BY REGRESSION							
Implement linear regression and multi-regression for a set of data points.								
Week-7	CRISP MODEL							
Implement crisp partitions for real-life iris dataset.								

Week-8	PERCEPTRON RULE
Write a program to implement Hebb's rule Write a program to implement Delta rule.	
Week-9	LOGIC GATES
Write a program to implement logic gates.	
Week-10	CLASSIFICATION
Implement SVM classification by Fuzzy concepts.	
Reference Books:	
D.K Prathikar, "Soft Computing", Narosa Publishing House, New Delhi, 2008.	
Web References:	
1. https://ldrp.ac.in/images/syllabus/BE-Computer/802-3%20soft%20computing.pdf http://itmgoi.in/download/CSE%20&%20IT/Soft%20Computing%20IT%20(IT-802).pdf	
2. http://mirlab.org/jang/book/	
SOFTWARE AND HARDWARE REQUIREMENTS FOR 18 STUDENTS:	
SOFTWARE: Python	
HARDWARE: 18 numbers of Intel Desktop Computers with 4 GB RAM	

DATA PREPARATION AND ANALYSIS LABORATORY

II Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB20	Core	L	T	P	C	CIA	SEE	Total
		0	0	4	2	30	70	100
Contact Classes: Nil		Total Tutorials: Nil		Total Practical Classes: 36		Total Classes: 36		
OBJECTIVES:								
The course should enable the students to:								
I. Learn pre-processing method for multi-dimensional data								
II. Practice on data cleaning mechanisms								
III. Learn various data exploratory analysis								
IV. Develop the visualizations for clusters or partitions								
LIST OF EXPERIMENTS								
Week-1	DATA PRE-PROCESSING AND DATA CUBE							
Data preprocessing methods on student and labor datasets Implement data cube for data warehouse on 3-dimensional data								
Week-2	DATA CLEANING							
Implement various missing handling mechanisms ,Implement various noisy handling mechanisms								
Week-3	EXPLORATORY ANALYSIS							
Develop k-means and MST based clustering techniques, Develop the methodology for assessment of clusters for given dataset								
Week-4	ASSOCIATION ANALYSIS							
Design algorithms for association rule mining algorithms								
Week-5	HYPTOTHYSIS GENERATION							
Derive the hypothesis for association rules to discovery of strong association rules; Use confidence and support thresholds.								
Week-6	TRANSFORMATION TECHNIQUES							
Construct Haar wavelet transformation for numerical data, Construct principal component analysis (PCA) for 5-dimensional data.								
Week-7	DATA VISUALIZATION							
Implement binning visualizations for any real time dataset, Implement linear regression techniques								

Week-8	CLUSTERS ASSESSMENT
Visualize the clusters for any synthetic dataset, Implement the program for converting the clusters into histograms	
Week-9	HIERARCHICAL CLUSTERING
Write a program to implement agglomerative clustering technique ,Write a program to implement divisive hierarchical clustering technique	
Week-10	SCALABILITY ALGORITHMS
Develop scalable clustering algorithms ,Develop scalable a priori algorithm	
Reference Books:	
1. Sinan Ozdemir, “Principles of Data Science”, Packt Publishers, 2016.	
Web References:	
1. https://paginas.fe.up.pt/~ec/files_1112/week_03_Data_Preparation.pdf 2. https://socialresearchmethods.net/kb/statprep.php 3. https://www.quest.com/solutions/data-preparation-and-analysis/	
SOFTWARE AND HARDWARE REQUIREMENTS FOR 18 STUDENTS:	
SOFTWARE: Open source Weka 3.8, Python	
HARDWARE: 18 numbers of Intel Desktop Computers with 4 GB RAM	

MOBILE APPLICATIONS AND SERVICES

III Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB22	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45		Total Tutorials: Nil		Total Practical Classes: Nil		Total Classes: 45		
OBJECTIVES:								
The course should enable the students to :								
I. Understand the three main mobile platforms and their ecosystems, namely Android, iOS, and Phone Gap / Web OS and designing and develop mobile applications using a chosen application development framework II. Explores emerging technologies and tools used to design and implement. III. Explore the techniques for deploying and testing mobile applications, and for enhancing their performance and scalability account of communications via network by wireless connectivity. IV. Prepare mobile application for multimedia and learn about additional issue like security, hacking etc.,								
UNIT-I	INTRODUCTION TO MOBILE COMPUTING						Classes: 09	
Introduction: Introduction to Mobile Computing, Introduction to Android Development Environment, Factors in Developing Mobile Applications, Mobile Software Engineering, Frameworks and Tools, Generic UI Development Android User								
UNIT-II	MOBILE COMPUTING -MORE ON UIS						Classes: 09	
More on UIs: VUIs and Mobile Apps, Text-to-Speech Techniques, Designing the Right UI, Multichannel and Multimodal UIs, . Storing and Retrieving Data, Synchronization and Replication of Mobile Data, Getting the Model Right, Android Storing and Retrieving Data, Working with a Content Provider.								
UNIT-III	NETWORK AND THE WEB:STATE MACHINE						Classes: 09	
Communications via Network and the Web: State Machine, Correct Communications Model, Android Networking and Web, Telephony Deciding Scope of an App, Wireless Connectivity and Mobile Apps, Android Telephony Notifications and Alarms: Performance, Performance and Memory Management, Android Notifications and Alarms, Graphics, Performance and Multithreading, Graphics and UI Performance, Android Graphics								
UNIT-IV	PUTTING IT ALL TOGETHER AND MULTIMEDIA						Classes: 09	
Putting It All Together : Packaging and Deploying, Performance Best Practices, Android Field Service App, Location Mobility and Location Based Services Android Multimedia: Mobile Agents and Peer-to-Peer Architecture, Android Multimedia								
UNIT-V	PLATFORMS AND ADDITIONAL ISSUES ,SECURITY AND HACKING						Classes: 09	
Platforms and Additional Issues: Development Process, Architecture, Design, Technology Selection, Mobile App Development Hurdles, Testing, Security and Hacking , Active Transactions, More on Security, Hacking Android.								

Text Books:

- 1 Wei-Meng Lee, “Beginning Android™ 4 Application Development”, 2012 by John Wiley & Sons

Reference Books:

1. <http://www.sctie.iitkgp.ernet.in/>
2. <http://www.rkala.in/softcomputingvideos.php>
3. <http://www.sharbani.org/home2/soft-computing-1>
4. http://www.myreaders.info/html/soft_computing.html

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1. <https://www.books.google.co.in/books?id=bVbj9nhvHd4C>
2. <https://www.books.google.co.in/books?id=GrZHPgAACAAJ&dq=1.+J.S.R.Jang,+C.T.Sun+and+E.Mizutani,+Neuro,+Fuzzy+and+Soft+Computing,+PHI,+2004,Pearson+Education.>

COMPILER FOR HPC

III Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB23	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45		Total Tutorials: Nil		Total Practical Classes: Nil		Total Classes: 45		
OBJECTIVES:								
The course should enable the students to :								
<ul style="list-style-type: none"> I. The objective of this course is to introduce structure of compilers and high performance II. Compiler design for students. Concepts of cache coherence and parallel loops in compilers are included. 								
UNIT-I	HIGH PERFORMANCE SYSTEMS						Classes: 09	
High Performance Systems , Structure of a Compiler, Programming Language Features, languages for High Performance.								
UNIT-II	DATA DEPENDENCE AND SCALAR ANALYSIS WITH FACTORED USE-DEF CHAINS						Classes: 09	
<p>Data Dependence: Data Dependence in Loops, Data Dependence in Conditionals, Data Dependence in Parallel Loops, Program Dependence Graph.</p> <p>Scalar Analysis with Factored Use-Def Chains: Constructing Factored Use-Def Chains, FUD Chains for Arrays, Induction Variables Using FUD Chains, Constant Propagation with FUD Chains, and Data Dependence for Scalars. Data Dependence Analysis for Arrays.</p>								
UNIT-III	LOOP RESTRUCTURING AND OPTIMIZING FOR LOCALITY						Classes: 09	
<p>Array Region Analysis, Pointer Analysis, I/O Dependence, Procedure Calls, Inter-procedural Analysis.</p> <p>Loop Restructuring: Simple Transformations, Loop Fusion, Loop Fission, Loop Reversal, Loop Interchanging, Loop Skewing, Linear Loop Transformations, Strip-Mining, Loop Tiling, Other Loop Transformations, and Inter-procedural Transformations.</p> <p>Optimizing for Locality: Single Reference to Each Array, Multiple References, General Tiling, Fission and Fusion for Locality.</p>								
UNIT-IV	CONCURRENCY ANALYSIS AND VECTOR ANALYSIS						Classes: 09	
<p>Concurrency Analysis: Concurrency from Sequential Loops, Concurrency from Parallel Loops, Nested Loops, Round off Error, Exceptions and Debuggers.</p> <p>Vector Analysis: Vector Code, Vector Code from Sequential Loops, Vector Code from For all Loops, Nested Loops, Round off Error, Exceptions, and Debuggers, Multi-vector Computers</p>								
UNIT-V	MESSAGE-PASSING MACHINES AND SCALABLE SHARED-MEMORY MACHINES						Classes: 09	
<p>Message-Passing Machines: SIMD Machines, MIMD Machines, Data Layout, Parallel Code for Array Assignment, Remote Data Access, Automatic Data Layout, Multiple Array Assignments, Other Topics.</p> <p>Scalable Shared-Memory Machines: Global Cache Coherence, Local Cache Coherence, Latency Tolerant Machines.</p>								

Text Books:

1. Michael Wolfe, High-Performance Compilers for Parallel Computing, Pearson

Reference Books:

1. <http://www.sctie.iitkgp.ernet.in/>
2. <http://www.rkala.in/softcomputingvideos.php>
3. <http://www.sharbani.org/home2/soft-computing-1>
4. http://www.myreaders.info/html/soft_computing.html

E-Text Books:

1. <https://www.books.google.co.in/books?id=bVbj9nhvHd4C>
2. <https://www.books.google.co.in/books?id=GrZHPgAACAAJ&dq=1.+J.S.R.Jang,+C.T.Sun+and+E.Mizutani,+Neuro,+Fuzzy+and+Soft+Computing,+PHI,+2004,Pearson+Education.>

OPTIMIZATION TECHNIQUES

III Semester: CSE								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB24	Elective	L	T	P	C	CIA	SEE	Total
		3	0	0	3	30	70	100
Contact Classes: 45		Total Tutorials: Nil		Total Practical Classes: Nil		Total Classes: 45		
OBJECTIVES:								
The course should enable the students to :								
I. The objective of this course is to provide insight to the mathematical formulation of real world problems.								
II. To optimize these mathematical problems using nature based algorithms. And the solution is useful specially for NP-Hard problems.								
UNIT-I	ENGINEERING APPLICATION OF OPTIMIZATION						Classes: 09	
Engineering application of Optimization, Formulation of design problems as mathematical programming problems.								
UNIT-II	GENERAL STRUCTURE OF OPTIMIZATION						Classes: 09	
General Structure of Optimization Algorithms, Constraints, The Feasible Region								
UNIT-III	BRANCHES OF MATHEMATICAL PROGRAMMING						Classes: 09	
Branches of Mathematical Programming: Optimization using calculus, Graphical Optimization, Linear Programming, Quadratic Programming, Integer Programming, Semi Definite Programming								
UNIT-IV	OPTIMIZATION ALGORITHMS						Classes: 09	
Optimization Algorithms like Genetic Optimization, Particle Swarm Optimization, Ant Colony Optimization etc.								
UNIT-V	REAL LIFE PROBLEMS						Classes: 09	
Real life Problems and their mathematical formulation as standard programming problems.								
Text Books:								
<ol style="list-style-type: none"> 1. Laurence A. Wolsey (1998). Integer programming. Wiley. ISBN 978-0-471-28366-9. 2. Practical Optimization Algorithms and Engineering Applications Andreas Antoniou. 3. An Introduction to Optimization Edwin K., P. Chong & Stanislaw h. Zak. 								
Reference Books:								
<ol style="list-style-type: none"> 1. Dimitris Bertsimas; Robert Weismantel (2005).” Optimization over integers”. Dynamic Ideas. ISBN 978-0-9759146-2-5. 2. John K. Karlof (2006). “Integer programming: theory and practice”.CRC Press. ISBN 978-0-8493-1914-3. 3. H. Paul Williams,” Logic and Integer Programming”. Springer. ISBN 978-0-387-92279-9. 								

Web References:

1. <http://www.sctie.iitkgp.ernet.in/>
2. <http://www.rkala.in/softcomputingvideos.php>
3. <http://www.sharbani.org/home2/soft-computing-1>
4. http://www.myreaders.info/html/soft_computing.html

E-Text Books:

1. <https://www.books.google.co.in/books?id=bVbj9nhvHd4C>
2. <https://www.books.google.co.in/books?id=GrZHPgAACAAJ&dq=1.+J.S.R.Jang,+C.T.Sun+and+E.Mizutani,+Neuro,+Fuzzy+and+Soft+Computing,+PHI,+2004,Pearson+Education.>

RESEARCH METHODOLOGY AND IPR

III Semester: CSE, ES, CAD/CAM, AE, ST, PEED								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BCSB31	Core	L	T	P	C	CIA	SEE	Total
		2	-	-	2	30	70	100
Contact Classes: 30	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 30			
OBJECTIVES:								
The course should enable the students to:								
I. Understand research problem formulation.								
II. Analyze research related information								
III. Follow research ethics								
IV. Understand that today's world is controlled by Computer, Information Technology; but tomorrow world will be ruled by ideas, concept, and creativity.								
UNIT-I	INTRODUCTION						Classes: 07	
Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations								
UNIT-II	RESEARCH ETHICS						Classes: 05	
Effective literature studies approaches, analysis Plagiarism, Research ethics.								
UNIT-III	RESEARCH PROPOSAL						Classes: 06	
Effective technical writing, how to write report, Paper Developing a Research Proposal.								
Format of research proposal, a presentation and assessment by a review committee								
UNIT-IV	PATENTING						Classes: 06	
Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.								
UNIT-V	PATENT RIGHTS						Classes: 06	
Patent Rights: Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.								
New Developments in IPR: Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.								
Text Books:								
1. Stuart Melville and Wayne Goddard, "Research methodology: an introduction for science & engineering students"								
2. Wayne Goddard and Stuart Melville, "Research Methodology: An Introduction"								
3. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners"								

Reference Books:

1. Halbert, “Resisting Intellectual Property”, Taylor & Francis Ltd ,2007.
2. Mayall , “Industrial Design”, McGraw Hill, 1992.
3. Niebel , “Product Design”, McGraw Hill, 1974.
4. Asimov , “Introduction to Design”, Prentice Hall, 1962.

Web References:

1. Robert P. Merges, Peter S. Menell, Mark A. Lemley, “ Intellectual Property in NewTechnological Age”, 2016
2. T. Ramappa, “Intellectual Property Rights Under WTO”, S. Chand, 2008

E-Text Books:

1. <http://nptel.ac.in/courses/107108011/>

BUSINESS ANALYTICS

Course Code	Category	Hours / Week			Credits	Maximum Marks			
		L	T	P		C	CIA	SEE	Total
BCSB25	Open Elective	3	-	-	3	30	70	100	
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45				
<p>OBJECTIVES: The course should enable the students to:</p> <p>I. Understand the role of business analytics within an organization. II. Analyze data using statistical and data mining techniques and understand relationships between the underlying business processes of an organization. III. To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making. IV. To become familiar with processes needed to develop, report, and analyze business data. V. Use decision-making tools/Operations research techniques. VI. Manage business process using analytical and management tools. VII. Analyze and solve problems from different industries such as manufacturing, service, retail, software, banking and finance, sports, pharmaceutical, aerospace etc.</p>									
UNIT-I	BUSINESS ANALYTICS							Classes: 09	
Business analytics: Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organization, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modeling, sampling and estimation methods overview.									
UNIT-II	REGRESSION ANALYSIS							Classes: 09	
Trendiness and Regression Analysis: Modeling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.									
UNIT-III	ORGANIZATION STRUCTURES							Classes: 09	
Organization Structures of Business analytics, Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modeling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modeling, nonlinear Optimization.									
UNIT-IV	FORECASTING TECHNIQUES							Classes: 09	
Forecasting Techniques: Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.									

UNIT-V	DECISION ANALYSIS	Classes: 09
Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making. Recent Trends in: Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.		
Text Books		
1. James Evans, “Business Analytics”, Persons Education.		
Reference Books		
1. Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, “Business analytics Principles, Concepts, and Applications”, Pearson FT Press.		
Web References		
1. http://nptel.ac.in/courses/110107092/		
E-Text Books		
1. http://nptel.ac.in/downloads/110107092/		

INDUSTRIAL SAFETY

Course Code	Category	Hours / Week			Credits	Maximum Marks			
		L	T	P		C	CIA	SEE	Total
BCSB26	Open Elective	3	-	-	3	30	70	100	
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45				
OBJECTIVES:									
The course should enable the students to:									
I. Ensuring duty holders apply inherent safety principles in managing risks.									
II. Prioritizing interventions based on the inherent hazards of the site and/or pipeline, performance of duty holders in controlling risks and other defined operational intelligence.									
III. Identifying the underlying, as well as the immediate, causes of any deficiencies in duty holders arrangements for managing risks.									
IV. Taking action to ensure immediate and underlying causes of failures of risk management are addressed.									
UNIT-I	INDUSTRIAL SAFETY							Classes: 09	
Industrial safety: Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.									
UNIT-II	MAINTENANCE ENGINEERING							Classes: 09	
Fundamentals of maintenance engineering: Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment.									
UNIT-III	CORROSION AND PREVENTION TECHNIQUES							Classes: 09	
Wear and Corrosion and their prevention: Wear- types, causes, effects, wear reduction methods, lubricants- types and applications, Lubrication methods, general sketch, working and applications, i.e. Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication.									
Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.									
UNIT-IV	FAULT TRACING							Classes: 09	
Fault tracing: Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.									
UNIT-V	PERIODIC AND PREVENTIVE MAINTENANCE							Classes: 09	
Periodic and preventive maintenance: Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets, Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance.									

Text Books

1. Higgins & Morrow, "Maintenance Engineering Handbook", Da Information Services.
2. H. P. Garg, "Maintenance Engineering", S. Chand and Company.

Reference Books

1. Audels, "Pump-hydraulic Compressors", Mcgraw Hill Publication.
2. Winterkorn, Hans, "Foundation Engineering Handbook", Chapman & Hall London.

Web References

1. https://onlinecourses.nptel.ac.in/noc18_mg42/preview

E-Text Books

1. [http://portal.unimap.edu.my/portal/page/portal30/Lecturer%20Notes/KEJURUTERAAN_KOMPUTE R/Semester%201%20Sidang%20Akademik%2020142015/DPT333%20Industrial%20safety%20and%20health/Chapter%201%20-%20Introduction%20-Zaizu_0.pdf](http://portal.unimap.edu.my/portal/page/portal30/Lecturer%20Notes/KEJURUTERAAN_KOMPUTE%20R/Semester%201%20Sidang%20Akademik%2020142015/DPT333%20Industrial%20safety%20and%20health/Chapter%201%20-%20Introduction%20-Zaizu_0.pdf)

OPERATIONS RESEARCH

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
BCSB27	Open Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The student should enable the students to:								
I. Apply the dynamic programming to solve problems of discrete and continuous variables.								
II. Understand the concept of nonlinear programming.								
III. Describe the sensitivity analysis.								
UNIT-I	INTRODUCTION							Classes: 09
Optimization Techniques, Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models								
UNIT-II	FORMULATION TECHNIQUES							Classes: 09
Formulation of a LPP - Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming.								
UNIT-III	NON LINEAR METHODS							Classes: 09
Nonlinear programming problem - Kuhn-Tucker conditions min cost flow problem. max flow problem - CPM/PERT.								
UNIT-IV	SCHEDULING MODELS							Classes: 09
Scheduling and sequencing - single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.								
UNIT-V	DYNAMIC PROGRAMMING AND GAME THEORY							Classes: 09
Competitive Models, Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation								
Text Books								
1. H.A. Taha, "Operations Research - An Introduction", PHI, 2008.								
2. H.M. Wagner, "Principles of Operations Research", PHI, Delhi, 1982.								
3. J.C. Pant, "Introduction to Optimisation: Operations Research", Jain Brothers, Delhi, 2008.								
Reference Books								
1. Hitler Libermann, "Operations Research" McGraw Hill Publications, 2009.								
2. Pannerseivam, "Operations Research" Prentice Hall of India, 2010.								
3. Harvey M Wagner, "Principles of Operations Research" Prentice Hall of India, 2010.								
Web References								
1. https://onlinecourses.nptel.ac.in/noc17_mg10/preview								
E-Text Books								
1. http://nptel.ac.in/courses/112106134/								

COST MANAGEMENT OF ENGINEERING PROJECTS

Course Code	Category	Hours / Week			Credits	Maximum Marks			
		L	T	P	C	CIA	SEE	Total	
BCSB28	Open Elective	3	-	-	3	30	70	100	
Contact Classes: 48	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 48				
OBJECTIVES:									
The course should enable the students to:									
I. Establish systems to help streamline the transactions between corporate support departments and the operating units.									
II. Devise transfer pricing systems to coordinate the buyer-supplier interactions between decentralized organizational operating units									
III. Use pseudo profit centers to create profit maximizing behavior in what were formerly cost centers.									
UNIT-I	INTRODUCTION							Classes: 09	
Introduction and Overview of the Strategic Cost Management Process									
UNIT-II	COST CONCEPTS							Classes: 09	
Cost concepts in decision-making; Relevant cost, Differential cost, Incremental cost and Opportunity cost. Objectives of a Costing System; Inventory valuation; Creation of a Database for operational control; Provision of data for Decision-Making.									
UNIT-III	PROJECT MANAGEMENT							Classes: 09	
Project: meaning, Different types, why to manage, cost overruns centers, various stages of project execution: conception to commissioning. Project execution as conglomeration of technical and nontechnical activities. Detailed Engineering activities. Pre project execution main clearances and documents.									
Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. Project commissioning: mechanical and process.									
UNIT-IV	COST BEHAVIOR AND PROFIT PLANNING							Classes: 09	
Cost Behavior and Profit Planning Marginal Costing; Distinction between Marginal Costing and Absorption Costing; Break-even Analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement, Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control; Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.									
UNIT-V	QUANTITATIVE TECHNIQUES							Classes: 09	
Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation Problems, Assignment problems, Simulation, Learning Curve Theory.									
Text Books									
1. Robert S Kaplan Anthony A. Alkinson, Management & Cost Accounting.									
2. N.D. Vohra, Quantitative Techniques in Management, Tata McGraw Hill Book Co. Ltd.									
Reference Books									
1. Cost Accounting A Managerial Emphasis, Prentice Hall of India, New Delhi.									
2. Charles T. Horngren and George Foster, Advanced Management Accounting.									
3. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting A. H. Wheeler publisher.									

Web References
1. https://onlinecourses.nptel.ac.in/noc16_ce02/preview
E-Text Books
1. http://nptel.ac.in/downloads/110101003/

COMPOSITE MATERIALS

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
BCSB29	Open Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. Understand the manufacturing processes of reinforcement fibers and matrices for composites.								
II. Understand the concept of tailored design philosophy.								
UNIT-I	INTRODUCTION							Classes: 09
Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.								
UNIT-II	REINFORCEMENTS							Classes: 09
Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.								
UNIT-III	MANUFACTURING OF METAL MATRIX COMPOSITES							Classes: 09
Casting, Solid State diffusion technique, Cladding, Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites.								
Liquid Metal Infiltration, Liquid phase sintering. Manufacturing of Carbon, Carbon composites: Knitting, Braiding, Weaving. Properties and applications.								
UNIT-IV	MANUFACTURING OF POLYMER MATRIX COMPOSITES							Classes: 09
Preparation of Moulding compounds and prepregs, hand layup method, Autoclave method, Filament winding method, Compression moulding, Reaction injection moulding. Properties and applications.								
UNIT-V	STRENGTH							Classes: 09
Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first ply failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.								
Text Books:								
1. R.W.Cahn, “Material Science and Technology” VCH, West Germany.								
2. WD Callister, Jr., Adapted by R. Balasubramaniam, “Materials Science and Engineering, An introduction”, John Wiley & Sons, NY, Indian edition, 2007.								
Reference Books:								
1. ed-Lubin, “Hand Book of Composite Materials”								
2. Deborah D.L. Chung, “Composite Materials Science and Applications”								
3. Danial Gay, Suong V. Hoa, and Stephen W. Tasi, “Composite Materials Design and Applications”								
Web References:								
1. https://freevideolectures.com/course/3479/processing-of-non-metals/5								
E-Text Books:								
1. https://www.asminternational.org/documents/10192/1849770/05287G_Sample_Chapter.pdf								

WASTE TO ENERGY

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
BCSB30	Open Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 45			
OBJECTIVES:								
The course should enable the students to:								
I. Understand the principles associated with effective energy management and to apply these principles in the day to day life.								
II. Develop insight into the collection, transfer and transport of municipal solid waste.								
III. Explain the design and operation of a municipal solid wasteland fill.								
IV. Device key processes involved in recovering energy from wastes, systematically evaluate the main operational challenges in operating thermal and biochemical energy from waste facilities.								
UNIT-I	INTRODUCTION TO ENERGY FROM WASTE							Classes: 09
Introduction to Energy from Waste: Classification of waste as fuel, Agro based, Forest residue, Industrial waste. MSW, Conversion devices. Incinerators, gasifiers, digestors								
UNIT-II	BIOMASS PYROLYSIS							Classes: 09
Biomass Pyrolysis: Pyrolysis, Types, slow fast , Manufacture of charcoal, Methods, Yields and application, Manufacture of pyrolytic oils and gases, yields and applications.								
UNIT-III	BIOMASS GASIFICATION							Classes: 09
Gasifiers, Fixed bed system, Downdraft and updraft gasifiers, Fluidized bed gasifiers, Design, construction and operation. Gasifier burner arrangement for thermal heating. Gasifier engine arrangement and electrical power, Equilibrium and kinetic consideration in gasifier operation.								
UNIT-IV	BIOMASS COMBUSTION							Classes: 09
Biomass stoves, Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.								
UNIT-V	BIOGAS							Classes: 09
Properties of biogas (Calorific value and composition), Biogas plant technology and status, Bio energy system. Design and constructional features, Biomass resources and their classification, Biomass conversion processes, Thermo chemical conversion, Direct combustion, biomass gasification, pyrolysis and liquefaction, biochemical conversion, anaerobic digestion. Types of biogas Plants, Applications. Alcohol production from biomass, Bio diesel production. Urban waste to energy conversion, Biomass energy programme in India.								
Text Books:								
1. Desai, Ashok V, "Non Conventional Energy", Wiley Eastern Ltd., 1990.								
Reference Books:								
1. Khandelwal, K. C. and Mahdi, S. S, "Biogas Technology - A Practical Hand Book", Vol. I & II Tata McGraw Hill Publishing Co. Ltd., 1983.								
2. Challal, D. S, "Food, Feed and Fuel from Biomass", IBH Publishing Co. Pvt. Ltd., 1991.								
Web References:								
1. http://nptel.ac.in/courses/103107125/								
E-Text Books:								
1. Biomass Conversion and Technology, C. Y. WereKo-Brobby and E. B. Hagan, John Wiley & Sons, 1996..								

ENGLISH FOR RESEARCH PAPER WRITING

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
BCSB32	Audit	2	-	-	0	30	70	100
Contact Classes: 24	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 24			
OBJECTIVES:								
The course should enable the students to:								
I. Understand that how to improve your writing skills and level of readability								
II. Learn about what to write in each section								
III. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission								
UNIT-I	PLANNING AND PREPARATION							Classes: 04
Planning and Preparation, Word Order, Breaking up long sentences, Structuring Paragraphs and Sentences, Being Concise and Removing Redundancy, Avoiding Ambiguity and Vagueness								
UNIT-II	ABSTRACT							Classes: 05
Clarifying Who Did What, Highlighting Your Findings, Hedging and Criticizing, Paraphrasing and Plagiarism, Sections of a Paper, Abstracts. Introduction								
UNIT-III	DISCUSSION AND CONCLUSIONS							Classes: 05
Review of the Literature, Methods, Results, Discussion, Conclusions, The Final Check. key skills are needed when writing a Title, key skills are needed when writing an Abstract, key skills are needed when writing an Introduction, skills needed when writing a Review of the Literature.								
UNIT-IV	WRITING SKILLS							Classes: 05
Skills are needed when writing the Methods, skills needed when writing the Results, skills are needed when writing the Discussion, skills are needed when writing the Conclusions								
UNIT-V	QUALITY AND TIME MAINTENANCE							Classes: 05
Useful phrases, how to ensure paper is as good as it could possibly be the first- time submission								
Text Books:								
1. Goldbort R, "Writing for Science", Yale University Press. 2011.								
2. Adrian Wallwork, "English for Writing Research Papers", Springer New York Dordrecht Heidelberg London, 2011.								
Reference Books:								
1. Highman N, "Handbook of Writing for the Mathematical Sciences", SIAM Highman's book.								
Web References:								
1. http://saba.kntu.ac.ir/eecd/ecourses/Seminar90/2011%20English%20for%20Writing%20Research%20Papers.pdf								
E-Text Books:								
1. Day R (2006) How to Write and Publish a Scientific Paper, Cambridge University Press.								

DISASTER MANAGEMENT

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
BCSB33	Audit	2	-	-	0	30	70	100
		Contact Classes: 24		Tutorial Classes: Nil		Practical Classes: Nil		Total Classes: 24
OBJECTIVES:								
The course should enable the students to:								
I. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.								
II. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.								
III. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.								
IV. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.								
UNIT-I	INTRODUCTION							Classes: 04
Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.								
UNIT-II	REPERCUSSIONS OF DISASTERS AND HAZARDS							Classes: 05
Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem. Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.								
UNIT-III	DISASTER PRONE AREAS IN INDIA							Classes: 05
Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics								
UNIT-IV	DISASTER PREPAREDNESS AND MANAGEMENT							Classes: 05
Preparedness: Monitoring of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.								
UNIT-V	RISK ASSESSMENT & DISASTER MITIGATION							Classes: 05
Disaster Risk: Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's Participation In Risk Assessment. Strategies for Survival. Disaster Mitigation: Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.								
Text Books:								
1. R. Nishith, Singh AK, "Disaster Management in India: Perspectives, issues and strategies", New Royal book Company.								

Reference Books:

1. Sahni, PardeepEt.Al, “Disaster Mitigation Experiences and Reflections”, Prentice Hall Of India, New Delhi.
2. Goel S. L. “Disaster Administration and Management Text and Case Studies”, Deep & Deep Publication Pvt. Ltd., New Delhi.

Web References:

1. <http://nptel.ac.in/courses/105101010/downloads/Lecture37.pdf>

E-Text Books:

1. Disaster management by Vinod k. Sharma

SANSKRIT FOR TECHNICAL KNOWLEDGE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BCSB34	Audit	2	-	-	0	30	70	100
Contact Classes: 24	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 24			
OBJECTIVES:								
The course should enable the students to:								
I. Get a working knowledge in illustrious Sanskrit, the scientific language in the world								
II. Learning of Sanskrit to improve brain functioning								
III. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power								
IV. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature								
UNIT-I	INTRODUCTION							Classes: 04
Alphabets in Sanskrit, Past/Present/Future Tense								
UNIT-II	SENTENCES							Classes: 04
Simple Sentences								
UNIT-III	ROOTS							Classes: 04
Order, Introduction of roots								
UNIT-IV	SANSKRIT LITERATURE							Classes: 04
Technical information about Sanskrit Literature								
UNIT-V	TECHNICAL CONCEPTS							Classes: 08
Technical concepts of Engineering-Electrical, Mechanical, Architecture, Mathematics								
Text Books:								
1. Suresh Soni, "India's Glorious Scientific Tradition", Ocean books (P) Ltd., New Delhi..								
Reference Books:								
1. Dr.Vishwas, "Abhyaspustakam", Samskrita-Bharti Publication, New Delhi								
Web References:								
1. http://learnsanskritonline.com/								
E-Text Books:								
1. Prathama Deeksha-Vempati Kutumb Shastri, "Teach Yourself Sanskrit", Rashtriya Sanskri Sansthanam, New Delhi Publication.								

VALUE EDUCATION

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
BCSB35	Audit	2	-	-	0	30	70	100
Contact Classes: 24	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 24			
OBJECTIVES:								
The course should enable the students to:								
I. Understand value of education and self- development								
II. Imbibe good values in students								
III. Let the should know about the importance of character								
UNIT-I	VALUES AND SELF-DEVELOPMENT							Classes: 04
Values and self-development. Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgments.								
UNIT-II	CULTIVATION OF VALUES							Classes: 06
Importance of cultivation of values. Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline.								
UNIT-III	PERSONALITY AND BEHAVIOR DEVELOPMENT							Classes: 06
Personality and Behavior Development - Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labor. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature.								
UNIT-IV	CHARACTER AND COMPETENCE							Classes: 03
Character and Competence –Holy books vs Blind faith. Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women.								
UNIT-V	SELF CONTROL							Classes: 03
All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively.								
Text Books:								
1. Dr. N. Venkataiah, “Value Education”								
Reference Books:								
1. Chakroborty, S.K. “Values and Ethics for organizations Theory and practice”, Oxford University Press, New Delhi.								
Web References:								
1. http://www.best-personal-development-books.com/personal-value-development.html								
2. http://nptel.ac.in/courses/109104068/								
E-Text Books:								
1. R.P. Shukla, “Value education and human rights”.								

CONSTITUTION OF INDIA

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
BCSB36	Audit	2	-	-	0	30	70	100
Contact Classes: 24	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 24			
OBJECTIVES:								
The course should enable the students to:								
I. Understand the premises informing the twin themes of liberty and freedom from a civil right perspective.								
II. 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.								
III. Address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.								
UNIT-I	HISTORY OF MAKING OF THE INDIAN CONSTITUTION & PHILOSOPHY OF THE INDIAN CONSTITUTION						Classes: 08	
History of Making of the Indian Constitution: History, Drafting Committee, (Composition & Working) Philosophy of the Indian Constitution: Preamble, Salient Features								
UNIT-II	CONTOURS OF CONSTITUTIONAL RIGHTS & DUTIES						Classes: 04	
Fundamental Rights, Right to Equality, Right to Freedom, Right against Exploitation, Right to Freedom of Religion, Cultural and Educational Rights, Right to Constitutional Remedies, Directive Principles of State Policy, Fundamental Duties.								
UNIT-III	ORGANS OF GOVERNANCE						Classes: 04	
Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive President, Governor, Council of Minister. Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions								
UNIT-IV	LOCAL ADMINISTRATION						Classes: 04	
District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Pachayati raj: Introduction, PRI: Zila Pachayat. Elected officials and their roles, CEO Zila Pachayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy								
UNIT-V	ELECTION COMMISSION						Classes: 04	
Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.								
Text Books:								
1. Dr. S. N. Busi, "Dr. B. R. Ambedkar framing of Indian Constitution", 1 st Edition, 2015.								
2. M. P. Jain, "Indian Constitution Law", Lexis Nexis, 7 th Edition, 2014.								
Reference Books:								
1. The Constitution of India, 1950 (Bare Act), Government Publication.								
2. D.D. Basu, "Introduction to the Constitution of India", Lexis Nexis, 2015.								

Web References:
1. http://www.constitution.org/cons/india/p18.html
E-Text Books:
1. https://www.india.gov.in/my-government/constitution-india/constitution-india-full-text

PEDAGOGY STUDIES

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
BCSB37	Audit	L	T	P	C	CIA	SEE	Total
		2	-	-	0	30	70	100
Contact Classes: 24	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 24			
OBJECTIVES:								
The course should enable the students to:								
I. Review existing evidence on the review topic to inform programme design and policy making undertaken by the DFID, other agencies and researchers.								
II. Identify critical evidence gaps to guide the development.								
UNIT-I	INTRODUCTION							Classes: 04
Introduction And Methodology: Aims and rationale, Policy background, Conceptual framework and terminology. Theories of learning, Curriculum, Teacher education. Conceptual framework, Research questions. Overview of methodology and Searching.								
UNIT-II	THEMATIC OVERVIEW							Classes: 02
Thematic overview: Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries. Curriculum, Teacher education.								
UNIT-III	PEDAGOGICAL PRACTICES							Classes: 04
Evidence on the effectiveness of pedagogical practices. Methodology for the in depth stage: quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change. Strength and nature of the body of evidence for effective pedagogical practices. Pedagogic theory and pedagogical approaches. Teachers' attitudes and beliefs and Pedagogic strategies.								
UNIT-IV	PROFESSIONAL DEVELOPMENT							Classes: 04
Professional Development: alignment with classroom practices and follows up Support. Peer support. Support from the head teacher and the community. Curriculum and assessment Barriers to learning: limited resources and large class sizes.								
UNIT-V	RESEARCH GAPS							Classes: 02
Research gaps and future directions, Research design, Contexts, Pedagogy. Teacher education. Curriculum and assessment. Dissemination and research impact.								
Text Books:								
1. Ackers J, Hardman F, "Classroom interaction in Kenyan primary schools", Compare, 31 (2), 245-261.								
2. Agrawal M, "Curricular reform in schools: The importance of evaluation", Journal of Curriculum Studies, 36 (3): 361-379.								
Reference Books:								
1. AkyeampongK, "Teacher training in Ghana - does it count?" Multi-site teacher education research project (MUSTER) country report 1. London: DFID.								
2. Akyeampong K, Lussier K, Pryor J, Westbrook J, "Improving Teaching and Learning of Basic Maths and Rreading in Africa: Does teacher preparation count?" International Journal Educational Development, 33 (3): 272-282.								
3. Chavan M, "Read India: A mass scale, rapid", 'learning to read' campaign.								

Web References:

1. www.pratham.org/images/resource%20working%20paper%202.pdf.
2. Alexander RJ (2001) Culture and pedagogy: International comparisons in primary education Oxford and Boston: Blackwell

E-Text Books:

1. www.pratham.org/images/resource%20working%20paper%202.pdf.

STRESS MANAGEMENT BY YOGA

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P		C	CIA	SEE
BCSB38	Audit	2	-	-	0	30	70	100
Contact Classes: 24	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 24			
OBJECTIVES:								
The course should enable the students to:								
I. To achieve overall health of body and mind.								
II. To overcome stress.								
UNIT-I	INTRODUCTION							Classes: 08
Definitions of Eight parts of yog. (Ashtanga)								
UNIT-II	YAM AND NIYAM							Classes: 04
Yam and Niyam. Do`s and Don`t`s in life. Ahinsa, satya, astheya, bramhacharya and aparigraha								
UNIT-III	SHAUCHA							Classes: 04
Shaucha, santosh, tapa, swadhyay, ishwarpranidhan								
UNIT-IV	ASAN AND PRANAYAM							Classes: 04
Asan and Pranayam. Various yog poses and their benefits for mind & body								
UNIT-V	BREATHING TECHNIQUES							Classes: 04
Regularization of breathing techniques and its effects-Types of pranayam								
Text Books:								
1. Swami Vivekananda, “Rajayoga or conquering the Internal Nature”, Advaita Ashrama (Publication Department), Kolkata								
Reference Books:								
1. Janardan Swami, “Yogic Asanas for Group Tarining-Part-I”, Yogabhyasi Mandal, Nagpur								
Web References:								
1. https://americanyoga.school/course/anatomy-for-asana/								
2. https://www.yogaasanasonline.com/								
E-Text Books:								
1. “Stress Management By Yoga” by Todd A. Hoover, M. D. D., Ht.								

**PERSONALITY DEVELOPMENT THROUGH LIFE ENLIGHTENMENT
SKILLS**

Course Code	Category	Hours / Week			Credits	Maximum Marks			
		L	T	P		C	CIA	SEE	Total
BCSB39	Audit	2	-	-	0	30	70	100	
Contact Classes: 24	Tutorial Classes: Nil	Practical Classes: Nil			Total Classes: 24				
OBJECTIVES:									
The course should enable the students to:									
I. To learn to achieve the highest goal happily									
II. To become a person with stable mind, pleasing personality and determination									
III. To awaken wisdom in students									
UNIT-I	HOLISTIC DEVELOPMENT							Classes: 08	
Neetisatakam-Holistic development of personality, Verses- 19,20,21,22 (wisdom), Verses- 29,31,32 (pride & heroism), Verses- 26,28,63,65 (virtue),Verses- 52,53,59 (dont's),Verses- 71,73,75,78 (do's)									
UNIT-II	BHAGWAD GEETA							Classes: 04	
Approach to day to day work and duties. Shrimad BhagwadGeeta: Chapter 2-Verses 41, 47,48. Chapter 3-Verses 13, 21, 27, 35.									
UNIT-III	BHAGWAD GEETA							Classes: 04	
Shrimad BhagwadGeeta: Chapter 6-Verses 5, 13, 17, 23, 35, Chapter 18-Verses 45, 46, 48.									
UNIT-IV	BASIC KNOWLEDGE							Classes: 04	
Statements of basic knowledge. Shrimad BhagwadGeeta: Chapter2-Verses 56, 62, 68. Chapter 12 -Verses 13, 14, 15, 16,17, 18									
UNIT-V	ROLE MODEL							Classes: 04	
Personality of Role model. Shrimad BhagwadGeeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39. Chapter18 – Verses 37,38,63									
Text Books:									
1. P.Gopinath, “Bhartrihari’s Three Satakam (Niti-sringar-vairagya)”, Rashtriya Sanskrit Sansthanam, New Delhi.									
Reference Books:									
1. Swami Swarupananda, “Srimad Bhagavad Gita”,Advaita Ashram (Publication Department), Kolkata.									
Web References:									
1. http://openlearningworld.com/section_personality_development.html									
E-Text Books:									
1. http://persmin.gov.in/otraining/UNDPProject/undp_UNITS/Personality%20Dev%20N%20DLM.pdf									

VISION AND MISSION OF THE INSTITUTE

VISION

To bring forth professionally competent and socially sensitive engineers, capable of working across cultures meeting the global standards ethically.

MISSION

To provide students with an extensive and exceptional education that prepares them to excel in their profession, guided by dynamic intellectual community and be able to face the technically complex world with creative leadership qualities.

Further, be instrumental in emanating new knowledge through innovative research that emboldens entrepreneurship and economic development for the benefit of wide spread community.

M.TECH - PROGRAM OUTCOMES (POS)

Upon completion of M.Tech Computer Science and Engineering, the students will be able to:

- PO-1 Apply Analyze a problem, identify and define computing requirements, design and implement appropriate solutions
- PO-2 Solve complex heterogeneous data intensive analytical based problems of real time scenario using state of the art hardware/software tools
- PO-3 Demonstrate a degree of mastery in emerging areas of CSE/IT like IoT, AI, Data Analytics, Machine Learning, cyber security, etc.
- PO-4 Write and present a substantial technical report/document
- PO-5 Independently carry out research/investigation and development work to solve practical problems
- PO-6 Function effectively on teams to establish goals, plan tasks, meet deadlines, manage risk and produce deliverables
- PO-7 Engage in life-long learning and professional development through self-study, continuing education, professional and doctoral level studies.

OBJECTIVES OF THE DEPARTMENT

DEPARTMENT OF COMPUTER SCIENCE ENGINEERING

M.Tech (CSE) Program Educational Objectives (PEO's)

A graduate of the Computer Science and Engineering Program should:

- PEO – I:** Independently design and develop computer software systems and products based on sound theoretical principles and appropriate software development skills.
- PEO – II:** Demonstrate knowledge of technological advances through active participation in life-long learning.
- PEO – III:** Accept to take up responsibilities upon employment in the areas of teaching, research, and software development.
- PEO – IV:** Exhibit technical communication, collaboration and mentoring skills and assume roles both as team members and as team leaders in an organization.

FREQUENTLY ASKED QUESTIONS AND ANSWERS ABOUT AUTONOMY

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

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

2. Shall IARE award its own Degrees?

No. Degree will be awarded by Jawaharlal Nehru Technological University, Hyderabad with a mention of the name IARE on the Degree Certificate.

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

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

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

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

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

An autonomous college carries a prestigious image. Autonomy is actually earned out of our continued past efforts on academic performances, our capability of self- governance and the kind of quality education we offer.

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

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

7. Will the students of IARE as an Autonomous College qualify for University Medals and Prizes for academic excellence?

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

8. Can IARE have its own Convocation?

No. Since the University awards the Degree the Convocation will be that of the University, but there will be Graduation Day at IARE.

9. Can IARE give a provisional degree certificate?

Since the examinations are conducted by IARE and the results are also declared by IARE, the college sends a list of successful candidates with their final Grades and Grade Point Averages including CGPA to the University. Therefore with the prior permission of the University the college will be entitled to give the provisional certificate.

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

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

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

Presently, it is 70 % external and 30% internal. As the autonomy matures the internal assessment component shall be increased at the cost of external assessment.

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

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

13. Why Credit based Grade System?

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

14. What exactly is a Credit based Grade System?

The credit based grade system defines a much better statistical way of judging the academic performance. One Lecture Hour per week of Teaching Learning process is assigned One Credit. One hour of laboratory work is assigned half credit. Letter Grades like A, B,C,D, etc. are assigned for a Range of Marks. (e.g. 91% and above is A+, 80 to 90 % could be A etc.) in Absolute Grading System while grades are awarded by statistical analysis in relative grading system. We thus dispense with sharp numerical boundaries. Secondly, the grades are associated with defined Grade Points in the scale of 1 to 10. Weighted Average of Grade Points is also defined Grade Points are weighted by Credits and averaged over total credits in a Semester. This process is repeated for all Semesters and a CGPA defines the Final Academic Performance

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

These norms are usually defined by UGC or AICTE. Usually around 25 Credits per semester is the accepted norm.

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

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

$$SGPA = \frac{\sum_{i=1}^n (C_i G_i)}{\sum_{i=1}^n C_i}$$

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

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

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

$$CGPA = \frac{\sum_{j=1}^n (C_i S_i)}{\sum_{j=1}^n C_i}$$

Where, S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester and j represent the number of courses in which a student's is registered upto the semester. CGPA is rounded to two decimal places.

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

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

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

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

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

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

21. How fast Syllabi can be and should be changed?

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

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

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

23. What are Statutory Academic Bodies?

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

24. Who takes Decisions on Academic matters?

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

25. What is the role of Examination committee?

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

26. Is there any mechanism for Grievance Redressal?

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

27. How many attempts are permitted for obtaining a Degree?

All such matters are defined in Rules & Regulation

28. Who declares the result?

The result declaration process is also defined. After tabulation work wherein the SGPA, CGPA and final Grades are ready, the entire result is reviewed by the Moderation Committee. Any unusual

deviations or gross level discrepancies are deliberated and removed. The entire result is discussed in the Examinations and Result Committee for its approval. The result is then declared on the institute notice boards as well put on the web site and Students Corner. It is eventually sent to the University.

29. Who will keep the Student Academic Records, University or IARE?

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

30. What is our relationship with the JNT University?

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

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

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

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

Yes, presently our PG programs also enjoying autonomous status.

MALPRACTICES RULES

DISCIPLINARY ACTION FOR / IMPROPER CONDUCT IN EXAMINATIONS

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

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

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



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad - 500 043

UNDERTAKING BY STUDENT/PARENT

“To make the students attend the classes regularly from the first day of starting of classes and be aware of the College regulations, the following Undertaking Form is introduced which should be signed by both student and parent. The same should be submitted to the Dean, Academic”.

I, Mr./Ms ----- joining I Semester for the academic year 2018-2019 in Institute of Aeronautical Engineering, Hyderabad, do hereby undertake and abide by the following terms, and I will bring the ACKNOWLEDGEMENT duly signed by me and my parent and submit it to the Dean, Academic.

1. I will attend all the classes as per the timetable from the starting day of the semester specified in the institute Academic Calendar. In case, I do not turn up even after two weeks of starting of classes, I shall be ineligible to continue for the current academic year.
2. I will be regular and punctual to all the classes (theory/practical/drawing) and secure attendance of not less than 80% in every course as stipulated by Institute. I am fully aware that an attendance of less than 70% in more than three courses will make me lose one year.
3. I will compulsorily follow the dress code prescribed by the college.
4. I will conduct myself in a highly disciplined and decent manner both inside the classroom and on campus, failing which suitable action may be taken against me as per the rules and regulations of the institute.
5. I will concentrate on my studies without wasting time in the Campus/Hostel/Residence and attend all the tests to secure more than the minimum prescribed Class/Sessional Marks in each course. I will submit the assignments given in time to improve my performance.
6. I will not use Mobile Phone in the institute premises and also, I will not involve in any form of ragging inside or outside the campus. I am fully aware that using mobile phone to the institute premises is not permissible and involving in Ragging is an offence and punishable as per JNTUH/UGC rules and the law.
7. I declare that I shall not indulge in ragging, eve-teasing, smoking, consuming alcohol drug abuse or any other anti-social activity in the college premises, hostel, on educational tours, industrial visits or elsewhere.
8. I will pay tuition fees, examination fees and any other dues within the stipulated time as required by the Institution / authorities, failing which I will not be permitted to attend the classes.
9. I will not cause or involve in any sort of violence or disturbance both within and outside the college campus.
10. If I absent myself continuously for 3 days, my parents will have to meet the HOD concerned/ Principal.
11. I hereby acknowledge that I have received a copy of IARE - R18 Academic Rules and Regulations, Syllabus copy and hence, I shall abide by all the rules specified in it.

ACKNOWLEDGEMENT

I have carefully gone through the terms of the undertaking mentioned above and I understand that following these are for my/his/her own benefit and improvement. I also understand that if I/he/she fail to comply with these terms, shall be liable for suitable action as per Institute/JNTUH/AICTE/UGC rules and the law. I undertake that I/he/she will strictly follow the above terms.

Signature of Student with Date

**Signature of Parent with Date
Name & Address with Phone Number**