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
STRUCTURAL 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

To produce eminent, competitive and dedicated civil engineers by imparting latest technical skills and ethical values to empower the students to play a key role in the planning and execution of infrastructural & developmental activities of the nation.

MISSION

To provide exceptional education in civil engineering through quality teaching, state-of-the-art facilities and dynamic guidance to produce civil engineering graduates, who are professionally excellent to face complex technical challenges with creativity, leadership, ethics and social consciousness.

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

The students of M.Tech Structural Engineering are prepared to:

PEO - I	Develop the skills for development of new materials, design and construction of structures that are sustainable.
PEO - II	Expose the students to the latest innovations and trends with a view to inculcate research orientation in structural engineering as well as in multidisciplinary streams..
PEO - III	Adopt to the technological advancements for professional development to cater for the changing needs of the society through critical thinking.
PEO - IV	Become as Professional Engineers, teaching experts and engage in Research and Development works both with ethically and societal responsibility.

M.TECH - PROGRAM OUTCOMES (PO's)

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

PO - 1	An ability to Independently carry out research/investigation and development work to solve practical problems.
PO - 2	An ability to Write and present a substantial technical report/document.
PO - 3	Students should be able to demonstrate a degree of mastery over the area as per the specialization of the program. The mastery should be at a level higher than the requirements in the appropriate bachelor program
PO - 4	Capable to apply the core, multidisciplinary knowledge for understanding the problems in structural engineering and allied fields.
PO - 5	Conceptualize and design civil engineering structures considering various socio-economic factors.
PO - 6	Engage in life-long learning for continuing education in research-level studies and professional development.

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 program 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 weeks

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 CURRICULUMANDCOURSESTRUCTURE

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 Laboratorycoursecarriescreditsbasedonthenumberofhours/weekasfollows:

- **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 EVALUATIONMETHODOLOGY

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:

9.2.1 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.

9.2.2 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 ATTENDANCEREQUIREMENTS 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.

10.3 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.

10.4 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.

10.5 A prescribed fee shall be payable towards Condonation of shortage of attendance.

10.6 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.

10.7 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 SCHEMEFORTHEAWARDOFGRADE

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 AWARDOFDEGREE

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 onGraduation Day. This will greatly encourage the students to strive for excellence in their academic work.

23.0 DISCIPLINE

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

24.0 GRIEVANCE REDRESSAL COMMITTEE

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

25.0 TRANSITORY REGULATIONS

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

25.2 Semester End Examination in each course under the regulations that precede immediately these regulations shall be conducted three times after the conduct of last regular examination under

those regulations. Thereafter, the failed students, if any, shall take examination in the equivalent papers of these regulations as suggested by the Chairman, BOS concerned.

26.0 REVISION OF REGULATIONS AND CURRICULUM

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

FAILURE TO READ AND UNDERSTAND THE REGULATIONS IS NOT AN EXCUSE

INSTITUTE OF AERONAUTICAL ENGINEERING

(AUTONOMOUS)

CIVIL 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										
BSTB01	Advanced Structural Analysis	PCC	Core	3	0	0	3	30	70	100
BSTB02	Advanced Solid Mechanics	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	Perspective	2	0	0	0	30	70	100
PRACTICAL										
BSTB09	Structural Design Laboratory	PCC	Core	0	0	4	2	30	70	100
BSTB10	Advanced Concrete 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										
BSTB11	FEM in Structural Engineering	PCC	Core	3	0	0	3	30	70	100
BSTB12	Structural Dynamics	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	Perspective	2	0	0	0	30	70	100
BSTB19	Research and Content Development	PCC	Skill	2	0	0	2	30	70	100
PRACTICAL										
BSTB20	Numerical Analysis Laboratory	PCC	Core	0	0	4	2	30	70	100
BSTB21	Mini Project with Seminar	PCC	Core	2	0	0	2	30	70	100
TOTAL				**18**	**00**	**04**	**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										
BSTB40	Phase-I Dissertation	Major Project	Core	0	0	4	10	30	70	100
TOTAL				**08**	**00**	**04**	**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
BSTB41	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
BSTB03	Theory of Thin Plates and Shells
BSTB04	Theory and Applications of Cement Composites
BSTB05	Theory of Structural Stability

PROFESSIONAL COREELECTIVE – II

Course Code	Course Title
BSTB06	Analytical and Numerical Methods for Structural Engineering
BSTB07	Structural Health Monitoring
BSTB08	Structural Optimization

PROFESSIONAL CORE ELECTIVE – III

Course Code	Course Title
BSTB13	Advanced Steel Design
BSTB14	Design of High Rise Structures
BSTB15	Design of Masonry Structures

PROFESSIONAL CORE ELECTIVE – IV

Course Code	Course Title
BSTB16	Design of Advanced Concrete Structures
BSTB17	Advanced Design of Foundations
BSTB18	Design of Industrial Structure

PROFESSIONAL CORE ELECTIVE – V

Course Code	Course Title
BSTB22	Design of Pre stressed Concrete Structures
BSTB23	Analysis of Laminated Composite Plates
BSTB24	Fracture Mechanics of Concrete Structures

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)

ADVANCED STRUCTURAL ANALYSIS

I Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB01	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 mainly deals with matrix analysis of structures. It begins with a review of the basic concepts of structural analysis and matrix algebra, and shows how the latter provides an excellent mathematical framework for the former. This is followed by detailed descriptions, and demonstrations through many examples, of how matrix methods can be applied to linear static analysis of skeletal structures (plane and space trusses; beams and grids; plane and space frames) by the stiffness method, and also the flexibility method. Also, it is shown how simple structures can be conveniently solved using a reduced stiffness formulation, involving far less computational effort. Finally, the analysis of elastic instability and second-order response is discussed. The main objective is to enable the student to have a good grasp of all the fundamental issues in these advanced topics in structural analysis, besides enjoying the learning process, and developing analytical and intuitive skills.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The advanced techniques to know the behavior of structural elements subjected to both vertical and horizontal loads which are used for designing all types of structures.
II. The finite element analysis of various structural elements for design purpose.
III. The Design independently civil engineering structures as per the requirements of client and provide detailed design drawings, quality control reports during construction for ensuring quality and economical structures.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	**Explain** the concepts of the static and kinematic indeterminacy of structures for analyzing the structures subjected to different loads	Remember
CO 2	**Analyze** continuous beams, portal frames for the given loading conditions using the stiffness, flexibility, approximate methods for ensuring structural efficiency	Analyse
CO 3	**Analyze** member forces due to applied loads, lack of fit and temperature changes for the indeterminate trusses	Analyse
CO 4	**Apply** the concept of stiffness matrix equations in global coordinate system with boundary condition for analysing member forces in beams and frame structures.	Apply
CO 5	**Explain** the shape function concepts of one and two-dimensional elements for enriching knowledge on stiffness matrix.	Understand
CO 6	**Make use of** modified galerkin method for computing approximate solution of one-dimensional boundary value problems	Apply

IV. SYLLABUS

UNIT –I	**INFLUENCE COEFFICIENTS**	**Classes: 09**
Physical Significance, Effects of Settlements, Temperature Change and Lack of Fit, Member Approach and Structure Approach.		
UNIT-II	**STIFFNESS METHOD APPLIED TO LARGE FRAMES**	**Classes: 09**
Force method and displacement method, Degree of Freedom, Local Coordinates and Global Coordinates.		
UNIT-III	**STIFFNESS MATRIX ASSEMBLY OF STRUCTURES AND APPLICATIONS TO SIMPLE PROBLEMS**	**Classes: 09**
Stiffness Matrix in Global Coordinates, Boundary Conditions, Solution of Stiffness Matrix Equations, Calculation of Reactions and Member Forces. Beams, Plane Trusses, Plane Rigid Jointed Frames and Grids by Structure Approach and Member Approach.		
UNIT-IV	**BOUNDARY VALUE PROBLEMS (BVP)**	**Classes: 09**
Boundary Value Problems: Approximate Solution of Boundary Value Problems, Modified Galerkin Method for One-Dimensional BVP, Matrix Formulation of the Modified Galerkin Method.		
UNIT-V	**LINEAR ELEMENT**	**Classes: 09**
Linear Element: Shape Functions, Solution for Poisson's Equation, General One Dimensional Equilibrium Problem.		

Text Books:

1. C.S. Reddy, "Basic Structural Analysis".
2. Ashok.K., "Advanced Structural Analysis", Jain, New Channel Brothers.
3. J. Meek, "Matrix Methods of Structural Analysis".
4. S S Bhavikatti, "Matrix Methods of Structural Analysis"

Reference Books:

1. Todd, J.D., "structural theory and analysis", the mac million press ltd., New York.
2. Menon,D., "advanced structural analysis", narosa publishing house, new delhi.
3. Mc Carmac, J. And Elling, R. E., "structural analysis: a classical and matrix a approach" , harper and row publishers.

Web References:

1. nptel.ac.in/courses/Webcourse-contents/.../Structural%20Analysis/pdf/m2l7.pdf.
2. https://nptel.ac.in/reviewed_pdfs/105106050/lec1.pdf
3. http://web.iitd.ac.in/~sbhalla/rc717.pdf

E-Text Books:

1. https://phindia.com/.../matrix_methods_of_structural_analysis_theory_and_problems
2. http://www.uomisan.edu.iq/library/admin/book/91314849583.pdf
3. http://priodeep.weebly.com/uploads/6/5/4/9/65495087/w._j._spencer__auth._-

ADVANCED SOLID MECHANICS

I Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB02	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 introduces the principles of elasticity, components of stresses and strains, differential equations of equilibrium, boundary conditions, compatibility conditions and stress function. This course also covers the two dimensional problems in rectangular coordinates and polar coordinates, Fourier series for two dimensional problems stress distribution symmetrical about an axis, pure bending of curved bars, strain components in polar coordinates, displacements for symmetrical stress distributions, simple symmetric and asymmetric problems, analysis of stress strain in three dimensions, torsion of prismatical bars and plasticity.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The transformation of stresses and strains in two and three dimensional problems related to structural elements.
II. The Engineering properties of materials, force-deformation and stress-strain relationships.
III. The plastic behaviour of deformable bodies in Cartesian coordinates and polar coordinates.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Explain theory of elasticity including strain/displacement and Hooke's law relationships for analysing the structures with in elastic range.	Understand
CO 2	Develop constitutive relationships between stress and strain in linearly elastic solid for analysing the stresses in the field.	Apply
CO 3	Analyze the Stresses and Strains, Strain Displacement and Compatibility Relations for Boundary Value Problems in the Principal Directions.	Analyze
CO 4	Explain the Plane Stress and Plane Strain Problems using Airy's stress Function and Two-Dimensional Problems in Polar Coordinates.	Understand
CO 5	Analyze boundary value problems using Modified Galerkin Method.	Analyze
CO 6	Examine the properties of ideally plastic solids using different yield criterion.	Analyze

IV. SYLLABUS

UNIT-I	INTRODUCTION TO ELASTICITY	Classes: 09

Displacement, Strain and Stress Fields, Constitutive Relations, Cartesian Tensors and Equations of Elasticity.

UNIT-II	STRAIN AND STRESS FIELD	Classes: 09
Elementary Concept of Strain, Stain at a Point, Principal Strains and Principal Axes, Compatibility Conditions, Stress at a Point, Stress Components on an Arbitrary Plane, Differential Equations of Equilibrium, Hydrostatic and Deviatoric Components.		
UNIT-III	**EQUATIONS OF ELASTICITY AND TWO-DIMENSIONAL PROBLEMS OF ELASTICITY**	**Classes: 09**
Equations of Equilibrium, Stress-Strain relations, Strain Displacement and Compatibility Relations, Boundary Value Problems, Co-axiality of the Principal Directions. Plane Stress and Plane Strain Problems, Airy's stress Function, Two-Dimensional Problems in Polar Coordinates.		
UNIT-IV	**TORSION OF PRISMATIC BARS**	**Classes: 09**
Torsion of Prismatic Bars: Saint Venant's Method, Prandtl's Membrane Analogy, Torsion of Rectangular Bar, Torsion of Thin Tubes.		
UNIT-V	**PLASTIC DEFORMATION**	**Classes: 09**
Plastic Deformation: Strain Hardening, Idealized Stress- Strain curve, Yield Criteria, von Mises Yield Criterion, Tresca Yield Criterion, Plastic Stress-Strain Relations, Principle of Normality and Plastic Potential, Isotropic Hardening.		

Text Books:

1. Timoshenko and Goodier , "Theory of Elasticity" , McGraw Hill Publishing Company, 1970.
2. RagabA.R.,BayoumiS.E , "Engineering Solid Mechanics"., CRC Press,1999.
3. Kazimi S. M. A, "Solid Mechanics"., Tata McGraw Hill,1994.

Reference Books:

1. SaddM.H , "Elasticity",Elsevier,2005.
2. Ameen.M, "Computational Elasticity", Narosa,2005.
3. KazimiS. M. A, "Solid Mechanics", Tata McGraw Hill,1994.
4. SrinathL.S "Advanced Mechanics of Solids", Tata McGraw Hill,2000.

Web References:

1. http://nptel.ac.in/courses/105106049/77
2. https://lecturenotes.in/subject/162/advanced-mechanics-of-solids-amos

E-Text Books:

1. http://nptel.ac.in/courses/105106049/pdf-assignments/main.pdf

THEORY OF THIN PLATES AND SHELLS

I Semester : ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB03	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

Plates and shells exhibit two dimensional structural actions that result in stronger, thinner and lighter structures and therefore, have economic advantage. This has opened the scope for the wide use of such elements in all fields of engineering due to significant increase of strength/weight ratio. The exposure to this course and its completion are very essential in understanding the behaviour of thin structures for their applications in design.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The Formulation of differential equations for bending of thin rectangular and circular plates.
II. The theory of large deflection of plates for efficient and economical design.
III. The numerical techniques and tools for the complex problems in thin plates.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Analyse the analytical solutions for rectangular plates by using Navier and Levy's methods, distributed and concentrated loads	Analyse
CO 2	Explain Governing differential equations in polar coordinate system of a annular plate subjected to different loading conditions for the design of thin plates.	Understand
CO 3	Examine the governing differential equation of rectangular plates on elastic foundations for the design of foundations.	Analyse
CO 4	Outline the general theory in bending of cylindrical shell, simplified method for analysis and design of the shells.	Apply
CO 5	Solve the governing equation of plate bending under the combined action of in plane loading and lateral loads for the design of plates.	Apply
CO 6	Examine the buckling of rectangular plates by compressive forces acting in one and two directions for the analysis of plates.	Analyze

IV. SYLLABUS

UNIT-I	INTRODUCTION	Classes: 09

Space Curves, Surfaces, Shell Co-ordinates, Strain Displacement Relations, Assumptions in Shell Theory, Displacement Field Approximations, Stress Resultants, Equation of Equilibrium using Principle of Virtual Work, Boundary Conditions.

UNIT-II	STATIC ANALYSIS OF PLATES	Classes: 09
Governing Equation for a Rectangular Plate, Navier Solution for Simply Supported Rectangular Plate under Various Loadings, Levy solution for Rectangular Plate with other Boundary Conditions.		
UNIT-III	**CIRCULAR PLATES**	**Classes: 09**
Introduction, basic relations in polar coordinates, Analysis under Axi-Symmetric Loading, Governing Differential Equation in Polar Co-ordinates. Approximate Methods of Analysis:Asymmetrical Bending of Circular Plates, Rayleigh-Ritz approach for Simple Cases in Rectangular Plates.		
UNIT-IV	**STATIC ANALYSIS OF SHELLS: MEMBRANE THEORY OF SHELLS**	**Classes: 09**
Introduction, Membrane Theory, Membrane Stresses, Cylindrical shells under general load and buckling, Conical shells and Spherical Shells.		
UNIT-V	**SHELLS OF REVOLUTION: WITH BENDINGRESISTANCE**	**Classes: 09**
Cylindrical and Conical Shells, Application to Pipes and Pressure Vessels, Thermal Stresses in Plate/Shell, stress-strain and displacement relations, the governing differential equation.		

Text Books:

1. Timoshenko S. and Krieger, “Theory of Plates and Shells”, McGraw Hill.
2. Chandra shekhara. K, “Theory of Plates”, Universities Press.
3. Timoshenko ,”Theory of Plates and Shells” , Tata McGraw Hill.

Reference Books:

1. UguralAnsel C,”Stresses in Plates and Shells”, McGraw Hill.
2. Kraus.H, “Thin Elastic Shells”, John Wiley and Sons.

Web References:

1. https://pdfs.semanticscholar.org/presentation/ce6d/b61238325d60d3f6dc0f1fbe7af33e397 2c1.pdf

E-Text Books:

1. https://ocw.mit.edu/courses/mechanical-engineering/2-081j-plates-and-shells-spring-2007/readings/lecturenote.pdf
2. http://community.wvu.edu/~bpbettig/MAE456/Lecture_10_Shell_Elements_b.pdf

THEORY AND APPLICATIONS OF CEMENT COMPOSITES

I Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB04	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

Concrete as one of the conventional composite material is invariably one of the most robust and versatile material. It performs extremely well under compression, however high strength concrete tends to be brittle. Concrete these days is modified in order to enhance its capacity for long term performance under harsh environmental & structural loads. Cement and concrete composites have made this possible. These composites comprise of binder or a matrix that binds together different types of fibers or fragments as per the requirements. The final product in form of composite is light, strong, flexible and more efficient in comparison to conventional composite i.e. concrete.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The Formulation of constitutive behaviour of composite materials: Ferro cement, SIFCON and Fibre Reinforced Concrete by understanding their strain- stress behavior.

II. The concept of Estimating strain constants using theories applicable to composite materials.

III. The analysis and design of structural elements made of cement composites.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Explain the stress-strain and characteristics of Characteristics of Composite Materials	Understand
CO 2	Formulate the constitutive behaviour of various composite materials.	Understand
CO 3	Classify the materials based on orthotropic and anisotropic behaviour.	Evaluate
CO 4	Estimate elastic constants using theories applicable to composite materials.	analyze
CO 5	Analyse the structural elements made of cement composites as ferrocement, SIFCON and fibre reinforced concrete.	Understand
CO 6	Design structural elements made of cement composites as ferrocement, SIFCON and fibre reinforced concrete.	Create

IV. SYLLABUS

UNIT-I	INTRODUCTION	Classes: 09

Classification and Characteristics of Composite Materials: Basic Terminology, Advantages. Stress-Strain Relations, Orthotropic and Anisotropic Materials, Engineering Constants for Orthotropic Materials, Restrictions on Elastic Constants, Plane Stress Problem, Biaxial Strength, Theories for an Orthotropic Lamina.

UNIT-II	MECHANICAL BEHAVIOUR	Classes: 09
Mechanics of Materials Approach to Stiffness- Determination of Relations between Elastic Constants, Elasticity Approach to Stiffness, Bounding Techniques of Elasticity, Exact Solutions, Elasticity Solutions with Continuity, Halpin, Tsai Equations, Comparison of approaches to Stiffness.		
UNIT-III	**CEMENT COMPOSITES**	**Classes: 09**
Types of Cement Composites, Terminology, Constituent Materials and their Properties, Composite Materials- Orthotropic and Anisotropic behavior. Construction Techniques for Fibre Reinforced Concrete: Ferrocement, SIFCON, Polymer Concretes, Preparation of Reinforcement, Casting and Curing		
UNIT-IV	**MECHANICAL PROPERTIES OF CEMENT COMPOSITES**	**Classes: 09**
Behavior of Ferrocement, Fiber Reinforced Concrete in Tension, Compression, Flexure, Shear, Fatigue and Impact, Durability and Corrosion		
UNIT-V	**APPLICATION OF CEMENT COMPOSITES**	**Classes: 09**
FRC and Ferrocement- Housing, Water Storage, Boats and Miscellaneous Structures. Composite Materials- Orthotropic and Anisotropic behaviour, Constitutive relationship, Elastic Constants. Analysis and Design of Cement Composite Structural Elements:Ferrocement, SIFCON and Fibre Reinforced Concrete		
Text Books:		
1. Jones R. M , "Mechanics of Composite Materials", Taylor and Francis,BSP Books, 2nd Edition, 1998. 2. Pama R. P, "Ferrocement – Theory and Applications", IFIC, 1980.		
Reference Books:		
1. Pama R. P ,"Ferrocement – Theory and Applications", IFIC, 1980. 2. Swamy R.N ,"New Concrete Materials", Blackie, Academic and Professional, Chapman & Hall. 1st Edition, 2019.		
Web References:		
1. http://nptel.ac.in/courses/101104010/		
E-Text Books:		
2. http://nptel.ac.in/courses/105108124/pdf/Lecture_Notes/LNm11.pdf		

THEORY OF STRUCTURAL STABILITY

I Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB05	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

Structural stability of the building is the condition of safely transferring the load on the building (Self weight of the building and Live load on the building like human loads, furniture load etc.). Failure occurs because of loads acting on the structure. A structure which will not topple over easily when acted upon by a load is said to be stable. This is very important because when the tilting force is removed, gravity pulls the structure back to its original position.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The fundamentals of stability of columns and frames for designing efficient structures.
II. The Assessment of buckling of thin walled bars and lateral buckling of beams, rectangular plates
III. The concept of stability criteria for analyzing discrete and continuous systems.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Analyze the buckling of columns, beam-columns and find critical loads using energy and non-energy methods.	Analyze
CO 2	Analyze the buckling of columns, beam-columns and find critical loads non-energy methods.	Analyze
CO 3	Analyze the lateral buckling of beams by energy and non-energy methods.	Analyze
CO 4	Analyze the buckling of rectangular plates and for various boundary conditions.	Analyze
CO 5	Find critical compressive loads for various boundary conditions.	Create
CO 6	Analyze the buckling of axially loaded cylindrical shells.	Analyze

IV. SYLLABUS

UNIT-I	**CRITERIA FOR DESIGN OF STRUCTURES**	**Classes: 09**
Stability, Strength, and Stiffness, Classical Concept ofStability of Discrete and Continuous Systems, Linear and nonlinear behaviour.		
UNIT-II	**STABILITY OF COLUMNS**	**Classes: 09**
Axial and Flexural Buckling, Lateral Bracing ofColumns, Combined Axial, Flexural and Torsion Buckling.		
UNIT-III	**STABILITY OF FRAMES**	**Classes: 09**
Introduction, modes of buckling,Member Buckling versus Global Buckling,critical load using various methods		

Differential equation buckling,Relative slenderness, Slenderness Ratio ofFrameMembers.		
UNIT-IV	**STABILITY OF BEAMS**	**Classes: 09**
Lateral torsion buckling, Stability of Plates: axial flexural buckling, shear flexural buckling, buckling under combined loads.		
UNIT-V	**STABILITY OF PLATES**	**Classes: 09**
Axial flexural buckling, shear flexural buckling, buckling under combinedLoads. Introduction to Inelastic Bucklingand Dynamic Stability.		
Text Books:		
1. Timoshenko and Gere , "Theory of elastic stability", Tata McGraw Hill,1981. 2. Alexander Chajes , "Principles of Structural Stability Theory", Prentice Hall, New Jersey.		
Reference Books:		
1. Iyengar, N. G. R, "Structural Stability of columns and plates" , Eastern west press Pvt. Ltd. 2. Bleich F. Bucking, "Strength of Metal Structures", Tata McGraw Hill, New York.		
Web References:		
1. http://nptel.ac.in/courses/105106116/10		
E-Text Books:		
1. https://www.colorado.edu/engineering/CAS/courses.d/Structures.d/IAST.Lect23.d/IAST.Lect23.Slides.pdf		

ANALYTICAL AND NUMERICAL METHODS FOR STRUCTURAL ENGINEERING

I Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB06	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

Numerical methods provide a way to solve problems quickly and easily compared to analytic solutions. Whether the goal is integration or solution of complex differential equations, there are many tools available to reduce the solution of what can be sometimes quite difficult analytical math to simple algebra. Analysis, modeling and solution of realistic engineering problems. Learning outcome 1 looks at algebraic methods, including polynomial division, exponential, trigonometric and hyperbolic functions, arithmetic and geometric progressions in an engineering context and expressing variables as power series.

II. COURSE OBJECTIVES:

The student will try to learn:

I. Formulation of the mathematical model of the problem to solve civil engineering problems
II. Partial differential equations with closed form or numerical solution in structural mechanics using numerical methods.
III. The applications of mathematical tools and statistical methods for the solution of the problems related to structures.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Solve algebraic equations.	Apply
CO 2	Obtain numerical solution of ordinary and partial differential equations.	Apply
CO 3	Develop integration method/s for structural analysis.	Apply
CO 4	Carry out interpolations and curve fitting	Analyze
CO 5	Obtain solution of Eigen value problems and Fourier series for structural analysis.	Analyze
CO 6	Apply iterative and transformation methods in structural engineering	Apply

IV. SYLLABUS

UNIT-I	FUNDAMENTALS OF NUMERICAL METHODS	Classes: 09

Error Analysis, Polynomial Approximations and Interpolations, Curve Fitting**;** Interpolation and extrapolation Solution of Nonlinear Algebraic and Transcendental Equations

UNIT-II	ELEMENTS OF MATRIX ALGEBRA:	Classes: 09

Solution of Systems of Linear Equations, Eigen Value Problems.

UNIT-III	NUMERICAL DIFFERENTIATION & INTEGRATION	Classes: 09
Numerical integration (Trapezoidal and Simpson's rule) for determining shear, moment and deflection in beams Gauss Quadrature formula for Numerical integration (Trapezoidal and Simpson's rule), Solution of ordinary and Partial Differential Equations.		
UNIT-IV	**FINITE DIFFERENCE SCHEME**	**Classes: 09**
Implicit & Explicit scheme, solution using Explicit method, Stability analysis of Explicit and Implicit scheme		
UNIT-V	**COMPUTER ALGORITHMS**	**Classes: 09**
Numerical Solutions for Different Structural Problems, Fuzzy Logic and Neural Network.		
Text Books:		
1. AtkinsonK. E., "An Introduction to Numerical Analysis", J. Wiley and Sons, 1989. 2. Stevan C.Chopra, Raymond P.Canal, "Numerical Methods for Engineers" McGraw HillBook Company. April 2009.		
Reference Books:		
1. Scheid F, "Theory and Problems of Numerical Analysis", McGraw Hill Book Company, (ShaumSeries), 1988. 2. Sastry S. S, "Introductory Methods of Numerical Analysis", Prentice Hall of India, 1998		
Web References:		
1. http://nptel.ac.in/courses/105105043/ 2. https://www.class-central.com/course/nptel-numerical-methods-finite-difference-approach-10003		
E-Text Books:		
1. http://nptel.ac.in/courses/103101111/downloads/Lecture-notes/Unit_6_Solving_ODE-IVPs.pdf		

STRUCTURAL HEALTH MONITORING

I Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB07	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

The course will provide the students with in-depth knowledge of technologies in structural health monitoring using smart materials as sensing and actuating elements to interrogate the structures. Damage detection techniques such as wave, impedance, and vibration-based damage detection techniques will be discussed and applied to different types of structures. , Advanced signal processing techniques such as wavelet, neural network and principal component analysis will be used to make the damage more quantifiable.

II. COURSE OBJECTIVES:

The course should enable the students to:

I. Diagnosis the distress in the structure understanding the causes and factors.
II. Assess the health of structure using static field methods.
III. Assess the health of structure using dynamic field tests.
IV. Suggest repairs and rehabilitation measures of the structure.

III. COURSE OUTCOMES:

CO 1	Explain the factors effecting structural health for the maintenance of structures.	**Remember**
CO 2	Illustrate the concept of various methods applied for monitoring of structures for structural safety.	**Understand**
CO 3	Interpret the importance of structural audit and assessment of health structures for the monitoring of structures.	**Understand**
CO 4	Recognize the importance of static tests and sensor systems for the safety of buildings.	**Apply**
CO 5	Demonstrate health monitoring of structures by using Dynamic Response Method.	**Apply**
CO 6	Outline piezo-electric materials and other smart materials for repair and rehabilitation of structures.	**Understand**

IV. SYLLABUS

UNIT-I	**STRUCTURAL HEALTH**	**Classes: 09**
Definition, Principles, significance of SHM, Factors affecting Health of Structures, Causes of Distress, Regular Maintenance.		
UNIT-II	**STRUCTURAL HEALTH MONITORING**	**Classes: 09**
Concepts, Use of Sensors, Building Instrumentation,Various Measures, Structural Safety in Alteration.		

UNIT-III	STRUCTURAL AUDIT AND STATIC FIELD TESTING	Classes: 09
Assessment of Health of Structure, Collapse andInvestigation, InvestigationManagement, SHM Procedures. State-of-Art damage identification and pattern reorganization methods. Types of Static Tests, Simulation and Loading Methods, sensor systems andhardware requirements, Static Response Measurement.		
UNIT-IV	**DYNAMIC FIELD TESTING**	**Classes: 09**
Types of Dynamic Field Test, Stress History Data, Dynamic ResponseMethods, Hardware for Remote Data Acquisition Systems, Remote Structural Health Monitoring.		
UNIT-V	**INTRODUCTION TO REPAIRS AND REHABILITATIONS OF STRUCTURES**	**Classes: 09**
Case Studies (Site Visits), piezo-electric materials and other smart materials, electro–mechanical impedance (EMI) technique,Adaptations of EMI technique.		
Text Books:		
1. Daniel Balageas, Claus_PeterFritzen, Alfredo Güemes , "Structural Health Monitoring" , John Wiley and Sons, 2006. 2. Douglas E Adams, "Health Monitoring of Structural Materials and Components_Methods with Applications", John Wiley and Sons, 200		
Reference Books:		
1. J. P. Ou, H. Li and Z. D. Duan , "Structural Health Monitoring and Intelligent Infrastructure", Vol1, Taylor and Francis Group, London, UK, 2006. 2. Victor Giurglutiu, "Structural Health Monitoring with Wafer Active Sensors", Academic Press Inc, 2007.		
Web References:		
1. http://nptel.ac.in/courses/112104160/3 2. http://nptel.ac.in/downloads/112104160/		
E-Text Books:		
1. https://books.google.co.in/books?id=DXOsGoqtiggC&printsec=frontcover#v=onepage&q&f=false. 2. https://www.researchgate.net/publication/273059503_Introduction_to_Structural_Health_Monitoring.		

STRUCTURAL OPTIMIZATION

I Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB08	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

Structural optimization is a discipline dealing with optimal design of load-carrying mechanical structures. A growing subfield of structural optimization is topology optimization, where a typical problem might be as follows: Given a predefined design domain (in two or three dimensions), some given supports in connection to the design domain, some given external loads, and a given material to be used, the problem consists of designing an optimal structure to carry the given loads. This should be done by finding the optimal subdomain, of the given design domain, to fill with material. The objective might be to minimize the total weight of the structure subject to constraints on displacements and stresses in the structure under the given loads. In order to attack this problem numerically, the design domain is discretized by a finite element model. One thus considers a discretized universe" in which for each individual discrete point.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The principles of structural optimization and be able to solve them analytically.
II. Structural optimization problems in the framework of calculus of variations as well as finite-variable optimization.
III. Contemporary literature on structural optimization in general and topology optimization in particular.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Classify optimization and various techniques.	Understand
CO 2	Solve various linear and Non-linear problems.	Apply
CO 3	Solve a problem by geometric programming and dynamic programming.	Apply
CO 4	Apply optimization to various structural elements	Apply
CO 5	Apply optimization to various structural elements	Apply
CO 6	Evaluate optimization to various structural elements	Evaluate

SYLLABUS

UNIT-I	INTRODUCTION	Classes: 09

Definition, Variables, Objective Function, Constraints, Simultaneous Failure Mode and Design, Classical External Problems

UNIT-II	CALCULUS OF VARIATION	Classes: 09
Differential calculus, Optimality criteria, Variational Principles with Constraints, Single variable optimization Multivariable optimization		
UNIT-III	**LINEAR PROGRAMMING**	**Classes: 09**
Integer Programming, Nonlinear Programming, Dynamic Programming, Geometric Programming and Stochastic Programming. Problem formulation, Graphical solution, Analytical method, Standard form, Slack, surplus and artificial variables		
UNIT-IV	**APPLICATIONS**	**Classes: 09**
Structural Steel and Concrete Members, Trusses and Frames, Methods for optimal design of structural elements, continuous beams and single storied frames using plastic theory.		
UNIT-V	**DESIGN**	**Classes: 09**
Frequency Constraint, Design of Layouts, Minimum weight design for truss members, Fully stressed design-Optimization principles to design of R.C. structures such as multi-storey buildings.		
Text Books:		
1. Spillers, William R, Keith M. MacBain, "Structural Optimization", Springer, 2009. 2. M. P. Bendsoe, O. Signmund, "Topology Optimization: Theory, methods and Applications" Springer.		
Reference Books:		
1. Haftka, Raphael T., Gürdal, Zafer, "Elements of Structural Optimization", Third Revised and Expanded Edition, kluver academic publishers. 2. Andrej Cherkaev, "Variational methods for Structural optimization", Springer.		
Web References:		
http://nptel.ac.in/courses/112108211/25		
E-Text Books:		
http://eprints-phd.biblio.unitn.it/1343/1/PhD.pdf		

STRUCTURAL DESIGN LABORATORY

I Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB09	Core	0	0	4	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 40				Total Classes:40		

I. COURSE OVERVIEW:

Structural Design Laboratory will summarize the key engineering, operational, safety, and sustainability considerations for the design of RC framed buildings. Introduces the design and behavior of large-scale structures and structural materials. This course Emphasizes the development of structural form and the principles of structural design. This Laboratory used to solve structural problems by building and testing simple mathematical models. STAAD.Pro is one of the most widely used structural analysis and design software products worldwide. It can be used for analysis and design of all types of structural projects from buildings, bridges to towers, tunnels, metro stations, water/wastewater treatment plants and more.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The basic elements with different loading type and supports with the aid of STAAD Pro software.
II. The Analysis and design of 2D Frame and multi-storey buildings with different load sets.
III. The Modeling and analysis of steel structures like beams and columns.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Determine of the effects of loads on physical structures.	Apply
CO 2	Design concrete structures like columns/beams/slabs/footings according to the international codes.	Create
CO 3	Perform code check, member selection and optimized part selection comprising of design/analysis cycles.	Understand
CO 4	Utilize built-in command file editor and straightforward command language.	Apply
CO 5	Perform exact and numerically productive plate/shell component consolidating out-of-plane shear and in-plane rotation.	Apply
CO 6	Complete component stress yield incorporating in-plane stresses, out-of-plane shear, bending and main stresses at nodal and also user indicated focuses.	Apply

IV. SYLLABUS

LIST OF EXPERIMENTS

Design and detailed drawing of complete G+ 3 structures by individual student using latest relevant IS codes.

Week-I	**INTRODUCTION TO STAAD SOFTWARE**
Introduction to STAAD Software	
Week-II	**STRUCTURAL SYSTEMS**
General Description-Type of structure, Unit systems, structure geometry and Co-ordinate systems	
Week-III	**COMMAND INPUTS**
STAAD III –Commands- Using Edit Input-Command Formats-Text Input.	
Week-IV	**DEVELOPING GEOMETRY AND DIMENSIONING**
STAAD PRE- Graphical Input Generation-Library- Geometry Generation – Dimensioning	
Week-V	**3D MODEL DEVELOPMENT**
STAAD POST – Graphical Post Processing – Animation – Icons – Isometric View – Zooming-Results of Analysis & Design – Query reports.	
Week-VI	**ASSIGNING DIFFERENT LOAD PARAMETERS**
LOAD – Member Load, Element Load, Joint Load, Floor Load, Self weight Command, Load case no, Load Combination	
Week-VII	**ANALYIS OF BEAM AND TRUSS**
Analysis of 2D Truss using STAAD-III Analysis of continuous Beams using STAAD-III	
Week-VIII	**ANALYIS OF RIGID FRAMES**
Analysis of 2D and 3D Rigid Frames using STAAD-III	
Week-IX	**DESIGN OF RC STRUCTURAL ELEMENTS**
Design of RC framed structures (Beams, columns, slabs, footings) using STAAD III Design of circular water tanks using STAAD-III	
Week-X	**ANALYSIS AND DESIGN OF STEEL STRUCTURES**
Analysis and Design of steel structures (Beams, columns)	
Text Books:	
1. T.S.Sarma, “Staad .Pro v8i for Beginners” Notion press, 2014. 2. Sivakumar Naganathan, “Learn Yourself Staad Pro V8i”, Lap Lambert Academic Publishing GmbH KG, 2012.	
Reference Books:	
1. Design of Steel Structures: Dr. Subramanian Narayanan - Oxford Publication	
Web References:	
1. https://onlinecourses.nptel.ac.in/noc17_ce21/preview.	
E-Text Books:	
1. https://civildigital.com/staad-pro-v8i-video-tutorials/.	

ADVANCED CONCRETE LABORATORY

I Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB10	Core	0	0	4	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 40				Total Classes:40		

I. COURSE OVERVIEW:

Advanced concrete laboratory provides a comprehensive coverage of the theoretical and practical aspects of the subject and includes the latest developments in the field of concrete construction. It incorporates the latest Indian standard specifications and codes regulating concrete construction. The properties of concrete and it constituent materials and the role of various admixtures in modifying these properties to suit specific requirements, such as ready mix concrete, reinforcement detailing, disaster-resistant construction, and concrete machinery have been treated exhaustively the and also special concrete in addition to the durability maintenance and quality control of concrete structure.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The design of high grade concrete and study the parameters affecting its performance.
II. The Non Destructive Testing methods for evaluating the existing structures.
III. The engineering principles to understand behavior of structural elements.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Construct the stress-strain curve of high strength concrete for the design of RC structures.	Apply
CO 2	Develop the correlation between cube strength and cylinder strength for understanding the different codal provisions other than IS.	Analyze
CO 3	Determine the relation between compressive strength and split tensile strength for the analysis of concrete in tension.	Analyze
CO 4	Identify the relation between the compressive strength and modulus of rupture of concrete for understanding the behavior of concrete in rupture.	Analyze
CO 5	Test for the Non-Destructive testing of concrete members using rebound hammer and ultrasonic pulse velocity.	Analyze
CO 6	Explain the behavior of beams under flexure, shear and torsion for design purpose.	Understand

IV. SYLLABUS

LIST OF EXPERIMENTS

Week-I	STRESS STRAIN CURVE FOR CONCRETE

Study of stress-strain curve of high strength concrete.

Week-II	**CORRELATION BETWEEN CUBE STRENGTH AND CYLINDER STRENGTH**
Correlation between cube strength and cylinder strength.	
Week-III	**DETERMINTION OF SPLIT TENSILE CONCRETE**
Split tensile strength.	
Week-IV	**DETERMINTION OF MODULUS OF RUPTURE CONCRETE**
Modulus of rupture.	
Week-V	**RELATION BETWEEN COMPRESSIVE STRENGTH AND SPLIT STRENGTH**
Correlation between compressive strength and cylinder strength.	
Week-VI	**RELATION BETWEEN COMPRESSIVE AND MODLUS OF RUPTURE**
Effect of cyclic loading on steel.	
Week-VII	**NON – DESTRUCTIVE TEST (NDT)**
Non-Destructive testing of existing concrete members.	
Week-VIII	**FLEXURE STRENGTH TEST**
Behavior of Beams under flexure.	
Week-IX	**SHEAR STRENGTH TEST**
Behavior of Beams under Shear.	
Week-X	**TORSION STRENGTH TEST**
Behavior of Beams under Torsion.	
Text Books:	
1. Concrete Technology, Shetty M. S., S. Chand and Co., 2006.	
Reference Books:	
1. Properties of Concrete, Neville A. M., Prentice Hall, 5thEdition, 2012.	
Web References:	
1. http://kec.edu.np/wp-content/uploads/2017/06/Advanced-Concrete-Technology.pdf.	
E-Text Books:	
1. http://alphace.ac.in/downloads/notes/cv/10cv81.pdf.	

FINITE ELEMENT METHOD IN STRUCTURAL ENGINEERING

II Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB11	Core	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

The Finite Element Method (FEM) is widely used in industry for analyzing and modelling structures and continua, whose physical behavior is described by ordinary and partial differential equations. The FEM is particularly useful for engineering problems that are too complicated to be solved by classical analytical methods. The main objective of this course is to introduce the mathematical concepts of the Finite Element Method for obtaining an approximate solution of ordinary and partial differential equations. In this course you will attend lectures on the fundamentals of the Finite Element Method. The learning process will be enhanced by completing assignments using mathematical software. You will also be introduced to a commercial Finite Element software package–ANSYS during lectures with computer laboratories providing opportunities to practice on, and to complete practical assignments, using ANSYS.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The Use of Finite Element Method for structural analysis.
II. The Execution of the Finite Element Program by using Software tools.
III. The continuum problems using finite element analysis.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Explain the concepts of matrix analysis of structures for understanding the FEM.	Understand
CO 2	Outline the concepts of elasticity, plane stress and plane strain conditions for the design purpose.	Understand
CO 3	Analyze the one- and two-dimensional structures using beam and bar elements.	Analyze
CO 4	Explain the concepts of iso-parametric elements for the analysis of Structures.	Understand
CO 5	Analyze the plates like slabs using plate elements.	Analyze
CO 6	Summarize the concepts of non-linear analysis for analyzing the real world situations	Understand

IV. SYLLABUS

UNIT-I	INTRODUCTION	Classes: 09

History and Applications. Spring and Bar Elements, Minimum Potential Energy Principle, Direct Stiffness Method, Nodal Equilibrium equations, Assembly of Global Stiffness Matrix, Element Strain and Stress.

UNIT-II	BEAM ELEMENTS	Classes: 09
Flexure Element, Element Stiffness Matrix, Element Load Vector.		
UNIT-III	**METHOD OF WEIGHTED RESIDUALS**	**Classes: 09**
Galerkin Finite Element Method, Application to Structural Elements, Interpolation Functions, Compatibility and Completeness Requirements, Polynomial Forms, Applications.		
UNIT-IV	**TYPES**	**Classes: 09**
Triangular Elements, Rectangular Elements, Three-Dimensional Elements, Isoparametric Formulation, Axi-Symmetric Elements, Numerical Integration, Gaussian Quadrature.		
UNIT-V	**APPLICATION TO SOLID MECHANICS & COMPUTER IMPLEMENTATION**	**Classes: 09**
Application to Solid Mechanics: Plane Stress, CST Element, Plane Strain Rectangular Element, Isoparametric Formulation of the Plane Quadrilateral Element, Axi- Symmetric Stress Analysis, Strain and Stress Computations. Computer Implementationof FEM procedure, Pre-Processing, Solution, Post-Processing, Useof Commercial FEA Software.		

Text Books:

1. Seshu P, “Finite Element Analysis”, Prentice-Hall of India, 2005.
2. Cook R. D, “Concepts and Applications of Finite Element Analysis”, Wiley J., New York, 1995.
3. Krishnamoorthy C.S, "Finite Elements Analysis - Theory and Programming",Tata McGraw Hill publishing company limited, New Delhi, 2008.

Reference Books:

1. Hutton David, “Fundamentals of Finite Element Analysis”, McGraw Hill, 2004.
2. Buchanan G.R, “Finite Element Analysis, McGraw Hill Publications, New York, 1995.
3. Zienkiewicz O.C. & Taylor R.L , “Finite Element Method”,. Vol. I, II & III, Elsevier, 2000
4. Belegundu A.D., Chandrupatla, “Finite Element Methods in Engineering”, T.R., Prentice Hall, India, 1991.

Web References:

1. http:// nptel.ac.in/courses/105106051/
2. http:// nptel.ac.in/courses/1051050
3. http://web.mit.edu/16.810/www/16.810_L4_CAE.pdf

STRUCTURAL DYNAMICS

II Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB12	Core	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

Structural Dynamics is of utmost importance for understanding the analysis and design consideration of structures subjected to dynamic loading. This course introduces the basic concepts of dynamic loading and the response of structures to such loads, and then uses these concepts to illustrate applications in practical structures. It begins with the derivation of the basic equations of motion for an ideal single degree-of-freedom structure using various approaches, and the solution of these equations for different types of loading. Further, the development of equations for multi-degree-of-freedom structures is considered, with multi-storied buildings as the example structures, and free and forced vibration response analysis of these multi-storied buildings shall be discussed.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The dynamics response of single and multi-degree freedom systems using fundamental theory and equations of motion.
II. The numerical solution of structural responses of different loading conditions for the design of structures.
III. The responses of structures subjected to earthquakes and blasts for the efficient and economic design of structures.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Explain the concepts of equation of motion of a dynamic system and different loads acting on the structures for understanding the behavior of structures.	Understand
CO 2	Outline the concept of damped vibrations of single degree freedom systems for the analysis of structures subjected to dynamic loads.	Understand
CO 3	Develop the expressions for response of single degree freedom systems based on loading function for the response of structure used in design.	Apply
CO 4	Develop the equations of structural response to dynamic loads using Duhamel's integral and fourier analysis.	Apply
CO 5	Analyse the two-degree freedom systems subjected to free and forced vibrations for the design purpose.	Analyse
CO 6	Analyse the multiple degree of freedom systems to know the natural frequencies, modes and mode shapes using orthogonality and normality principles and superposition method.	Analyse

IV. SYLLABUS

UNIT -I	INTRODUCTION	Classes: 09

Objectives, Importance of Vibration Analysis, Nature of Exciting Forces, Mathematical Modeling of Dynamic Systems.

UNIT -II	SINGLE DEGREE OF FREEDOM SYSTEM	Classes: 09
Free and Forced Vibration with and without Damping, Response to Harmonic Loading, Response to General Dynamic Loading using Duhamel's Integral, Fourier Analysis for Periodic Loading, State Space Solution for Response.		
UNIT -III	**NUMERICAL SOLUTION**	**Classes: 09**
Introduction, accuracy and stability, Solution to Response using New mark Method and Wilson Method, State Space solution for response Numerical Solution for State Space Response using Direct Integration.		
UNIT -IV	**MULTIPLE DEGREE OF FREEDOM SYSTEM (LUMPED PARAMETER)**	**Classes: 09**
Two Degree of Freedom System, Multiple Degree of Freedom System, Inverse Iteration Method for Determination of Natural Frequencies and Mode Shapes, Dynamic Response by Modal Superposition Method, Direct Integration of Equation of Motion.		
UNIT -V	**MULTIPLE DEGREE OF FREEDOM SYSTEM & SPECIAL TOPICS IN STRUCTURAL DYNAMICS**	**Classes: 09**
Multiple Degree of Freedom System (Distributed Mass and Load): Single Span Beams, Free and Forced Vibration, Generalized Single Degree of Freedom System. Special Topics in Structural Dynamics(Concepts only): Dynamic Effects of Wind Loading, Moving Loads, Vibrations caused by Traffic, Blasting and Pile Driving, Foundations for Industrial Machinery, Base Isolation.		

Text Books:

1. Clough R. W. and Penzien J, "Dynamics of Structures", McGraw Hill.
2. Chopra A. K, "Structural Dynamics and Introduction to Earthquake Engineering", illustrated, Prentice Hall, 4th Edition, 2012.
3. Smith J. W, "Vibration of Structures - Application in Civil Engineering Design", Chapman and Hall.

Reference Books:

1. Humar J. L., "Dynamics of Structures", Prentice Hall.
2. Paz Mario, "Structural Dynamics Theory and Computation", CBS Publication.
3. Hart and Wong, "Dynamics of Structures"

Web References:

1.http://nptel.ac.in/courses/105101006/

E-Text Books:

1. http://scmero.ulb.ac.be/Teaching/Courses/MECA-H-303/MECA-H-303-Lectures.pdf

ADVANCED STEEL DESIGN

II Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB13	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

This course is recommended for postgraduate students in the structural engineering program who are interested in learning the design of steel structures. This course provides relevant material properties of different types of steel material specifications and design considerations. It covers the behavior and design of structural steel components and helps to gain an educational and comprehensive experience in the design of simple steel structures. It also delivers students with a thorough understanding of the iterative nature of design and the fundamental principles on which the analyses are based. This course is mainly designed to introduce the behavior and design of tension members, compression members, laterally restrained and unrestrained beams, beam-columns and connections design. It deals with two types of connections namely welded and bolted connections. Students are expected to obtain basic knowledge about the design and failure mode of steel structural members after finishing this course.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The Design of steel structural components by using different codal procedures.
II. Analysis and design of beam-columns for stability, strength and drift.
III. Design of welded and bolted joint connections for high rise and bridge structures.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Learn the behavior and design of structural steel components like truss and frame structures	Understand
CO 2	Explain an educational and comprehensive experience in the design of simple steel structures	Understand
CO 3	Obtain basic knowledge about the design and failure mode of steel structural members after finished this course.	Analyze
CO 4	Analyze wind loads on buildings and design truss bridges.	Analyze
CO 5	Analyze and design of tower structures.	Analyze
CO 6	Analyze and design various welded and bolted connections	Analyze

IV. SYLLABUS

UNIT -I	PROPERTIES OF STEEL	Classes: 09

Mechanical Properties, Hysteresis, Ductility, Hot Rolled Sections: compactness and non-compactness, slenderness, residual stresses

UNIT -II	DESIGN OFSTEEL STRUCTURES	Classes: 09
Inelastic Bending Curvature, Plastic Moments, Design Criteria Stability, Strength, Drift. Stability of Beams: Local Buckling of Compression Flange &Web, Lateral Torsional Buckling		
UNIT -III	**STABILITY OF COLUMNS AND METHOD OF DESIGNS**	**Classes: 09**
Slenderness Ratio, Local Buckling of Flanges and Web, Bracing of Column about Weak Axis Allowable Stress Design, Plastic Design, Load and Resistance Factor Design		
UNIT -IV	**STRENGTH CRITERIA**	**Classes: 09**
Beams -Flexure, Shear, Torsion, Columns - Moment Magnification Factor, Effective Length, PM Interaction, Biaxial Bending, Joint Panel Zones.		
UNIT -V	**DRIFT CRITERIA AND CONNECTIONS**	**Classes: 09**
Drift Criteria: P Effect, Deformation Based Design Connections: Welded, Bolted, Location Beam Column, Column Foundation, Splices		

Text Books:

1. P. Dayaratnam, "Design of Steel Structures", S. Chand (2012).
2. Dr. Ramachandra & Vivendra, "Design Steel Structures" Volume – II, Gehlot Scientitic Publishes Journals Department.
3. S.K. Duggal, "Limit State Design of Steel Structures", McGraw Hill Education Private Ltd. New Delhi.

Reference Books:

1. Galyord & Gaylord, "Design of Steel Structures", Tata McGraw Hill, Education (2012).
2. Indian Standard Code – IS:800 (2007).
3. B.O. Kuzamanovic and N.Willems, "Steel Design for Structural Engineers", Prentice Hall (1997).

Web References:

1. http://nptel.ac.in/courses/105106113/

E-Text Books:

1. https://www.iare.ac.in/sites/default/files/lecture_notes/lec%20notes%20ASD.pdf

DESIGN OF HIGH RISE STRUCTURES

II Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB14	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

The high-rise building is generally defined as one that is taller than the maximum height. The foundations of high-rise buildings must sometimes support very heavy gravity loads, and they usually consist of concrete piers, piles, or caissons that are sunk into the ground. Skyscrapers are created using a steel skeleton structure. Giant girder grids are formed by riveting metal beams end to end to form vertical columns. At each floor, the vertical columns are connected to horizontal girder beams to help strengthen and reinforce the structure.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The Analysis, design and detailing of Transmission/ TV tower, Mast and Trestles with different loading conditions.
II. The design principles and techniques such as P-Delta effect, soil structure interaction for efficient design of high rise structures..
III. The behaviour of various structural systems under extreme loading conditions.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Analyze various components involved in design of chimneys	Analyze
CO 2	Identify about different systems and various loads in Tall structures.	Apply
CO 3	Identify about various structural systems and their behavior.	Apply
CO 4	Interpret static, dynamic and stability analysis of various systems.	Understand
CO 5	Classify various Flooring systems and modern progress of tall structures.	Understand
CO 6	Develop Application of software in analysis and design.	Apply

IV. SYLLABUS

UNIT-I	DESIGN OF TRANSMISSION/ TV TOWER	Classes: 09

Mast and trestles: Configuration, bracing system, analysis and design for vertical transverse and longitudinal loads

UNIT-II	ANALYSIS AND DESIGN OF RC AND STEEL CHIMNEY	Classes: 09

Foundation design for varied soil strata.

UNIT-III	TALL BUILDINGS	Classes: 09
Structural Concept, Configurations, various systems, factors affecting growth, height and structural form, Gravity load, dead load, live load, live load reduction technique, impact load, Wind and Seismic loads, combination of load.		
UNIT-IV	**FIREFIGHTING PROVISION OF TALL BUILDINGS**	**Classes: 09**
Dynamic approach, structural design considerations and IS code provisions. Firefighting design provisions.		
UNIT-V	**APPLICATION**	**Classes: 09**
Application of software in analysis and design.		

Text Books:

1. Varyani U. H, "Structural Design of Multi-storeyed Buildings", South Asian Publishers,New Delhi, 2nd Ed., 2002.
2. Taranath B. S, "Structural Analysis and Design of Tall Building", McGraw Hill, 1988.
3. Shah V. L. &Karve S. R., "Illustrated Design of Reinforced Concrete Buildings(GF+3storeyed)", Structures Publications, Pune, 2013

Reference Books:

1. Smith Byran S. and Coull Alex , "Tall Building Structures" , Wiley India. 1991.
2. Wolfgang Schueller, "High Rise Building Structures", Wiley, 1971.

Web References:

1. http://nptel.ac.in/courses/105106113/13

E-Text Books:

1. http://www.byggmek.lth.se/fileadmin/byggnadsmekanik/publications/tvsm5000/web5213.pdf

DESIGN OF MASONRY STRUCTURES

II Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB15	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

Masonry structures constitute approximately 85% of the built stock in a developing country such as India; however, a vast majority of this is non-engineered or semi-engineered constructions demonstrating poor performance, particularly under earthquake actions. The current course aims at elucidating theories on mechanical behaviour of masonry assemblages under different actions, and introduces students to working stress and limit state approaches to analysis and design of unreinforced, reinforced, confined masonry structures for gravity and lateral loads, including earthquake loads. The course will also briefly address behaviour of masonry infill walls and procedures for structural assessment and strengthening of existing masonry structures. Students who undertake this course will have an understanding of behavior of structural masonry under different loads, and be able to estimate capacities and design masonry walls and systems.

II. COURSE OBJECTIVES:

The student will try to learn:

I. Structural analysis of load bearing brick and block masonry.
II. Structural design of walls, columns and beams in unreinforced and reinforced masonry.
III. Application of simple structural models for calculation and design of building parts and detailing.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Describe about masonry construction	Understand
CO 2	Assess the strength and stability of masonry walls	Evaluate
CO 3	Identify the various interactions involved in structural elements	Apply
CO 4	Describe the effect of curing, ageing and workmanship of a masonry wall	Understand
CO 5	Explain the design aspects of reinforced masonry	Understand
CO 6	Make use of various model techniques for analyzing the components	Apply

IV. SYLLABUS

UNIT -I	INTRODUCTION	Classes: 09

Historical Perspective, Masonry Materials, Masonry Design Approaches, Overview of Load Conditions, Compression Behaviour of Masonry, Masonry Wall Configurations, Distribution of Lateral Forces

UNIT -II	FLEXURAL STRENGTH	Classes: 09

Flexural Strength of Reinforced Masonry Members: In plane and Out-of-plane Loading. Shear Strength and Ductility of Reinforced Masonry Members

UNIT -III	INTERACTIONS	Classes: 09
Structural Wall, Columns and Pilasters, behavior of axially loaded columns, axial strength of reinforced masonry columns. Retaining Wall, principal types of retaining walls, lateral pressures on retaining walls, external stability of a retaining wall, Pier and Foundation		
UNIT -IV	**PRESTRESSED MASONRY**	**Classes: 09**
Stability of Walls, Coupling of Masonry Walls, Openings, Columns, Beams.		
UNIT -V	**ELASTIC ANDINELASTIC ANALYSIS**	**Classes: 09**
Modeling Techniques, Static Push Over Analysis and use of Capacity Design Spectra.		
Text Books:		
1. NarendraTaly, "Design of Reinforced Masonry Structures", ICC, 2nd Edition, 2010. 2. Hamid Ahmad A. and Drysdale Robert G, "Masonry Structures: Behavior and Design", 1994. Mechanics of Masonry Structures, Editor: Maurizio Angelillo, 2014.		
Reference Books:		
Earthquake-resistant Design of Masonry Buildings, Toma_evi_Miha, Imperial College Press, 1999.		
Web References:		
http://nptel.ac.in/courses/105102088/28		
E-Text Books:		
http://civil.iisc.ac.in/ksnseminar.pdf		

DESIGN OF ADVANCED CONCRETESTRUCTURES

II Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB16	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

Design of reinforced concrete structures is an introductory design course in civil engineering. In this course, basic elements governed by bending, shear, axial forces or combination of them are identified and are considered as building blocks of the whole structure. The design will be done as per IS 456:2000.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The design of special structures by understanding their behaviour in terms of shear force and bending moment.
II. Design and prepare detail structural drawings for execution citing relevant IS codes.
III. The Design independently civil engineering structures as per the requirements of client and provide detailed design drawings, quality control reports during construction for ensuring quality and economical structures.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Understand the behaviour of reinforced concrete under flexure and shear for designing beams, slabs and columns under various load condition	Understand
CO 2	Explain the concepts of plastic hinge and plastic moment for understanding the redistribution of moments and moment rotation characteristics of reinforced concrete members	Understand
CO 3	Analyse flat and ribbed slabs under given loading for designing and obtaining the reinforcement detailing in end and middle strips of the slab	Analyse
CO 4	Analyse the load distribution in deep beams for designing and fixing of reinforcement details in deep beams	Analyse
CO 5	Develop the concept of axial, uni-axial and bi-axial loading on compression members for designing the same to meet the safety and serviceability conditions.	Apply
CO 6	Analyse the soil properties for designing various types of footings for transferring the superimposed loads safely to the soil beneath.	Analyse

IV. SYLLABUS:

UNIT-I	**DESIGN PHILOSOPHY**	**Classes: 09**
Modeling of Loads, Material Characteristics		
UNIT-II	**REINFORCED CONCRETE**	**Classes: 09**
P-M, M-phi Relationships, Strut-and- Tie Method, Design of Deep Beam and Corbel.		

UNIT-III	ANALYSIS AND DESIGNING OF SHEAR WALLS	Classes: 09
Introduction, fundamental concepts, types of shear walls, rigidity and relative rigidity of a shear wall. Design considerations for shear walls, Design of Shear Wallsas per IS code & ACI code,		
UNIT-IV	**DESIGN OF SHEAR AND TORSION**	**Classes: 09**
Compression Field Theory for Shear Design, Design against Torsion; IS, ACI and Euro code.		
UNIT-V	**STEEL STRUCTURES**	**Classes: 09**
Stability Design, Torsional Buckling - Pure, Flexural and Lateral, Design Of Beam-Columns, Fatigue Resistant Design, IS code, AISC Standards and Euro code		

Text Books:

1. Pillai S. U. and MenonD, 'Reinforced Concrete Design", Tata McGraw-Hill, 3rdEdition, 1999.
2. Subramaniam N, "Design of Steel Structures", Oxford University Press, 2008.
3. Park R.and Paulay T, "Reinforced Concrete Structures", John Wiley & Sons, 1995

Reference Books:

1. Varghese P. C, "Advanced Reinforced Concrete Design", Prentice Hall of India, New Delhi.
2. Hsu T. T. C. and Mo Y. L , "Unified Theory of Concrete Structures", John Wiley & Sons, 2010.
3. SalmonC. G., Johnson J. E. and Malhas F. A. "Steel Structures Design and Behavior Emphasizing Load and Resistance Factor Design", Pearson Education, 5th Ed, 2009.
4. Ramchandra, "Design of Steel Structures" , Vol. II,. Standard Book House, Delhi.
5. Neal B.G, "Plastic Methods of Structural Analysis", Chapman and Hall London.

Web References:

1. https://lecturenotes.in/subject/179/design-of-advanced-concrete-structures-dacs

E-Text Books:

1. http://nptel.ac.in/downloads/105105104/

ADVANCED DESIGN OF FOUNDATIONS

II Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB17	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

Foundation engineering is a branch of geotechnical engineering which applies soil mechanics, structural engineering and project serviceability requirements for design and construction of foundations for on shore, offshore, and in-land structures. This course addresses the design of shallow, deep and well foundations, the stability of slopes, stability of retaining walls and embankments against failure. The course also discusses the safety and serviceability considerations in the design of foundations.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The methods of soil exploration, field tests on soil by planning and soil investigation report documentation.
II. The stability of infinite and finite slopes using different parameters.
III. The various earth pressure theories and stability of retaining walls.
IV. The lab experiments and field tests for the estimation of bearing capacity of shallow, deep and well, foundations.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Discover standardized method of soil exploration for classifying the soil core type and to make decision on type and depth of foundation.	Analyze
CO 2	Evaluate the bearing capacity of the foundation soil for selecting the suitable type and depth foundation and to make surface from the settlement.	Evaluate
CO 3	Inspect the pile group capacity and settlement of the foundation soil under the action of eternal load for selecting the accurate type of the pile foundation.	Analyze
CO 4	Examine the theories and recommended provisions to avoid underground structures free from the collapse and tilting.	Analyze
CO 5	Select most accurate type and method for laying the sheeting and bracing related to shallow and deep cuts to make sure the structures safe from the uplift pressure.	Evaluate
CO 6	Discover the soil-structure interaction under the shock load and vibration loads to ensure structures free from the failures due to the action of sudden and earthquake loads.	Analyze

IV. SYLLABUS

UNIT -I	**PLANNING OF SOIL EXPLORATION**	**Classes: 09**
Planning of Soil Exploration for Different Projects, Methods of Subsurface Exploration, Methods of Borings along with Various Penetration Tests.		
UNIT -II	**SHALLOW FOUNDATIONS**	**Classes: 09**
Requirements for Satisfactory Performance of Foundations, Methods of Estimating Bearing Capacity, Settlements of Footings and Rafts, Proportioning of Foundations using Field Test Data, Pressure - Settlement Characteristics from Constitutive Laws.		
UNIT -III	**PILE FOUNDATIONS**	**Classes: 09**
Methods of Estimating Load Transfer of Piles, Settlements of Pile Foundations, Pile Group Capacity and Settlement. Laterally Loaded Piles, Pile Load Tests, Analytical Estimation of Load- Settlement Behavior of Piles, Proportioning of Pile Foundations, Lateral and Uplift Capacity of Piles.		
UNIT -IV	**WELL FOUNDATION**	**Classes: 09**
IS and IRC Code Provisions, Elastic Theory and Ultimate Resistance Methods. Tunnels and Arching in Soils, Pressure Computations around Tunnels		
UNIT -V	**OPEN CUTS, COFFER DAMS**	**Classes: 09**
Sheeting and Bracing Systems in Shallow and Deep Open Cuts in Different Soil Types. Coffer Dams, Various Types, Analysis and Design, Foundations under uplifting loads, Soil-structure Interaction.		

Text Books:

1. N.P. Kurian, “Design of foundation system”, Narosa Publishing House.
2. J. E. Bowles, “Foundation Analysis and Design” , Tata McGraw Hill New York.

Reference Books:

1. Analysis and Design of Substructures, Swami Saran, Oxford and IBH Publishing Co. Pvt. Ltd, New Delhi.

Web References:

1. http://nptel.ac.in/courses/105105039/

E-Text Books:

1. https://lecturenotes.in/subject/244/advanced-foundation-engineering-afe

DESIGN OF INDUSTRIAL STRUCTURES

II Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB18	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

The purpose of this course is to develop an in-depth knowledge in the area of design of industrial structure with the latest code of practice as per the Indian Standard. On completion of this course student gain good confidence in designing major industrial structures like bridge plate girders, industrial structures like gantry girders, water tanks, support structures, high rise chimneys and pre-engineered thin walled structures.

II. COURSE OBJECTIVES:

The student will try to learn:

I. Design principles of Steel Gantry Girders, bunkers and silos.
II. The design and detailing of portal frames and gable frames
III. The design of, resting on the ground and elevated water tanks according to IS code.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Discuss the planning and functional requirements of Industrial structures.	Understand
CO 2	Discover the need to learn about the design concepts, and constructional aspects of Industrial structures	Create
CO 3	Analyze and evaluate the importance of various construction materials for Industrial constructions	Analyze
CO 4	Design portal frames, tower cranes and bracing system in Industrial buildings.	Create
CO 5	Analyze and design various structural elements in water tanks	Analyze
CO 6	Analyze and design structural elements used in pre-cast construction including fabrication, erection and installation	Analyze

IV. SYLLABUS

UNIT-I	STEEL GANTRY GIRDERS	Classes: 09

Introduction, loads acting on gantry girder, permissible stress, types ofgantry girders and crane rails, crane data, maximum moments and shears, construction detail, design procedure.

UNIT-II	PORTAL FRAMES	Classes: 09

Design of portal frame with hinge base, design of portal frame with fixed base -Gable Structures – Lightweight Structures

UNIT-III	STEEL BUNKERS AND SILOS	Classes: 09

Design of square bunker, Jansen's and Airy's theories, IS Code provisions – Design of side plates.

Stiffeners, Hooper, Longitudinal beams Design of cylindrical silo, Side plates, ring girder, stiffeners.

UNIT-IV	CHIMNEYS	Classes: 09
Introduction, dimensions of steel stacks, chimney lining, breech openings and access ladder, loading and load combinations, design considerations, stability consideration, design of base plate, design of foundation bolts, design of foundation		
UNIT-V	**WATER TANKS, DESIGN OF PRESSED STEEL WATER TANK**	**Classes: 09**
Design of stays: Joints, Design of hemispherical bottom water tank, side plates, Bottom plates, joints, Ring girder: Design of staging and foundation.		

Text Books:

1. Punmia B. C., Jain Ashok Kr., Jain Arun Kr, "Design of Steel Structure", Lakshmi Publishers, 2nd Edition, 1998.

Reference Books:

1. Ram Chandra, "Design of Steel Structures', Standard Publishers, 12th Edition, 2009.
2. Subramaniyam., "Design of Steel Structures,

Web References:

1. http://nptel.ac.in/courses/105106113/3

E-Text Books:

1. http://nptel.ac.in/downloads/105106113/

NUMERICAL ANALYSIS LABORATORY

II Semester: **ST**

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB20	Core	0	0	4	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 40				Total Classes:40		

I. COURSE OVERVIEW:

This course deals with the numerical solutions of linear and non-linear equations by using different algorithms. These includes bi section method, newton's method, method of least squares, gauss elimination method, gauss zordan method, gauss seidal method, trapezoidal rule, simpson's rule and ranga-kutta method. This will enable the students to accostum with programming using different computer languages.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The Roots of non-linear equations by Bisection method and Newton's method.
II. The system of Linear Equations using Gauss - Elimination/ Gauss - Seidal Iteration/Gauss - Jorden Method.
III. The integrations numerically using Trapezoidal and Simpson's rules

III. COURSE OUTCOMES

After successful completion of the course, students should be able to:		
CO 1	Analyze the roots of non-linear equation using bisection and newton's method.	Analyze
CO 2	Evaluate the curve fitting by using method of least squares approximations.	Evaluate
CO 3	Determine the linear system of equations using gauss elimination, gauss seidal and gauss Jordan methods.	Analyze
CO 4	Solve the integrations numerically using trapezoidal and simpson's rule.	Apply
CO 5	Explain the numerical solution of ordinary differential equations using Euler's Method.	Analyze
CO 6	Analyze the numerical solution of ordinary differential equations by using Runge- Kutta Method.	Apply

IV. SYLLABUS

LIST OF EXPERIMENTS

Week-I	**BISECTION METHOD**
Find the Roots of Non-Linear Equation Using Bisection Method	
Week-II	**NEWTON'S METHOD**
Find the Roots of Non-Linear Equation Using Newton's Method.	

Week-III	**CURVE FITTING**
Curve Fitting by Least Square Approximations.	
Week-IV	**GAUSS ELIMINATION METHOD**
Solve the System of Linear Equations Using Gauss - Elimination Method.	
Week-V	**GAUSS SEIDAL ITERATION METHOD**
Solve the System of Linear Equations Using Gauss - Seidal Iteration Method.	
Week-VI	**GAUSS JORDEN METHOD**
Solve the System of Linear Equations Using Gauss - Jorden Method.	
Week-VII	**TRAPEZIODIAL RULE**
Integrate numerically using Trapezoidal Rule.	
Week-VIII	**SIMPSON'S RULE**
Integrate numerically using Simpson's Rules.	
Week-IX	**EULER'S METHOD**
Numerical Solution of Ordinary Differential Equations By Euler's Method.	
Week-X	**RUNGE KUTTA METHOD**
Numerical Solution of Ordinary Differential Equations By Runge- Kutta Method.	
Text Books:	
1. D.A. Bini, M. Capovani, O. Menchi, "Method of Numerical Algebra Linear", Zanichelli, 1988.	
Reference Books:	
1. R. Bevilacqua, D.A. Bini, M. Capovani, O. Menchi, MetodiNumerici, Zanichelli, 1992	
Web References:	
1. http://www.iitg.ac.in/physics/fac/charu/courses/ph508/lab5.pdf	
E-Text Books:	
1. https://www.researchgate.net/publication/275014975_A_Numerical_Analysis_Lab_Solving_System_of_Linear_Equations	

RESEARCH AND CONTENT DEVELOPMENT

II Semester: **ST**

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB19	Core	0	0	4	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 48				Total Classes:48		

. COURSE OVERVIEW:

This course deals with improving the aesthetic quality of your work, LaTeX users benefit from automating many of the tedious processes involved in writing a professional publication. LaTeX allows you to manage references, figures, tables, footnotes, formatting, mathematical equations, algorithms, scientific proofs, and more in a programmatic fashion that provides benefits far exceeding that of word processing software.

II. OBJECTIVES:

The course should enable the students to:

I. Understand the fundamental concepts of computer networking.
II. Use the preamble of LaTeX file to define document class and layout options.
III. Use latex and various templates acquired from the course to compose mathematical documents
IV. Understand web design concepts

III. COURSE OUTCOMES

CO1	Summarize the basic concepts of LaTex for preparation of research article	Understand
CO2	Develop the layout of Mathematical equation, Graphs and tables for LaTeX document preparation	Apply
CO3	Apply the various Formatting Styles in LaTex for develop the project certificates.	Apply
CO4	Develop the Excel Spread Sheets for creating the Scheduler and GPA - Features	Create
CO5	Make use of HTML and Network Connectivity for WEB designing for sample project	Apply
CO6	Analyze the surfing the web and Router Configuration for Web Browsers, Cabling a network using CCNA.	Analyse

IV. SYLLABUS:

LIST OF EXPERIMENTS

Week – I	**LaTeX FORMATTING**

Introduction of LaTex and LaTeX document formatting:
Create a LaTeX document with following formatting: All margins with l.5, headings with bold, text with normal, chapter name with blue color, line space with l.5.

Week – II	**TECHNICAL PAPER PREPARATION IN LaTeX**

Essential steps in writing the technical report:
Create a technical report according to IEEE format includes title of the paper, authors name and affiliations,abstract and keywords, introduction section, background section, and other sections, references.

Week – III	**FORMATTING MATHEMATICAL EQUATIONS IN LaTeX**
Create a LaTeX document with following mathematical equations along with equation numbers in Italicformat: summation (represent in sigma symbol), integration, integral of summation, average of summation trigonometric equations, polynomial and non-polynomial equations.	
Week – IV	**GRAPHICS AND TABLES IN LaTeX**
Create a LaTeX documents with images and image caption at centre alignment, table with thick border and table caption with centre alignment, row height, content with cell centre alignment.	
Week – V	**VARIOUS FORMATTING STYLES IN LaTeX**
Using LaTeX to create project certificate. Features to be covered:- Formatting Fonts in word, Drop Cap in word. Applying Text effects. Using Character Spacing, Borders and Colors, Inserting Header and Footer, using Date and Time option in both LaTeX.	
Week – VI	**EXCEL SPREAD SHEETS**
Spreadsheet Orientation: Accessing, overview of toolbars, saving spreadsheet files. Using help and resources. Creating a Scheduler: Gridlines, Format Cells, Summation, auto fill, Formatting Text Calculating GPA-Features to be covered:- Cell Referencing, Formulae in spreadsheet - average std. deviation, Charts, Renaming and Inserting worksheets, Hyper linking, Count function, Sorting, Conditional formatting	
Week – VII	**PREPARATION OF POWERPOINT PRESENTATION IN LaTeX**
Student should work on basic power point utilities and tools in Latex which help them create basic power point presentation. PPT Orientation, Slide Layouts, Inserting Text, Formatting Text, Bullets and Numbering. Auto Shapes. Lines and Arrows	
Week – VIII	**WEB PAGES CREATION AND DESIGNING**
HTML, creating simple web pages, images and links, design of web pages Develop home page: Student should learn to develop his/her home page using HTML consisting of his/her photo, name, address and education details as a table and his/her skill set as a list.	
Week – IX	**WEB DESIGN FOR SAMPLE PROJECT**
Create a webpage with HTML describing your department. Use paragraph and list tags. Apply various colors to suitably distinguish key words. Also apply font styling like italics, underline and two other fonts to words you find appropriate. Also use header tags. Create links on the words e.g. "Wi-Fi" and "LAN" to link them to Wikipedia pages. Insert an image and create a link such that clicking on image takes user to other page. Change the background color of the page. At the bottom create a link to take user to the top of the page.	
Week – X	**NETWORK CONNECTIVITY**
Students should get connected to their Local Area Network and access the Internet. In the process they configure the TCP/IP setting. . Finally students should demonstrate how to access the websites and email.	
Week – XI	**SURFING THE WEB**
Web Browsers, Surfing the Web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and pop up blockers.	

Week – XII	ROUTER CONFIGURATION
Cabling a network using CCNA, basic and challenge router configuration, subnetting, practical test router connections and settings, troubleshooting challenges.	
Reference Books:	
1. Introduction to Information Technology, ITL Education Solutions limited, Pearson Education India, 2005 2. DavrdAnfimion and KenQuamme, "IT Essentials: PC Hardware and Software Companion Guide,Third Edition, Cisco Press, 2008	
Web References:	
1. hnps://www.latex-tutorialcom/tutorials/ 2. https://tutorial.techaltum.com//webdesigning.html	

MINI PROJECT

II Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB21	Core	0	0	4	2	30	70	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 45				Total Classes:45		

OBJECTIVES:

The course should enable the students to:

I. Identify structural engineering problems reviewing available literature.
II. Study different techniques used to analyze complex structural systems.
III. Work on the solutions given and present solution by using his/her technique applying engineering principles.

Guidelines to be followed

Mini Project will have mid semester presentation and end semester presentation. Mid semesterpresentation will include identification of the problem based on the literature review on the topicreferring to latest literature available.

End semester presentation should be done along with the report on identification of topic for thework and the methodology adopted involving scientific research, collection and analysis of data,determining solutions highlighting individuals' contribution.

Continuous assessment of Mini Project at Mid Sem and End Sem will be monitored by theDepartmental committee.

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 course should enable the students to:

I. Understand research problem formulation.
II. Analyze research related information.
III. Follow research ethics.
IV. Understand that today's world is controlled by Computer, Information Technology; but tomorrow world will be ruled by ideas, concept, and creativity.

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/		

DESIGN OF PRESTRESSED CONCRETE STRUCTURES

III Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB22	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

Introduction to Prestressed concrete-prestressing concepts; pre-tensioning and post-tensioning; full and partial prestress; the need for prestress; advantages and disadvantages; methods of prestressing. Forces imposed by prestressing (straight, draped and kinked tendon profiles). Load balancing. Introductory examples. Design requirements: strength and serviceability. Material properties. Design for serviceability: stress limits; serviceability criteria; determination of prestress and eccentricity; cable profiles; cracked section analysis; decompression and cracking moment; effect of cracking at service loads; short-term deflection calculations; crack control; design for strength: limit state design. Rectangular stress block. Ultimate moment capacity. Effect of non-prestressed steel; ductility; transfer strength; design for shear-effect of prestress on shear; stirrup design. Special problems in prestressing: losses; effect of creep and shrinkage; end block design-bursting and spalling forces in post anchorages; transmission lengths in pre-tensioned members. Statically indeterminate beams: introduction to continuous prestressed concrete beams; secondary moments.

II. COURSE OBJECTIVES:

The course should enable the students to:

I. Find out losses in the prestressed concrete.
II. Understand the basic aspects of prestressed concrete fundamentals, including pre and post-tensioning processes.
III. Analyze prestressed concrete deck slab and beam/ girders.
IV. Design prestressed concrete deck slab and beam/ girders.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Explain the concepts of stresses and strains developed within the structures subjected to different loads and their combinations for understanding the behavior of prestressed concrete structures.	Understand
CO 2	Elucidate the concept of methods of pre and post tensioning and the systems of prestressing for the designing of prestressed concrete structural elements	Understand
CO 3	Estimate the losses in the prestress and post tensioned members for the efficient design of prestressed concrete structures.	Analyze
CO 4	Design prestressed and post tensioned structural elements using Indian standard code method.	Apply
CO 5	Summarize the concepts of transfer of prestress in pre and post tensioned members by bond and transmission length using Indian standard code method.	Understand
CO 6	Design the composite prestressed concrete structural elements subjected to flexure and shear for designing multi storied structures.	Apply

IV. SYLLABUS

UNIT-I	**INTRODUCTION TO PRESTRESSED CONCRETE**	**Classes: 09**
Types of prestressing, systems and devices, materials, losses in prestress. Analysis of PSC flexural members: basic concepts, stresses at transfer and service loads, ultimate strength in flexure, code provisions.		
UNIT-II	**STATICALLY DETERMINATE PSC BEAMS**	**Classes: 09**
Design for ultimate and serviceability limit states for flexure, analysis and design for shear and torsion, code provisions. Transmission of prestressing, pretensioned members; Anchorage zone stresses for post tensioned members.		
UNIT-III	**STATICALLY INDETERMINATE STRUCTURES**	**Classes: 09**
Plane Truss – Determinacy and Analysis method, Structural Analysis – Plane truss and Space truss. Analysis and design - continuous beams and frames, choice of cable profile, linear transformation and concordancy		
UNIT-IV	**COMPOSITE CONSTRUCTION**	**Classes: 09**
Composite construction with precast PSC beams and cast in-situ RC slab - Analysis and design, creep and shrinkage effects. Partial prestressing - principles, analysis and design concepts, crack width calculations.		
UNIT-V	**ANALYSIS AND DESIGN**	**Classes: 09**
Analysis and design of prestressed concrete pipes, columns with moments		

Text Books:

1. Lin T.Y, "Design of Prestressed Concrete Structures", Asia Publishing House, 1955.
2. Krishnaraju N, "Prestressed Concrete", Tata McGraw Hill, New Delhi, 1981.

Reference Books:

1. GuyanY, "Limited State Design of Prestressed Concrete", Applied Science Publishers, 1972.
2. IS: 1343- Code of Practice for Prestressed Concrete
3. IRC: 112- code for concrete road bridges.

Web References:

1. http://nptel.ac.in/courses/105106117/

E-Text Books:

1. http://textofvideo.nptel.ac.in/105106118/lec17.pdf

ANALYSIS OF LAMINATED COMPOSITE PLATES

III Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB23	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

Laminated composite materials are increasingly being used in a large variety of structures including aerospace, marine and civil infrastructure owing to the many advantages they offer: high strength/stiffness for lower weight, superior fa-tigue response characteristics, facility to vary fiber orientation, material and stacking pattern, resistance to electro-chemical corrosion, and other superior material properties of composites.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The analysis of rectangular composite plates using different analytical methods.
II. The Finite Element Solutions for Bending of Rectangular Laminated Plates using FSDT
III. The development of computer programs for the analysis of composite plates.

III.COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Apprehend the stress strain relationship of orthotropic and anisotropic materials.	Understand
CO 2	Assess the failure criterion and fracture mechanics of composites.	Understand
CO 3	Analyze the rectangular composite plates using the analytical methods.	Analyze
CO 4	Analyze the composite plates using advanced finite element method	Analyze
CO 5	Develop the computer programs for the analysis of composite plates	Create
CO 6	Analyze the rectangular laminated plates using finite element methods	Analyze

IV. SYLLABUS

UNIT-I	INTRODUCTION	Classes: 09
Displacement Field Approximations for Classical Laminated Plate Theory (CLPT)and First Order Shear Deformation Theory (FSDT), Analytical Solutions for Bending of Rectangular Laminated Plates using CLPT.		
UNIT-II	**GOVERNING EQUATIONS.**	**Classes: 09**
Navier Solutions of Cross-Ply and Angle-Ply Laminated Simply-Supported Plates, Determination of Stresses. Levy Solutions for Plates with Other Boundary Conditions, Analytical Solutions for Bending of Rectangular Laminated Plates Using FSDT.		

UNIT-III	FINITE ELEMENT SOLUTIONS	Classes: 09
Finite Element Solutions for Bending of Rectangular Laminated Plates using CLPT. Stiffness Matrix and Truss element, truss element stiffness matrix, truss element bending function and Beam element		
UNIT-IV	**INTRODUCTION TO FINITE ELEMENT METHOD**	**Classes: 09**
Introduction to Finite Element Method, Rectangular Elements, Formation of Stiffness Matrix,Formation of Load Vector, Numerical Integration, Post Computation of Stresses		
UNIT-V	**FEM MODELLING OF LAMINATED PLATES**	**Classes: 09**
Finite Element Solutions for Bending of Rectangular Laminated Plates using FSDT.Finite Element Model, C0Element Formulation, Post Computation of Stresses. Analysis of Rectangular Composite Plates using Analytical Methods.		
Text Books:		
1. J. N. Reddy , "Mechanics of Laminated Composite Plates and Shells".		
Reference Books:		
1. Reddy J. N., CRC Press, "Mechanics of Laminated Composites Plates and Shells".		
Web References:		
1. http://ethesis.nitrkl.ac.in/5685/1/110ME0327-3.pdf		
E-Text Books:		
1. http://ethesis.nitrkl.ac.in/5878/1/110ME0335-6.pdf		

FRACTURE MECHANICS OF CONCRETE STRUCTURES

III Semester: ST

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
BSTB24	Elective	3	0	0	3	30	70	100
Contact Classes: 45	Tutorial Classes: 0	Practical Classes: Nil				Total Classes: 45		

I. COURSE OVERVIEW:

Over the last twenty years, many theoretical, numerical and experimental methods have evolved in the field of Fracture Mechanics of Concrete. These have led to practical applications in reinforced-concrete design, assessment, monitoring and retrofitting, as well as innovative high-performance and durable cementations materials. Although Fracture Mechanics of Concrete is now mature as a framework for defining and solving a variety of engineering problems, there is still much work to be done in improving previous theoretical and numerical models, and for re-interpreting established phenomena. In particular, there are new developments in the treatment of scale effects; the implementation of 3D-discretisation; and the combination of continuous and discontinuous models. Other areas of rapid progress are the development of innovative testing techniques; the proposal of non-local and anisotropic constitutive laws; the formulation of lattice and multistage models, and the development of coupled multifold theories.

II. COURSE OBJECTIVES:

The student will try to learn:

I. The concepts and principles of fracture mechanics for the analysis of structural components.
II. The analytical and computational tools needed to solve the idealized problems.
III. The fracture and fatigue behavior of different materials to focus on research in this area.

III.COURSE OUTCOMES:

After successful completion of the course, students should be able to:		
CO 1	Describe the fracture types and micro mechanism for concrete structures	Analyze
CO 2	Explain the energy concepts in crack and crack resistance for the analysis of structural components.	Evaluate
CO 3	Demonstrate the linear elastic fracture mechanics for the propagation of cracks.	Analyze
CO 4	Interpret the importance of Crack tip plastic zone for durable concrete structures.	Analyze
CO 5	Explain micromechanics and various models in crack for fracture mechanics models.	Analyze
CO 6	Describe the crack propagation concepts for the applications of concrete structures.	Evaluate

IV. SYLLABUS

UNIT-I	INTRODUCTION	Classes: 09

Fracture Mechanics, Crack in a Structure, Mechanisms of Fracture and Crack Growth, Cleavage Fracture,

UNIT-II	CRACKING MECHANISM	Classes: 09
Ductile Fracture, Fatigue Cracking, Environment assisted Cracking, Service Failure Analysis.		
UNIT-III	**STRESS AT CRACK TIP**	**Classes: 09**
Stress at Crack Tip, Linear Elastic Fracture Mechanics, Griffith's Criteria, Stress Intensity Factors. Crack Tip Plastic Zone, Erwin's Plastic Zone Correction, R curves, Compliance, J Integral, Concept of CTOD and CMD.		
UNIT-IV	**MATERIAL MODELS**	**Classes: 09**
General Concepts, Crack Models, Band Models, Models based on Continuum Damage Mechanics.		
UNIT-V	**APPLICATIONS TO CONCRETE STRUCTURES**	**Classes: 09**
Applications to High Strength Concrete, Fibre Reinforced Concrete, Crack Concepts and Numerical Modeling		

Text Books:

1. Suri C. T. and Jin Z.H., "Fracture Mechanics", 1st Edition, Elsevier Academic Press, 2012.
2. BroekDavid, "Elementary Engineering Fracture Mechanics", 3rd Rev. Ed. Springer, 1982.
3. Elfgreen L, "Fracture Mechanics of Concrete Structures – Theory and Applications", RILEMReport, Chapman and Hall, 1989.

Reference Books:

1. Victor, Li C., Bazant Z. P, "Fracture Mechanics – Applications to Concrete", ACI SP 118, ACI Detroit, 1989.

Web References:

1. http://www.nptel.ac.in/courses/112106065/#

E-Text Books:

1. http://www.civil.northwestern.edu/people/bazant/PDFs/Papers/P90.pdf

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

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		
BCSB29	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 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		
		L	T	P	C	CIA	SEE	Total
BCSB30	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 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 course should enable the students to:

I. Understand that how to improve your writing skills and level of readability
II. Learn about what to write in each section
III. Understand the skills needed when writing a Title Ensure the good quality of paper at very first-time submission.

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 course should enable the students to:

I. Learn to demonstrate a critical understanding of key concepts in disaster risk reduction and humanitarian response.
II. Critically evaluate disaster risk reduction and humanitarian response policy and practice from multiple perspectives.
III. Develop an understanding of standards of humanitarian response and practical relevance in specific types of disasters and conflict situations.
IV. Critically understand the strengths and weaknesses of disaster management approaches, planning and programming in different countries, particularly their home country or the countries they work in.

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 course should enable the students to:

I. Get a working knowledge in illustrious Sanskrit, the scientific language in the world
II. Learning of Sanskrit to improve brain functioning
III. Learning of Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power
IV. The engineering scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature.

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 course should enable the students to:

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

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 course should enable the students to:

I. Understand the premises informing the twin themes of liberty and freedom from a civil right perspective.
II. Address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
III. Address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

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 course should enable the students to:

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 yoga and its importance	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