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

INSTITUTE VISION | MISSION | QUALITY POLICY

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.

QUALITY POLICY

Our policy is to nurture and build diligent and dedicated community of engineers providing a professional and unprejudiced environment, thus justifying the purpose of teaching and satisfying the stake holders.

A team of well qualified and experienced professionals ensure quality education with its practical application in all areas of the Institute.

DEPARTMENT VISION | MISSION

VISION

The Vision of the department is to produce competent graduates suitable for industries and organizations at global level including research and development with Social responsibility.

MISSION

To provide an open environment to foster professional and personal growth with a strong theoretical and practical background having an emphasis on hardware and software development making the graduates industry ready with social ethics.
Further the Department is to provide training and to partner with Global entities in education and research.

M.TECH - PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

The students of M. Tech Computer Science and Engineering are prepared to:

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	Apply advanced-level knowledge, techniques, skills, and modern tools in the field of computer scienceand engineering and its allied areas for solving real-time problems.

M.TECH - PROGRAM OUTCOMES (PO's)

Upon completion of M.Tech Degree, the students will be able to:

PO - 1	Independently carry out research/investigation and development work to solve practical problems
PO - 2	Write and present a substantial technical report/document
PO - 3	Demonstrate a degree of mastery in computer science and engineering emerging areas such as datascience, cyber security, and application development
PO - 4	Apply advanced-level knowledge, techniques, skills, and modern tools in the field of computer scienceand engineering and its allied areas for solving real-time problems.
PO - 5	Function effectively in multidisciplinary environments with the knowledge of frontier technologies byworking cooperatively, creatively, and responsively as a member or leader in diverse teams.
PO - 6	Engage in life-long learning for continuing education in doctoral-level studies and professionaldevelopment.

CONTENTS

"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) A student will be eligible for the award of M.Tech degree on securing a minimum of 5.0/10.0 CGPA.
b) 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**
Type of Assessment	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
90% and above (≥ 90% , ≤ 100%)	10	S (Superior)
Below 90% but not less than 80% (≥80% , <90%)	9	A+ (Excellent)
Below 80% but not less than 70% (≥70% , <80%)	8	A (Very Good)
Below 70% but not less than 60% (≥60% , <70%)	7	B+ (Good)
Below 60% but not less than 50% (≥ 50% , <60%)	6	B (Average)
Below 50% (< 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,

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

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.

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

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

$$Thus,\ CGPA = \frac{20x6.9 + 22x7.8 + 25x5.6 + 26x6.0}{93} = 6.51$$

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 ≥ 7.5	CGPA ≥ 6.5 and < 7.5	CGPA ≥ 5.5 and < 6.5	CGPA ≥ 5.0 and < 5.5	CGPA < 5.0
First Class with Distinction	**First Class**	**Second Class**	**Pass Class**	**Fail**

a) 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.

b) 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:

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

b) 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 AERONAUTICALENGINEERING

(AUTONOMOUS)

COMPUTER SCIENCE AND ENGINEERING

COURSE CATALOG – R18

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 COREELECTIVE – I

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

PROFESSIONAL COREELECTIVE – 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 – III SEMESTERS)

MATHEMATICAL FOUNDATIONS OF COMPUTER SCIENCE

I Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BCSB01	Core	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I.COURSE OVERVIEW:

This course covers the concepts of Probability theory, Sampling Techniques, Statistical Inference, Graph Theory and various applications of Mathematical and statistical concepts in different branches of Computer Science. This course helps the students in gaining the knowledge and apply the mathematical logics to many modern techniques of information technology like machine learning, programming language design etc.

II.COURSE OBJECTIVES:

The students will try to learn:

I. 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. The mathematical logics to many modern techniques in information technology like machine learning, programming language design, and concurrency.
III. The various sampling and classification problems.

III.COURSE OUTCOMES:

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

CO 1	**Make use of** probability theory and distributions for depicting the expected outcome of possible values in the data generating process/experiment	Apply
CO 2	**Build** statistical models based on random sampling data for getting unbiased estimates in performing data analysis.	Understand
CO 3	**Examine** regression and multivariate statistical models for solving classification and curve fitting problems in data analysis.	Analyze
CO 4	**Identify** appropriate techniques of graphs and combinatorial theory for finding solutions to shortest path and enumeration problems.	Remember
CO 5	**Choose** appropriate mathematical and statistical techniques for solving applications in emerging areas of Information Technology	Apply

IV.SYLLABUS:

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		
		L	T	P	C	CIA	SEE	Total
BCSB02	Core	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

The course covers the concepts of data structures and techniques for analyzing the performance and complexity of the algorithms on data structures and their applications using mathematical tools like asymptotic notations and also covers concepts like dictionaries, hash tables, trees and graphs, search trees.

II.OBJECTIVES:

The students will try to learn:

I. The data structures and techniques of algorithm analysis.
II. The problems using different data structures and compare their performance and tradeoffs.
III. The implementation of linked data structures such as linked lists and binary trees.
IV. The graph algorithms such as shortest path and minimum spanning tree.
V. The Advanced data structures such as balanced search trees, hash tables, priority queues

III.COURSE OUTCOMES:

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

CO 1	**Analyze** the performance and complexity of the algorithms on data structures and their applications using mathematical tools like asymptotic notations.	Analyze
CO 2	**Construct** complex data structures for processing, organizing, and accessing information.	Apply
CO 3	**Design** and Implement non-linear data structures using trees and graphs.	Create
CO 4	**Organize** data in the form of trees and graphs for data in the form of trees and graphs.	Create
CO 5	**Model** the real-world data using red black and splay trees comparison of text, patterns, and querying.	Create

IV.SYLLABUS.

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

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.

Text Books:

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:

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 tothe 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:

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://comsciers.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		
		L	T	P	C	CIA	SEE	Total
BCSB03	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I.COURSE OVERVIEW:

The course covers the concepts of various machine learning algorithms and techniques with a modern outlook focusing on recent advances using modelling techniques, supervised and unsupervised learning.

II.OBJECTIVES:

The students will try to learn:

I. The Design and analyze various machine learning algorithms and techniques with a modern outlook focusing on recent advances.
II. The Explore supervised and unsupervised learning paradigms of machine learning.
III. The Explore Deep learning technique and various feature extraction strategies.

III.COURSE OUTCOMES:

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

CO 1	**Make use of** the basic methods of supervised learning with linear models and binary classification include in multiclass outputs	Apply
CO 2	**Summarize d**ecision trees, support vector machines in optimizing basic methods of regression.	Understand
CO 3	**Sketch** the key issues and applications in clustering and dimensionality reduction.	Apply
CO 4	**Experiment** matrix factorization used to process reduction in unsupervised learning	Understand
CO 5	**Correlate** the modeling techniques and scalable machine learning in various time series data and graphical models.	Apply

IV.SYLLABUS:

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:

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		
		L	T	P	C	CIA	SEE	Total
BCSB04	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I.COURSE OVERVIEW:

In this course students equips with a solid foundation in understanding the architecture, performance analysis, routing protocols, and security considerations of these networks. By exploring simulation techniques, analyzing performance metrics, and identifying potential attacks.

II.OBJECTIVES:

The students will try to learn:

I. The Architect sensor networks for various application setups.
II. The Devise appropriate data dissemination protocols and model links cost.
III. The Understandings of the fundamental concepts of wireless sensor networks and have a basic knowledge of the various protocols at various layers.
IV. The performance of sensor networks and identify bottlenecks.

III.COURSE OUTCOMES:

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

CO 1	**Summarize** a wireless sensor network architectures and its related hardware platforms.	Understand
CO 2	**Demonstrate** the network simulator-3 for simulation of wireless sensor networks.	Apply
CO 3	**Analyze** the performance of Medium Access Control protocols in terms of power consumption, fairness, channel utilization and control packet overhead.	Analyze
CO 4	**Identify** possible attacks and their counter measures wireless sensor networks.	Apply
CO 5	**Categorize** various routing protocols for improving the performance of the wireless sensor networks.	Analyze

IV. SYLLABUS:

UNIT-I	INTRODUCTION TO WIRELESS SENSOR NETWORKING	Classes: 09

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.

UNIT-II	INTRODUCTION TO NS-3	Classes: 09

Introduction to Network Simulator 3 (ns-3), Description of the ns-3 core module and simulation.

UNIT-III	MEDIUM ACCESS CONTROL PROTOCOL DESIGN	Classes: 09
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)		
UNIT-IV	**SECURITY**	**Classes: 09**
Possible attacks, countermeasures, SPINS, Static and dynamic key distribution.		
UNIT-V	**ROUTING PROTOCOLS**	**Classes: 09**
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.		

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. AndreawsF. Molisch, "Wireless Communications", Wiley India, 2nd Edition, 2006.

Web References:

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

E-Text Books:

1. 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		
		L	T	P	C	CIA	SEE	Total
BCSB05	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I.COURSE OVERVIEW:

The course covers the concepts of Artificial Intelligence (AI) with fuzzy logic, reasoning and learning techniques and methodologies for developing systems that demonstrate intelligent behavior including dealing with uncertainty, learning from experience and following problem solving strategies found in nature.

II.OBJECTIVES:

The students will try to learn:

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.

II. 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.

III.COURSE OUTCOMES:

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

CO 1	**Explain** a wireless sensor network for given sensor data using microcontroller, transceiver, middleware and operating system.	Knowledge
CO 2	**Categorize** the performance of schedule based and random Medium Access Control protocols for power consumption, fairness, channel utilization and control packet overhead.	Analyze
CO 3	**Construct** the performance of Geographic routing protocols for power consumption, scalability and latency parameters.	Apply
CO 4	**Evaluate** the performance of transport control protocols for congestion detection and avoidance, reliability and control packet overhead parameters	Evaluate
CO 5	**Distinguish** the design issues and different categories of MAC protocols	Analyze

IV. SYLLABUS:

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. Heuristic search methods: best-first search, admissible evaluation functions, hill climbing search. Optimisation and search such as stochastic annealing and genetic algorithm.		
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? .
2. 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/.
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		
		L	T	P	C	CIA	SEE	Total
BCSB06	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

The course offers comprehensive coverage of key topics including R programming, SQL, NoSQL, and data analysis. It equips students with the necessary skills to document and transfer their research findings while effectively communicating them through visualization techniques.

II.OBJECTIVES:

The students will try to learn:

I. The fundamental knowledge on basics of data science and R programming.
II. The programs in R language for understanding and visualization of data using statistical functions and plots.
III. To apply hypotheses and data into actionable predictions.
IV. The a range of machine learning algorithms along with their strengths and weaknesses.
V. The document and transfer the results and effectively communicate the findings using visualization techniques

III.COURSE OUTCOMES:

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

CO 1	**Make use of** various data description functions in for exhibiting various stages of the data science process.	Understand
CO 2	**Identify** interfacing packages for handling SQL and NoSQL databases for performing data analysis	Remember
CO 3	**Evaluate** models using clustering and classification techniques.	Evaluate
CO 4	**Solve** various real-time problems on various hypothesis conditions by using artificial neural networks.	Apply
CO 5	**Illustrate** delivering results through documentation and visualization techniques	Understand

IV. SYLLABUS:

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:

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:

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:

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.

DISTRIBUTED SYSTEMS

I Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BCSB07	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I.COURSE OVERVIEW:

The course provides a solid foundation in the fundamental concepts of distributed database design and distributed query optimization. Additionally, the course covers parallel query processing and optimization techniques, equipping students with the knowledge to effectively handle large-scale data processing in distributed environments.

II.OBJECTIVES:

The students will try to learn:

I. The fundamental concepts and issues of managing large volume of shared data in a parallel and distributed environment

II. Insight into related research problems

III.COURSE OUTCOMES:

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

CO 1	**Summarize** various issues raised in usage of distributed database in location transparency application.	Evaluate
CO 2	**Outline** the design of a distributed databases in semantic data control and issues raised in query processing.	Analyze
CO 3	**Identify** various factors used in distributed query optimization in transaction managements & concurrency control.	Apply
CO 4	**Summarize** different types of failures, reliability issues and recovery protocols to improve performance of system.	Evaluate
CO 5	**Apply** parallel distributed systems in applications of internet and peer to peer network applications.	Apply

IV. SYLLABUS:

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://mylovelibrabry.com/emylibraryus/free.php?asin=1466583282.

ADVANCE WIRELESS AND MOBILE NETWORKS

I Semester :CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BCSB08	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I.COURSE OVERVIEW:

This course offers a comprehensive understanding of wireless networking, focusing on multiple access techniques for wireless communication. Students will learn about the principles and protocols of wireless LAN (Local Area Network), gaining insights into its practical applications and challenges. Additionally, the course covers the concepts of information extraction and machine translation.

II.OBJECTIVES:

The students will try to learn:

I. The examples of wireless communication systems, paging systems, cordless telephone systems.
II. The different generations of mobile networks, WAN and PAN.
III. The concepts of basic cellular system, frequency reuse, channel assignment strategies, hand off strategies.
IV. The mobile communication protocols.
V. The WAN industry, wireless home networking IEEE 802.11 the physical layer

III.COURSE OUTCOMES:

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

CO 1	**Outline** various types of compression used in wireless networking with an illustration.	Evaluate
CO 2	**Make use of** different types of generations of mobile networks in mobile wireless communication systems with a specific application.	Analyze
CO 3	**Choose** an appropriate wireless access protocol in creation of mobile IP with an illustration.	Remember
CO 4	**Select** an appropriate wireless LAN technology in applications of web TVs and gaming devices with a wireless router.	Evaluate
CO 5	**Utilize** wireless WAN in information extraction and machine translation used in short messaging services in GPRS mobile application protocol.	Apply

IV. SYLLABUS:

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

Wireless WAN: Mechanism to support at mobile environment, communication in the infrastructure , IIS95 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.

Text Books:

1. Theodore, S. Rappaport, “Wireless Communications, Principles, Practice”, PHI, 2nd Edition, 2002.
2. William Stallings, “Wireless Communication and Networking”, PHI, 2nd Edition, 2003.

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. Andreaws F. Molisch, “Wireless Communications”, Wiley India, 2nd Edition, 2006.

Web References:

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

ADVANCED DATA STRUCTURES LABORATORY

I Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BCSB09	Core	0	0	4	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 36				Total Classes:36		

I.COURSE OVERVIEW:

It covers the design and analysis of fundamental data structures and engages learners to use advanced data structures as tools to algorithmically design efficient computer programs that will cope with the complexity of actual applications. This course is essential for image viewer software, music players, and multiplayer game using data structures.

II. OBJECTIVES:

The students will try to learn:

I. How to Implement linear and nonlinear data structures.
II. How to Analyze various algorithms based on their time complexity.
III. Appropriate data structure and algorithm design method for a specific application.
IV. The suitable data structure to solve various computing problems.

III. COURSE OUTCOMES:

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

CO 1	**Design and analyze** a divide and conquer algorithm using data structures and ADT/libraries.	Analyze
CO 2	**Use** stack operations for evaluating mathematical expressions.	Understand
CO 3	**Demonstrate** collision resolution techniques with hashing technique.	Understand
CO 4	**Implement** set operations using union operations.	Apply
CO 5	**Use** tree traversal algorithms for solving graph applications.	Understand

IV. SYLLABUS

LIST OF EXPERIMENTS

Week-1	**DIVIDE AND CONQUER - 1**

a. 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.
b. 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**

a. 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.
b. 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

a. 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.
b. Design and implement Queue and its operations using Arrays

Week-4	HASHING TECHNIQUES

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<=n and k takes values from [1 to m], m>n. To handle the collisions use the following collision resolution techniques

a. Linear probing
b. Quadratic probing
c. Random probing
d. Double hashing/rehashing

Week-5	APPLICATIONS OF STACK

Write C programs for the following:

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

Week-6	BINARY SEARCH TREE

Write a program for Binary Search Tree to implement following operations:

a. Insertion
b. Deletion
    i. Delete node with only child
    ii. Delete node with both children
c. Finding an element
d. Finding Min element
e. Finding Max element
f. Left child of the given node
g. Right child of the given node

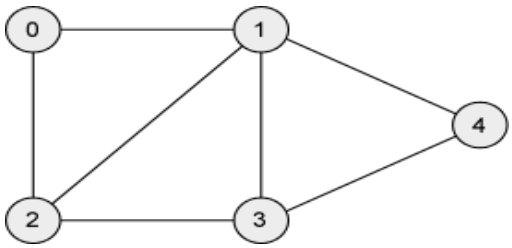
Finding the number of nodes, leaves nodes, full nodes, ancestors, descendants.

Week-7	DISJOINT SET OPERATIONS

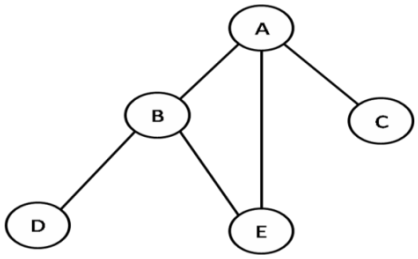
a. Write a program to implement Make_Set, Find_Set and Union functions for Disjoint Set Data Structure for a given undirected graph G(V,E) using the linked list representation with simple implementation of Union operation.
b. Write a program to implement Make_Set, Find_Set and Union functions for Disjoint 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

a. Print all the nodes reachable from a given starting node in a digraph using BFS method.

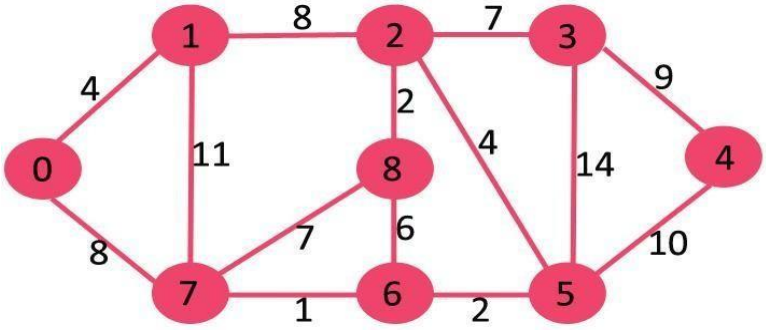


b. Check whether a given graph is connected or not using DFS method.



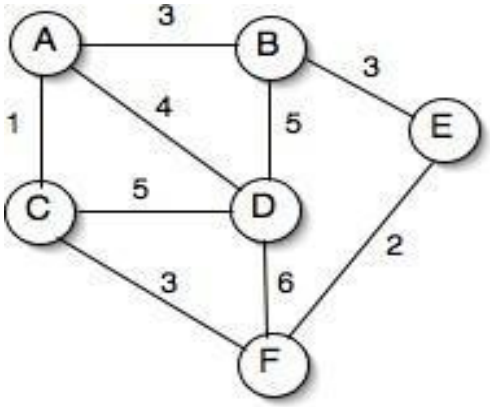
Week-9	SHORTEST PATHS ALGORITHM

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



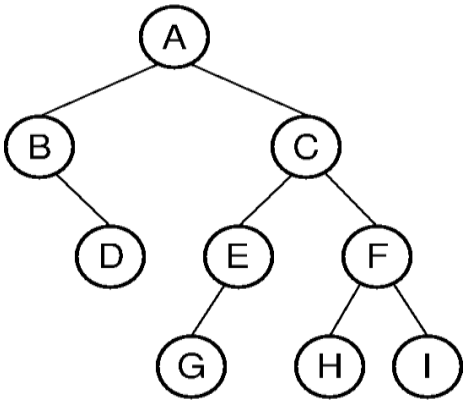
Week-10	MINIMUM COST SPANNING TREE

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



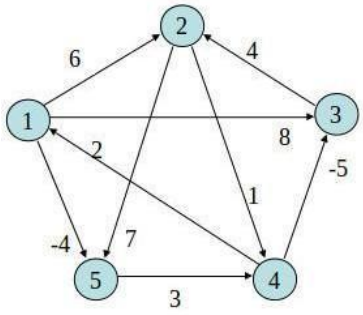
Week-11	TREE TRAVESRSALS

Perform various tree traversal algorithms for a given tree.



Week-12	ALL PAIRS SHORTEST PATHS

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, 3rdEdition, 2014.
5. Horowitz Ellis, Satraj Sahni, Susan Anderson, Freed, "Fundamentals of Data Structures in C", W. H. Freeman Company, 2ndEdition, 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		
		L	T	P	C	CIA	SEE	Total
BCSB10	Core	0	0	4	2	30	70	100
Contact Classes: Nil	Total Tutorials: Nil	Total Practical Classes: 36				Total Classes: 36		

I. COURSE OVERVIEW:

The data science laboratory provides hands-on experience with various concepts and techniques in the field of data science. Students will learn to utilize R as a powerful calculator application, enabling them to perform calculations, data manipulations, and statistical analyses efficiently. The laboratory also focuses on reading and writing different types of datasets, allowing students to work with diverse data sources and formats.

II. COURSE OBJECTIVES:

The students will try to learn:

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.

III. COURSE OUTCOMES:

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

CO 1	**Make use of** the container Data types for displaying the functional values.	Remember
CO 2	**Demonstrate** the reading and writing operations from the web, and disk.	Understand
CO 3	**Illustrate** the nature and relationships of data with effective visualizations for exploring the data.	Analyze
CO 4	**Analyze** the linear data models in data exploration.	Analyze
CO 5	**Develop** the classification and clustering models to label the data.	Create

IV. SYLLABUS:

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**
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**
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).	
Week-7	**MULTIPLE REGRESSION MODEL**
Apply multiple regressions, if data have a continuous independent variable. Apply on above dataset.	
Week-8	**REGRESSION MODEL FOR PREDICTION**
Apply regression Model techniques to predict the data on above dataset.	
Week-9	**CLASSIFICATION MODEL**
a. Install relevant package for classification. b. Choose classifier for classification problem. c. Evaluate the performance of classifier.	
Week-10	**CLUSTERING MODEL**
a. Clustering algorithms for unsupervised classification. b. Plot the cluster data using R visualizations.	

Reference Books:

Yanchang Zhao, "R and Data Mining: Examples and Case Studies", Elsevier, 1st Edition, 2012.

Web References:

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		
		L	T	P	C	CIA	SEE	Total
BCSB11	Core	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I.COURSE OVERVIEW:

The course offers a comprehensive understanding of web security concepts, equipping students with the knowledge and skills to combat cybercrimes effectively. Students will learn to identify and analyze key components of cyber security network architecture, enabling them to design robust and secure systems.

II.OBJECTIVES:

The students will try to learn:

I. The core information assurance principles.
II. The key components of cyber security network architecture.
III. How to Apply cyber security architecture principles.
IV. The risk management processes and practices.

III.COURSE OUTCOMES:

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

CO 1	**Summarize** web security concepts to overcome cybercrimes.	Understand
CO 2	**Make use of** cryptography techniques for protecting systems from unauthorized access and information security.	Remember
CO 3	**Demonstrate** web hacking and cybercrime investigation tools for detecting and recovering in the web domain.	Apply
CO 4	**Identify** digital forensics procedures and policies to manage organizational security risks.	Understand
CO 5	**Recognize** database security concepts and cyber laws for data protection in digital space.	Create

IV. SYLLABUS:

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

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.

Text Books:

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.

Reference Books:

1. Nelson Phillips, EnfingerSteuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.
2. Kevin Mandia, Chris Prosise, 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.

Web References:

1. http://www.mail.nih.gov/user/faq/tlsssl.htm
2. http://www.openssl.org/
3. http://www.ntsecurity.net/

E-Text Books:

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		
		L	T	P	C	CIA	SEE	Total
BCSB12	Core	3	-	-	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

The course empowers students to leverage soft computing techniques for decision-making systems. They will learn to apply methods such as fuzzy logic, genetic algorithms, and neural networks to solve complex problems and make informed decisions. By utilizing these flexible and robust approaches, students will gain the ability to handle real-world complexities where precise mathematical modeling is challenging or impractical.

II. OBJECTIVES:

The students will try to learn:

I. Different soft computing concepts.
II. The supervised learning and unsupervised learning networks.
III. The ideas of neural networks, fuzzy logic.

III. COURSE OUTCOMES:

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

CO 1	**Recognize** the importance of knowledge representation and processing in intelligent system.	Understand
CO 2	**Describe** the characteristics and constitutes of soft computing for decision making systems.	Understand
CO 3	**Demonstrate** the models of artificial neural systems or classification problems.	Apply
CO 4	**Apply** the learning rules and its working principle for computer vision and image processing applications.	Understand
CO 5	**Compare** he importance of auto and hetero associative memories for distinct cases of neural network systems.	Create

IV. SYLLABUS

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

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		

I. COURSE OVERVIEW:

This course provides students with the necessary skills to utilize appropriate data preparation techniques, enabling them to transform raw data into a standardized format. Students will learn the process of parsing and performing transformations on data, ensuring its consistency and compatibility for further analysis.

II. OBJECTIVES:

The students will try to learn:

I. The data for analysis and develop meaningful Data Visualizations

III. COURSE OUTCOMES:

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

CO 1	**Select** appropriate data preparation techniques to transform raw data into a standard format.	Understand
CO 2	**Apply** data cleaning methods on real-time data for usage of data in analytics.	Apply
CO 3	**Make use of** statistical methods for performing exploratory analysis.	Remember
CO 4	**Infer** complex data models with respect to time series and geographical data mining.	Create
CO 5	**Identify** the effective visualization techniques for data communication.	Remember

IV. SYLLABUS

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		

I. COURSE OVERVIEW:

The course allows student to know software vulnerabilities and security analysis in preventing unauthorized access and modifications and obtain the ability to manage and troubleshoot a network running multiple services and also Defend web and mobile applications against attackers, software containing minimum vulnerabilities and flaws.

II. OBJECTIVES:

The students will try to learn:

I. How to fix software flaws and bugs in various software.
II. How 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. The Techniques for successfully implementing and supporting network services on an enterprise scale and heterogeneous systems environment.
IV. The Methodologies and tools to design and develop secure software containing minimum vulnerabilities and flaws.

III. COURSE OUTCOMES:

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

CO 1	**Make use of** software Vulnerabilities and Security analysis in preventing unauthorized access and modifications.	Create
CO 2	**Design** and Develop a multitier solution for problem solving in an enterprise application development.	Create
CO 3	**Develop** directory based server infrastructure in a heterogeneous system.	Create
CO 4	**Model** the ability to manage and troubleshoot a network running multiple services.	Understand
CO 5	**Demonstrate** an application to defend web and mobile application against attackers.	Understand

IV. SYLLABUS

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		
		L	T	P	C	CIA	SEE	Total
BCSB15	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I .COURSE OVERVIEW:

In this course on computer vision, students gain comprehensive knowledge and practical skills in various aspects of image analysis and pattern recognition. The course focuses on applying computer vision techniques to medical imaging, specifically in CT-Scan and MRI analysis. Students learn how to process and analyze medical images to extract meaningful information and assist in diagnosis.

II. OBJECTIVES:

The students will try to learn:

I. Both the theoretical and practical aspects of computing with images.
II. The foundation of image formation, measurement, and analysis.
III. The geometric relationships between 2D images and the 3D world.
IV. The principles of state-of-the-art deep neural networks.

III. COURSE OUTCOMES:

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

CO 1	**Demonstrate** an application of computer vision in CT-Scan and MRI analysis.	Understand
CO 2	**Develop** an edge detection technique used for image segmentation.	Create
CO 3	**Develop** a segmentation technique used for morphological filtering application.	Create
CO 4	**Apply** future extraction and analysis in data preprocessing.	Apply
CO 5	**Make use of** different types of pattern analysis techniques in dimensionality reduction.	Create

IV. SYLLABUS

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:		
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		
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HUMAN AND COMPUTER INTERACTION

II Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BCSB16	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil			Total Classes: 45			

I .COURSE OVERVIEW:

This course is concerned with the design, evaluation, and implementation of interactive computing systems for human use and with the study of major phenomena surrounding them. The knowledge of this subject is to practice system design, selection, installation, evaluation, and use along with the knowledge of human characteristics, interaction styles, use context, task characteristics, and design processes.

II. OBJECTIVES:

The students will try to learn:

I. The foundations of Human Computer Interaction
II. The design technologies for individuals and persons with disabilities
III. Aware of mobile Human Computer interaction.
IV. The guidelines for user interface.

III. COURSE OUTCOMES:

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

CO 1	**Apply** different HCI paradigms and design principles to create user-centered and engaging interfaces.	Apply
CO 2	**Make use of** interaction designs to create interventions in complex situations using software, and physical devices	Apply
CO 3	**Choose** various cognitive models used to represent user tasks and skills in the context of interactive systems.	Apply
CO 4	**Interpret** the Mobile Ecosystem for understanding its various components and stakeholders	Understand
CO 5	**Utilize** the key concepts and principles of contextual tools used in the design of web interfaces.	Apply

IV. SYLLABUS

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:

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

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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.

GPU COMPUTING

II Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BCSB17	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

This course provides students with comprehensive knowledge of GPUs, covering various aspects including memory hierarchy, synchronization across CPU and GPU, and debugging GPU programs. Students will gain a deep understanding of the inner workings of GPUs and how to effectively utilize their capabilities.

II. OBJECTIVES:

The students will try to learn:

The parallel programming with Graphics Processing Units (GPUs).

III. COURSE OUTCOMES:

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

CO 1	**Make use of** GPU programming for running Highly Parallel general purpose competitions in 2-Dimensional and 3-Dimensional thread mapping.	Understand
CO 2	**Identify** different types of memories used in GPUs for performance evaluation for a specific application.	Apply
CO 3	**Develop** a GPU program for usage of concurrent data structures applied in different types of functions.	Evaluate
CO 4	**Make use of** stream processing techniques used in GPUs in applications of weather modeling & medical applications.	Apply
CO 5	**Develop** a GPU program in application of image processing, graph algorithms & deep learning.	Understand

IV. SYLLABUS

UNIT-I	**INTRODUCTION**	**Classes: 13**

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

UNIT-II	**MEMORY**	**Classes: 08**

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

UNIT-III	SYNCHRONIZATION	Classes: 08
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 **Functions**: Device functions, Host functions, Kernels functions, Using libraries (such as Thrust), and developing libraries.		
UNIT-IV	**SUPPORT AND STREAMS**	**Classes: 09**
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.		
UNIT-V	**CASE STUDIES**	**Classes: 5**
Image Processing, Graph algorithms, Simulations, Deep Learning		

Text Books:

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	Total
BCSB18	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

This course provides students with comprehensive knowledge on how to combat cybercrime through digital forensics. Students will gain expertise in various areas, including cybercrime scene analysis, evidence management and presentation, computer forensics, network forensics, mobile forensics, and legal aspects of digital forensics.

II. OBJECTIVES:

The students will try to learn:

I. How to Combines both the technical expertise and the knowledge required to investigate, detect and prevent digital crimes.
II. The Knowledge on digital forensics legislations, digital crime, forensics processes and procedures, data acquisition and validation, e-discovery tools
III. The E-evidence collection and preservation, investigating operating systems and file systems, network forensics, art of steganography and mobile device forensics

III. COURSE OUTCOMES:

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

CO 1	**Organize** digital investigations that conform to accepted professional standards and are based on the investigative process: identification, preservation, examination, analysis, and reporting.	Understand
CO 2	**Understand** the Computer forensics and digital detective and various processes, policies and procedures.	Apply
CO 3	**Identify** E-discovery, guidelines and standards, E-evidence, tools and environment.	Evaluate
CO 4	**Experiment** Email and web forensics and network forensics**.**	Apply
CO 5	**Relate** work collaboratively with clients, management, and/or law enforcement to advance digital investigations or protect the security of digital resources.	Understand

IV. SYLLABUS

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

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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.

SOFT COMPUTING LABORATORY

II Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BCSB19	Core	0	0	4	2	30	70	100
Contact Classes: Nil	Total Tutorials: Nil	Total Practical Classes: 36				Total Classes: 36		

I. COURSE OVERVIEW:

In this laboratory sessions, students will engage in hands-on exercises, programming assignments, and data analysis tasks. By actively working with these soft computing techniques, students will develop a practical understanding of their applications and gain valuable skills for solving complex problems in various domains.

II. OBJECTIVES:

The students will try to learn:

I. The Fuzzy concepts
II. Neural networks with back propagation and without preparation
III. The operators of genetic algorithms Practice on crisp partitions

III. COURSE OUTCOMES:

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

CO 1	**Develop** an ANN model with or without backpropagation.	Create
CO 2	**Show** fuzzy relations on fuzzy relations to handle uncertainty and solve engineering problems.	Remember
CO 3	**Apply** genetic algorithms to optimization problems	Apply
CO 4	**Use the** ANOVA model for analyzing the covariance of data.	Create
CO 5	**Solve** real problems using a soft computing approach.	Create

IV. SYLLABUS

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 NEAURAL 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.pdfhttp://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		
		L	T	P	C	CIA	SEE	Total
BCSB20	Core	0	0	4	2	30	70	100
Contact Classes: Nil	Total Tutorials: Nil	Total Practical Classes: 36				Total Classes: 36		

I. COURSE OVERVIEW:

In this laboratory students will develop a solid understanding of data pre-processing, cluster analysis, genetic algorithms, data transformation, and hierarchical clustering. These skills will enable them to effectively prepare and analyze data, derive valuable insights, and make data-driven decisions in various domains.

II. OBJECTIVES

The students will try to learn:

I. The pre-processing method for multi-dimensional data
II. The Practice on data cleaning mechanisms
III. The various data exploratory analysis
IV. The visualizations for clusters or partitions

COURSE OUTCOMES:

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

CO 1	**Apply** pre-processing techniques for cleaning data.	Apply
CO 2	**Develop** a cluster models for categorizing data a cluster models for categorizing data	Create
CO 3	**Apply** genetic algorithms to optimization problems	Apply
CO 4	**Implement** data transformation techniques on spatial, time series and numerical data	Apply
CO 5	**Choose** clustering algorithm for implementing hierarchical clustering	Remember

IV. SYLLABUS

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 mechanism, 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

RESEARCH METHODOLOGY AND IPR

III Semester: CSE, ES, CAD/CAM, AE, ST, PEED

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BCSB31	Core	2	-	-	2	30	70	100
Contact Classes: 30	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 30		

I. COURSE OVERVIEW:

This course imparts research methodology and philosophy of intellectual property rights, including basic concepts employed in quantitative and qualitative research methods, Patents, Copyrights, and Trademarks. It provides the research framework, research methodology research design, and formulation hypothesis, sampling techniques, data analysis and report writing. It implies on research skills and intellectual property rights to encourage new creations, including technology, artwork, and inventions, that might increase economic growth.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The research problem formulation.
II. The research related information.
III. The research ethics.
IV. How Today's world is controlled by Computer, Information Technology; but tomorrow world will be ruled by ideas, concept, and creativity.

III. COURSE OUTCOMES:

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

CO1	**Interpret** the technique of determining a research problem for a crucial part of the research study.	**Remember**
CO2	**Examine** the way of methods for avoiding plagiarism in research.	**Apply**
CO3	**Apply** the feasibility and practicality of research methodology for a proposed project.	**Apply**
CO4	**Make use of** the legal procedure and document for claiming patent of invention.	**Understand**
CO5	**Identify** different types of intellectual properties, the right of ownership, scope of protection to create and extract value from IP.	**Understand**
CO6	**Defend** the intellectual property rights throughout the world with the involvement of world intellectual property organization	**Apply**

IV. SYLLABUS:

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/		

MOBILE APPLICATIONS AND SERVICES

III Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BCSB22	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

In this course on mobile application and services, students learn a range of concepts, skills, and practical knowledge related to developing mobile applications and leveraging mobile services. This course also include mobile computing -more on UIs, network and the web: state machine, platforms and additional issues, security and hacking.

II. OBJECTIVES:

The students will try to learn:

I. 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. The emerging technologies and tools used to design and implement.
III. The techniques for deploying and testing mobile applications, and for enhancing their performance and scalability account of communications via network by wireless connectivity.
IV. How to prepare mobile application for multimedia and learn about additional issue like security, hacking etc..

III. COURSE OUTCOMES:

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

CO 1	**Select** suitable software tools and APIs for the development of a particular mobile application.	Remember
CO 2	**Use** Intents to dial a number or to send SMS Broadcast Receivers.	Apply
CO 3	**Create** a file and reading data from files using Persistent Storage.	Create
CO 4	**Use** a content provider for inserting, deleting, retrieving and updating data using SQLite.	Apply
CO 5	**Choose** an appropriate application development to design, write and test small interactive programs for mobile devices.	Remember

IV. SYLLABUS

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

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.

COMPILER FOR HPC

III Semester: CSE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BCSB23	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

The course provides students to possess a strong foundation in high-performance computing, including proficiency in programming languages, optimization techniques, and an understanding of different architectures. This equips them with the skills needed to develop and optimize software for demanding computational tasks and harness the full potential of high-performance systems.

II. OBJECTIVES:

The students will try to learn:

I. The objective of this course is to introduce structure of compilers and high performance
II. The Compiler design for students.
III. The Concepts of cache coherence and parallel loops in compilers are included

III. COURSE OUTCOMES:

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

CO 1	**Outline** various languages used in high performance systems with an illustration.	Create
CO 2	**Demonstrate** Usage of data dependence in parallel loops and Scalar analysis Using FUD Chains.	Apply
CO 3	**Summarize a** different types of loop transformation techniques used in loop restructuring and optimizing.	Evaluate
CO 4	**Make use of** different types of Loops used in Concurrency and Vector Analysis in High Performance Computing Systems.	Apply
CO 5	**Identify** different types of message passing and scalable memory sharing machines used in compilers for High Performance Computing.	Remember

IV. SYLLABUS

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

Data Dependence: Data Dependence in Loops, Data Dependence in Conditionals, Data Dependence in Parallel Loops, Program Dependence Graph.

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.

UNIT-III	**LOOP RESTRUCTURING AND OPTIMIZING FOR LOCALITY**	**Classes: 09**

Array Region Analysis, Pointer Analysis, I/O Dependence, Procedure Calls,Inter-procedural Analysis.
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.
Optimizing for Locality: Single Reference to Each Array, Multiple References, General Tiling, Fission and Fusion for Locality.

UNIT-IV	**CONCURRENCY ANALYSIS AND VECTOR ANALYSIS**	**Classes: 09**

Concurrency Analysis: Concurrency from Sequential Loops, Concurrency from Parallel Loops, Nested Loops, Round off Error, Exceptions and Debuggers.
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

UNIT-V	**MESSAGE-PASSING MACHINES AND SCALABLE SHARED-MEMORY MACHINES**	**Classes: 09**

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.
Scalable Shared-Memory Machines: Global Cache Coherence, Local Cache Coherence, Latency Tolerant Machines.

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		
		L	T	P	C	CIA	SEE	Total
BCSB24	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Total Tutorials: Nil	Total Practical Classes: Nil			Total Classes: 45			

I. COURSE OVERVIEW:

The course provide students to possess a strong foundation in optimization theory, algorithms, and their applications in engineering. They develop critical thinking skills to identify optimization opportunities in various engineering domains and formulate effective mathematical models to address them. This equips them with the knowledge and tools necessary to optimize processes, improve system performance, and make data-driven decisions in engineering applications.

II. OBJECTIVES:

The students will try to learn:

I. The objective of this course is to provide insight to the mathematical formulation of real world problems.

II. How to optimize these mathematical problems using nature based algorithms. And the solution is useful specially for NP-Hard problems

III. COURSE OUTCOMES:

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

CO 1	**Make** use of recursive algorithm design technique in appropriate contexts.	Remember
CO 2	**Calculate** and implement linked lists, stacks and queues in Python	Apply
CO 3	**Choose** linear programming using Approximation and Randomized algorithm	Evaluate
CO 4	**Design** flow-networks and matrix computation using Strassen's algorithm	Apply
CO 5	**Describe** the variable metric methods for constrained optimization**.**	understand

IV. SYLLABUS

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:

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:

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.

BUSINESS ANALYTICS

Open Electives

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		

I. COURSE OVERVIEW:

This course covers the fundamentals of data analysis, such as data gathering or data mining .this course covers concepts of data analysis, regression analysis, organization structures, forecasting techniques and decision analysis. The *data analytics* tools help in the data mining processes from loading to transformation, aggregation, automated parameter, and process optimization.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The role of business analytics within an organization.
II. The relationships between the underlying business processes of an organization.
III. To gain an understanding of how managers use business analytics to formulate

III COURSE OUTCOMES:

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

CO1	Analyze data using statistical and business analytics technology	Analyze
CO2	Solve business problems and to support managerial decision making	Apply
CO3	Choose business decision Strategies with the without outcome probabilities	Apply
CO4	Perform statistical analysis on variety of data	Apply
CO5	Experiment Data using Business Analytics Technology	Apply

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	FORCASTING 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		
BCSB26	Open Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

In this course, students develop a comprehensive understanding of industrial safety principles and practices. They are equipped with the skills to identify, assess, and manage workplace hazards, promoting a culture of safety in their future engineering careers.

II. COURSE OBJECTIVES:

The students will try to learn:

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.

III. COURSE OUTCOMES:

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

CO 1	Describe the theories of accident causation and preventive measures of industrial accidents.	Understand
CO 2	Summarize the functions of maintenance department and application tools used for maintenance	Understand
CO 3	Recall the corrosion and its prevention methods	Remember
CO 4	Outline the fault tracing methods of various types of equipment	Understand
CO 5	Explain the Periodic and preventive maintenance of mechanical and electrical equipment	Understand

IV. SYLLABUS

UNIT-I	INDUSTRIAL SAFTEY	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	**PERODIC 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. H. P. Garg, "Maintenance Engineering", S. Chand and Company.		
Reference Books		
1. Audels, "Pump-hydraulic Compressors", Mcgraw Hill Publication. 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_KOMPUTER/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	Total
BCSB27	Open Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

The course allow students to possess a solid understanding of optimization techniques and their applications. They are equipped with the skills to formulate and solve optimization problems, analyze and interpret results, and make optimal decisions in various domains such as operations management, logistics, finance, and engineering.

II. COURES OBJECTIVES:

The students will try to learn:

I. Apply the dynamic programming to solve problems of discreet and continuous variables.
II. Understand the concept of nonlinear programming.
III. Describe the sensitivity analysis.

III. COURSE OUTCOMES:

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

CO1	Recall the basics of operation research	Understand
CO2	Explain the characteristics and scope of OR	Understand
CO3	Outline and formulate mathematical problems	Understand
CO4	Select optimal problems solving techniques for a given problem using LP	Apply
CO5	Solve transportation, travelling sales man and Assignment problems	Apply

IV. COURSE OUTCOMES:

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. Pannerselvam, “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		

I. COURSE OVERVIEW:

The course allow students to have a comprehensive understanding of cost management principles and practices in engineering projects. They are equipped with the skills to plan, estimate, control, and communicate project costs effectively, contributing to the successful delivery of projects within budgetary constraints

II. COUSRE OBJECTIVES:

The students will try to learn:

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.

III. COURSE OUTCOMES:

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

CO 1	Summarize the concept of strategic cost management, strategic cost analysis – target costing, life cycle costing and Kaizen costing and the cost drive concept.	Understand
CO 2	Describe the decision-making; relevant cost, differential cost, incremental cost and opportunity cost, objectives of a costing system.	Understand
CO 3	Interpret the meaning and different types of project management and project execution, detailed engineering activities.	Understand
CO 4	Understand the project contracts, cost behavior and profit planning types and contents, Bar charts and Network diagram	Understand
CO 5	Analyze by using quantitative techniques for cost management like PERT/CPM.	Analyze

IV. SYLLABUS:

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	Total
BCSB29	Open Elective	3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

In this course, students will gain insight into the manufacturing processes for composites, from choosing appropriate reinforcement fibers to integrating them with suitable matrices. They will develop an understanding of the challenges and considerations involved in achieving desired strength properties. This knowledge will enable them to evaluate and optimize the manufacturing processes for different types of composites based on specific application requirements.

II. COUSE OBJECTIVES:

The students will try to learn:

I. The manufacturing processes of reinforcement fibers and matrices for composites.
II. The concept of tailored design philosophy.

III. COURSE OUTCOMES:

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

CO 1	Identify the basic mechanical behavior of composite materials and make sound prediction on the likely behavior of new combinations of materials.	Understand
CO 2	Explain the properties of and applications of fibers, particle reinforcements and make use of rule of mixtures	Understand
CO 3	Interpret Manufacturing of Metal Matrix Composites, Properties and applications.	Understand
CO 4	Understand Manufacturing of polymer Matrix Composites, Properties and applications	Understand
CO 5	Recall the concepts of failure criteria of strength	Remember

IV. SYLLABUS:

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 play 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		
BCSB30	Open Elective	L	T	P	C	CIA	SEE	Total
		3	-	-	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

In this course, students will gain insights into the principles associated with effective energy management using biomass resources. They will understand the different conversion technologies and their applications in sustainable energy systems. By applying these principles in their daily lives, students will be able to make informed decisions regarding energy consumption, resource utilization, and environmental sustainability.

II. COURSE OBJECTIVES:

The students will try to learn:

I. The principles associated with effective energy management and to apply these principles in the day to day life.
II. The collection, transfer and transport of municipal solid waste.
III. The design and operation of a municipal solid wasteland fill.
IV. The key processes involved in recovering energy from wastes, systematically evaluate the main operational challenges in operating thermal and biochemical energy from waste facilities.

III. COURSE OUTCOMES:

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

CO 1	**Identify** the different sources and types of solid waste by the properties of municipal solid waste for segregation and collection of waste.	Remember
CO 2	**Explain** the energy generation technologies from waste treatment plants and disposal of solid waste by aerobic composting and incineration process.	Understand
CO 3	**Illustrate** the classification, preliminary design considerations of landfill and methods of landfill disposal of solid to control greenhouse gases.	Analyze
CO 4	**Understand** the Composition, characteristics of leachate to control the emission of gases by monitoring the movement of landfill leachate.	Understand
CO 5	**Outline** the Biochemical conversion of biomass for energy generation by anaerobic digestion of solid waste.	Create

IV. SYLLABUS:

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	Total
BCSB32	Audit	2	-	-	0	30	70	100
Contact Classes: 24	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 24		

I. COURSE OVERVIEW:

In this course, students will be equipped with the necessary tools to effectively communicate their research findings in a scholarly manner. They will develop the ability to write clear, concise, and well-structured research papers that adhere to academic standards. These skills will not only benefit them in their academic pursuits but also in their future professional careers as researchers, scholars, and professionals in various fields

II. COURSE OBJECTIVES:

The students will try to learn:

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.

III. COURSE OUTCOMES:

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

CO 1	Interpret the technique of determining a research problem for a crucial part of the research study	Apply
CO 2	Examine the way of methods for avoiding plagiarism in research	Understand
CO 3	Apply the feasibility and practicality of research methodology for a proposed project.	Apply
CO 4	Make use of the legal procedure and document for claiming patent of invention.	Apply
CO 5	Identify different types of intellectual properties, the right of ownership, scope of protection to create and extract value from IP	Apply

IV. SYLLABUS:

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	Total
BCSB33	Audit	2	-	-	0	30	70	100
Contact Classes: 24	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 24		

I. COURSE OVERVIEW:

In the course on disaster management, students will explore a range of important topics and gain valuable knowledge and skills to effectively address and mitigate the impact of disasters and covers areas like Repercussions of Disasters and Hazards, Disaster-Prone Areas in India, Risk Assessment and Disaster Mitigation

II. COURSE OBJECTIVES:

The students will try to learn:

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.

III. COURSE OUTCOMES:

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

CO 1	Understand to describe the basic types of Environmental hazards and disasters. Understand how to react effectively to natural, manmade, and technological threats.	Understand
CO 2	Understand how to react effectively to natural, manmade, and planetary hazards	Understand
CO 3	Explore the history of the field and comprehend how past events are earthquake, landslides, and volcanic hazards.	Analyze
CO 4	Describe the basic concepts of the emergency management cycle mitigation, preparedness, response, and recovery	Understand
CO 5	Recognizes the stakeholders in disaster management system, their jurisdiction and responsibilities	Remember

IV. SYLLABUS:

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. 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		

I. COURSE OVERVIEW:

In this course, Studying Sanskrit enhances students' analytical thinking and problem-solving abilities. The intricate grammar and logical structure of Sanskrit nurture their analytical skills, enabling them to dissect complex concepts and extract profound insights. This heightened analytical thinking can be applied across different technical disciplines, fostering innovative solutions to contemporary challenges

II. COURSE OBJECTIVES:

The students will try to learn:

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.

III. COURSE OUTCOMES:

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

CO 1	Understand the basic Sanskrit grammar	Understand
CO 2	Formulate simple sentences	Apply
CO 3	Apply order and roots	Apply
CO 4	Understand Ancient Sanskrit literature about science & technology	Understand
CO 5	Develop logical thinking being a logical language in technical concepts	Apply

IV. SYLLUBUS:

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	Total
BCSB35	Audit	2	-	-	0	30	70	100
Contact Classes: 24	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 24		

I. COURSE OVERVIEW:

In the course on value education, students emerge with a heightened sense of self-awareness, a strong moral foundation, and the skills necessary for personal and professional success. They are equipped with the knowledge and tools to navigate ethical challenges, contribute positively to society, and lead a purposeful and fulfilling life based on their core values and principles.

II. COURSE OBJECTIVES:

The students will try to learn:

I. Understand value of education and self- development
II. Imbibe good values in students
III. Let the should know about the importance of character

III. COURSE OUTCOMES:

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

CO 1	Understand the significance of ethical human conduct and self-development	Understand
CO 2	Adopt value-based living and holistic technologies to save nature	Apply
CO 3	Inculcate positive thinking, dignity of labor and religious tolerance	Apply
CO 4	Develop the overall Character and Competence through self-management	Analyze
CO 5	Practice Self-control. Honesty through Studying effectively all religious messages	Apply

IV. SYLLABUS:

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. 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	Total
BCSB36	Audit	2	-	-	0	30	70	100
Contact Classes: 24	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 24		

I. COURSE OVERVIEW:

The course on the Constitution of India provides students with a comprehensive understanding of the historical context, principles, and structure of the Indian Constitution. It explores the journey and philosophy behind the making of the Indian Constitution, highlighting the vision and ideals of the founding fathers.

II. COURSE OBJECTIVES:

The students will try to learn:

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.

III. COURSE OUTCOMES:

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

CO 1	Describe historical background of the constitution making and its importance for building a democratic India.	Understand
CO 2	Understand the Constitutional Rights and and duties	Understand
CO 3	Explain the functioning of three wings of the government i.e., executive, legislative and judiciary	Understand
CO 4	Analyse the decentralization of power between central, state and local self-government.	Analyze
CO 5	Apply the knowledge in strengthening of the constitutional institutions like CAG, Election Commission and UPSC for sustaining democracy	Apply

IV. SYLLABUS:

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", 1st Edition, 2015.
2. M. P. Jain, "Indian Constitution Law", Lexis Nexis, 7th 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	Total
BCSB37	Audit	2	-	-	0	30	70	100
Contact Classes: 24	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 24		

I. COURSE OVERVIEW:

In this course in pedagogy studies, students gain a solid foundation in educational principles and practices. They develop a deep understanding of effective teaching and learning strategies, empowering them to create engaging and meaningful learning experiences for their future students. Whether pursuing a career in teaching or any other field that involves knowledge transfer, students emerge with the knowledge and skills to inspire and facilitate learning, making a positive impact on the lives of others.

II.COURSE OBJECTIVES:

The students will try to learn:

I. Review existing evidence on the review topic to inform program design and policy making undertaken by the DFID, other agencies and researchers.
II. Identify critical evidence gaps to guide the development.

III. COURSE OUTCOMES:

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

CO 1	Identify the Methodology and conceptual framework of teachers education	Understand
CO 2	Understand pedagogical practices are being used by teachers in formal and informal classrooms in developing countries	Understand
CO 3	Interpret the evidence on the effectiveness of these pedagogical practices, in what conditions, and with what population of learners	Understand
CO 4	Classify the importance of class room practice, curriculum and learning in Professional Development.	Understand
CO 5	Summarize teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy	Understand

IV. SYLLABUS:

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.

Web References:

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

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	Total
BCSB38	Audit	2	-	-	0	30	70	100
Contact Classes: 24	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 24		

I. COURSE OVERVIEW:

In a course on stress management by yoga, engineering students learn a variety of yoga techniques and principles that promote physical, mental, and emotional well-being. These techniques include yoga postures (asanas), breathing exercises (pranayama), meditation, and relaxation techniques.

II. COURSE OBJECTIVES:

The students will try to learn:

I. How to achieve overall health of body and mind.
II. How to overcome stress.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to: (Same as R18)

CO 1	Understand Ashtanga yog and its impartance	Understand
CO 2	Identify the Dos and Do nots of Life by practicing the Yam and Niyam	Analyze
CO 3	Interpret the Shaucha and its components	Understand
CO 4	Make use of breathing techniques and Asan and Pranayam	Understand
CO 5	Develop healthy mind in a healthy body thus improving social health also	Apply

IV. SYLLABUS:

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		

I. COURSE OVERVIEW:

In this course, students delve into various aspects of personal development and self-awareness. They learn techniques to improve self-confidence, self-esteem, and self-awareness, which are vital for thriving in their engineering careers. Students explore their strengths, weaknesses, values, and beliefs, enabling them to develop a clearer understanding of themselves and their goals.

II. COURSE OBJECTIVES:

The students will try to learn:

I. How to achieve the highest goal happily
II. How a person become with stable mind, pleasing personality and determination
III. Awaken wisdom in students

III. COURSE OUTCOMES:

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

CO 1	**Summarize** steps to develop personality with stable mind, pleasing manners and determination.	Understand
CO 2	**Identify** day to day work and duties for developing peace and prosperity as depicted in Geeta.	Analyze
CO 3	**Formulate** the daily life style by depicting the verses from Bhagavatgeetha.	Analyze
CO 4	**Outline** the verses of Shrimad Bhagavad Geetha for holistic development.	Create
CO 5	Demonstrates personality development by verses of Bhagavatgeetha.	Create

IV. SYLLUBUS:

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		

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.

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

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.

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

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
	If the candidate:	
1. (a)	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, cell phones, pager, palm computers or any other form of material concerned with or related to the subject of the examination (theory or practical) in which he is appearing but has not made use of (material shall include any marks on the body of the candidate which can be used as an aid in the subject of the examination)	Expulsion from the examination hall and cancellation of the performance in that subject only.
(b)	Gives assistance or guidance or receives it from any other candidate orally or by any other body language methods or communicates through cell phones with any candidate or persons in or outside the exam hall in respect of any matter.	Expulsion from the examination hall and cancellation of the performance in that subject only of all the candidates involved. In case of an outsider, he will be handed over to the police and a case is registered against him.
2.	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the subject of the examination (theory or practical) in which the candidate is appearing.	Expulsion from the examination hall and cancellation of the performance in that subject and all other subjects the candidate has already appeared including practical examinations and project work and shall not be permitted to appear for the remaining examinations of the subjects of that Semester/year. The Hall Ticket of the candidate is to be cancelled and sent to the Controller of Examinations.
3.	Impersonates any other candidate in connection with the examination.	The candidate who has impersonated shall be expelled from examination hall. The candidate is also debarred and forfeits the seat. The performance of the original candidate, who has been impersonated, shall be cancelled in all the subjects of the examination (including practicals and project work) already appeared and shall not be allowed to appear for examinations of the remaining subjects of that semester/year. The candidate is also debarred for two consecutive semesters from class work and all semester end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat. If the imposter is an outsider, he will be handed over to the police and a case is registered against him.

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

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

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