BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

B.Tech
Civil Engineering
Curriculum Effective from A.Y. 2020-21 (R20 Regulations)

SYLLABUS BOOK
Four Year B.Tech.

Bapatla Engineering College:: Bapatla

(Autonomous under Acharya Nagarjuna University)
(Sponsored by Bapatla Education Society)
BAPATLA-522102, Guntur District, A.P.
www.becbapatla.ac.in

The Vision and Mission of the Institute

Vision:

- To build centers of excellence, impart high quality education and instill high standards of ethics and professionalism through strategic efforts of our dedicated staff, which allows the college to effectively adapt to the ever-changing aspects of education.
- To empower the faculty and students with the knowledge, skills and innovative thinking to facilitate discovery in numerous existing and yet to be discovered fields of engineering, technology and interdisciplinary endeavors.

Mission:

- Our Mission it to impart the quality education at par with global standards to the students from all over India and in particular those from the local and rural areas.
- We continuously try to maintain high standards so as to make them technologically competent and ethically strong individuals who shall be able to improve the quality of life and economy of our country.

The Vision and Mission of the Department

The Vision:

- The goal is to educate the students through active student-teacher engagement, enabling departmental graduates to become self-sustaining individuals who can tackle global challenges and create employment opportunities.

The Mission:

- **M1:** To maintain and elevate technical competence in students to drive excellence, contributing to their working organization's success in a dynamic and competitive landscape.
- **M2:** To empower the students for succeeding in thriving careers while maintaining a harmonious work culture. It inculcates the spirit of individual growth and collaboration, creating an environment where both personal and collective successes are prioritized.
- **M3:** To cultivate top-tier academic and administrative leaders. The department is committed to identify, nurture and empower students who will excel in leadership roles within the academic and administrative domains, contributing to the success of the organization.

Program Educational Objectives (PEO's)

PEO-I: The graduates will be rigorously trained to build a successful career in the field of Civil Engineering or pursue higher studies by acquiring knowledge in mathematics, basic sciences, and the fundamentals of Civil Engineering.

PEO-II: The graduates will be trained to perform as professional engineers by planning, analyzing, and optimally designing Civil Engineering systems with a focus on social awareness and responsibility.

PEO-III: The graduates will be trained to demonstrate professionalism, an ethical approach, strong communication skills, and teamwork in delivering their responsibilities with excellence and readiness to tackle the challenges of the current scenario.

PEO-IV: The graduates shall acquire the skills necessary to become successful entrepreneurs, and they will also be taught to cultivate an attitude of continuous learning with a research-oriented mind-set.

Program Specific Outcomes (PSOs).

PSO1: Analyze the Civil Engineering problems by applying the knowledge of the basic sciences, Engineering skills, mathematics and computational tools.
PSO2: Design and execute the high quality Civil Engineering Projects by taking into account the threshold economics, environmental, professional ethics, and health and safety factors involved in the infrastructure development.
PSO3: Apprise Communication skills and leadership attributes towards the team work and also involve in research and development that promotes sustainable solution to the practical reality in dealing with Civil Engineering Problems.
PSO4: Enhance the practical knowledge of Civil Engineering field through the laboratory and field investigations in regular consultancy works.

	PROGRAM OUTCOMES (POs)
Engineering Graduates will be able to:	
1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)
Profile of the College

Year of Start	1981
Courses offered	**B.Tech.:** 1. Civil Engineering (CE),2. Computer Science & Engineering(CSE), 3. Electronics & Communication Engineering(ECE), 4. Electrical & Electronics Engineering(EEE), 5. Electronics & Instrumentation Engineering(EIE), 6. Information Technology(IT), 7.MechanicalEngineering(ME) 8. Data Science (DS) 9.Cyber Security(CS) 10. CSE-AIML(AM)
	M.Tech.: 1.CE (Structural Engineering), 2.ME(CAD/CAM), 3. ECE(Communication Engineering & Signal Processing), 4. EEE(Power Systems Engineering) & 5.C.S.E.
	Master of Computer Applications (MCA)
	M.Sc.:Mathematics,Physics,Electronics,Chemistry(Organic&Analytical)&Computer Science
Accredited by NBA in the years	07.05.2003(CE,CSE,ECE,EEE,EIE,ME) 16.03.2007(CH,CE,CSE,ECE,EEE,EIE,IT&ME) 04.01.2013(CH,CE,CSE,ECE,EEE,EIE&ME)
Autonomous Status	2010
Accredited by NAAC	A+(3.49/4 CGPA),2023
Research Park	Innovation Centres:1)Kuka Robotic Technology Centre 2) Bosch Rexroth Centre of Competence in Automation Technologies 3)T-Machines Centre of Excellence 4)Industry Institute Interaction Cell
Library	Titles: 29,281; Books: 78,972 Journals: International Online-745,Print-25,National Print-80,Educational CDs-3,261;No.ofStaff:8
Sports facilities	Cricket, Basket Ball, Volley Ball, Ball Badminton, Hockey, Tennis, Foot Ball, Table Tennis, Chess, Caroms & Weight Lifting, Weight Training
Area	30Acres;Built-up Area: 56102Sq.mt.
Awards	Best Library (2011, 14, 18), Best laboratory (2009, 10, 11), Best UG Performance College (2011, 12),Best Eco Friendly Campus(2016) from Acharya Nagarjuna University
CISCO	A two-way interactive CISCO Digital Media System that is first of its kind in the South Asia Pacific Region at a cost of Rs.3 Crores
StudentsActivities	Centre for Creative Arts**(CCA)** for cultural & arts and **AWAAZ** the literary club with the main motto of nurturing the inherent talents in the students.
NCC	NCC (Army wing) unit 50 cadets. Training will be given by the P.I.Staff from1(A) Engr.Coy,Guntur.
NSS	There are three wings i.e., NSS-1,NSS-2,andNSS-3(Women). It is mandatory for all the students
Facilities	Hostel for girls, Food court, Own Transport,24x7power supply, Mineral water, Bank, Post Office

ABOUT THE BAPATLA EDUCATION SOCIETY

BAPATLA EDUCATION SOCIETY was established in the year 1962 registered No:58/1962 under societies act XXI of 1860 with a prime motto of servicing to rural community by establishing various educational institutes.

Distinguished Office Bearers of the Society:

SriM. SrinivasaRao

President

Sri D. Rama Mohan Rao

Vice President-1

Sri G. Dileep Kumar

Vice President-2

Sri M. NageswaraRao
Secretary

SriK.Hari Padma Prasad

Jt. Secretary &
Correspondent

Sri T. RamaKrishnaRao
Treasurer

Under the society, education from KG (Kinder Garden) to PG (Post Graduation) is offered at an Affordable cost. The management members are imbued with a spirit of selfless service and believe in the principle of Academic Autonomy. The Management obtains feedback all the stake holders of the college and suitably advises and motivates employees in a discrete manner. As a mark of commitment to good management, rules and regulations are applied with justice and fair play. Above all, the management makes all the efforts to provide congenial environment for learning in the campus

MESSAGE FROM PRINCIPAL

Dr.Nazeer Shaik

M.Tech,Ph.D

A warm welcome to NAAC accredited Bapatla Engineering College (BEC). The Bapatla Engineering College (Autonomous), one of the seven educational institutions sponsored by the Bapatla Education Society, was established in 1981 with a vision to impart quality technical education and is affiliated to Acharya Nagarjuna University. The College is credited with beautifully laid out and thoughtfully designed. The college has well qualified faculty members from IITs, NITs and reputed universities and has 63 doctorates and more than 60 faculty pursuing Doctorate degrees.

The college is one of the first generation self-financed engineering colleges started in the year 1981 and is regarded as one of the best engineering colleges in the state of Andhra Pradesh.

The teaching learning process in the campus is meticulously planned and effectively implemented by the Heads of the Departments with the able support of the staff members. Continuous evaluation backed by remedial classes, student counseling and parent interactions, form the nucleus of the teaching learning process.

The college is chosen by several world renowned leaders such as Bosch Rexroth Center of Competence in Automation Technologies, Siemens Center of Excellence and Kuka Robotic Technology Center to have their centers of research and innovation under one roof in a unique Research Park established at a cost of Rs.20 Crores.

BEC has taken the class room teaching to world class level through the two-way interactive Digital Media System. We are member of Indian Society for Technical Education (ISTE), Computer Society of India (CSI) etc. Various workshops, seminars, conferences, and Faculty Development Programs (FDP) are conducted through ISTE, and add-on courses and several skill development programs are being organized by the college.

The Department of Training and Placement facilitates the maximum employment opportunities to all the deserving candidates of final and pre-final year students. Many of our Alumni are decorating the top positions at many reputed Multi-National Companies.

We always look at the employability skills and try to perfectly match with the requirements of the Industry. We impart training in Technical Skills and Life Skills (Soft Skills) as a part of our curriculum to mould and shape the personalities and make the students employable.

We emphasize mainly on Assessment and Evaluation, analyzing the training needs of each candidate, and provide Career Guidance and Counseling. The college provides Training on Business English Communication Skills, Aptitude, Domain skills as needed by the Industry. We promote industrial visits and knowledge sessions to make students familiar with industrial practices. The college encourages students to pursue internships to gain work experience in industries and increase their employability. EDP Cell conducts various programs to develop entrepreneurship culture among students.Over50 companies visited our college, and more than 65% of eligible students have been placed in various reputed companies for the academic year 2018-19. The students of the college continuously excel in national and international competitive examinations like GATE, IELTS, GRE and TOEFL. We have several Industry MOUs which will help to train faculty and students on latest trends in the technology. Some of the MOUS are listed below:

The college is enriched with Centre for Innovation Incubation and Entrepreneurship (CIIE) and well-established library with Digital Library facility that caters to the needs of student. The institution is a hub of Student clubs that helps them to gratify their creative and innovative minds and weaving social responsibility with leadership qualities among students. The college also provides amenities like subsidized transportation, food court, mineral water, internet, Bank, Post office, Ladies Hostel and Dispensary equipped with an ambulance for the convenience of faculty, staff and students.

We have Governing body (Autonomous), College Academic Council for the continuous improvement of academic performance. We have formed several Committees for Grievance and Redressal, Examination, Admission, Library, Student Welfare, Internal Complaints, Extra-Curricular Activities, Academic Audit, Disciplinary, Research, Sports, Training and Placement, Alumni Affairs, Anti-Ragging, Campus Facilities, and Maintenance under Planning and Evaluation Committee.

We wish all the students to utilize the infrastructure and the experienced faculty of our institution to equip themselves with emerging technologies and innovative skills that make them lead the nation in to new heights of advancement and development to enrich every citizen’s life.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

Academic Rules & Regulations
(R20 Regulations)
Regulations for Four Year Bachelor of Technology (B.Tech)

1. Award of B.Tech. Degree

A student will be declared eligible for the award of the B.Tech. degree if he/she fulfils the following academic regulations:

i. Pursues a course of study for not less than four academic years and in not more than eight academic years. However, for the students availing Gap year facility, this period shall be extended by two years at the most and these two years would not be counted in the maximum time permitted for graduation. A lateral entry student pursues a course of study for not less than three academic years and in not more than six academic years

ii. Registers for 160 credits and secures all 160 credits. However, a lateral entry student registers for 121 credits and secures all the 121 credits from III semester to VIII semester of Regular B. Tech. program.

iii. The student will be eligible to get Under graduate degree with Honors or additional minor engineering if he/she completes an additional 20 credits

iv. A student will be permitted to register either for Honors degree or additional minor engineering but not both.

2. Students, who fail to fulfil all the academic requirements for the award of the degree within eight academic years from the year of their admission, shall forfeit their seat in B.Tech. course and their admission stands cancelled. A lateral entry student should complete the course within six academic years from the year of their admission, failing which his/her admission in B.Tech course stands cancelled.

3. Courses of study

The following courses of study are offered at present as specializations for the B. Tech. course

S.No.	Title of the UG Programme	Abbreviation
1.	Civil Engineering	CE
2.	Computer Science & Engineering	CS
3.	Electrical & Electronics Engineering	EE
4.	Electronics & Communication Engineering	EC
5.	Electronics & Instrumentation Engineering	EI
6.	Information Technology	IT
7.	Mechanical Engineering	ME

8.	Cyber Security	CB
9.	Data Science	DS
10.	CSE (Artificial Intelligence & Machine Learning	CM

4. Credits:

i. *Credit:* A unit by which the course work is measured. It determines the number of hours of instructions required per week. One credit is equivalent to one hour of teaching (Lecture) or two hours of practical work/field work per week.

ii. *Academic Year:* Two consecutive (one odd + one even) semesters constitute one academic year.

iii. *Choice Based Credit System (CBCS):* The CBCS provides choice for students to select from the prescribed courses.

iv. Each course in a semester is assigned certain number of credits based on following

Description	Hours/Week	Credits
Theory	03	03
Tutorial	01	01
Practical	03	1.5
Internship (At the end of IV & VI evaluated in V & VII resp.)	-	1.5/3.0
Project Work	24	12

5. Course Structure

Every course of the B.Tech program will be placed in one of the 8 categories with suggested credits as listed below.

S.No.	Category	Category Description	Abbreviated Category	Credits
1	Humanities and social science	Humanities and social science including Management courses	HS	10.5
2	Basic Sciences	Basic Science courses	BS	21
3	Engineering Science courses	Engineering Science Courses including workshop, drawing, basics of electrical / mechanical / computer etc.	ES	24

4	Professional core	Professional core Courses	PC	51
5	Job Oriented /Open Electives	Emerging and job oriented/ Open Elective Courses- from other technical	JO/OE	12
6	Professional Courses	Professional Elective Courses relevant to chosen specialization/ branch	PE	18
7	Project Work & Internship	Project Work, Seminar, Internship in industry elsewhere	PW/INT	16.5
8	Mandatory courses	Environmental Studies, Induction training, Universal human Values, Ethics, Indian Constitution, Essence of Indian Traditional Knowledge (Non-Credit)	MC	0
9	Skill Oriented Courses	Skill Oriented Courses relevant to domain, interdisciplinary, communication skill, industry	SO	10
		Total Credits		160

6. Weightage for course evaluation

6.1 Course Pattern

- The entire course of study is for four academic years. Semester pattern shall be followed in all years.
- A student eligible to appear for the end examination in a subject, but absent or has failed in the end examination may appear for that subject at the next supplementary examination when offered.
- When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

6.2 Evaluation Process

The performance of the students in each semester shall be assessed course wise. All assessments will be done on absolute mark basis. However, for the purpose of reporting the performance of a candidate, letter grades and grade points will be awarded.

The performance of a student in each course is assessed with alternate assessment methods, term examinations on a continuous basis during the semester called Continuous Internal Evaluation (CIE) and a Semester End Examination (SEE) conducted at the end of the semester. For each theory, design and/or drawing course, there shall be a comprehensive Semester End Examination (SEE) of three hours duration at the end of each Semester, except where stated otherwise in the detailed Scheme of Instruction.
The performance of a student in each semester shall be evaluated subject wise with a maximum of 100 marks for theory and 100 marks for practical subject. In addition,

Internships carried out after IV Semester & VI Semester shall be evaluated for 100 marks each and the Internship along with Project Work carried out in VIII Semester shall be evaluated for 100 marks. For theory subjects, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination. For practical subjects, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End- Examination. For project work, the distribution shall be 30 marks for Internal Evaluation and 70 marks for the End-Examination / Viva-Voce. The distribution of marks between Continuous Internal Evaluation (CIE) and Semester End Examination (SEE) to be conducted at the end of the semester will be as follows:

Nature of the Course	**CIE**	**SEE**
Theory subjects	30	70
Practical	30	70
Summer / Industrial / Research Internship	-	100
Project Work	30	70

6.3 Continuous Internal Evaluation (CIE) in Theory subjects:

6.3.1 In each Semester there shall be two Term examinations and some ***Alternate Assessment Tools (AAT)*** like Home Assignment, Class Test, Problem Solving, Group Discussion, Quiz, Seminar and Field Study in every theory course. The Alternate Assessment Tools with detailed modality of evaluation for each course shall be finalized by the teacher concerned before beginning of the course. It will be reviewed and approved by the Department Committee.

The Term Examination is conducted in the regular mode according to a schedule which will be common for a particular year of study. The maximum weightage for Term Examinations, AATs and the calculation of marks for CIE in a theory course is given in the following Table.

Particulars	**Term Exams (Max. 20 marks)**	**AAT (Max. 10 marks)**
Better Performed exam	75% of marks obtained	Continuous assessment by teacher as per the predetermined course delivery & assessment plan. (Minimum two & maximum four assessments). AAT marks shall be considered based on average of all tests conducted.
Other exam	25% of marks obtained	

A minimum of 15 (50%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as qualified in that course and eligible to write the Semester End Examination (SEE) of that course. If a student fails to obtain 15 marks in CIE, he can register for the course repetition as per the guidelines mentioned in 6.5.

Make up Test:

a) A student can appear for a Make-up Test for **maximum two theory subjects** of a semester to improve marks in the Continuous Internal Evaluation (CIE).
b) A student is eligible for **Make-up test** which is conducted after the second Mid Term examination and before SEE examination if he/she satisfies the following conditions.
   i) Unable to secure 50% internal marks (CIE) and has more than or equal to 50% attendance in a particular theory subject (After finalizing the internal marks).
   ii) Attendance in Remedial classes is more than or equal to 65% (if Remedial classes are conducted) or greater than 50% marks in the I Mid Term Examination and AAT 1 together.
   iii) Attended 50% of CIE tests (at least one AAT & one Mid Term Examinations).
c) The make-up test will be conducted for 30 marks (6 X 1M, 2X 12M) in Mid Examination format covering the entire syllabus and the marks obtained in this test are final. However, the maximum marks awarded will be 15 only.

6.3.2 Semester End Examination (SEE) in Theory and Design Course:

a) For each theory, design and/or drawing course, there shall be a comprehensive Semester End Examination (SEE) of three hours duration at the end of each Semester for 70 marks, except where stated otherwise in the detailed Scheme of Instruction. Question paper setting shall be set by the teacher or teachers together in a multi section courses and to be verified as described in policy document.
b) A minimum of 25 marks are to be secured exclusively in the Semester End Examination (SEE) of theory, design and/or drawing course. However a minimum 40 marks are to be secured in CIE & SEE together for the award of the grade and securing the credits in that course.

6.3.3 Continuous Internal Evaluation (CIE) in laboratory courses:

The evaluation for Laboratory course is based on CIE and SEE. The CIE for 30 marks comprises of 15 marks for day to day laboratory work, 5 marks for record submission and 10 marks for a laboratory examination at the end of the semester. In any semester, a minimum of 90% of prescribed number of experiments / exercises specified in the syllabi for laboratory course shall be taken up by the students. They shall complete these experiments / exercises in all respects and get the record certified by the internal lab teacher concerned and the Head of the Department concerned to be eligible to appear for the Final Examination in that laboratory course.

A minimum of 15 (50%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as qualified in that lab course and eligible to

write the SEE of that lab course. If a student fails to obtain 15 marks in CIE, he can register for the course repetition as per the guidelines mentioned in 6.5.

6.3.4 Semester End Examination (SEE) in laboratory courses:

a) For each laboratory course, the Semester End Examination (SEE) shall be conducted by one internal and one external examiner appointed by the Principal and the duration of the exam shall be for three hours. The SEE is for 70 marks which include 15 marks for write up, 35 marks for lab experiment/exercise, 15 marks for Viva-voce and 5 marks for general impression.

b) A minimum of 25 marks are to be secured exclusively in the Semester End Examination (SEE) of laboratory course. However a minimum 40 marks are to be secured in CIE & SEE together for the award of the grade and securing the credits in that course.

6.3.5 Evaluation of Summer Internship and Industrial/Research Internship:

a) Summer Internship at the end of IV semester and Industrial/Research Internship at the end of VI carried out in industry are to be evaluated in V & VII semesters respectively based report and certificate provided by the industry. The report and certificate will be evaluated by the department committee for 100 marks. 50 marks shall be for the report and certificate and 50 marks based on seminars/presentation to the department committee by the student.

b) A minimum of 40 (40%) marks are to be secured exclusively to be declared as passed and securing the credits in the internships.

6.3.6 Evaluation of the Project

a) The evaluation shall be based on CIE and SEE. The CIE is for 30 marks which consists of reviews at the end of each month as per the Process Document in the form of seminars/presentations for 15 marks and the project report submitted at the end of the semester which is evaluated for 15 marks. A minimum of 15 (50%) marks and 50% attendance are to be secured by the student exclusively in CIE in order to be declared as qualified in the project work and eligible to write the SEE in the project work.

b) SEE shall be evaluated in the form of a Viva-Voce and demonstration of the thesis work for 70 marks. Viva-voce Examination in project work shall be conducted by one internal examiner (Member of PWC) and one external examiner to be appointed by the principal. A minimum of 25marks shall be obtained exclusively in SEE in order to be declared as passed in the Project work.

c) Completion of internships along with Project work in VIII Semester is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student has to repeat and complete the internship.

6.4 There shall be mandatory courses with zero credits. There shall be no external examination. However, attendance in the mandatory course shall be considered while calculating aggregate attendance and student shall be declared to have passed the mandatory course only when he/she secures 50% or more in the internal examinations. In case, the student fails, a re-examination shall be conducted for failed candidates every six months/semester at

a mutually convenient date of college/student satisfying the conditions mentioned in item 1 & 2 of the regulations.

6.5 Course Repetition (Repeater course)

The students not qualified to write SEE in a course may register for the repeater courses through course repetition and summer semester. The students have to apply to the Principal through the respective HOD by paying prescribed fees.

Course repetition: A student can take up a maximum of two theory courses in a semester immediately after the semester end examinations of that particular semester in accordance with the guidelines recommended by the Academic Council. The students who are not taking regular semester courses may additionally register for one more theory course.

The documents for monitoring the candidates registered for course repetition are available with the Heads of the Departments and Exam Section.

6.6 There shall be five Professional Elective Courses from V Semester to VII and for each elective there shall be choices such that the student shall choose a course from the list of choice courses offered by the department for that particular elective.

6.7 There shall be three Job Oriented elective Courses in all programs from V to VII semester.

One Open Elective course in VII semester will be offered by various departments. The student shall register for open elective in the VII semester offered by other departments in such a manner that he/she has not studied the same course in any form during the Program.

The students shall be permitted to pursue up to a maximum of two elective courses (either Professional Elective Courses in clause 6.6 or Open Electives/ Job Oriented Courses in clause 6.7) under MOOCs (Massive Open Online Courses) offered by NPTEL and other reputed organizations as notified by the Department during the semester. Each of the Courses must be of minimum 8/12 weeks in duration. The student has to acquire a certificate for the concerned course from the agency during the semester only in order to earn the credits for that course. For further details and guidelines, the students can visit the college website.

6.8 There shall be a mandatory **induction program** for three weeks before the commencement of first semester.

6.9 Minor in a discipline (Minor degree/program) concept is introduced in the curriculum for all conventional B. Tech programs in which it offers a major. The main objective of Minor in a discipline is to provide additional learning opportunities for academically motivated students and it is an optional feature of the B. Tech. program.

a. i) Students who are desirous of pursuing their special interest areas other than the chosen discipline of Engineering may opt for additional courses in minor specialization groups offered by a department other than their parent department. For example, If Mechanical Engineering student selects subjects from Civil Engineering under this scheme, he/she will get Major degree of Mechanical Engineering with minor degree of Civil Engineering

   ii) Student can also opt for Industry relevant tracks of any branch to obtain the Minor Degree, for example, a B.Tech Mechanical student can opt for the industry relevant tracks like Data Mining track, IOT track, Machine learning track etc.

b. The BOS concerned shall identify as many tracks as possible in the areas of emerging technologies and industrial relevance / demand. For example, the minor tracks can be the fundamental courses in CSE, ECE, EEE,CE,ME etc or industry tracks such as Artificial

Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSI etc.

c. The list of disciplines/branches eligible to opt for a particular industry relevant minor specialization shall be clearly mentioned by the respective BOS.

d. There shall be no limit on the number of programs offered under Minor. The University/Institution can offer minor programs in emerging technologies based on expertise in the respective departments or can explore the possibility of collaborating with the relevant industries/agencies in offering the program.

e. The concerned BOS shall decide on the minimum enrolments for offering Minor program by the department. If a minimum enrolments criterion is not met, then the students may be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BOS.

f. A student shall be permitted to register for Minor program at the beginning of 4th semester provided that the student must have acquired a minimum of **8.0 SGPA** in each semester up to the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Minor Program stands cancelled and he/she shall continue with the regular Program. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minor registration active

g. A student shall earn additional 20 credits in the specified area to be eligible for the award of B. Tech degree with Minor. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

h. Out of the 20 Credits, 16 credits shall be earned by undergoing specified courses listed by the concerned BOS along with prerequisites. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. If a course comes with a lab component, that component has to be cleared separately. A student shall be permitted to choose only those courses that he/she has not studied in any form during the Program.

i. In addition to the 16 credits, students must pursue at least 2 courses through MOOCs. The courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Student has to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn 4 credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the university/academic council.

j. Student can opt for the Industry relevant minor specialization as approved by the concerned departmental BOS. Student can opt the courses from Skill Development Corporation (APSSDC) or can opt the courses from an external agency recommended and approved by concerned BOS and should produce course completion certificate. The Board of studies of the concerned discipline of Engineering shall review such courses being offered by eligible external agencies and prepare a fresh list every year incorporating latest skills based on industrial demand.

k. A committee should be formed at the level of College/Universities/department to evaluate the grades/marks given by external agencies to a student which are approved by concerned BOS. Upon completion of courses the departmental committee should convert the obtained grades/marks to the maximum marks assigned to that course. The controller of examinations can take a decision on such conversions and may give appropriate grades.

l. If a student drops (or terminated) from the Minor program, they cannot convert the earned credits into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

m. In case a student fails to meet the CGPA requirement for B.Tech degree with Minor at any point after registration, he/she will be dropped from the list of students eligible for degree with Minors and they will receive B. Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

n. Minor must be completed simultaneously with a major degree program. A student cannot earn the Minor after he/she has already earned bachelor's degree.

o. Minimum enrollment for a Minor course to be offered is 12

6.10 Honors degree in a discipline:

Students of a Department/Discipline are eligible to opt for Honors Program offered by the same Department/Discipline.

a. A student shall be permitted to register for Honors program at the beginning of 4th semester provided that the student must have acquired a minimum of **8.0 SGPA** in each semester up to the end of 2nd semester without any backlogs. In case of the declaration of the 3rd semester results after the commencement of the 4th semester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Program stands cancelled and he/she shall continue with the regular Program. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Honors registration active

b. Students can select the additional and advanced courses from their respective branch in which they are pursuing the degree and get an honors degree in the same. e.g. If a Mechanical Engineering student completes the selected advanced courses from same branch under this scheme, he/she will be awarded B.Tech. (Honors) in Mechanical Engineering.

c. In addition to fulfilling all the requisites of a Regular B.Tech Program, a student shall earn 20 additional credits to be eligible for the award of B. Tech (Honors) degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160 credits).

d. Out of the 20 additional Credits to be acquired, 16 credits shall be earned by undergoing specified courses listed as pools, with four courses, each carrying 4 credits. The remaining 4 credits must be acquired through two MOOCs, which shall be domain specific, each with 2 credits and with a minimum duration of 8/12weeks as recommended by the Board of studies.

e. It is the responsibility of the student to acquire/complete prerequisite before taking the respective course. The courses offered in each pool shall be domain specific courses and advanced courses.

f. The concerned BOS shall decide on the minimum enrolments for offering Honors program by the department. If minimum enrolments criteria are not met then the

students shall be permitted to register for the equivalent MOOC courses as approved by the concerned Head of the department in consultation with BOS.

g. Each pool can have theory as well as laboratory courses. If a course comes with a lab component, that component has to be cleared separately. The concerned BOS shall explore the possibility of introducing virtual labs for such courses with lab component. (Model pool list is enclosed in the Annexure-2).

h. MOOC courses must be of minimum 8 weeks in duration. Attendance will not be monitored for MOOC courses. Students have to acquire a certificate from the agencies approved by the BOS with grading or marks or pass/fail in order to earn credits. If the MOOC course is a pass/fail course without any grades, the grade to be assigned will be as decided by the BOS/academic council.

i. The concerned BOS shall also consider courses listed under professional electives of the respective B. Tech programs for the requirements of B. Tech (Honors). However, a student shall be permitted to choose only those courses that he/she has not studied in any form during the Program.

j. If a student drops or is terminated from the Honors program, the additional credits so far earned cannot be converted into free or core electives; they will remain extra. These additional courses will find mention in the transcript (but not in the degree certificate). In such cases, the student may choose between the actual grade or a "pass (P)" grade and also choose to omit the mention of the course as for the following: All the courses done under the dropped Minors will be shown in the transcript. None of the courses done under the dropped Minor will be shown in the transcript.

k. In case a student fails to meet the CGPA requirement for Degree with Honors at any point after registration, he/she will be dropped from the list of students eligible for Degree with Honors and they will receive regular B.Tech degree only. However, such students will receive a separate grade sheet mentioning the additional courses completed by them.

l. Honors must be completed simultaneously with a major degree program. A student cannot earn Honors after he/she has already earned bachelor's degree.

6.11 National Service Scheme (NSS)/Yoga is compulsory for all the Undergraduate students. The student participation shall be for a minimum period of 45 hours during the first year. Grades will be awarded as Very Good, Good, and Satisfactory in the mark sheet on the basis of participation, attendance, performance and behaviour. If a student gets Un-satisfactory grade, he/she has to repeat the above activity in the subsequent years along with the next year students.

6.12 Students shall undergo two summer internships each for a minimum of six weeks duration at the end of second and third years of the program for 1.5 credits & 3 credits respectively. The organization in which the student wishes to carry out Internship need to be approved by Internal Department Committee comprising Head of Department and two senior faculty members. The student shall submit a detailed technical report along with internship certificate from the Internship organization in order to obtain the prescribed credits. The student shall submit the Internship Report along with Certificate of Internship. The evaluation of the first and second summer internships shall be conducted at the end of the V Semester & VII semester respectively.

There shall be internal evaluation for 100 marks and there shall not be external evaluation. The Internal Evaluation shall be made by the departmental committee (Head of the Department and two senior faculty of the department) on the basis of the internship report submitted by the student.

Completion of the internship is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such a case, the student shall repeat the internship in the subsequent summer provided that the student doesn't pursue two summer internships in the same summer.

Community Service Project focusing on specific local issues shall be an alternative to the six weeks of summer Internship, whenever there is any emergency and when students cannot pursue their summer internships. The Community Service Project shall be for 6 weeks in duration which includes preliminary survey for 1 week, community awareness programs for one week, community immersion program in consonance with Government agencies for 3 weeks and a community exit report (a detailed report) for one week. The community service project shall be evaluated for 100 marks by the internal departmental committee comprising Head of the Department and two senior faculty of the department. **However, the first priority shall be given to the internship.**

6.13 There shall also be a mandatory full internship in the final semester (VIII Semester) of the Program along with the project work. The organization in which the student wishes to carry out the Internship need to be approved by Internal Department Committee comprising Head of the Department and two senior faculty. The faculty of the respective department monitors the student internship program along with project work. At the end of the semester, the candidate shall submit a certificate of internship and a project report. The project report and presentation shall be internally evaluated for 30 marks by the departmental project work committee. The Viva-Voce shall be conducted for 70 marks by a Project work committee and an External Examiner.

Completion of internship is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such a case, the student shall repeat the internship along with project work for next six months.

6.14 There shall be five skill-oriented courses offered during III semester to VII semester. Out of the five skill courses, two shall be skill-oriented programs related to the domain and these two shall be completed in second year. Of the remaining three skill courses, one shall necessarily be a soft skill course and the remaining 2 shall be skill-advanced courses either from the same domain or Job oriented skill courses, which can be of inter disciplinary nature.

The student can choose between a skill advanced course being offered by the college or to choose a certificate course being offered by industries/Professional bodies/APSSDC or any other accredited bodies which are duly approved by the Internal Department Committee. The

credits assigned to the skill advanced course shall be awarded to the student upon producing the Course Completion Ccertificate from the agencies / professional bodies.

The Internal Department Committee comprising Head of Department and two senior faculty shall evaluate the grades / marks awarded for a course by external agencies and convert to the equivalent marks / grades.

7. Attendance Requirements:

- A student shall be eligible to appear for semester end examinations (SEE), if he/she acquires a minimum of 75% of attendance in aggregate of all the subjects in a semester.
- Condonation of shortage of attendance in aggregate up to 10% (65% and above and below 75%) in each semester may be granted on medical ground duly approved by the Principal.
- Shortage of Attendance below 65% in aggregate shall in NO case be condoned.
- Further the student must obtain a minimum of 50% attendance in each subject failing which; the student shall not be permitted to write the SEE of that subject. Student has to register this subject through course repetition and satisfy the CIE qualification criteria of attendance and marks in the subsequent semesters.
- Students whose shortage of attendance is not condoned in any semester are not eligible to take their end examination of that class and their registration shall stand cancelled.
- A student will not be promoted to the next semester unless he satisfies the attendance requirements of the present semester. They may seek readmission for that semester when offered next.
- A stipulated fee shall be payable towards condonation of shortage of attendance to the college.

8. Minimum Academic Requirements:

The following academic requirements have to be satisfied in addition to the attendance requirements mentioned in item no.7.

8.1 A student shall be deemed to have satisfied the minimum academic requirements and earned the credits allotted to each theory, practical, design, drawing subject or project, if he/she secures not less than 15 marks in CIE and 25 marks in SEE. In case of, internships, project work viva – voce, he/she should secure 40% of the total marks. For mandatory courses minimum 15 marks in CIE are to be secured.

8.2 B.Tech students: A student shall be promoted from II to III year only if he/she fulfils the academic requirement of securing 40% of the credits in the subjects that have been studied up to III Semester from the following examinations.

- One regular and two supplementary examinations of I Semester.
- One regular and one supplementary examination of II Semester.
- One regular examination of III semester.

Lateral Entry students: A student shall be promoted from II to III year only if he/she fulfils the academic requirement of securing 40% of the credits in the subjects that have been studied up to III Semester from the following examinations.

- One regular examination of III semester.

8.3 B.Tech students: A student shall be promoted from III year to IV year only if he/she fulfils the academic requirements of securing 40% of the credits in the subjects that have been studied up to V semester from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

- ✓ One regular and four supplementary examinations of I Semester.
- ✓ One regular and three supplementary examinations of II Semester.
- ✓ One regular and two supplementary examinations of III Semester.
- ✓ One regular and one supplementary examinations of IV Semester.
- ✓ One regular examination of V Semester.

Lateral entry students: A student shall be promoted from III year to IV year only if he/she fulfils the academic requirements of securing 40% of the credits in the subjects that have been studied up to V semester from the following examinations, irrespective of whether the candidate takes the end examination or not as per the normal course of study.

- ✓ One regular and two supplementary examinations of III Semester.
- ✓ One regular and one supplementary examinations of IV Semester.
- ✓ One regular examination of V Semester.

If a student is detained for want of credits for particular academic year by sections 8.2 and 8.3 above, the student may make up the credits through supplementary examinations and only after securing the required credits he/she shall be permitted to join in the V Semester or VII Semester as the case may be.

8.4 A student shall register and put up minimum attendance in all 160 credits and earn all the 160 credits. Marks obtained in all 160 credits shall be considered for the calculation

of aggregate percentage of marks obtained. In case of lateral entry students, the number of credits is 121.

8.4.1 Students who fail to earn 160 credits as indicated in the course structure within eight academic years from the year of their admission shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.

Lateral entry students who fail to earn 121 credits as indicated in the course structure within six academic years from the year of their admission shall forfeit their seat in B.Tech. course and their admission shall stand cancelled.

9. Course Pattern:

(i) A student eligible to appear for the end examination in a subject, but absent or has failed in the end examination may appear for that subject at the next supplementary examination when offered.

When a student is detained due to lack of credits/shortage of attendance he/she may be re-admitted when the semester is offered after fulfilment of academic regulations. In such case, he/she shall be in the academic regulations into which he/she is readmitted.

(ii) **With–holding of Results**

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

(iii) **Grading**

After each subject is evaluated for 100 marks, the marks obtained in each subject will be converted to a corresponding letter grade as given below, depending on the range in which the marks obtained by the student fall.

Table – Conversion into Grades and Grade Points assigned

Range in which the marks in the subject fall	Grade	Grade Points Assigned
≥ 90	S (Superior)	10
80-89	A (Excellent)	9
70-79	B (Very Good)	8
60-69	C (Good)	7
50-59	D (Average)	6
40-49	E (Below Average)	5
< 40	F (Fail)	0
Absent	Ab (Absent)	0

A student obtaining Grade F shall be considered failed and will be required to reappear for that subject when the next supplementary examination offered. Same is the case with a student who obtains ‘Ab’ in end examination.

For **mandatory** courses "Satisfactory" or "Unsatisfactory" shall be indicated instead of the letter grade and this will not be counted for the computation of SGPA/CGPA.

10. Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA)

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

$$\text{SGPA} = \frac{\sum_{i=1}^{n} C_i \times GP_i}{\sum_{i=1}^{n} C_i}$$

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

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

$$\text{CGPA} = \frac{\sum_{j=1}^{m} SGPA_j \times TC_j}{\sum_{j=1}^{m} TC_j}$$

where "$SGPA_j$" is the SGPA of the j^{th} semester and TC_j is the total number of credits in that semester.

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

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

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

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

11. Award of Class

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

Class Awarded	**CGPA Secured**
First Class with Distinction	≥ 7.5

First Class	≥ 6.5 < 7.5
Second Class	≥ 5.5 < 6.5
Pass Class	≥ 5.0 < 5.5

12. Gap Year

Gap year concept of Student Entrepreneur in Residence shall be introduced and outstanding students who wish to pursue entrepreneurship are allowed to take a break of one year at any time after II year to pursue entrepreneurship full time. This period may be extended to two years at the most and these two years would not be counted for the time for the maximum time for graduation. An evaluation committee shall be constituted by the College to evaluate the proposal submitted by the student and the committee shall decide whether or not to permit the student(s) to avail the Gap Year.

13. Transitory Regulations

Discontinued, detained, or failed candidates are eligible for readmission as and when the semester is offered after fulfilment of academic regulations. Candidates who have been detained for want of attendance or not fulfilled academic requirements or who have failed after having undergone the course in earlier regulations or have discontinued and wish to continue the course are eligible for admission into the unfinished semester from the date of commencement of class work with the same or equivalent subjects as and when subjects are offered, and they will be in the academic regulations into which they get readmitted.

Candidates who were permitted with Gap Year shall be eligible for rejoining into the succeeding year of their B.Tech from the date of commencement of class work, and they will be in the academic regulations into which the candidate is presently re-joining.

14. Minimum Instruction Days

The minimum instruction days including exams for each semester shall be 90 days.

15. Medium of Instruction

The Medium of Instruction is **English** for all courses, laboratories, internal and external examinations and project reports.

16. Rules of Discipline

(i) Use of mobile phones with camera, in the campus is strictly prohibited.
(ii) Students shall behave and conduct themselves in a dignified and courteous manner in the campus/Hostels.
(iii) Students shall not bring outsiders to the institution or hostels.
(iv) Students shall not steal, deface, damage or cause any loss to the institution property.
(v) Students shall not collect money either by request or coercion from others within the campus or hostels.
(vi) Students shall not resort to plagiarism of any nature/extent. Use of material, ideas, figures, code or data without appropriate acknowledgement or permission of the original source shall be treated as cases of plagiarism. Submission of material, verbatim or paraphrased, that is authored by another person or published earlier by oneself shall also be considered as cases of plagiarism.
(vii) Use of vehicles by the students inside the campus is prohibited.
(viii) Any conduct which leads to lowering of the esteem of the organization is prohibited.

(ix) Any material to be uploaded to social media sites need to be approved by Head of the Department concerned/Dean/Principal.

(x) Any student exhibiting prohibited behaviour shall be suspended from the institute. The period of suspension and punishment shall be clearly communicated to the student. The student shall lose the attendance for the suspended period

(xi) Dress Code

Boys : All the boy students should wear formal dresses. Wearing T-shirts and other informal dresses in the campus is strictly prohibited.

Girls : All the girls students shall wear saree / chudidhar with dupatta

17. Punishments for Malpractice cases – Guidelines

The examinations committee may take the following guidelines into consideration while dealing with the suspected cases of malpractice reported by the invigilators/squad members etc; during end examinations. The punishment may be more severe or less severe depending on the merits of the individual cases.

S.No.	Nature of Malpractice/Improper conduct	Punishment
1	Possesses or keeps accessible in examination hall, any paper, note book, programmable calculators, Cellphones, pager, palm computers or any other form of material concerned with or related to the course 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 student which can be used as an aid in the course of the examination).	Expulsion from the examination hall and cancellation of the performance in that course only.
2	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 course.
3	Copying detected on the basis of internal evidence, such as, during valuation or during special scrutiny.	Cancellation of the performance in that course and all other courses the candidate has appeared including practical examinations and project work of that semester/year examinations.
4	Gives assistance or guidance or receives it from any other student	Expulsion from the examination hall and cancellation of the performance in that

	orally or by any other body language methods or communicates through cell phones with any other student or persons in or outside the exam hall in respect of any matter.	course only of all the students involved. In case of an outsider, he will be handed over to the police and a case shall be registered against him.
5	Has copied in the examination hall from any paper, book, programmable calculators, palm computers or any other form of material relevant to the course of the examination (theory or practical) in which the student is appearing.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year.
6	Comes in a drunken condition to the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year.
7	Smuggles in the Answer book or takes out or arranges to send out the question paper during the examination or answer book during or after the examination	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The student is also debarred for two consecutive semesters from class work and all examinations. The continuation of the course by the student is subject to the academic regulations in connection with forfeit of seat.
8	Refuses to obey the orders of the Chief Superintendent / 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 officer-in charge 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 officer-in-charge, or any person on duty in or outside the examination hall or any of his relations, or indulges in any	In case of students of the college, they shall be expelled from examination halls and cancellation of their performance in that course and all other courses of that semester/year. The students also are debarred and forfeit their seats. In case of outsiders, they will be handed over to the police and a police case shall be registered against them.

	other act of misconduct or mischief which result in damage to or destruction of property in the examination hall or any part of the College campus 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.	
9	Leaves the exam hall taking away answer script or intentionally tears up the script or any part there of inside or outside the examination hall.	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical examinations and project work of that semester/year. The candidate is also debarred for two consecutive semesters from classwork and all end examinations. The continuation of the course by the candidate is subject to the academic regulations in connection with forfeiture of seat.
10	Possesses any lethal weapon or firearm in the examination hall.	Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work of that semester/year. The student is also debarred and forfeits the seat.
11	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 S.No7 to S.No 9.	For Student of the college: Expulsion from the examination hall and cancellation of the performance in that course and all other courses including practical examinations and project work 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 shall be registered against them.
12	Impersonates any other student in connection with the examination	The student who has impersonated shall be expelled from examination hall. The student is debarred from writing the remaining exams, and rusticated from the college for one academic year during which period the student will not be permitted to write any exam. If the imposter is an outsider, he will be handed over to the

		police and a case shall be registered against him. The performance of the original student who has been impersonated, shall be cancelled in all the courses of the examination including practicals and project work of that semester/year. The student is rusticated from the college for two consecutive years during which period the student will not be permitted to write any exam. The continuation of the course by the student is subject to the academic regulations in connection with forfeiture of seat.
13	If any malpractice is detected which is not covered in the above S.No 1 to S.No 12 items, it shall be reported to the college academic council for further action and award suitable punishment.	
14	Malpractice cases identified during sessional examinations will be reported to the examination committee nominated by Academic council to award suitable punishment.	

18.0 ADDITIONAL ACADEMIC REGULATIONS:

18.1 Any attempt to impress upon the teachers, examiners, faculty and staff of Examinations, bribing for either marks or attendance will be treated as malpractice.

18.2 When a component of Continuous Internal Evaluation (CIE) or Semester End Examination (SEE) is cancelled as a penalty, he/she is awarded zero marks in that component.

19.0 AMENDMENTS TO REGULATIONS:

The Academic Council of Bapatla Engineering College (Autonomous) reserves the right to revise, amend, change or nullify the Regulations, Schemes of Examinations and / or Syllabi, Academic schedules, Examination schedules, Examination pattern, Moderation to students, Special opportunity to complete degree beyond stipulated time and any other matter pertained that meets to the needs of the students, society and industry without any notice and the decision is final.

Discipline and Code of Conduct for Students

The following are some of the important rules of discipline. All students are required to be aware of and act consistently with these values.

1. Students must punctually attend all lectures, practicals, tutorials, assignments, tests, examinations, etc. A student whose attendance and/or progress in the various tests and examinations are not satisfactory and who does not perform the required number of assignments, tutorials and/or practicals are likely to lose their terms. Prolonged absence even on ground of ill health may also lead to loss of terms. Defaulters will not be sent up for Final /University Examinations.
2. The identity card is meant for identifying bonafide students and is used for permitting the students to participate in various activities and programs of the college. Every student must wear Identity card as long as he/she is in the college campus. It must be produced by the student whenever demanded by the member of the teaching or non-teaching staff of the college. Every student must wear his/her Identity card in the college every day. He/She must take proper care of it to avoid its misuse by other students and outsiders. In case the Identity card is lost, the matter should be immediately reported to the Principal and an application should be made for a duplicate Identity card, which will be issued on payment of charges.
3. The conduct of the students in the classes and in the premises of the college shall be such as will cause no disturbance to teachers, fellow students or other classes.
4. Every student shall wear a clean formal dress while coming to the college also when representing the college for various activities out station.
5. No Society or Association shall be formed in the College and no person should be invited in the college campus without the specific permission of the Principal.
6. No student is allowed to display any Notice/Circular/Poster/Banner in the College premises without the prior permission of the Principal.
7. Using foul language in the college campus is prohibited. If any student is caught using foul language, disciplinary action shall be initiated against the student.
8. Use of **BEC name tag or logo** by the students for their caste, political, religious, personal reasons is prohibited. Further placing banners on caste, political, religious, personal reasons, promoting cinema heroes & political leaders, taking possessions and burning fire crackers in front of the college is strictly prohibited. If any student is involved in such activities in and around the campus, severe disciplinary action will be taken including rusticating from the college and filing a criminal case.
9. Outsiders are not permitted in the college premises without the prior permission of the Principal. College students are not allowed to bring their relatives/friends to the college premises without the permission of the principal.

10. All meetings, cultural programs, debates, elocutions etc. organized on the college premises must be held in presence of teaching staff members and with the prior permission of the Principal. The subjects of debates/elocutions must have the prior approval of the principal.
11. Conducting fresher's meet, farewell meets etc. by the students outside the campus are prohibited. If any student is involved in such activities (organizing as well as participating), severe disciplinary action will be taken including rusticating from the college.
12. Students must take proper care of the college property. Strict action will be taken against students damaging College property and will be required to compensate the damage.
13. Students should not be involved in academic offences including cheating or plagiarism in academic course work malpractices at the College/Board/University Examinations
14. Smoking is strictly prohibited in the college premises.
15. If, for any reason, the continuance of a student in the College is found detrimental to the best interest of the college, the Management may ask the student to leave the college without assigning any reasons and the decision will be final and binding on the student.
16. Playing music on Transistors, Tape-Recorders, Car Stereos, Mobile phones or any other similar gadgets with or without earphones is strictly prohibited in the college premises. Defaulters will be punished and their instrument shall be confiscated.
17. Use of Mobile phones is strictly prohibited in the academic area of the college, Defaulters will be penalized and their instrument confiscated.
18. Students who are travelling to college on personal vehicles (2/4 wheelers) need to have valid driving license issued by RTO and follow all the rules listed by RTO. Students have to park the vehicle in the parking area of the college.
19. Students must not hang around in the college premises while the classes are at work.
20. Students must not attend classes other than their own without the permission of the authority concerned.
21. Students shall do nothing inside or outside the college that will interface with the discipline of the college or tarnish the image of the college.
22. Students are not allowed to communicate any information about college matters to Press.
23. Matters not covered above will be decided at the discretion of the Principal.

Acts of misbehavior, misconduct, indiscipline or violation of the Rules of Discipline mentioned above liable for one more punishments as stated below:

A. Warning to the students.
B. Warning to the student as well as inform the parents.
C. Imposition of a fine.
D. Denial of gymkhana, library, laboratory, N.C.C., N.S.S. student aid or any other facility for a specified period or for the whole Term/Year.
E. Expulsion from College for a specified period
F. Cancellation of Terms.

G. Refusal of admission in the term or academic year.
H. Cancellation of admission.
I. Rustication.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)
Anti Ragging Rules and Regulations
(As per AICTE Norms)

1. What constitutes Ragging: - Ragging constitutes one or more of any of the following acts:

a. any conduct by any student or students whether by words spoken or written or by an act which has the effect of teasing, treating or handling with rudeness a fresher or any other student;

b. indulging in rowdy or undisciplined activities by any student or students which causes or is likely to cause annoyance, hardship, physical or psychological harm or to raise fear or apprehension thereof in any fresher or any other student;

c. asking any student to do any act which such student will not in the ordinary course do and which has the effect of causing or generating a sense of shame, or torment or embarrassment so as to adversely affect the physique or psyche of such fresher or any other student;

d. any act by a senior student that prevents, disrupts or disturbs the regular academic activity of any other student or a fresher;

e. exploiting the services of a fresher or any other student for completing the academic tasks assigned to an individual or a group of students.

f. any act of financial extortion or forceful expenditure burden put on a fresher or any other student by students;

g. any act of physical abuse including all variants of it: sexual abuse, homosexual assaults, stripping, forcing obscene and lewd acts, gestures, causing bodily harm or any other danger to health or person;

h. any act or abuse by spoken words, emails, posts, public insults which would also include deriving perverted pleasure, vicarious or sadistic thrill from actively or passively participating in the discomfiture to fresher or any other student;

i. any act that affects the mental health and self-confidence of a fresher or any other student with or without an intent to derive a sadistic pleasure or showing off power, authority or superiority by a student over any fresher or any other student.

2. Actions to be taken against students for indulging and abetting ragging in technical institutions Universities including Deemed to be University imparting technical education:-

a) The punishment to be meted out to the persons indulged in ragging has to be exemplary and justifiably harsh to act as a deterrent against recurrence of such incidents.

b) Every single incident of ragging a First Information Report (FIR) must be filed without exception by the institutional authorities with the local police authorities.

c) The Anti-Ragging Committee of the institution shall take an appropriate decision, with regard to punishment or otherwise, depending on the facts of each incident of ragging and nature and gravity of the incident of ragging.

d) Depending upon the nature and gravity of the offence as established the possible punishments for those found guilty of ragging at the institution level shall be any one or any combination of the following:-

(i) Cancellation of admission
(ii) Suspension from attending classes
(iii) Withholding/withdrawing scholarship/fellowship and other benefits
(iv) Debarring from appearing in any test/examination or other evaluation process
(v) Withholding results
(vi) Debarring from representing the institution in any regional, national or international meet, tournament, youth festival, etc.
(vii) Suspension/expulsion from the hostel
(viii) Rustication from the institution for period ranging from 1 to 4 semesters
(ix) Expulsion from the institution and consequent debarring from admission to any other institution.
(x) Collective punishment: when the persons committing or abetting the crime of ragging are not identified, the institution shall resort to collective punishment as a deterrent to ensure community pressure on the potential raggers.

Guidelines for Remedial Classes and Make-up Test (R20 Regulations)

The guidelines for conducting the remedial classes:

d) Faculty need to identify the underperforming students in their respective subject. An underperforming student is one, whose marks less than 50% in the I Mid Term Examination and AAT 1 together. A list of such students should be prepared by the faculty soon after the I Mid Term examination is over and get it signed by the concerned HOD.

e) Faculty should conduct remedial classes for the underperforming students with an objective of improving their marks in the CIE. Minimum number of remedial classes to be taken should be 20% of the classes taken prior the I Mid Term Examination which is 6 classes. Teaching methodology is left to the faculty member, but he/she should keep the objective in mind.

f) Regular students who could not appear for the I Mid Term Examination and AAT (with genuine reason) should appear to the remedial classes with the prior permission of the HOD.

g) The entire process of conduct of remedial classes should be well documented and is subjected to academic audit.

The guidelines for conducting the Make-up test:

h) A student can appear for a Make-up Test for **maximum two theory subjects** of a semester to improve marks in the Continuous Internal Evaluation (CIE).

i) A student is eligible for **Make-up test** which is conducted after the second Mid Term examination and before SEE examination if he/she satisfies the following conditions.

iv) Unable to secure 50% internal marks (CIE) and has more than or equal to 50% attendance in a particular theory subject (After finalizing the internal marks).

v) Attendance in Remedial classes is more than or equal to 65% (if Remedial classes are conducted) or greater than 50% marks in the I Mid Term Examination and AAT 1 together.

vi) Attended 50% of CIE tests (at least one AAT & one Mid Term Examinations).

j) The make-up test will be conducted for 30 marks (6 X 1M, 2X 12M) in Mid Examination format covering the entire syllabus and the marks obtained in this test are final. However, the maximum marks awarded will be 15 only.

k) The eligible students have to apply by paying a fee prescribed by the institution and submit the application along with a letter of request indicating the genuineness of his/her candidature to be eligible for the make-up test. Applications should be approved by the concerned HOD. After approval from the HOD the concerned department will conduct the make-up test and send the updated CIE marks to COE immediately.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)
APPLICATION FOR MAKE-UP TEST

Date:

1. Name of the Candidate :
2. Register Number :
3. Academic Year :
3. Branch :
4. Year & Semester of Study :
5. Student Mobile No. :

Make-up test Applied For:

S.No.	Sub Code	Subject Title	% of Subject Attendance in Regular Classes	CIE Marks				(To be filled by the concerned subject faculty)	
				AAT-1	Mid-1	AAT-2	Mid-2	% Attendance in Remedial Classes*	Signature
01									
02									

***** Write 'NA' if the student name is not in the remedial class list.

Signature of the Student Signature of the HOD

Fee Particulars:

The make-up test fee has to be paid through HDFC payment gateway and a printout of the receipt has to be taken. The student has to submit the office copy of the receipt in the COE office, get the signature and has to submit the signed application form along with student copy of the receipt in the department.

Amount paid in Rs	Date of payment	Signature of Exam Section Clerk

Note:

1. As per the "Make-up test guidelines", the eligible students have to fill this form, with the signature of the concerned subject faculty and the HOD.
2. After making the payment, the filled form along with a photocopy of the payment receipt has to be submitted in the department.
3. The make-up test will be scheduled and conducted by the department.

Guidelines for Internships

As per R20 guidelines, every student has to undergo internship twice, once between IV and V semester, the other between VI and VII Semester. The first internship is for a duration of 4 weeks and the second internship is for a duration of 6 weeks.

There shall be a departmental internship committee consisting of the Head of the Department and two faculty members nominated by the HOD. The committee shall identify the potential organizations which can provide internship opportunity to the students. The department shall enter into an MOU with the concerned organization and the details will be shared with the students.

The students shall be informed to apply for undergoing internship in the specified proforma. The details and consent of the organization in which he/she is seeking for internship are to be furnished. Further, the student along with the parent must submit an undertaking form. The committee shall scrutinize the applications and approve the same. If a student fails to acquire internship, he/she may be permitted to undergo equivalent work (mini project, research project, fabrication work, field work, research paper, etc.,) in the department under the guidance of a faculty member.

After the completion of the internship, the student must submit the report and attend a departmental internal assessment for award of grade and credits.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

Internship Approval Proforma

Name of the Department
Name of the Student
Registered No
Email id
Mobile No
Academic Year
Internship Semester After VI Semester / After IV Semester

Internship Details

Internship Organization
Duration in weeks
Start Date of Internship
End Date of Internship
Probable Date of Certificate Submission

Note:
1. The consent letter from the organization is to be enclosed
2. Undertaking form from the student and parent

Signature of the Student

Recommendations of the Internship Committee:

Signature of the Head of the Department

Guidelines for Massive Open Online Courses (MOOCs)

1. Head of the department should constitute a three member MOOC committee under his chairmanship along with two more members.

2. The committee should take the responsibility of

   (i) Notifying the MOOC courses twice in a semester (May and November) along with the details of portals offering the MOOC such as NPTEL/SWAYAM.

   (ii) Checking the relevance of courses to the concerned branch.

   (iii) Verifying the syllabus of chosen MOOC course and to ensure that it is not studied in the regular curriculum (either full or partial)

3. A student willing to take MOOCS course should apply in the prescribed format to the concerned Head of the Department at least one week prior to the commencement of the MOOC course.

4. The MOOC committee should ensure the following

   (i) The course duration must be minimum of 12 weeks

   (ii) The course should contain a proctored examination for evaluation

   (iii) The agency offering MOOCs should be a recognized and reputed one and approved by the BOS of the concerned program.

5. Students should submit the Course completion certificate with marks memos to the department MOOCs committee.

6. If the certifying authority/agency is not able to conduct the exam, then the student can show certified course progress, applied hall ticket and mail communication from the authority as proofs and can avail the extension time by one semester for submitting the course completion certificate.

7. After the student submits the MOOCs certificates, the committee should recommend 3 credits and the appropriate grade to be allocated to the student and send to the Controller of Examination.

8. If a student fails to successfully complete and acquire the certificate as per the guidelines and timelines specified by the concerned MOOCs authority, he/she has to register for that course subsequently. Unsuccessful candidates in the first attempt shall be marked as supplementary.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

MOOCS APPLICATION

Date:

Name of the department:
Name of the Student:
Registered No:
Email id:
Mobile No:
Academic Year & Semester

S.No	Course Title	MOOCS Agency	Duration in Weeks	Course Start & End date	Probable Date of Certificate Submission	MOOCs Course in lieu of (Professional Elective/Job Oriented)	Remarks

Note: Syllabus, Timelines and Guidelines of the MOOC course should be attached.

Signature of the Student

Recommendations of the MOOCs Committee:

Signature of the Head of the Department

Guidelines for Project work

1. In R20 regulations, there is no theory or practical courses in VIII semester. An exclusive 12 credit course is included as Project Work and Internship. The student should mandatorily undergo internship as well as project work parallelly. At the end of the semester the student should submit an internship completion certificate along with a project report. A student shall also be permitted to submit project report on the work carried out during the internship.

2. The departmental internship committee is advised to strictly adhere to the established guidelines for internships. Furthermore, it is recommended that internships for students be limited to organization/ industry authorized by **APSCHE/AICTE INTERNSHIP PORTAL/PUBLIC SECTOR ORGANIZATIONS**. This restriction applies to both online and offline internship opportunities.

3. The Head of the department should constitute a three-member Project Work Committee (PWC) under his chairmanship with three faculty members as defined in the Process Document for project work (R20 regulation). The PWC shall adhere to the process explained in the said document.

4. Evaluation of the Project work:
   i) The evaluation shall be based on CIE and SEE. The CIE is for 30 marks which consists of reviews at the end of each month as per the Process Document in the form of seminars/presentations for 15 marks and the project report submitted at the end of the semester which is evaluated for 15 marks. A minimum of 15 (50%) marks and 50% attendance are to be secured by the student exclusively in CIE in order to be declared as qualified in the project work and eligible to write the SEE in the project work.
   ii) SEE shall be evaluated in the form of a Viva-Voce and demonstration of the thesis work for 70 marks. Viva-voce Examination in project work shall be conducted by one internal examiner (Member of PWC) and one external examiner to be appointed by the principal. A minimum of 25 marks shall be obtained exclusively in SEE in order to be declared as passed in the Project work.
   iii) Completion of internships along with Project work in VIII Semester is mandatory, if any student fails to complete internship, he/she will not be eligible for the award of degree. In such cases, the student has to repeat and complete the internship.

5. The project work committee should ensure the following, if the students are doing project work at any organization/ industry.

i) The student gets placement before commencement of eighth semester and joined the organization/Industry as advance placement. The student who obtained project work opportunity in organization / Industry may also be allowed as per the recommendation of the PWC.

ii) The above students will be informed to apply in the specified proforma for approval to undergo for project work along with the details and consent of the organization in which he/she is seeking for doing project work. Further, the student and the parent/guardian have to submit an undertaking form to the concerned department. The PWC shall scrutinize the applications and approve.

iii) The list of such approved students undertaking project work in organization/ industry shall be maintained in the department by the PWC.

iv) The students who are undertaking the project work outside the campus have to necessarily submit the monthly attendance duly certified by the concerned authority in the organization/ industry.

v) The PWC will have to maintain interaction regularly with the out-side organization/ concerned who are offering the project works.

vi) During the course of project work, the student has to attend the departmental internal reviews/assessment periodically as notified by the department mandatory. After the completion of the project work, the student has to submit the report and attend semester end assessment examination by paying prescribed exam fee for award of grade and credits.

vii) The students who are undertaking the project work outside the campus will have to complete their project work with in the stipulated period (as per Academic Calendar) along with the in house project work students and also submit the internship completion certificate at the end of the semester.

Project work Approval Proforma

Date:

Name of the Department	
Name of the Student	
Registered No.	
Email id	
Mobile Number	
Academic Year and Semester	

Project Work Details:

Organization/Industry Name	
Duration in weeks	
Start Date of Project work	
End Date of Project work	
Probable Date of Project work completion Certificate Submission	

Note: 1. The Consent letter from the organization/Industry is to be enclosed.

2. Undertaking form from the student and parent.

Signature of the Student

Recommendations of the Project work Committee (PWC):

Signature of the Project Coordinator

Signature of the Head of the Department

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

Process document for Project work

As per the R20 regulations, students are required to do a project work in the VIII semester and submit a report. The following is the process to be followed for the project work.

A. Projects Batches and Guide allocation

1. The Head of the department should constitute a three-member Project Work Committee (PWC) under his chairmanship with three faculty members. One of them shall be a senior faculty member and acts as a Project Coordinator.
2. List of faculty members and their specializations, research areas will be communicated to the students. The information is disseminated via email, notice boards and display on the website. List of projects and their titles/themes should be identified and same may be communicated to all the students. Project batches are formed based on the performance of the students up to VI semester.
3. Students are given an option of specifying their choices for the project titles/guides and the final allocation of guides to project batches is done based on the merit order and the choices opted by the project batches.
4. It is to be ensured that no project batch should have more than 4 students.
5. Not more than two batches should be allocated to each project guide.

B. Project classification and mapping with program outcomes and program specific outcomes.

Projects may be broadly classified into the following categories.

1. Application oriented: When the project is related to hardware, then all the components are procured and assembled to get the desired outcome. If it is related to software, then a complete working version of the application is to be created.
2. Research oriented: In this category extensive review of literature is done. This aims to learn and implement new methods or procedures and validate results.
3. Simulation projects: These projects may be hardware or software related. The students will create a working prototype for the same.

- The PWC should ensure that the projects are selected in such a way that the program outcomes and program specific outcomes are mapped with the themes of the project works.
- A document consisting of project titles, area of specialization, project guides should be prepared and submitted to the concerned HOD and should be put on the website. The theme of the work may be changed with the consent of the project guide.

C. Continuous monitoring mechanism and evaluation

1. Project slots (24 hours per week) should be allocated as per the existing scheme and curriculum.
2. A laboratory or a class room should be identified for executing the project works. It is preferred to have a separate laboratory for the purpose of conducting the project works.
3. Each project batch is allowed to consult their respective guide to discuss about their Progress during the project slot.

4. At the end of every month there will be an overall assessment of each project by the PWC by scheduling project reviews in association with project guides.
5. The performance of the students should be evaluated in each review and should be documented.
6. Department staff meeting should be conducted to discuss the performance of the students in the projects and should be documented.

D. Methodology to assess individual as well as collective Contribution/understanding of Project:

1. The project guide should monitor the presence (attendance) of each student in the project work
2. The project guide should ensure that the batch allocated to him is able to understand the objectives of the project. The guide should also identify the requirements (hardware and software) of the project. If a particular software or hardware is not available, same may be communicated to the HOD and may be procured based on the financial and budgetary requirements.
3. Evaluation of the project is based on
    i. Understanding the objectives of the project.
    ii. Day to day work done by the students (Should be documented)
    iii. Partial/Full completion of the project
    iv. Students presentation and demonstration
    v. Results and documentation
4. Evaluation is intimated to the students for further improvement

F. Papers published/Awards won/conferences attended

1. It is encouraged for every project batch to publish/communicate a paper in any national/ international conference/journal. The project guide may encourage the students so that the work of their batch is published as a research paper.
2. Students must be given some awareness/training program for effective writing of a research paper. The research papers should be checked with anti-plagiarism software before the submission to the concerned journal or conference.
3. A report should be prepared by the concerned coordinator comprising all the research papers published and should be made available in the library and soft copies must be put on the website for availability to the students.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

APPLICATION FOR HONOR/MINOR DEGREE (A.Y SEMESTER)

Date:

1. Name of the Candidate :
2. Register Number and Branch :
3. Semester wise SGPA obtained : (Enclose Xerox copies of marks memos)

S.No.	Passed all the subjects in single attempt(Yes/No)	B.Tech/ Lateral Entry*	Month and Year	SGPA
01		Semester I		
02		Semester II		
03		Semester III		
04		Semester IV		
05		Semester V		
06		Semester VI		

*For Lateral entry students, furnish the SGPA from third Semester of B.Tech only

4. Student Mobile No. :
5. Parent Mobile No. :
6. Undertaking by the Candidate: _____

(To be written by the candidate)

Undertaking : I have read the guidelines for Honor/Minor Degree and I will abide by the same.

SIGNATURE OF THE CANDIDATE

Signature of the Mentor **Signature of the HOD** **Signature of the Principal**

Department of Civil Engineering

R20 Course Components

S. No.	Course component	% of credits	Total number of contact hours	Credits offered
1	**Basic Science (BS)**	11.25	21	18
2	**Engineering Science (ES)**	12.1875	28	19.5
3	**Humanities Social Science (HS)**	4.6875	9	7.5
4	**Professional Core (PC)**	38.4735	75	61.5
5	**Open Elective (OE) / Job oriented Elective**	7.5	16	12
6	**Program Elective (PE)**	9.375	15	15
7	**Project Work (PW)**	7.5	24	12
8	**Skill Oriented Courses**	6.25	15	10
9	**Mandatory Courses**	0	9	0
10	**Summer Internship**	2.8125	0	4.5
	T O TAL	**100**	**212**	**160**

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Civil Engineering

Effective From the Academic Year-2020-2021(R20 Regulations)

First Year B.Tech(SEMESTER – I)

Code	Category	Course Title	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CE101/MA01	BS	Linear Algebra and Ordinary Differential Equations	2	1	0	3	30	70	100	3
20CE102/PH02	BS	Advanced Optics and Material Testing	3	0	0	3	30	70	100	3
20CE103	ES	Introduction to civil Engineering	3	0	0	3	30	70	100	3
20CE104/EL01	HS	Communicative English	3	0	0	3	30	70	100	3
20CE105/EM01	ES	Electrical Technology& Mechanical Technology	3	0	0	3	30	70	100	3
20CEL101/CSL04	ES	Computer Programming Lab	1	0	4	5	30	70	100	3
20CEL102/PHL01	BS	Physics Lab	0	0	3	3	30	70	100	1.5
20CEL103/ELL01	HS	English Communication Skills Lab	0	0	3	3	30	70	100	1.5
TOTAL			**16**	0	**10**	**26**	**240**	**560**	**800**	**21**
Induction Program		First 3 weeks (Physical activity, creative arts, Universal Human Values, Literary, Proficiency Module, Familiarization with branch/dept)								

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture, T: Tutorial, P: Practical

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Civil Engineering

Effective From the Academic Year-2020-2021(R20 Regulations)

First Year B.Tech (SEMESTER – II)

Code	Category	Course Title	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CE201/MA02	BS	Numerical Methods and Advanced Calculus	2	1	0	3	30	70	100	3
20CE202/CY01	BS	Engineering Chemistry	3	0	0	3	30	70	100	3
20CE203	ES	Engineering Mechanics	3	0	0	3	30	70	100	3
20CE204	PC	Building Materials, Planning and Construction	3	0	0	3	30	70	100	3
20CEL201/MEL01	ES	Engineering Graphics	1	0	4	5	30	70	100	3
20CEL202/CYL01	BS	Chemistry Lab	0	0	3	3	30	70	100	1.5
20CEL203/MEL02	ES	Work Shop Practice	0	0	3	3	30	70	100	1.5
20CE205/MC01	MC	Environmental Studies	3	0	0	3	30	-	30	0
NSS		National Service Scheme	-	-	-	-	-	-	-	0
TOTAL			**16**	**0**	10	**26**	**240**	**490**	**730**	**18**

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Civil Engineering

Effective From the Academic Year-2020-2021(R20 Regulations)

Second Year B.Tech (SEMESTER – III)

Code	Category	Course Title	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CE301/MA03	BS	Probability and Statistics	2	1	0	3	30	70	100	3
20CE302	PC	Surveying	3	0	0	3	30	70	100	3
20CE303	PC	Solid Mechanics	3	0	0	3	30	70	100	3
20CE304	PC	Concrete Technology	3	0	0	3	30	70	100	3
20CE305	PC	Fluid Mechanics	3	0	0	3	30	70	100	3
20CEL301/SOC1	SO	MATLAB Programming for Civil Engineers (Skill oriented course-I)	1	0	2	3	30	70	100	2
20CEL302	PCL	Building Drawing Lab	0	0	3	3	30	70	100	1.5
20CEL303	ESL	Engineering Geology Lab	0	0	3	3	30	70	100	1.5
20CEL304	PCL	Surveying Lab	0	0	3	3	30	70	100	1.5
20CE306/MC02	MC	Professional Ethics and Human Values	2	0	0	2	30		30	0
TOTAL			**18**	0	**11**	**29**	**300**	**630**	**930**	***21.5***

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Civil Engineering

Effective From the Academic Year-2020-2021(R20 Regulations)

Second Year B.Tech (SEMESTER – IV)

Code	Category	Course Title	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CE401/EL02	HS	Technical English	3	0	0	3	30	70	100	3
20CE402	PC	Environmental Engineering	3	0	0	3	30	70	100	3
20CE403	PC	Mechanics of Materials	3	0	0	3	30	70	100	3
20CE404	PC	Hydraulics & Hydraulic Machines	3	0	0	3	30	70	100	3
20CE405	PC	Soil Mechanics	3	0	0	3	30	70	100	3
20CEL401/SOC2	SO	Soft skills Lab (Skill oriented course-II)	1	0	2	3	30	70	100	2.0
20CEL402	PCL	Environmental Engineering Lab	0	0	3	3	30	70	100	1.5
20CEL403	PCL	H & HM Lab	0	0	3	3	30	70	100	1.5
20CEL404	PCL	Materials Testing Laboratory	0	0	3	3	30	70	100	1.5
TOTAL			**16**	**0**	11	**27**	**270**	**630**	**900**	***21.5***
20CE4H/20CE4M	**Honors/Minor courses**		3	1	0	0	**30**	**70**	**100**	***4***

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Civil Engineering
Effective From the Academic Year-2020-2021(R20 Regulations)
Third Year B.Tech (SEMESTER – V)

Code	Category	Course Title	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CE501	PC	Structural Analysis	3	0	0	3	30	70	100	3
20CE502	PC	Foundation Engineering	3	0	0	3	30	70	100	3
20CE503	PC	Design of Concrete structures	3	0	0	3	30	70	100	3
20CE504/PE1	PE	Professional Elective-I	3	0	0	3	30	70	100	3
20CE505/JO1	JO	Job Oriented Elective-I	2	0	2	4	30	70	100	3
20CEL501/SOC3	SO	BIM (Skill Advanced course-I)	1	0	2	3	30	70	100	2
20CEL502	PC	Geo technical Engineering Laboratory	0	0	3	3	30	70	100	1.5
20CEL503	ES	Python Programming Laboratory	0	0	3	3	30	70	100	1.5
20CEL504/INT1	Summer Internship*								100	1.5
20CE506/MC03	MC	Indian Constitution	2	0	0	2	30	-	30	0
TOTAL			**17**	**0**	10	**27**	**270**	**560**	**930**	***21.5***
20CE5H/20CE5M	**Honors/Minor courses**		3	1	0	0	**30**	**70**	**100**	***4***

***Summer Internship (Mandatory) after IV Semester (to be evaluated during Vsemester).**

Professional Elective-I :

1A	Advanced Environmental Engineering
1B	Low cost Housing Techniques
1C	Town planning and Architecture
1D	Sustainable Engineering & Technology

Job Oriented Elective – I

1A	Remote sensing & Drone Technology
1B	Plumbing and Fire Services
1C	Rural Water supply distribution systems

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Civil Engineering

Effective From the Academic Year-2020-2021(R20 Regulations)

Third Year B.Tech (SEMESTER – VI)

Code	Category	Course Title	Scheme of Instruction (Hours per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CE601	PC	Design of steel structures	3	0	0	3	30	70	100	3
20CE602	PC	Water Resource Engineering	3	0	0	3	30	70	100	3
20CE603	PC	Highway Engineering	3	0	0	3	30	70	100	3
20CE604/PE2	PE	Professional Elective-II	3	0	0	3	30	70	100	3
20CE605/JO2	JO	Job oriented Elective-II	2	0	2	4	30	70	100	3
20CEL601/SOC4	SO	Geographical Information System (Skill Advanced course-II)	1	0	2	3	30	70	100	2
20CEL602	PC	Advanced Surveying Laboratory	0	0	3	3	30	70	100	1.5
20CEL603	PC	Structural Analysis Design and Detailing Laboratory	0	0	3	3	30	70	100	1.5
20CEL604	PC	Transportation Engineering Laboratory	0	0	3	3	30	70	100	1.5
20CE606/MC04	MC	Essence of Indian Traditional Knowledge	2	0	0	2	30	-	30	
TOTAL			**17**	**0**	13	**30**	**300**	**630**	**930**	***21.5***
20CE6H/20CE6M	**Honors/Minor courses**		3	1	0	0	**30**	**70**	**100**	***4***

Professional Elective-II:

2A	Advanced structural Analysis
2B	Environmental Geotechnics
2C	Pre stressed concrete
2D	Air and Noise Pollution & Control

Job Oriented Elective – II

2A	Estimation and quantity surveying
2B	Health Audit of structures and Retrofitting of structures
2C	Offshore Renewable Energy

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Civil Engineering

Effective From the Academic Year-2020-2021(R20 Regulations)

Final Year B.Tech (SEMESTER – VII)

Code	Category	Course Title	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CE701	PC	Construction Management	3	0	0	3	30	70	100	3
20CE702/PE3	PE	Professional Elective-III	3	0	0	3	30	70	100	3
20CE703/PE4	PE	Professional Elective- IV	3	0	0	3	30	70	100	3
20CE704/O	OE	Open Elective**	2	0	2	4	30	70	100	3
20CE705/PE5	PE	Professional Elective-V	3	0	0	3	30	70	100	3
20CE706/JO3	JO	Job Oriented Elective-III	2	0	2	4	30	70	100	3
20CEL701/SOC5	SO	Quantity Estimation & Project Management Laboratory Skill Advanced course-III)	1	0	2	3	30	70	100	2
20CEL702/INT2	Industrial/Research Internship*							100	100	3
TOTAL			**17**	**0**	6	**23**	**210**	**540**	**800**	***23***
20CE7H/20CE7M	**Honors/Minor courses**		3	1	0	0	**30**	**70**	**100**	***4***

Professional Elective-III:

3A	Advanced Design of Concrete structures
3B	Instrumentation and Sensor technology in Civil Engineering
3C	Watershed Management
3D	Ground Improvement Techniques

Professional Elective-IV

4A	Railway and Air Port Engineering
4B	Earthquake Resistant Design of Structures
4C	Geosynthetics
4D	Ground Water Development and Management

Professional Elective-V :

5A	Irrigation structures
5B	Pavement Analysis and Design
5C	Disaster preparedness and planning management
5D	Solid and Hazardous waste Management

Job Oriented Elective – III

3A	Bridge Engineering
3B	Green Buildings and Sustainability
3C	Quality Control and Quality Assurance

OPEN ELECTIVES

Department	CODE	SUBJECT
AIML	CM1	Artificial Intelligence
	CM2	Introduction to Machine Learning
CIVIL	CE1	Air Pollution and Control
	CE2	Remote Sensing and GIS
CB	CB1	Digital Forensics
	CB2	Introduction to Information Security and Cyber Laws
CSE	CS1	Database Management System
	CS2	Java Programming
DS	DS1	Data Warehousing and Data Mining
	DS2	Social Network Analysis
ECE	EC1	Digital Image Processing
	EC2	Embedded System & Design
EEE	EE1	Non Conventional Energy Sources
	EE2	Electrical Energy Conservation and Auditing
	EE3	Industrial Electrical Systems
EIE	EI1	Sensors and Signal Conditioning
IT	IT1	Cyber Security
	IT2	Web Technologies
MECH	ME1	Automobile Engineering
	ME2	Renewable energy sources
	ME3	Project Management
	ME4	Entrepreneurship Development
CHEMISTRY	CY1	Chemistry in Space technology
	CY2	Artificial Intelligence in Sustainable Chemistry
	CY3	Material Chemistry in daily life
ENGLISH	EL1	Professional Communication
MATHS	MA1	Graph Theory
	MA2	Abstract Linear Algebra
PHYSICS	PH1	Nanomaterials and Technology
	PH2	Optoelectronic devices and applications
	PH3	Fiber optics communication
NCC	NCC	National Cadet Corps

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Civil Engineering

Effective From the Academic Year-2020-2021(R20 Regulations)

Final Year B.Tech (SEMESTER – VIII)

Code No.	Category Code	Course Title	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CE801/PW	PW	Projectwork& Internship	0	0	24	24	30	70	100	12
TOTAL			**0**	**0**	0	**0**	**30**	**70**	**100**	***12***
20CEHM1/20CEMM1	**Honors/Minor courses (MOOCS-I)**		-	-	-	-	-	-	-	4
20CEHM2/20CEMM2	**Honors/Minor courses (MOOCS-II)**		-	-	-	-	-	-	-	4

LIST OF HONORSCOURSES:

CODE	SUBJECT
A	Advanced Surveying
B	Advanced Concrete Technology
C	Advanced Fluid Mechanics
D	Engineering Rock Mechanics
E	Repair and Rehabilitation of Structures
F	Water power Engineering
G	Industrial Waste water Treatment
H	Geospatial Data Processing
I	Prefabricated Structures
J	EnvironmentalImpact Assessment and Management
K	Advanced Foundation Engineering
L	Urban Transportation planning
M	Design and Detailing of Irrigation Structures
N	Advanced Design of Steel structures
O	Soil Dynamics and Machine Foundation
P	Intelligent Transportation Systems

LIST OF MINORCOURSES:

CODE	SUBJECT
A	Construction Materials and Planning
B	Surveying
C	Solid Mechanics
D	Fluid Mechanics
E	Water Resource Engineering
F	Environmental Engineering
G	Basic Design of Concrete and Steel structures
H	Geotechnical Engineering
I	Estimation & Quantity Surveying
J	Transportation Engineering

LINEAR ALGEBRA AND ORDINATRY DIFFERENTIAL EQUATIONS I B. Tech. I Semester 20CE101/MA01								
Lectures	:	2	Tutorial	:	1	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Solve a system of linear homogeneous and non-homogeneous equations, finding the inverse of a given square matrix and also its Eigen values and Eigen vectors
➢	Identify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order ordinary differential equations.
➢	Create and analyze mathematical models using higher order differential equations to solve application problems that arise in engineering.
➢	Solve a linear differential equation with constant coefficients with the given initial conditions using Laplace Transforms.

Course Outcomes: After studying this course, the students will be able to

CO1	Find the eigen values and eigen vectors of a given matrix and its inverse.
CO2	Apply the appropriate analytical technique to find the solution of a first order ordinary differential equation.
CO3	Solve higher order linear differential equations with constant coefficients arise in engineering applications.
CO4	Apply Laplace transforms to solve differential equations arising in engineering

UNIT-1	(12 Hours)

Linear Algebra: Rank of a Matrix; Elementary transformations of a matrix; Gauss-Jordan method of finding the inverse; Consistency of linear System of equations: Rouches theorem, System of linear Non-homogeneous equations, System of linear homogeneous equations; vectors; Eigen values; properties of Eigen values(without proofs); Cayley-Hamilton theorem (without proof).

[Sections: 2.7.1; 2.7.2; 2.7.6; 2.10.1; 2.10.2; 2.10.3; 2.12.1; 2.13.1; 2.14; 2.15.]

UNIT-2	(12 Hours)

Differential Equations of first order: Definitions; Formation of a Differential equation; Solution of a Differential equation; Equations of the first order and first degree; variables separable; Linear Equations; Bernoulli's equation; Exact Differential equations; Equations reducible to Exact equations: I.F found by inspection, I.F of a Homogeneous equation, In the

equation M dx+ N dy = 0, $\frac{\frac{\partial M}{\partial y}-\frac{\partial N}{\partial x}}{N}$ is a function of x and $\frac{\frac{\partial N}{\partial x}-\frac{\partial M}{\partial y}}{M}$ is a function of y. Applications of a first order Differential equations: Newton's law of cooling; Rate of decay of Radio-active materials. [Sections: 11.1; 11.3; 11.4; 11.5; 11.6; 11.9; 11.10; 11.11; 11.12.1; 11.12.2; 11.12.4; 12.6; 12.8]	
UNIT-3	(12 Hours)
Linear Differential Equations: Definitions; Theorem; Operator D; Rules for finding the complementary function; Inverse operator; Rules for finding the Particular Integral; Working procedure to solve the equation; Method of Variation of Parameters; Applications of Linear Differential Equations: Oscillatory Electrical Circuits. [Sections: 13.1; 13.2.1; 13.3; 13.4; 13.5; 13.6; 13.7;13.8.1;14.1;14.5].	
UNIT-4	(12 Hours)
Laplace Transforms: Definition; conditions for the existence; Transforms of elementary functions; properties of Laplace Transforms; Transforms of derivatives; Transforms of integrals; Multiplication by t^n; Division by t; Inverse transforms- Method of partial fractions; Other methods of finding inverse transforms; Convolution theorem(without proof); Application to differential equations: Solution of ODE with constant coefficients using Laplace transforms. [Sections:21.2.1; 21.2.2; 21.3; 21.4; 21.7; 21.8; 21.9; 21.10; 21.12; 21.13; 21.14; 21.15.1]	
Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44th edition, Khanna publishers, 2017.
References :	[1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. [2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	2	-	-	-	-	-	-	-	-	2	2	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	2	2	-	-	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

ADVANCED OPTICS AND MATERIAL TESTING

I B.Tech – I Semester (Code: 20CE102/PH02)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30		Semester End Examination (3Hours)	:	70	

Pre-Requisite: None

Course Objectives: Students will learn

➢	To circulate the knowledge about the advanced optics and know its Engineering applications. .
➢	To familize with the basis of quantum theory and to solve the physical problems.
➢	To classify solids and to have a basic idea about the structural determination of crystals.
➢	To make aware of some of the analytical techniques for material testing.

Course Outcomes: After studying this course, the students will be able to

CO1	Understand the principles in the production and application of lasers and their effective utilization in optical communications. .
CO2	Demonstrate appropriate competence and working knowledge of laws of modern physics in understanding advanced technical engineering courses.
CO3	Demonstrate the ability to apply knowledge of band theory of solids and to make understand the concept of energy band gap and hole.
CO4	Understand the crystal geometrics and estimate the crystal structure by X-ray diffraction technique and learn production and applications of ultrasonics and extend it for material testing using various nuclear techniques.

UNIT-1	(12 Hours)

ADVANCED OPTICS

Lasers: Interaction of radiation with matter. Einstein co-efficients, Properties of laser, Population inversion, LASER principle, pumping schemes-Three level and four level laser, Types of lasers: solid-state lasers (Ruby), gas lasers (He-Ne), Semiconductor lasers; applications of lasers in industry and medicine.

Fibre Optics: Importance of optical fibre, Structure and principle of optical fibre, acceptance angle and numerical aperture, Types of optical fibres based on modes and refractive index, V-number, losses associated with optical fibres, fibre optical communication, advantages of optical fibres.

UNIT-2	(12 Hours)

Quantum Mechanics: Dual nature of light, de-Broglie's concept of matter waves, Davisson Germer electron diffraction experiment, Heisenberg Uncertainty principle and applications (non-existence of electron in a nucleus and finite width of spectral lines), one dimensional time- independent and dependent Schrödinger wave equations, physical significance of wave function, applications of time-independent Schrödinger wave equation to particle in a box(one dimensional), tunneling, the scanning tunneling microscope.

UNIT-3	(12 Hours)

Band theory of solids and Structure determination

Band theory of Solids: Failures of classical free electron theory, success and failures of quantum free electron theory, Bloch theorem statement, Kronig-Penny model (without derivation), effective mass of electron, concepts of energy band gap and hole.

Structure determination: Crystal lattices (Bravias), Crystal systems and structures, planes, Miller indices, Bragg‟s law, structural analysis of crystals using X-Ray powder diffraction method (XRD).

UNIT-4	(12 Hours)

Ultrasonics and Nuclear Techniques

Ultrasonics: Properties of ultrasonics, General applications of ultrasonics.

Applications of Ultrasonic Testing: Weld inspection, Material analysis, corrosion testing, concrete under water measurements, Ultrasonic testing in the foundry industry.

NDT: Production of Ultrasonic waves, Pulse echo technique, time of flight diffraction technique, A –scan presentation, B- scan presentation, C –scan presentation.

Nuclear Techniques: Nuclear radio isotopes, Applications of radio isotopes (medical and industry) Properties of α,β,ɤ-rays and radiographic testing (NDT).

Text Books :	1. Avadhanulu and Kshirsagar. *A Text Book of Engineering Physics*. S.Chand and Co., 2013 2. P.Srinivasa Rao and K.Muralidhar. *Applied physics* 3. Charles Kittel. *Introduction to Solid State Physics*. 8 edition 4. S.O. Pillai. *Solid State Physics*
References :	1. B.S. Murty, P. Shankar, Baldev Raj, B.B. Rath, and J. Murday. *Text book on Nanoscience and Nanotechnology*. Springer Science and Business Media, 2013 2. P.Srinivasa Rao and K.Muralidhar. *Basic Engineering Physics*. Himalaya, 2016

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												**PSO's**			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	-	2	2	2	2							2	-	-	-
CO2	3	3	-	2									2	-	-	-
CO3	2	2		2									2	-	-	-
CO4	3	3	2	2	3								2	-	-	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

INTRODUCTION TO CIVIL ENGINEERING
I B.Tech – I Semester (Code: 20CE103)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30		Semester End Examination (3Hours)		:	70

Prerequisites: None

Course Objectives:

- To provide a comprehensive overview of the component fields within civil engineering.
- Expose students to current Civil Engineering projects and their societal implications.
- To learn about different branches of geology.
- To provide a sound foundation for the further study of measurement techniquesand building surveying case study.

Course Outcomes: Students will be able to

CO1: Understand the importance of civil engineering in the infrastructural development of society.
CO2: Understand the types, and classification of varoius structures.
CO3: Understand the method of different geological processes.
CO4: Understand the knowledge of the basic principles of surveying.

UNIT I

History of Civil Engineering, Relevance of Civil Engineering in the overall infrastructural development of the country. Various domains of Civil Engineering. Roles and responsibilities of Civil Engineer.

UNIT II

Types and classification of structures – buildings, bridges, dams, retaining walls, water tanks. Brief description about - Roads, railways, runways.

UNIT III

Engineering Geology –

Introduction: Branches of Geology; Importance of Geology in Civil Engineering. Physical geology: Geological Processes; Weathering – Process, Types. Landforms.Mass wasting: Classification; Causes and effects; Preventive measures.

UNIT IV

Surveying - Object and uses, Fundamental principles, Classification of surveying, Plans and maps, Scales, units of measure, Conventional symbols, shrinkage factor.

Text Books:

1. Khanna, S. K., C. E. G. Justo, A.Veeraragavan "Text book on Highway Engineering." Nem Chand Bros, Roorkee (2014).10th Edition
2. Railway Engineering by M.M.Agarwal; Prabha& Co, New Delhi
3. Airport Engineering by G.V.Rao; Tata McGraw HFill, New Delhi
4. A Text Book of Engineering Geology by N. Chennakesavulu, McMillan India Ltd., Delhi.2005
5. Surveying Vol. 1 by Dr. K. R. Arora; Standard Book House;

Reference Books:

1. Kadiyali, L. R., and N. B. Lal. Principles and Practices of Highway Engineering: (Including Expressways and Airport Engineering). Khanna Publishers, 2005.
2. Principles of Engineering Geology by KVGK Gokhale. B.S.Publications-2005
3. Surveying Vol-I&II by B.C. Punmia, Laxmi Publications
4. Ramamrutham.S, Basic Civil Engineering, DhanapathiRai Publishing co.
5. Kandya.A.A., Elements of Civil Engineering.Charotar Publishing house

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	-	-	-	-	-	2	2	-	2	-	2	2	-	-	-
CO2	-	-	-	-	-	-	2	-	-	2	-	2	2	-	-	-
CO3	3	-	-	-	-	-	2	-	-	2	-	2	2	-	-	-
CO4	2	-	-	-	-	-	-	-	2	2	-	2	2	-	-	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

COMMUNICATIVE ENGLISH
I B.Tech – I Semester (Code: 20CE104/HS01)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30		Semester End Examination (3Hours)		:	70

Course Objectives

The course aims

- At enhancing the vocabulary competency of the students
- To enable the students to demonstrate proficiency in the use of written English, including proper spelling, grammar, and punctuation
- To enhance theoretical and conceptual understanding of the elements of grammar
- Understand and apply the conventions of academic writing in English
- To enhance the learners' ability of communicating accurately and fluently

Course Outcomes

The students would be able to

CO1: Understand how to build academic vocabulary to enrich their writing skills
CO2: Produce accurate grammatical sentences
CO3: Analyse the content of the text in writing
CO4: Produce coherent and unified paragraphs with adequate support and detail

UNIT-I

1.1 **Vocabulary Development**: Word formation-Formation of Nouns, Verbs & Adjectives from Root words-Suffixes and Prefixes
1.2 **Essential Grammar:** Prepositions, Conjunctions, Articles
1.3 **Basic Writing Skills**: Punctuation in writing
1.4 **Writing Practices**: Mind Mapping, Paragraph writing (structure-Descriptive, Narrative, Expository & Persuasive)

UNIT-II

2.1 **Vocabulary Development**: Synonyms and Antonyms
2.2 **Essential Grammar**: Concord, Modal Verbs, Common Errors
2.3 **Basic Writing Skills**: Using Phrases and clauses
2.4 **Writing Practices**: Hint Development, Essay Writing

UNIT- III

3.1 **Vocabulary Development**: One word Substitutes
3.2 **Essential Grammar**: Tenses, Voices
3.3 **Basic Writing Skills**: Sentence structures (Simple, Complex, Compound)
3.4 **Writing Practices**: Note Making

UNIT- IV

4.1 **Vocabulary Development**: Words often confused
4.2 **Essential Grammar**: Reported speech, Common Errors
4.3 **Basic Writing Skills**: Coherence in Writing: Jumbled Sentences
4.4 **Writing Practices**: Paraphrasing &Summarising

Reference Books

- Communication Skills, Sanjay Kumar &PushpaLatha. Oxford University Press:2011.
- Practical English Usage, Michael Swan. Oxford University Press:1995.
- Remedial English Grammar, F.T.Wood. Macmillan:2007.
- Study Writing, Liz Hamplyons& Ben Heasley. Cambridge University Press:2006

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	-	-	-	-	-	-	-	2	2	3	2	2	-	-	2	-
CO2	-	-	-	-	-	-	-	2	2	3	2	2	-	-	2	-
CO3	-	-	-	-	-	-	-	2	2	3	2	2	-	-	2	-
CO4	-	-	-	-	-	-	-	2	2	3	2	2	-	-	2	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

ELECTRICAL TECHNOLOGY & MECHANICAL TECHNOLOGY

I B.Tech– I Semester (Code: 20CE105)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			30	Semester End Examination (3hours)			70

Part- A: ELECTRICAL TECHNOLOGY

UNIT – I

Electrical circuit elements (R, L and C), Definitions of voltage and current, Power & Energy, Kirchhoff current and voltage laws, Direct Current; Alternating Current; Comparison between Half wave & Full wave Rectifiers, Advantages of Alternating Current. Have wave and Full wave Rectifiers.

ELECTRICAL MACHINES: Constructional details, Working Principle & Applications of DC Generators & Motors. Constructional details, working & Applications of Transformers.

UNIT – II

ELECTRICAL MACHINES (Contd.): Constructional details, Working Principle & Applications of Alternators, Three phase and single phase Induction Motors.

TRANSMISSION LINES: Necessity of Transmission Lines, Types of Towers; sad and stress in overhead conductors at level supports; sag span curves, effect of wing on sag.

Part- B: MECHANICAL TECHNOLOGY

UNIT – I

TRANSMISSION OF POWER: Belt drives: Velocity ratio, Slip, Ratio of tensions, Power transmitted, Creep.

PRINCIPLES OF MANUFACTURING PROCESSES: Casting, Rolling, Drawing, Turning, Drilling, Milling, Welding & Soldering.

UNIT – II

Thermal Prime movers: Principle and operation of I.C Engines, Working of 2-S, 4-S, S.I and C.I engines, comparison of S.I & C.I, 2-S & 4-S engines, Brief introduction to civil construction equipment.

Compressors: Operation and application of single stage and multistage reciprocating air compressors.

TEXT BOOK : Engineering Basics by T.Thyagarajan, K.P. Sendur Chelvi and T.R. Rangaswamy, New Age International Ltd.

TEXT BOOK : Elements of Mechanical Engineering by Mathur, Mehta&Tewari, Jain Brothers, New Delhi.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	1	-	-	2	-	-	-	3	1	2	1	2	1	1	2
CO2	2	1	-	-	2	-	-	-	3	1	2	1	2	1	1	2
CO3	2	1	-	-	2	-	-	-	1	1	2	1	2	1	1	2
CO4	2	1	-	-	2	-	-	-	3	1	2	1	2	1	1	2

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

COMPUTER PROGRAMMING LAB

I B.Tech – I Semester (Code: 20CEL101/CSL01)

Lectures	1	Tutorial	0	Practical	4	Credits	3
Continuous Internal Assessment	:	30	Semester End Lab Examination (3 Hours)	:	70		

Course Objectives: To learn

- Geometrical Approach to the mean value theorems and their application to the mathematical problems.
- Concept of Sequence and Series
- Evaluation of improper integrals using Beta and Gamma functions
- Evaluation of multiple integrals and their applications
- Basic properties of vector point function and their applications to line, surface and volume integrals

Course Outcomes: Students will be able to

CO1: Read and write simple C language codes.
CO2: Develop programs with conditionals and loops.
CO3: Define programs with arrays and lists.
CO4: Develop programs with pointers and recursions.

UNIT – I

Overview of C, Constants, Variables and Data Types, Operators and Expressions, Managing I/O operations.

Programming Exercises for Unit I:C-expressions for algebraic expressions, evaluation of arithmetic and Boolean expressions. Syntactic errors in a given program, output of a given program, values of variables at the end of execution of a program fragment, filling the blanks in a given program. Programs using Scientific and Engineering formulae. Finding the largest of the three given numbers. Computation of discount amount on different types of products with different discount percentages. Finding the class of an input character, finding the type of triangle formed with the given sides, computation of income-tax, computation of electricity bill and conversion of lower case character to its upper case.

UNIT II

Decision Making and Branching, Decision Making and Looping

Programming Exercises for Unit II: To print the sum of the digits of a given number and to display the image of a given number. To find whether a given number is prime, printing Fibonacci sequence.

UNIT III

Data Structures: Arrays, Character Arrays and Strings

Programming Exercises for Unit III: Computation of statistical parameters of a given list of numbers. To find the length of a string, compare strings, reverse a string, copy a string and to find whether the given string is palindrome or not. Transpose of a matrix, product and sum of matrices and sorting of names using arrays. Sorting a list of names using character array.

UNIT IV

User-defined Functions

Programming Exercises for Unit - IV: Functions - Insertion sort, Linear search. Recursive functions to find factorial & GCD (Greatest Common Divisor)

TEXT BOOK:

1. Programming in ANSI C by E. Balaguruswamy, Seventh Edition. TMH

REFERENCE BOOKS:

1. Kernighan BW and Dennis Ritchie M, "C programming language", 2nded, Prentice Hall.
2. Yashavant P. Kanetkar, "Let us C", BPB Publications.
3. Herbert Schildt, "C: The Complete Reference", 4th edition, Tata Mcgraw-Hill.

Ashok N.Kamthane, "Programming in C", PEARSON 2nd Edition

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	3	-	-	-	-	-	-	-	-	2	-	3	2	-
CO2	3	3	3	-	-	-	-	-	-	-	-	2	-	3	3	-
CO3	3	3	3	-	-	-	-	-	-	-	-	2	-	3	3	-
CO4	3	3	3	-	-	-	-	-	-	-	-	2	-	3	2	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

PHYSICS LABORATORY
I B.Tech– I Semester (Code: 20CEL102/PHL01)

Lectures	:	0	Practical	3	Continuous Assessment	:	30
Final Exam	:	3 hours	Credit	1.5	Final Exam Marks	:	70

Pre-Requisite: None

Course Objectives: Students will learn

- Basic experiments such as Magnetic Field Measurements, Hall Effect and LCR resonance give the knowledge to apply them in magnetic applications.
- The experiments CRO, Solar Cell, LASER diode provides the thorough understanding of OPTO Electronic devices useful in Engineering and Industrial applications.
- The measurements relating to various physical parameters of materials make the student to understand their utility, design and fabrication of several devices.

Course Outcomes: After studying this course, the students will be able to

CO1	Acknowledge the important aspects of earth magnetic field, realize the use of Maxwells equations in various magnetic applications
CO2	Realization of material properties and parameters.
CO3	Get hands on experience in various opto-electronic devices like Solar Cell, Photo Cell and their applications.

LIST OF EXPERIMENTS:

1. Determination of acceleration due to gravity at a place using compound pendulum.
2. Study the variation of intensity of magnetic field along the axis of a circular coil using Stewart-Gee's apparatus.
3. Determination of thickness of thin wire using air wedge interference bands.
4. Determination of radius of curvature Plano convex lens by forming Newton rings.
5. Determination of wavelengths of mercury spectrum using grating normal incidence method.
6. Determination of dispersive power of a given material of prism using prism minimum deviation method.
7. Draw the resonant characteristic curves of L.C.R. series circuit and calculate the resonant frequency.
8. Draw the characteristic curves of a photocell and calculate the maximum velocity of electron.

9. Verify the laws of transverse vibration of stretched string using sonometer. 10. Determine the rigidity modulus of the given material of the wire using Torsional pendulum. 11. Draw the load characteristic curves of a solar cell. 12. Determination of Hall coefficient of a semiconductor. 13. Determination of voltage and frequency of an A.C. signal using C.R.O. 14. Determination of Forbidden energy gap of Si &Ge. 15. Determination of wavelength of laser source using Diode laser. Any three experiments are virtual

Text Books :	Engineering physics laboratory manual P.Srinivasarao & K.Muraldhar, HimalayaPublications.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												**PSO's**			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	2	2	-	-	-	-	2	-	-	-	2	-	-	-
CO2	3	3	2	2	-	-	-	-	2	2	-	-		-	-	2
CO3	3	3	2	2	2	-	-	-	2	-	-	-	2	-	-	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

ENGLISH COMMUNICATION LAB
I B.Tech– I Semester (Code: 20CEL103/HSL01)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment			30	Semester End Examination (3hours)			70

Course Objectives:

- To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- To improve students' fluency in English and neutralize their mother tongue
- To make them use effective vocabulary both in formal and informal situations

Course Outcomes:

The student would be able to

CO1: Better understand the nuances of English language through audio- visual Experience and group activities

CO2: Develop neutralization of accent for intelligibility

CO3: Build confidence to enhance their speaking skills

CO4: Use effective vocabulary both in formal and informal situations

UNIT-I

1.1 Listening Skills; Importance – Purpose- Process- Types
1.2 Barriers to Listening
1.3 Strategies for Effective Listening

UNIT-II

2.1 Phonetics; Introduction to Consonant, Vowel and Diphthong sounds
2.2 Stress
2.3 Rhythm
2.4 Intonation

UNIT-III

3.1 Formal and Informal Situations
3.2 Expressions used in different situations
3.3 Introducing Yourself & Others-Greeting & Parting-Congratulating-Giving Suggestions & Advices-Expressing Opinions-Inviting People-Requesting-Seeking Permission-Giving Information- Giving Directions- Sympathizing- Convincing People- Complaining & Apologizing-Thanking Others- Shopping- Travelling- Conversational Gambits

UNIT-IV

4.1 JAM Session
4.2 Debates
4.3 Extempore

Reference Books:

- Communication Skills, Sanjay Kumar and PushpaLata. Oxford University Press. 2011
- Better English Pronunciation, J.D. O' Connor. Cambridge University Press:1984
- New Interchange (4rth Edition), Jack C Richards. Cambridge University Press:2015
- English Conversation Practice, Grant Taylor. McGraw Hill:2001

Software:

- Buzzers for conversations, New Interchange series
- English in Mind series, Telephoning in English
- Speech Solutions, A Course in Listening and Speaking

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	-	-	-	-	-	-	-	-	3	3	2	2	-	-	2	-
CO2	-	-	-	-	-	-	-	-	3	3	2	2	-	-	2	-
CO3	-	-	-	-	-	-	-	-	3	3	2	2	-	-	2	-
CO4	-	-	-	-	-	-	-	-	3	3	2	2	-	-	2	-

NUMERICAL METHODS AND ADVANCED CALCULUS I B. Tech. II Semester 20CE201/MA02								
Lectures	:	2	Tutorial	:	1	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Solve algebraic, transcendental and system of linear equations with the help of numerical methods.
➢	Apply the techniques of numerical integration whenever and wherever routine methods are not applicable and solve the first order ordinary differential equations numerically with the given initial condition using different methods.
➢	Evaluate double and triple integrals and apply them to find areas and volumes.
➢	Evaluate the line, surface and volume integrals and learn their inter-relations and applications.

Course Outcomes: After studying this course, the students will be able to

CO1	Solve non-linear equations and system of linear equations with the help of Numerical techniques.
CO2	Solve the first order ordinary differential equations numerically with the given initial condition.
CO3	Find the area and volume of plane and three dimensional figures using multiple integrals.
CO4	Apply vector integral theorems to obtain the solutions of engineering problems involving circulation, flux, and divergence in vector fields.

UNIT-1	(12 Hours)

Numerical Solution of Equations: Introduction; Solution of algebraic and transcendental equations: Bisection method, Method of false position, Newton-Raphson method; Useful deductions from the Newton-Raphson formula; Solution of linear simultaneous equations; Direct methods of solution: Gauss elimination method, Gauss-Jordan method, Factorization method; Iterative methods of solution: Jacobi's iterative method, Gauss-Seidel iterative method.
[Sections:28.1; 28.2; 28.3; 28.5; 28.6; 28.7.1;28.7.2].

UNIT-2	(12 Hours)

Finite differences and Interpolation: Finite differences: Forward differences, Backward differences; Newton's interpolation formulae: Newton's forward interpolation formula, Newton's backward interpolation formula; Interpolation with unequal intervals; Lagrange's interpolation

formula; Divided differences; Newton's divided difference formula; Numerical integration; Trapezoidal rule; Simpson's one-third rule; Simpson's three-eighth rule; Numerical solution of ODE's: Introduction; Picard's method; Euler's method; Runge-Kutta method. [Sections:29.1; 29.1-1; 29.1.2; 29.6; 29.9; 29.10; 29.11; 29.12; 30.4; 30.6; 30.7; 30.8; 32.1; 32.2; 32.4; 32.7].	
UNIT-3	(12 Hours)
Multiple Integrals: Double integrals; Change of order of integration; Double integrals in polar coordinates; Area enclosed by plane curves; Triple integrals; Volumes of solids: Volume as Triple integral, Change of variables. [Sections: 7.1; 7.2; 7.3; 7.4; 7.5; 7.6.2; 7.7.2].	
UNIT-4	(12 Hours)
Vector calculus and its Applications: Scalar and vector point functions; Del applied to scalar point functions-Gradient: Definition, Directional derivative; Del applied to vector point functions: Divergence, Curl; Line integral; Surfaces: Surface integral, Flux across a surface; Green's theorem in the plane (without proof); Stokes theorem (without proof); Gauss divergence theorem(without proof). [Sections: 8.4; 8.5; 8.5.1; 8.5.3; 8.6; 8.11.1; 8.12.2; 8.12.3; 8.13; 8.14; 8.16]	
Text Books :	B.S.Grewal, "Higher Engineering Mathematics", 44th edition, Khanna publishers, 2017.
References :	[1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons. [2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												**PSO's**			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	2	-	-	-	-	-	-	-	-	2	2	-	-	-
CO2	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-	-
CO3	3	3	2	-	-	-	-	-	-	-	-	2	2	-	-	-
CO4	3	3	2	-	-	-	-	-	-	-	-	2	3	-	-	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

ENGINEERING CHEMISTRY
(Common to all branches)
I B.Tech – II Semester (Code: 20CE202/CY01)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

COURSE OBJECTIVES: The student should be conversant:

- With the principles of water characterization and treatment of water for industrial purposes and methods of producing water for potable purposes.
- To understand the thermodynamic concepts, energy changes, concept of corrosion & its control.
- With the conventional energy sources, solid, liquid and gaseous Fuels & knowledge of knocking and anti-knocking characteristics.
- With aim to gain good knowledge of organic reactions, plastics, conducting polymers & biodegradable polymers.

COURSE OUTCOME:

After studying this course, students will be able to:

CO1: Develop innovative methods to produce soft water for industrial use and potable water at B Cheaper cost.
CO2: Apply their knowledge in converting various energies of different systems and protection of different metals from corrosion.
CO3: Have the capacity of applying energy sources efficiently and economically for various needs.
CO4: With aim to gain good knowledge of organic reactions, plastics, conducting polymers & biodegradable polymers.

UNIT I:
Water Chemistry **15 hrs**

Introduction: water quality parameters
Characteristics: Alkalinity, Hardness - Estimation & simple neumerical problems,
Boiler Troubles - Sludges, Scales, Caustic embrittlement, boiler corrosion, Priming and foaming;
Internal conditioning- phosphate, calgon and carbonate methods.
External conditioning - Ion exchange process & Zeolite proess
WHO Guidelines, Potable water, Sedimentation, Coagulation, Filtration. Disinfection methods: Chlorination, ozonization and UV treatment.
Salinity – Treatment of Brackish water by Reverse Osmosis and Electrodialysis.

UNIT II **15 hrs**

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies.Free energy and emf.Cell potentials, the Nernst equation and applications.

Corrosion: Types of corrosion - Chemical or dry corrosion, Electrochemical or wet corrosion; Galvanic, stress, pitting and differential aeration corrosion; Factors effecting corrosion, **Corrosion control** – Cathodic protection, and electro plating (Au)&electoless Ni plating.

UNIT III: Fuels **15 hrs**

Classification of fuels; Calorific value of fuels (lower, higher)

Solid fuels: Determination of calorific value (Bomb Calorimeter) & related problems, Coal ranking,

Liquid Fuels: Petroleum refining and fractions, composition and uses. Knocking and anti-knocking Agents, Octane number and Cetane number; Bio fuels- Biodiesel, general methods of preparation and advantages

Gaseous fuels: CNG and LPG,

Flue gas analysis – Orsat apparatus.

UNIT IV: **15 hrs**

Organic reactions and synthesis of a drug molecule

Introduction to reactions involving substitution (SN^1, SN^2), addition (Markownikoff's and anti-Markwnikoff's rules) , elimination (E_1& E_2), Synthesis of a commonly used drug molecule.(Aspirin and Paracetamol)

Polymers: Conducting polymers: Classification, Intrinsic and Extrinsic conducting polymers and their applications**.** Plastics: Thermoplasts and thermosetting plastics, Bskelite and PVC.

Bio degradable polymers: types, examples-Polyhydroxybuterate (PHB), Polyhydroxybuterate-co-β-hydroxyvalerate (PHBV), applications.

TEXT BOOKS:

1. P.C. Jain and Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi 17th edition (2017).
2. SeshiChawla, "Engineering Chemistry"DhanpatRai Pub, Co LTD, New Delhi 13th edition, 2013.

REFERENCES:

1 Essential Of Physical Chemistry by ArunBahl, B.S. Bahl, G.D.Tuli, by ArunBahl, B.S. Bahl, G.D.Tuli, Published by S Chand Publishers, 12th Edition, 2012.

2 Text Book of Engineering Chemistry by C.P. Murthy, C.V. Agarwal, A. Naidu B.S. Publications, Hyderabad (2006).

3 Engineering Chemistry by K. Maheswaramma, Pearson publishers 2015.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	3	2	3	-	2	3	-	-	-	-	3	-	-	2	3
CO2	2	3	2	3	-	2	3	-	-	-	-	3	-	-	2	3
CO3	2	3	2	3	-	2	3	-	-	-	-	3	-	-	2	3
CO4	2	3	2	3	-	2	3	-	-	-	-	3	-	-	2	3

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

ENGINEERING MECHANICS

I B.Tech – II Semester (Code: 20CE203)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	70

Course Objectives: To learn

- The concepts Force systems, free body diagrams, resultant of forces and equations of equilibrium, Supports and support reaction sand calculation of Centroid
- The Concept of moment of inertia of plane figures, Laws and applications of friction and the Analysis of the truss and determination of axial forces by Method of Joints.
- Motion of a body and their relationships and application of D Alembert's principle in rectilinear and curvilinear motions
- AboutMass moment of inertia of material bodies, Plane motion of a body about a fixed axis

Course Outcomes: Students will be able to

CO1: Analyze the forces developed at the contact of the bodies by constructing the freebody diagram and location of centroid

CO2: Analyze the systems with friction, and M.I of composite figures .

CO3: Analyze the axial forces in the members of truss andunderstanding of the principles of dynamics

CO4: Analyze of moment of inertia of material bodies and Rotation of rigid body about fixed axis.

UNIT – I

Concurrent Forces in a Plane

Principles of statics – composition and resolution of forces – equilibrium of concurrent forces in a plane –Method of moments.

Parallel Forces in a Plane

Two parallel forces – general case of parallel forces in a plane – center of parallel forces – Centroids of composite plane figures and curves-

UNIT – II

Moments of Inertia of Plane Figures

Moment of inertia of a plane figure with respect to an axis in its plane – Moment of Inertia with respect to an axis perpendicular to the plane of the figure – Parallel axis theorem.

Friction

Characteristics of friction – problems involving dry friction, ladder friction and wedge friction.

UNIT – III

Analysis of Plane Trusses

Trusses types – Axial forces finding in the members using method of joints.

Kinematics and Kinetics of a particle

Kinematics of rectilinear motion – principles of dynamics – Differential equations of rectilinear motion, D'Alemberts principle -Kinematics of curvilinear motion – Differential equations of curvilinear motion – D'Alembert's principle.

UNIT – IV

Moments of Inertia of Material Bodies

Moment of inertia of a rigid body – Moment of inertia of a lamina – Moments of inertia of three – dimensional bodies.

Rotation of a Rigid Body about a Fixed Axis

Kinematics of rotation – Equation of motion for a rigid body rotating about a fixed axis – D'Alembert's principle.

TEXT BOOK

1. Engineering mechanics by S. Timoshenko and D. H. Young – McGraw-Hill International edition (For concepts and symbolic problems)
2. Engineering mechanics statics and dynamics by R. C. Hibbeler and Ashok Gupta - Pearson (For numerical problems using S.I. system of units)

REFERENCE BOOKS

1. Vector mechanics for engineers statics and dynamics by Beer and Johnston, Tata McGraw-Hill publishing company, New Delhi

2.Engineering mechanics statics and dynamics by A. K. Tayal – Umesh publication, Delhi (For numerical problems using S.I. system of units)

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-	2
CO2	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-	2
CO3	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-	2
CO4	3	2	-	-	-	-	-	-	-	-	-	-	3	-	-	2

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

BUILDING MATERIALS, PLANNING AND CONSTRUCTION
I B.Tech – II Semester (Code :20CE204)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

COURSE OBJECTIVES

- To make the students aware of selection of good building construction materials such as bricks, stones, timber etc.
- To make the students aware of the construction of various stages of buildings as floors, roofs, brick and stone masonry walls.
- To make the student aware of staircases, dampness and temporary supporting structures used in construction.
- To make the students aware of the building bye laws and planning rules.

COURSE OUTCOMES

CO1: Understand the students about the characteristics of construction materials used in civil engineering.
CO2: Understand the foundations of many basic engineering concepts related earthquake engineering.
CO3: Understand the students about the staircases types dampness and about the temporary supporting structures used while construction of a building
CO4: Understand the inputs required to help them attain professional expertise and establish themselves as building planners.

UNIT – I

1. Stones

Qualities of a good building stone, Common building stones of India.

2. Bricks

General; Composition of good brick earth; Harmful ingredients in brick earth; Manufacture of bricks by clamp burning and kiln (only Hoffman's kiln) burning, Qualities of good bricks; Tests for bricks; Classification of bricks; Size and weight of bricks

3. Lime

General; Some definitions; Sources of lime; Constituents of lime stones; Classification of limes; Properties of fat lime and hydraulic lime;

4. Timber

Definition; Structure of a tree; Qualities of good timber; Decay of timber; Preservation of timber; Advantages of timber construction; Uses of timber;

UNIT –II

5. Stone & Brick Masonry

Technical terms; Types of bonds in brickwork and their suitability. Classification of stone masonry

6. Walls

Classification of walls.

7. Floors

Technical terms; Types of ground floors

8. Roofs

Technical terms; Classification of roofs; Steel sloping roofs; Roof covering materials; Types of flat roofs;

UNIT –III

9. Staircases

Technical terms; Types of stair-cases, design considerations.

10. Dampness And Damp Proofing

Causes of dampness; Methods of preventing dampness; Damp proofing materials and their classification; Methods of providing DPC under different situations.

11. Scaffolding, Shoring, Under Pinning And Form Work

Types of scaffolding; Types of formwork; Centering.

UNIT –IV

12. An Approach To Planning

Site planning; Space requirement–Establishing areas for different units, Furniture requirements, Roominess, Flexibility, Sanitation, Lighting, Ventilation, Space for equipment for air–conditioning, Space for machinery etc.; Flow diagram and line plan–Grouping, Circulation, Orientation, Aspect and prospect, Privacy, Elegance and economy; Climatic considerations; Architectural composition–Unity, Mass composition, Contrast, Proportion, Scale, Accentuation and rhythm.

13. Building Rules And Bye–Laws

Zoning regulations; Regulations regarding layouts or sub-divisions; Building regulations; Rules for special type of buildings; Calculation of plinth, floor and carpet area; Floor space index.

15. Building Elements

Conventional signs; Guidelines for staircase planning; Guidelines for selecting doors and windows; Terms used in the construction of door and window.

TEXT BOOKS

1. Engineering Materials by S. C. Rangwala; Charotar Publishing House, Anad.
2. Building construction by B. C. Punmiaet all; Laxmi Publications, New Delhi.
3. Planning and Designing Buildings by Yashwant S. Sane, Allies Book Stall.

REFERENCE

1. Building Drawing by M.G. Shah, C.M. Kale and S.Y. Patki, Tata McGrqw-Hill, New Delhi. 2. Building Materials by SK Duggal

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	2	2	2	3	2	-	-	-	-	2	3	3	-	2
CO2	3	2	2	2	2	2	-	-	-	-	-	2	3	3	-	2
CO3	3	2	1	3	2	-	2	-	-	-	-	2	3	3	-	2
CO4	3	3	1	3	3	-	2	-	-	-	-	2	3	3	1	2

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

ENGINEERING GRAPHICS

I B.Tech – II Semester (Code: 20CEL201/MEL01)

Lectures	1	Tutorial	0	Practical	4	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Course Objectives: To learn

- clear picture about the importance of engineering graphics in the field of engineering the drawing skills and impart students to follow Bureau of Indian Standards
- To give an idea about Geometric constructions, Engineering curves, orthographic projections and pictorial projections
- imagination skills about orientation of points, lines, surfaces and solids
- basic drafting skills of AutoCAD

Course Outcomes: Students will be able to

CO1: Students will be able to enhance their visualization skills and drawing communicationskills

CO2: Students will be able to have knowledge on general geometrical constructions and skills on plotting projections of lines , planes and solids.

CO3: Students will be able to generate the pictorial views into orthographic views of simple castings.

CO4: Students will be able to convert the orthographic views into isometric views of simple objects.

UNIT – I

INTRODUCTION: Introduction to Drawing instruments and their uses, geometrical construction procedures

INTRODUCTION TO AUTOCAD:

Basics of sheet selection, Draw tools, Modify tools, dimensioning

METHOD OF PROJECTIONS: Principles of projection - First angle and third angle projectionof points. Projection of straight lines.Traces of lines.

UNIT II

PROJECTIONS OF PLANES: Projections of plane figures: circle, square, rhombus, rectangle, triangle, pentagon and hexagon.

UNIT – III

PROJECTIONS OF SOLIDS: Projections of Cubes, Prisms, Pyramids, Cylinders and Cones Inclined to one plane. .

UNIT –IV

ISOMETRIC PROJECTIONS: Isometric Projection and conversion of Orthographic views into isometric views. (Treatment is limited to simple objects only).

UNIT –V

ORTHOGRAPHIC PROJECTIONS: Conversion of pictorial views into Orthographic views. (Treatment is limited to simple castings).

TEXT BOOK:

1. Engineering Drawing with AutoCAD by Dhananjay M. Kulkarni (PHI publication)
2. Engineering Drawing by N.D. Bhatt & V.M. Panchal. (Charotar Publishing House, Anand). (First angle projection)

REFERENCE BOOKS:

1. Engineering Drawing by Dhananjay A Jolhe, Tata McGraw hill publishers
2. Engineering Drawing by Prof.K.L.Narayana& Prof. R.K.Kannaiah.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO2	2	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO3	2	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-
CO4	2	2	-	-	-	-	-	-	-	-	-	-	1	-	-	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

CHEMISTRY LAB
I B.Tech – II Semester (Code: 20CEL202/CYL01)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Pre-Requisite: None.

Course Objectives: The course consists of experiments related to the principles of chemistry required for engineering student. The student should know:

- The basics of chemistry lab to carry out the qualitative and quantitative analysis of any given sample.
- To determine the percentage purity of washing soda bleaching powder and given salt. The measurement of quality parameters of water to check its suitability for domestic and industrial purpose
- To estimate the characteristic properties of oil for its use at various level
- To synthesize the Soap, Resin and Aromatic Ester followed by their applications. The use and utility of some instruments like PH meter, Conduct meter and Potentiometer for various applications

Course Outcomes: After the completion of the course students will be able to

CO-1	Familiar with fundamental basics of Chemistry lab
CO-2	Estimate purity of washing soda, bleaching powder and quantity of Iron and other salts.
CO-3	Gain the knowledge regarding the quality parameters of water & oil like Salinity, hardness, alkalinity saponification and iodine value.etc.
CO-4	Prepare high polymers and soap & Instrumentation techniques

LIST OF EXPERIMENTS

1. Introduction to Chemistry Lab (the teachers are expected to teach fundamentals like Calibration of Volumetric Apparatus, Primary, Secondary Solutions, Normality, Molarity, Molality etc. and error, accuracy, precision, theory of indicators, use of volumetric titrations).

2. Volumetric Analysis:

a. Estimation of Washing Soda.
b. Estimation of Active Chlorine Content in Bleaching Powder
c. Estimation of Mohr's salt by permanganometry.
b. Estimation of given salt by using Ion-exchange resin using Dowex-50.

3. **Analysis of Water**:

a. Determination of Alkalinity of Tap water.
b. Determination of Total Hardness of ground water sample by EDTA method
c. Determination of Salinity of water sample.

4. Estimation of properties of oil:

a. Estimation of Acid Value
b. Estimation of Saponification value.

5. Preparations:

a. Preparation of Soap
b. Preparation of Urea-formaldehyde resin
c. Preparation of Phenyl benzoate.

6. Demonstration Experiments (Any two of the following):

a. Determination of p^H of given sample.

b. Determination of conductivity of given sample by conductometer.

c. Potentiometric Determination of Iron.

Text Books :	1. Practical Engineering Chemistry by K.Mukkanti, Etal, B.S. Publicaitons,Hyderabad, 2009. 2. Inorganic quantitative analysis, Vogel, 5th edition, Longman group Ltd.London, 1979.
References :	1. Text Book of engineering chemistry by R.n. Goyal and HarrmendraGoel. 2. A text book on experiments and calculations- Engineering Chemistry. S.S. Dara. 3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2												3			-
CO2	2	2	2	2		2						2				-
CO3	2	2	2	2		2						2	2			-
CO4	2	2	2	2								2				-

WORKSHOP PRACTICE

I B.Tech – II Semester (Code: 20CEL203/MEL02)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Prerequisites: None

Course Objectives:

- To impart student knowledge on various hand tools for usage in engineering applications.
- Be able to use analytical skills for the production of comonents.
- Design and model different prototypes using carpentry, sheet metal and welding.
- Make electrical connections for daily applications.
- To make student aware of safety rules in working environments.

Course Outcomes: After completion of this course student should be able to:

CO1: Make half lap joint, Dovetail joint and Mortise &Tenon joint
CO2: Produce Lap joint, Tee joint and Butt joint using Gas welding
CO3: Prepare trapezoidal tray, Funnel and T-joint using sheet metal tools
CO4: Make connections for controlling one lamp by a single switch, controlling two lamps by a single switch and stair case wiring.

Syllabus:

1. Carpentry
   a. Half Lap joint
   b. Dovetail joint
   c. Mortise &Tenon joint
2. Welding using electric arc welding process/gas welding
   a. Lap joint
   b. Tee joint
   c. Butt joint
3. Sheet metal operations with hand tools
   a. Trapezoidal tray
   b. Funnel
   c. T-joint
4. House wiring
   a. To control one lamp by a single switch
   b. To control two lamps by a single switch
   c. Stair-case wiring

TEXT BOOKS:

1. P.Kannaiah and K.L.Narayana, Workshop Manual, SciTech Publishers, 2009.
2. K. Venkata Reddy, Workshop Practice Manual, BS Publications, 2008.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	3	2	-	2	-	2	-	-	-	-	2	-	-	3	2
CO2	2	3	2	-	2	-	2	-	-	-	-	2	-	-	3	2
CO3	2	3	2	-	2	-	2	-	-	-	-	2	-	-	3	2
CO4	-	-	2	-	2	-	2	-	-	-	-	2	-	-	3	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

ENVIRONMENTAL STUDIES
I B.Tech – II Semester (Code: 20CE205/MC01)

Lectures	3	Tutorial	0	Practical	0	Credits	0
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	0		

Prerequisites: None

Course Objectives: To learn

- To develop an awareness, knowledge, and appreciation for the naturalenvironment.
- To understand different types of ecosystems exist in nature.
- To know our biodiversity.
- To understand different types of pollutants present in Environment.To know the global environmental problems.

Course Outcomes: Students will be able to

CO1: Compare various ecosystems such as forest, grassland, desert, and aquatic case studies, relate to the environmental concepts & the levels of energy flow in an ecosystem, Discuss the preventive as well as remedial measures for conservation of biodiversity.

CO2: Integrate and analyse the various natural and manmade factors that affect forests,environment & propose alternative sources of energy to meet the growing energy needs of ourpopulation. Identify the importance of sustainable growth and developmental.

CO3: Evaluate the pollution case studies and propose control measures of Urban and industrial wastes. Appreciate the ethical, cross-cultural, and historical context of environmental issues and the links between human and natural systems.

CO4: Understand key concepts from economic, political, and social analysis as they pertain to the design and evaluation of environmental policies, Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world.

UNIT – I

Introduction: Definition, Scope and Importance, Need for public awareness. Ecosystems: Definition, Structure and Functions of Ecosystems, types - Forest, Grassland, Desert, Aquatic (Marine, pond and estuaries). *6 periods*

Biodiversity: Definition and levels of Biodiversity; Values of Biodiversity - Consumptive, Productive, Social, Aesthetic, Ethical and Optional; Threats and Conservation of Biodiversity; Hot Spots of Biodiversity, Bio-geographical Classification of India, India as a mega diversity nation. *Chipko movement case study* *6 periods*

UNIT – II

Natural resources: Land: Land as a resource, Causes and effects of land degradation - Soil erosion, Desertification. **Forest**: Use of forests, Causes and effects of deforestation, Afforestation, Mining - benefits and problems. **Water**: Uses, floods and drought, Dams - benefits and problems.

Energy: Importance of energy, Environmental Impacts of Renewable and Non-renewable energy resources. *Silent Valley Project and Narmada BachaoAndolan case studies8 periods*

Sustainability: Definition, Concept and Equitable use of resources for sustainable development; Rain water harvesting and Watershed management. Fieldwork on Rain water harvesting and Watershed management. *6 periods + 6 hours field work/Demonstration*

UNIT – III

Pollution: Definition; Causes, effects and control of air, water and nuclear pollution; *Chernobyl Nuclear Disaster* case study; Solid Waste: urban, Industrial and hazardous wastes; Integrated waste management - 3R approach, composting and vermicomposting. *12 periods*

Environmental acts: Water and air (Prevention and Control of pollution) acts, Environmental protection act, Forest Conservation act. *6 periods*

UNIT – IV

Environmental issues: Green house effect & Global warming, Ozone layer depletion, Acid rains, Green Revolution, Population Growth and environmental quality, Environmental Impact Assessment.Environmental Standards (ISO 14000, etc.) *12 periods*

Case Studies: Bhopal Tragedy, Mathura Refinery and TajMahal, and Ralegan Siddhi (Anna Hazare). *6 periods*

Field work: Visit to a local area to document environmental assets – Pond/Forest/Grassland. Visit to a local polluted site- Urban and industry/ Rural and Agriculture. *6 hrs.*

TEXT BOOKS:

1. "Environmental Studies" by Benny Joseph, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. "Comprehensive environmental studies"- JP Sharma, Laxmi Publications.
3. Text Book of environmental Studies – ErachBharucha

REFERENCE BOOKS:

1. "Environmental studies", R.Rajagopalan, Oxford University Press.
2. "Introduction to Environmental Science", Anjaneyulu Y, B S Publications
3. "Environmental Science", 11th Edition – Thomson Series – By Jr. G. Tyler Miller.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4
CO1	-	-	-	-	-	2	2	-	1	1	-	2	-	-	-	-
CO2	-	-	-	-	-	2	2	-	2	1	-	1	-	-	-	-
CO3	-	-	-	-	-	3	3	1	2	3	2	1	-	-	-	-
CO4	-	-	-	-	-	1	2	1	2	1	-	3	-	-	-	-

PROBABILITY AND STATISTICS II B. Tech. III Semester 20CE301/MA03								
Lectures	:	2	Tutorial	:	1	Practical	:	0
CIE Marks	:	30	SEE Marks	:	70	Credits	:	3

Pre-Requisite: None

Course Objectives: Students will learn how to

➢	Apply the continuous probability densities to various problems in science and engineering.
➢	Estimate the point and interval estimators of the mean, variance and proportion for the given Sample data and apply Z-test, t-test to various real-life problems
➢	Apply various sample tests like F-test and $\chi 2$ -test for decision making regarding the Population based on sample data.
➢	Compute the level of correlation, the best fit curve to the given data by the method of least squares and also perform ANOVA arising in the field of engineering.

Course Outcomes: After studying this course, the students will be able to

CO1	Apply discrete and continuous probability distributions to various problems arising in Engineering applications.
CO2	Perform Test of Hypothesis for a population parameter for single sample.
CO3	Perform Test of Hypothesis for population parameters for multiple samples.
CO4	Interpret the results of correlation, regression and one way ANOVA for the given data.

UNIT-1 (12 Hours)

Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Uniform Distribution, Gamma Distribution and its applications, Beta Distribution and its applications, Weibull distribution, Joint Distributions (Discrete), Joint Distributions (Continuous).
(Sections 5.1, 5.2, 5.3, 5.5,5.7, 5.8, 5.9, 5.10)

UNIT-2 (12 Hours)

Populations and Samples, The sampling distribution of the mean (σ known), The sampling distribution of the mean (σ unknown), The sampling distribution of the variance, Point estimation, Interval estimation, Tests of Hypotheses, Null Hypothesis and Tests of hypotheses, Hypothesis concerning one mean.

(Sections 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.4, 7.5, 7.6)	
UNIT-3	(12 Hours)
Comparisons-Two independent Large samples, Comparisons-Two independent small samples, matched pairs comparisons, The estimation of variances, Hypotheses concerning one variance, Hypotheses concerning two variances. (Sections 8.2, 8.3, 8.4, 9.1, 9.2, 9.3) .	
UNIT-4	(12 Hours)
Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning several proportions. The method of least squares, curvilinear regression, multiple regression, correlation, Completely Randomized Designs. (10.1, 10.2, 10.3, 11.1, 11.3, 11.4, 11.6, 12.1, 12.2)	
Text Books :	Miller & Freund's "Probability and Statistics for Engineers", Richard A. Johnson, 8th Edition, PHI.
References :	1. R.E Walpole, R.H. Myers & S.L. Myers 'Probability & Statistics for Engineers and Scientists', 6th Edition, PHI. 2. Murray R Spiegel, John J.Schiller, R. AluSrinivasa, 'Probability &Satistics', Schaum's outline series.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												**PSO's**			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	-	-	-	-	-	-	-	-	-	2	3	-		-
CO2	3	3	2	-	-	-	-	-	-	-	-	2	2	-		-
CO3	3	3	2	-	-	-	-	-	-	-	-	2	2	-		-
CO4	3	3	3	-	-	-	-	-	-	-	-	2	2	-		-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)
SURVEYING
II B.Tech – I Semester (Code : 20CE302)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

Course Objectives:

- To study the basics of linear/angular measurement methods like chain surveying, compass surveying.
- To study the basics of leveling and theodolite survey in elevation and angular measurements.
- To deal with various methods employed for the measurement of areas and volumes.
- To study different methods of setting & design of simple circular curves & introduce about EDM, Digital theodolite and total station.

Course Outcomes:

CO1: Understand terminology, ranging methods, chain and tape corrections, errors in surveying, types of compasses, local attraction.

CO2: Undertstand knowledge to proficiently conduct theodolite traverse and execute levelling tasks.

CO3: Understand calculating the area of tracts with both straight and irregular boundaries using various formulae, determining the volume of level and two-level sections, and knowedge of triangulation.

CO4: Understand setting out various types of curves, as well as the field procedures for conducting surveys using total stations.

UNIT –I

Chain survey-Terminology-Ranging-methods, Chain & tape corrections-problems, obstacles in chaining Errors in surveying- Types & sources of errors. Compass survey-Bearings-Types of compass-F.B-B.B-Local attraction-Problems on local attraction, Declination.

UNIT –II

Theodolite traverse- Types of traverse- Checks in closed & open traverse- Latitude and Departures-Error of closure-Problems on Omitted measurements.

Levelling-Classification of levelling-Terminology-Types of levels-booking and reducing levels & Problems.

UNIT –III

Areas & Volumes- Area of tract with straight & irregular boundaries by various formulae-Volume of level sections- Problems.

Triangulation –classification- Baseline – site selection for base line- Classification of Signals

UNIT –IV

Setting out curves: Types, elements of simple circular, Compound & Reverse curves.

Principle of Electronic Distance Measurement, Types of EDM instruments, Total Station – Parts of a Total Station – Accessories –Advantages and Applications.

TEXT BOOKS:

1. Arora, K.R, Surveying, Vol-I, II and II, Standard Book House, 15th edition
2. Surveying Vol. I&II by B.C. Punmia ,Laxmi Publications,

REFERENCES:

1. Chandra A.M., Higher Surveying, Third Edition, New Age International (P) Limited, .
2. C. Venkatramaiah, Text Book of Surveying, Universities Press Pvt Ltd, Hyderabad. Revised Edition .
3. Madhu N., Sathikumar, R. and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, .

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	1	-	1	-	1	-	1	2	1	1	2	3	-	-	2
CO2	3	1	-	1	-	1	-	1	2	1	1	2	3	-	-	2
CO3	3	1	-	1	-	1	-	1	2	1	1	2	3	-	-	2
CO4	3	1	-	1	-	1	-	1	2	1	1	2	3	-	-	2

SOLID MECHANICS
II B.Tech – I Semester (Code : 20CE303)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

Course objectives:

- Analysis of members subjected to normal, shear and temperature stresses in elastic members subjected to axial forces for both determinate and indeterminate structures and their application
- Importance of analyzing internal forces in beams
- Basic flexure formula and shear formula and their application in beams.
- Torsional formulaand its application on members of circular section and closely coiled helical spring with strain energy concept for axially loaded members.

Student Learning Outcomes:

On completion of the course the student will be able to:

CO1: Understand the concepts of plain stress and strain in axially loaded elastic members and its applications to thin walled pressure vessels.

CO2: Analyze the internal forces in the beams for different types of loads.

CO3: Applying the stress concept to beams subjected to flexure and shear.

CO4: Analyze the shafts and closely coiled helical springs under Torsion.

UNIT-I

1. Simple Stresses and Strains

Introduction, Method of sections; Stress concept, Analysis for normal and shear stress; Strain concept; Stress - Strain relations; Hooks law, Elastic constants and relations; Poissons ratio; Deformation of axially loaded bars; Statically indeterminate axially loaded bars; Temperature stresses

2. Thin Walled Pressure Vessels

Thin cylinders; circumferential and longitudinal stresses; spherical pressure vessels

UNIT-II

3. Internal Forces in Statically Determinate Beams

Introduction: Diagrammatic conventions for supports and loads: Calculation of beam reactions: Application of method of sections; Shear force in beams; Bending moment in beams; Shear force and bending moment diagrams.

UNIT-III

4. Normal Stresses in Beams

Introduction; Basic assumptions; Elastic flexure formula; Application of flexure formula

5. Shear Stress in Beams

Introduction; Shear flow; Shear stress formula for beams; Shear beam flanges; Shear center

UNIT-IV

6. Torsion

Introduction: Application of method of sections; Torsion of circular elastic bars – Basic assumptions, Torsion formula; combined bending and torsion

7. Springs

Springs - Types of springs – Stresses in closely coiled helical springs; deflection of close coiled helical springs.

TEXT BOOKS:

1. Engineering mechanics of solids by E.P.Popov, Prentice Hall of India, 2005.

2. Strength of Materials by T.D. GunneswaraRao and M. Andal, Cambridge University Press.

REFERENCES:

1. Elements of strength of materials by S.P.Timoshenko and D.H.Young, Affiliated East-West Press Pvt.Ltd., 2005.

2. Strength of materials by S. S. Bhavikatti, Vikas Publishing House Pvt. Ltd., 1998.

3. Strength of materials by S. Ramamrutham, DhanpatRai Publishing Company Pvt. Ltd., 2011

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	2	2	-	-	-	-	-	-	-	3	3	3	2	3
CO2	3	3	2	2	-	-	-	-	-	-	-	3	3	3	2	3
CO3	3	3	2	2	-	-	-	-	-	-	-	3	3	3	2	3
CO4	3	3	2	2	-	-	-	-	-	-	-	3	3	3	2	3

CONCRETE TECHNOLOGY
II B.Tech – I Semester (Code : 20CE304)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			30	Semester End Examination (3 Hours)			70

Course Objectives

- To understand the basic physical and chemical properties of cement, admixtures and aggregates
- To understand the properties and factors influencing the workability of fresh concrete
- To understand various tests for determining strength of concrete and effect of water/cement ratio on the strength of hardened concrete
- To apply the basic concepts and applications of concretes and special concretes, determine various mix proportions of concretes

Learning Outcomes :

CO1: Interpret the basic physical and chemical properties of cement, admixtures and aggregates.
CO2: Interpret the properties and factors influencing the workability of fresh concrete.
CO3: Interpret various tests for determining strength of concrete and effect of water/cement ratio on the strength of hardened concrete.
CO4: Apply the basic concepts and applications of concretes and special concretes, determine various mix proportions of concretes.

UNIT-I

1. Cement
Approximate Oxide composition of cement, Bogue's compounds, Hydration of cement, Gel formation, Types of cement, Quality tests on cement as per Indian standards
2. Aggregates and Water
Classification and Characteristics of Aggregates, bulking of sand, Grading of Aggregates, Tests on aggregates as per Indian standards, Tolerable concentrations of some impurities in mixing water, Permissible limits of solids in water as per IS 456:2000.

UNIT-II

3. Fresh Concrete
Properties of Fresh Concrete, Workability of concrete, Factors affecting workability of concrete, Measurement of workability of concrete by different tests, batching of concrete, Compaction and curing of concrete.

4. Hardened Concrete

Water-cement ratio-Abram's Law; Gel/Space ratio; Maturity concept of concrete; Tests on hardened concrete- compression, split tension, and flexure as per Indian standards, Factors influencing strength of concrete, Relationship between different strengths.

UNIT-III

5. Durability of Concrete

Factors influencing the durability of concrete, Chemical effects on concrete and control methods-Carbonation, Sulphate attack and Chloride attack.

6. Chemical and Mineral Admixtures

Classification of Admixtures, Chemical Admixtures - Plasticizers, Super Plasticizers, Retarders, Accelerators, Air-entraining Admixtures, Effect of Chemical Admixtures on the fresh and hardened properties of concrete, Mineral Admixtures - Fly ash, Silica Fume, Effect of Mineral Admixtures on the fresh and hardened properties of concrete.

UNIT-IV

7. Concrete Mix Design

Concept of mix design, Different methods of mix design, Factors affecting mix design, Indian standard method of mix design as per IS 10262-2019.

8. Special Concretes

Introduction to High performance Concrete – Light Weight Concrete - Fibre Reinforced Concrete - Self Compacting Concrete.

TEXTBOOKS

1. Concrete technology by M.S.Shetty, S.Chand& Company Pvt. Ltd., New Delhi
2. Concrete technology by M.L.Gambhir, Tata McGraw-Hill Publishing company Ltd., New Delhi

REFERENCE BOOKS

1. Properties of concrete by A.M.Neville, Longman Publishers
2. Concrete: Microstructure, Properties and Materials – P.K. Mehta and J.M. Monteiro, McGraw Hill Publishers

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	1	-	-	-	-	-	-	-	-	-	1	3	-	2
CO2	3	2	1	-	-	-	-	-	-	-	-	-	1	3	-	2
CO3	3	2	1	-	-	-	-	-	-	-	-	-	1	3	-	2
CO4	3	2	1	-	-	-	-	-	-	-	-	-	1	3	-	2

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

FLUID MECHANICS
II B.Tech – I Semester (Code : 20CE305)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

Prerequisites: None

Course Objectives:

- To familiarize with the properties of fluids and the applications of fluid mechanics.
- To formulate and analyze problems related to calculation of forces in fluid structure interaction.
- Ability to understand types of flows and analyze fluid flow problems with the application of the energy equation.
- To determine the losses in a flow system and flow through pipes.

Course Outcomes: Students will be able to

CO1: Interpret various fluid properties and behaviors, enabling them to solve practical engineering problems

CO2: Apply the energy equation effectively and able to determine discharge in pipes.

CO3: Apply the concepts of orifices, mouthpieces, rectangular notches and triangular notches in engineering problem

CO4: Integrating momentum equations, forces on pipe bends, energy losses and Reynolds's experiments in pipe flow.

UNIT I

Properties of Fluids: Specific gravity, viscosity, surface tension and Capillarity.

Fluid Statics: Introduction, pressure, Pascal's law, hydrostatic law, measurement of pressure-simple and differential manometers, Total pressure and centre of pressure on vertical, horizontal and Inclined surfaces.

Buoyancy: Stability of submerged bodies and floating bodies; Meta-centre and meta-centric height(Analytical Method)

UNIT II

Fluid Kinematics: Classification of flows: Steady, unsteady, uniform and non-uniform flows; Laminar and turbulent flows; Streamline; Path line; Streak line; Continuity equation; Velocity potential and stream function.

Fluid Dynamics: Euler's equation of motion; Bernoulli's equation.

Flow Measurement in Pipes: Discharge through a venturimeter and orificemeter; Measurement of velocity by pitot tube.

UNIT III

Orifice and Mouthpiece: Introduction to orifices (Small and large) and mouth pieces.

Notches: Discharge over a Rectangular and Triangular notch.

UNIT IV

Flow through pipes: Momentum equation, Force exerted by flowing fluid on pipe-bend, major and minor energy losses, Hydraulic gradient and total energy line, Reynolds's experiments of pipe flow.

Text Books:

1. Hydraulics and Fluid Mechanics by P. N. Modi& S. N. Seth; Standard book house; New Delhi
2. Fluid Mechanics and Hydraulic Machines by R. K. Bansal; Laxmi Publications; New Delhi.

Reference Books:

1. Fluid Mechanics by A. K. Jain; Khanna Publishers, Delhi, 2008
2. Fluid Mechanics by Streeter and wyile, McGrawhil Publications.
3. Fluid Mechanics by S K Som& G Biswas (TMH)

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	2	-	-	-	-	-	-	-	-	1	3	2	-	2
CO2	3	3	2	-	-	-	-	-	-	-	-	1	3	2	-	2
CO3	2	3	2	-	-	-	-	-	-	-	-	2	3	3	-	2
CO4	2	3	2	-	-	1	-	-	-	-	-	2	3	3	-	2

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

MAT LAB Programming for Civil Engineering
II B.Tech – I Semester (Code : 20CEL301/SOC01)

Lectures	1	Tutorial	0	Practical	2	Credits	2
Continuous Internal Assessment		:	0	Semester End Examination (3 Hours)			0

Course Objectives

- Understanding the MATLAB software.
- Being able to do simple calculations using MATLAB.
- Being able to carry out simple numerical computations and analyses using MATLAB.

Course outcomes:

CO1: Read and write matlab codes to perform simple maths

CO2: Develop programs with conditionals and loops.

CO3: Define programs with arrays and lists.

CO4: Develop user defined programs and M-Files.

UNIT-I

Introduction to MATLAB Programming: The MATLAB environment, Basic computer programming - Variables and constants, operators and simple calculations - Formulas and functions - MATLAB toolboxes.

UNIT-II

Matrices and vectors: Matrix and linear algebra review - Vectors and matrices in MATLAB - Matrix operations and functions in MATLAB.

UNIT-III

MATLAB programming: Algorithms and structures - MATLAB scripts and functions (m-files) - Simple sequential algorithms - Control structures (if…then, loops), Reading and writing data, file handling - Personalized functions - Toolbox structure - MATLAB graphic functions

Project-on session: Interactive hands-on-session develops one or more MATLAB scripts that solve a concern civil engineering problem.

- Finding deflection of Portal frame or Truss
- Estimation volumes using contours.

Text Books:

1. Matlab For Beginners ,A Gentle Approach by Peter I.Kattan, Petra Books, 2008.
2. MATLAB: A Practical Introduction to Programming and Problem Solving by Stormy Attaway, Butterworth-Heinemann Inc; 6th edition, 2022

Reference Books:

1. MATLAB Handbook with Applications to Mathematics, Science, Engineering, and Finance by Jose Miguel David Baez-Lopez, David Alfredo Baez Villegas, CRC Press, 2019.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	3	-	-	-	-	-	-	-	-	2	-	3	2	-
CO2	3	3	3	-	-	-	-	-	-	-	-	2	-	3	3	-
CO3	3	3	3	-	-	-	-	-	-	-	-	2	-	3	3	-
CO4	3	3	3	-	-	-	-	-	-	-	-	2	-	3	2	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

BUILDING DRAWING LABORATORY
II B.Tech – I Semester (Code : 20CEL302)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

Course Objectives:

- To learn basic commands of Auto CAD software.
- To draw conventional signs, symbols of materials used in a building drawing.
- To draw the building elements like door, window, foundation and staircase etc
- To draw plan, section and elevations of buildings and various building components.

Course Outcomes:

CO1: Understand Basic Auto CAD commands.

CO2: Understand Various conventional signs, symbols of materials and building elements like door, window and foundation etc.

CO3: Understand principles of planning, principles of building bye-laws and ability to draw the line diagrams as per National Building Code.

CO4: Prepare Drawing plan, section and elevations of buildings and various building components.

PART A: Basics and introduction to building drawing:

Introduction to building drawing, Importance of building drawing, scale, legend, direction, units, limits, definition-plan, section, elevation, plotting, Learning basic commands of AUTO CAD software.

PART B: Using drawing tools and Auto cad software:

(1) Drawing conventional signs.
(2) Drawing and guidelines for door, window,
(3) Drawing and guidelines for staircase and foundation.
(4) Draw Plan, sections and Elevation of a single room building.
(5) Drawing plan, sections and Elevation of single storey residential building.
(6) Drawing plan, sections and Elevation of two storied residential building.
(7) Drawing plan, sections and Elevation of a public building.

Note: A minimum of five (5 Nos) shall be done and recorded

Reference books: building planning and drawing by N.kumaraswami& A. kameeswararao

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	-	3	-	3	-	-	-	-	-	-	3	-	2	-	2
CO2	2	-	3	-	3	-	-	-	-	-	-	3	-	3	-	2
CO3	2	-	3	-	3	2	2	2	-	-	-	3	-	3	-	3
CO4	2	-	3	-	3	2	2	2	-	-	-	3	-	3	-	3

ENGINEERING GEOLOGY LABORATORY
II B.Tech – I Semester (Code : 20CEL303)

Lectures	0	Tutorial	0		Practical	3	Credits	1.5
Continuous Internal Assessment			:	30	Semester End Examination (3 Hours)			70

Course Objectives:

- To Identify the Formation of Minerals.
- To Understand the Megascopic Identification of Rocks and Minerals.
- To Understand Geological Maps.
- To inspire the students to think clearly and critically the solution of the civil engineering problems in the context of geological knowledge

Course Outcomes: Students will be able to

CO1: Knowledge: Recognize and describe geological materials and processes relevant to engineering.
CO2: Comprehension: Explain how geological factors impact site stability and interpret geological data.
CO3: Application: Apply geotechnical testing and geological knowledge to make recommendations for engineering projects.
CO4: Analysis: Analyze geological data and engineering problems to assess risks and propose mitigation strategies for different geological scenarios.

List of Experiments:

1. Study of Survey of India Topographical Maps
2. Interpretation of Contour maps
3. Study of Satellite Imageries
4. Megascopic identification of Rocks & Minerals
5. Study of Folds through Models
6. Study of Faults through Models
7. Study of Tunnel Models
8. Seismic Hammer Sounding Method
9. Electrical Resistivity Method (Vertical Electrical Sounding)

Text Books

1. P.C. Varghese, Engineering Geology for Civil Engineers, PHI Learning private limited.
2. Parbin Singh, Engineering & General Geology, S.K. Kataria and Sons- Delhi.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	-	3	-	3	2	-	-	2	3	-	2	-	-	2
CO2	3	3	-	3	-	3	-	-	-	2	3	-	3	-	-	2
CO3	3	3	-	3	-	3	-	-	-	2	3	-	3	-	-	2
CO4	3	3	-	3	-	3	-	-	-	2	3	-	3	-	-	2

SURVEYING LAB
II B.Tech – I Semester (Code : 20CEL304)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

Course Objectives

- To measure chainage of a line using tape and chain and recording of details along the chain line.
- To find the included angles and local attraction of traverse by using compass.
- To determine the elevation difference between two points & eliminate errors due to curvature of earth and refraction.
- To plot a building by using plane table surveying.
- To measure the horizontal and vertical angles of various points by theodolite.

Learning Outcomes

CO1: Understand conducting of various surveying tasks including measuring the area of plots using Cross Staff survey

CO2: Understand Conducting of compass traversing.

CO3: Determining inaccessible distances using both compass and theodolite surveys, measuring horizontal and vertical angles with theodolite.

CO4: Understand Conducting leveling tasks for different scenarios, determining approximate elevations for reconnaissance surveys, and plotting longitudinal sections of routes using profile leveling.

EXPERIMENTS

1. Measurement of area of the plot using Cross staff survey.
2. Traversing by compass and its adjustment.
3. Determination of inaccessible distance using compass survey.
4. Measurement of Horizontal angle by using theodolite.
5. Measurement of Vertical angle by using theodolite.
6. Determination of inaccessible distance using theodolite survey.
7. Determination of difference between two points by simple leveling.
8. Determination of difference between no. of points which are at diff distances by differential levelling.
9. Determination of approximate elevations for reconnaissance survey by Fly leveling.
10. Determination of difference between two points which are separated by some obstruction by reciprocal leveling.
11. Plotting of the longitudinal section of any route by profile leveling.

TEXT BOOKS AND REFERENCES:

1. Surveying Vol-I by Dr K.R. Arora.
2. Surveying Vol-I by Dr B. C. Punmia.
3. Plane surveying by A M Chandra

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	-	-	-	-	-	-	1	-	1	-	1	-	3	2
CO2	3	2	-	-	-	-	-	-	1	-	1	-	1	-	3	2
CO3	3	2	-	-	-	-	-	-	1	-	1	-	1	-	3	2
CO4	3	2	-	-	-	-	-	-	1	-	1	-	1	-	3	2

PROFESSIONAL ETHICS AND HUMAN VALUES
II B.Tech – I Semester (Code : 20CE306/MC02)

Lectures	2	Tutorial	0	Practical	0	Credits	0
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			0

Course Objectives

- To create awareness on professional ethics and Human Values
- To create awareness on Engineering Ethics providing basic knowledge about engineering Ethics, Variety of moral issues and Moral dilemmas, Professional Ideals and Virtues.
- To provide basic familiarity about Engineers as responsible Experimenters, Research Ethics, Codes of Ethics, Industrial Standards
- To inculcate knowledge and exposure on Safety and Risk, Risk Benefit Analysis and have an idea about the Collective Bargaining, Confidentiality, Professional, Employee, Intellectual Property Rights

Learning Outcomes

CO1: Students understand the core values that shape the ethical behaviour of an engineer and Exposed awareness on professional ethics and human values.

CO2: The students will understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories

CO3: The students will understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.

CO4: The students will acquire knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives

UNIT – I

1. Human Values

What is engineering – who is an engineer- Morals, Values and Ethics – Integrity – Work Ethics – Civic Virtue - Respect for Others – Living Peacefully – Caring – Sharing – Honesty – Courage – Valuing Time – Co-Operation –Commitment – Empathy – Self-Confidence – Character - Spirituality.

UNIT – II

2. Engineering Ethics

Senses of Engineering Ethics – Variety of Moral Issued – Types of Inquiry – Moral Dilemmas –Moral Autonomy – Kohlberg's Theory – Gilligan's Theory – Consensus and Controversy –Professions and Professionalism- Theories About Right Action –Self-Interest.

UNIT – III

3. Engineering as Social Experimentation

Engineering as Experimentation – Engineers as Responsible Experimenters – Codes of Ethics –Balanced Outlook on Law.

4. Responsibilities and Rights

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality –Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

UNIT – IV

5. Global Issues

Multinational Corporations – Environmental Ethics – Computer Ethics – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors –Moral Leadership.Sample Code of Ethics like ASCE, IEEE, Institution of Engineers (India), Institution of Electronics and Telecommunication Engineers (IETE), India Etc.,

TEXT BOOKS

1. Professional Ethics and Values by R.S.Naagarazan.
2. Govindarajan M, Natarajan S, Senthil Kumar V.S., "Engineering Ethics", PHI, New Delhi, 2004

REFERENCE BOOKS

1. Charles D,Fleddermann, "Engineering Ethics", Pearson / PHI, New Jersey 2004 (Indian Reprint)
2. Charles E Harris, Michael S.Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases" Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available)
3. John R Boatright, "Ethics and the conduct of business" Pearson, New Delhi, 2003.
4. Edmund G.Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers" Oxford University Press, Oxford, 2001.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	-	-	-	-	-	1	1	3	1	2	-	-	-	3	-	-
CO2	-	-	-	-	-	3	2	3	-	1	-	-	-	3	-	-
CO3	-	-	-	-	-	3	2	1	-	-	-	-	-	3	-	-
CO4	-	-	-	-	-	3	2	2	-	1	3	-	-	3	-	-

TECHNICAL ENGLISH
II B.Tech – II Semester (Code : 20CE401/HS02)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)				70

Course Objectives

The course aims

- At enhancing the vocabulary competency of the students
- To introduce corrective measures to eliminate grammatical errors in speaking and writing
- To learn writing as a process, including various invention heuristics (such as brainstorming), gathering evidence, considering audience, drafting, revising, editing, and proofreading
- Use grammatical, stylistic, and mechanical formats and conventions appropriate for a variety of purposes
- Produce coherent, organized, readable prose for a variety of rhetorical situations

Course Outcomes

The student would be able to

CO1: Make use of contextual clues to infer meanings of unfamiliar words from context
CO2: Understand how to apply technical information and knowledge in practical documents for a variety of purposes
CO3: Use grammatical, stylistic, and mechanical formats and conventions appropriate to various audiences and disciplines
CO4: Build confidence to participate actively in writing activities (individually and in collaboration) that model effective technical communication in the workplace

UNIT-I L P T
12 0 0

1.1 Vocabulary Development: Familiarising Idioms & Phrases
1.2 Grammar for Academic Writing: Making Requests
1.3 Language Development: Using Transition & Link words
1.4 Technical Writing: Letter Writing & Email Writing

UNIT-II L P T
10 0 0

2.1 Vocabulary Development: Analogous words, Gender Sensitive language
2.2 Grammar for Academic Writing: Tenses: Simple Past /Present Perfect, The Future: Predicting & Proposing
2.3 Language Development: Cloze tests
2.4 Technical Writing: Technical Reports

UNIT-III

L	P	T
10	0	0

3.1 Vocabulary Development: Abbreviations& Acronyms
3.2 Grammar for Academic Writing: Describing(People/Things/Circumstances) : Adjectival & Adverbial groups
3.3 Language Development: Transcoding (Channel conversion from chart to text)
3.4 Technical Writing: Circular, Memos, Minutes of Meeting

UNIT-IV

L	P	T
10	0	0

4.1 Vocabulary Development: Corporate vocabulary
4.2 Grammar for Academic Writing: Inversions & Emphasis
4.3 Language Development: Reading Comprehension
4.4 Technical Writing: Resume Preparation

Reference Books

- Communication Skills, Sanjay Kumar &PushpaLatha. Oxford University Press: 2011.
- Technical Communication Principles and Practice. Oxford University Press: 2014.
- Advanced Language Practice, Michael Vince. MacMilan Publishers: 2003.
- Objective English (Third Edition), Edgar Thorpe &Showick. Pearson Education: 2009
- English Grammar: A University Course (Second Edition), Angela Downing & Philip Locke, Routledge Taylor & Francis Group: 2016

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	-	-	-	-	-	-	-	2	2	3	2	2	-	-	2	-
CO2	-	-	-	-	-	-	-	2	2	3	2	2	-	-	2	-
CO3	-	-	-	-	-	-	-	2	2	3	2	2	-	-	2	-
CO4	-	-	-	-	-	-	-	2	2	3	2	2	-	-	2	

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

ENVIRONMENTAL ENGINEERING
II B.Tech – II Semester (Code : 20CE402)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)				70

COURSE OBJECTIVES

- To estimate the quantity of drinking water and domestic wastewater generated
- To explain the various types of water and wastewater characteristics
- To demonstrate the common physical, chemical and biological unit operations encountered in treatment processed
- To identify and design various methods available for the treatment of water and wastewater

COURSE OUTCOMES

CO1: Analyse and Estimate the quantity of water requirement on basis of per capita consumption and forecasting population. And various physico-chemical tests conducted to water.

CO2.:Apply the basic knowledge for the design of various methods available for the treatment of water and design of distribution system.

CO3:Understand the physical, chemical and biological characteristics of wastewater and quantity estimation for the purpose of sewer design.

CO4: Apply the basic knowledge for the design of various methods available for the treatment of wastewater.

UNIT-I

Water Supply: Objectives of water supply scheme, Estimating requirements; Design period; Per capita consumption; Factors affecting per capita consumption; Fire demand; Fluctuations in demand; Population forecasting methods.

UNIT-II

Water treatment and Distribution: Design of water treatment units such as sedimentation, Coagulation, filtration and disinfection; Methods of Distribution, Layout of Distribution system; Analysis of Distribution by Hardy Cross method and practice for simple networks.

UNIT-III

Introduction to Sanitary Engineering: Conservancy and water carriage system; Sewerage systems; Relative merit sand Demerits; Design of sewers; Characteristics of sewage, Expression for BOD.

Sewer Appurtenances Man holes, Drop man holes, Flushing tanks, Street inlets; Catch basins; Storm water regulators;

UNIT-IV

Preliminary and Primary Treatment of Sewage

Preliminary and Primary Treatment Operations: Screens, Grit Chambers, Skimming Tank and Sedimentation Tank

Secondary Treatment:

Trickling filters; Principles of action; Filter types; Recirculation; Final settling tanks; Operational problems and remedies;

Activated sludge process; Features of operation; Organic loading parameters; Methods of aeration; Sludge bulking; Sludge volume index.

TEXT BOOKS:

1. Elements of public health engineering by K.N. Duggal; S.Chand& Company Ltd., New Delhi.
2. Environmental Engineering volume.I&II–by by Dr.B.C.Punmia,:Water Supply Engg. &Wastewater engineering.

REFERENCES:

1. MetcalfandEddy,WastewaterEngineering-collection,Treatment,DisposalandReuse,McGrawHill Pub. Co.,1995.
2. Environmental Engineering volume. I & II– by S.K.Garg: Water Supply and Wastewater engineering, Khanna Publishers, Delhi .
3. Water Supply and Sanitary Engineering by G.S. Bride; Dhanpatrai and sons, Delhi

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	2	1	1	-	3	2	1	-	-	-	2	1	-	-	3
CO2	3	3	1	1	-	3	2	1	-	-	-	2	-	-	-	2
CO3	2	2	1	1	-	3	2	1	-	-	-	2	1	-	-	3
CO4	3	3	1	1	-	3	2	1	-	-	-	2	-	-	-	2

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

MECHANICS OF MATERIALS
II B.Tech – II Semester (Code : 20CE403)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

COURSE OBJECTIVES:

- To understand multi-axial stresses and principal stresses and principal strains;
- Toanalyse structural members under compound stresses;
- To derive expression for critical load carrying capacity of columns under different load conditions and apply various failure criteria for general stress states at points;
- To determine deflections of beams using geometrical and strain energy methods.

LEARNING OUTCOMES:

On completion of the course the student will be able to:

CO1: Anlyze the principal stresses for plain stress problems and computing the compound stresses due to normal and shear stress.

CO2: Understand the buckling concepts of long columns and theories of failures.

CO3: Applying the strain energy concepts to determine the deflections of determinate beams.

CO4: Determines the deflection of statically determinate beams by geometrical methods.

UNIT-I

1. **Analysis of Plane Stress**

Introduction; The basic problem; Equations for transformation of plane stress; Principle planes and principal stresses; Maximum shearstress; Mohr's circle of stress; Construction of Mohr's circle.

2. **Compound Stresses**

Introduction; Superposition and its limitations; Superposition of normal stresses; eccentrically loaded short columns; Core or Kernel of section; Superposition of shear stresses

UNIT -II

3. **Buckling of Columns**

Introduction; Examples of instability; Criteria for stable equilibrium; Euler's load for column with pinned ends; Euler's load for column with different end restraints; Limitations of the Euler's formula; Generalized Euler buckling load formula; Eccentric loads and secant formula.

4. Theories of failure

Maximum Principal stress theory- Maximum shear stress theory- Maximum strain theory, Maximum strain energy theory-Maximum distortion energy theory

UNIT -III

5. Deflections of Statically Determinate Beams (Geometrical Methods)

Introduction; Strain-curvature and Moment-Curvature relation; Governing differential equation for deflection of elastic beams; Alternative differential equations of elastic beams; solution of beam deflection problem by Direct integration and Macaulay's; Introduction to moment area method; Derivation of Moment area theorems; conjugate-beam method; slope and deflection of beams using moment area method and conjugate-beam method.

UNIT -IV

6. Deflections of Statically Determinate Structures (Energy Methods)

Introduction;Strain energy due to bending; Castigliano's theorems- Application of Castigliano's theorem for calculating deflection of beams, frames and trusses- Virtual work method for deflections

TEXT BOOKS:

1. Engineering mechanics of solids by E.P.Popov, Prentice Hall of India, 2005.

2. Strength of Materials by T.D. GunneswaraRao and M. Andal, Cambridge University Press.

REFERENCES:

1. Elements of strength of materials by S.P.Timoshenko and D.H.Young, Affiliated East-West

Press Pvt.Ltd., 2005.

2. Strength of materials by S. S. Bhavikatti, Vikas Publishing House Pvt. Ltd., 1998.

3. Strength of materials by R. K. Bansal, Lakshmi Publications (P) Ltd., 2007

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	2	2	-	-	-	-	-	-	-	3	3	3	2	3
CO2	3	3	2	2	-	-	-	-	-	-	-	3	3	3	2	3
CO3	3	3	2	2	-	-	-	-	-	-	-	3	3	3	2	3
CO4	3	3	2	2	-	-	-	-	-	-	-	3	3	3	2	3

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

HYDRAULICS & HYDRAULIC MACHINES

II B.Tech – II Semester (Code : 20CE404)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

Prerequisites: None

Course Objectives:

- Design of open channels for most economical sections like rectangular, trapezoidal and circular sections
- Understand Gradually Varied flow and Rapidly Varied Flow though the channels and its applications
- Understand the mechanics of impact of jet on various types of vanes, Impulse and Reaction Turbines
- Perform dimensional analysis of a given set of variables using Buckingham's π theorem and relate the model and prototype.

Course Outcomes: Students will be able to
CO1: Analyze the flow through open channels.
CO2: Apply the concepts of Gradually Varied flow and Rapidly Varied Flow.
CO3: Analyze the impact of jets and turbines problems with the application of the momentum equation.
CO4: Analyze the characteristics flow the centrifugal pumps and dimensional analysis.

UNIT I

Open Channel Flow (Uniform Flow): Comparison between open channel flow and pipe flow, Types of channels, Chezy's and Manning's equation, Flow through a Rectangular, Trapezoidal and Circular channels. Most efficient channel section- Rectangular, Trapezoidal and Circular.

Open Channel Flow (Non uniform Flow): Specific energy, Specific energy diagram, Critical flow, critical flow in rectangular channel.

UNIT II

Gradually Varied Flow (GVF): Gradually varied flow in rectangular channels-equation, Classification of channel slopes, classification of surface profiles.

Rapidly Varied Flow (RVF): Hydraulic jump, elements and characteristics of hydraulic jump, Types of hydraulic jump, Location and applications of hydraulic jump, Energy loss in a hydraulic jump.

UNIT III

Impact of Jets: Force exerted by the jet on a stationary and moving plates – vertical, inclined and curved, force exerted by jet on flat plates series of vanes.

Turbines: Classification of turbines and working principles of turbines, draft tube-types, specific speed and unit quantities.

UNIT IV

Centrifugal Pumps: Efficiencies, working procedure; priming; velocity triangles; performance and characteristics curves; multistage pumps and cavitation effects.

Dimensional analysis & Model similitude: Introduction, Rayleigh's method and Buckingham's PI theorem, Types of similarities, Dimensionless numbers.

TEXT BOOKS:

1. Hydraulics and Fluid Mechanics by P. N. Modi& S. N. Seth; Standard book house; New Delhi
2. Fluid Mechanics by A. K. Jain; Khanna Publishers, Delhi, 2008

REFERENCE BOOKS:

1. Fluid Mechanics by Streeter and wyile, McGrawhill Publications.
2. Flow in Open Channel by K.Subramanya, Tata McGrawhill Publications.
3. Fluid Mechanics and Hydraulic Machines by R. K. Bansal; Laxmi Publications

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	3	3	-	-	-	-	-	-	-	-	1	3	2	-	2
CO2	3	3	2	-	-	-	-	-	-	-	-	1	3	2	-	2
CO3	2	3	2	-	-	2	-	-	-	-	-	2	3	3	-	2
CO4	2	3	3	-	-	2	-	-	-	-	-	2	3	3	-	2

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

SOIL MECHANICS
II B.Tech – II Semester (Code : 20CE405)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

COURSE OBJECTIVES:

- To enable the student to understand soil formation, structure, determination of index properties of soil and various soil classification systems.
- To impart the concept of effective stress principle, seepage of water through soil, use of flow nets and various laboratory and field tests to determine coefficient of permeability
- To enable the student to understand the principles and methods of compaction of soils and determination of vertical stress distribution in soils under different loading conditions
- To enable the student to understand the principles of consolidation, determination of rate and magnitude of consolidation settlement, also to understand the concept of shear strength of soils, strength parameters using various laboratory tests.

COURSE OUTCOMES:

Student will be able to

CO1: Understand the concept of soil formation, identify various types of soils using index properties of soil.

CO2: Apply the concept of soil structure and various soil classification systems, various methods to determine coefficient of permeability.

CO3: Apply the principle of effective stress and principle of compaction to determine discharge of water through soils and degree of compaction in the field.

CO4: Evaluate consolidation settlement of soils and shear strength parameters using various laboratory tests.

UNIT I

1. **Basic Definitions, Relationships and Index Properties of soils**
   Soil formation and soil types; Regional soil deposits of India; Phase diagrams; Simple definitions; Some important relationships; Index Properties: Grain size distribution; Atterberg Limits; Relative density; Significance of other Soil Aggregate properties

2. **Classification of Soils**
   Soil structure and Clay Minerals; Introduction to soil classification; Particle size classification as per IS-code; Unified soil classification system; Indian standard soil classification system, applications of soil classification

UNIT II

3. **Principles of Effective Stress, Capillarity and Permeability**: Introduction, Principle of effective stress; physical meaning of effective stress; capillarity in soils; Permeability of Soils: Darcy's law and its Validity; Determination of coefficient of permeability: constant and variable head methods, Factors affecting permeability; Permeability of stratified soil deposits.
4. **Seepage through Soils**: Head, Gradient and Potential; Seepage pressure, Quick sand condition; Two dimensional flow- Laplace's equation; flow nets: properties and uses; graphical method for obtaining flow nets; seepage in anisotropic condition.

UNIT III

5. **Vertical Stresses Below Applied Loads**: Introduction; Boussinesq's equation; vertical stress distribution diagrams; vertical stress beneath loaded areas- point load, line load, strip load, Circular, rectangular load; Newmark's influence chart; Approximate stress distribution methods for loaded areas; Westergaard's equation.
6. **Compaction of Soils**: Introduction; Laboratory tests; Factors affecting compaction; Structure and engineering behaviour of compacted cohesive soils; Compaction in the field; Compaction specifications and field control.

UNIT IV

7. **Compressibility of Soil and Consolidation**: Introduction; Compressibility; Time-rate of consolidation: Mechanics of consolidation; Terzaghi's theory of one- dimensional consolidation; Consolidation test; Computation of settlement; Secondary consolidation settlement.
8. **Shear Strength of Soils:** Introduction; Stress at a point- Mohr Circle of stress; Mohr-coulomb Failure Criterion; Modified failure envelope, Measurement of Shear Strength-Direct shear test, Triaxial test, Unconfined compression test and Vane shear tests; Shear strength of Clayey soils; Shear Strength of Sands; Drainage conditions and Strength parameters.

TEXT BOOKS:

1. Basic and Applied Soil Mechanics – GopalRanjan and A.S.R.Rao, New Age International Publishers
2. Foundation
Analysis & Design by Bowles, J.E., McGraw- Hill Book Co.
3. B.N.D.Narasinga Rao, " Soil Mechanics and Foundation Engineering", Wiley Pulishers, India, 2015.

REFERENCES:

1. Braja M. Das, "Principles of geotechnical engineering" Cengage learning publishers, 2002
2.. A Text book of Soil Mechanics and Foundation Engineering , K.R. Arora , Standard Publishers & Distributions, New Delhi.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	1	-	-	1	1	2	2	3	3	2	2	2	2	1	3
CO2	3	2	3	2	2	2	3	3	2	3	2	2	2	3	2	3
CO3	3	3	3	3	3	3	3	3	3	3	2	2	2	3	2	3
CO4	2	3	3	3	3	3	3	3	3	3	2	2	2	3	2	3

SOFT SKILLS LAB
II B.Tech – II Semester (Code : 20CEL401/SOC02)

Lectures	1	Tutorial	0	Practical	2	Credits	2
Continuous Internal Assessment		:	0	Semester End Examination (3 Hours)			0

Course Objectives: Students will be able to

- To make the engineering students aware of the importance, the role and the content of softskills through instruction, knowledge acquisition, demonstration and practice.
- To know the importance of interpersonal and intrapersonal skills in an employability setting.
- Actively participate in group discussions / interviews and prepare & deliver presentations.
- Function effectively in multi-disciplinary and heterogeneous teams through the knowledge of team work, Inter-personal relationships, stress management and leadership quality. Course Learning Outcomes: Students will be able to

Course Learning Outcomes: Students will be able to

CO1: Use appropriate body language in social and professional contexts.
CO2: Demonstrate different strategies in presenting themselves in professional contexts.
CO3: Analyze and develop their own strategies of facing the interviews successfully.
CO4: Develop team coordinating skills as well leadership qualities.

LIST OF EXPERIMENTS

1. Body Language & Identity Management

a. Facial Expressions – Kinesics - Occulesics
b. Haptics - Proxemics
c. Para Linguistics
d. Appearance
e. Identity Management Communication

2. Emotional Intelligence & Life Skills

a. Self Awareness through Johari Window and SWOC analysis
b. Self Motivation
c. Empathy
d. Assertiveness & Managing Stress
e. Positive Attitude
f. Time Management
g. Goal Setting: Short term, Long Term, Vision, Mission.

3.Business Presentations

a. Preparing effective Presentations Power Point Presentations
b. Power Point Presentations

c. Using Visual Aids
d. Mock Presentations

4.Employability Skills

a. Group Discussion
b. Team Building and Leadership Qualities
c. Interview Skills

Reference Books:

- Personality Development and Soft skills (Second Edition), Barun K. Mithra. Oxford University Press: 2016
- The Definitive Book of Body Language, Allan & Barbara. Pease International:2004
- Working with Emotional Intelligence, Daniel Goleman. Bloomsbury:1998
- English for Jobseekers, LinaMukhopadhyay. Cambridge University Press:2013
- The 7 Habits of Highly Effective People, Stephen R.Covey. St. Martin's Press:2014

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	-	-	-	-	-	-	-	2	3	3	2	2	-	2	-	-
CO2	-	-	-	-	-	-	-	2	3	3	2	2	-	2	-	-
CO3	-	-	-	-	-	-	-	2	3	3	2	2	-	2	-	-
CO4	-	-	-	-	-	-	-	2	3	3	2	2	-	2	-	-

ENVIRONMENTAL ENGINEERING LABORATORY
II B.Tech – II Semester (Code : 20CEL402)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

Course Objectives:

- To determine the physical characteristics of drinking water/sewage – turbidity.
- To determine chemical characteristics of drinking water/sewage – pH, various types of solids, acidity, alkalinity, D.O etc.
- To estimate optimum dosage of coagulant (Alum)
- To train the student for checking the suitability of water for construction and drinking purposes.

Course Outcomes:

CO1: Determining the econcentration of solids in water/sewage.

CO2: Understanding the estimation procedures for chemical characteristics like pH, Acidity, Alkalinity, Hardness etc. of water/sewage.

CO3: Determining the optimum dosage of coagulant (Alum) by Jar test apparatus.

CO4: Determining the freshness of water/sewage by conducting Wrinklers test (D.O.Test).

Note: A minimum of twelve (12No) shall be done and recorded

1. Determination of total .suspended and dissolved solids in water / sewage sample.
2. Determination of fixed and volatile solids in water / sewage sample.
3. Determination of Settleable Solids.
4. Determination of turbidity of water / sewage sample.
5. Determination of pH value of water / sewage sample.
6. Determination of optimum dosage of coagulant.
7. Determination of residual chlorine.
8. Determination of temporary and permanent hardness of water sample.
9. Determination of chloride concentration of water / sewage sample.
10. Determination of acidity of water sample.
11. Determination of alkalinity of water sample.

12. Determination of fluorides in water sample.
13. Determination of Dissolved Oxygen of water / sewage sample.
14. Determination of Biochemical Oxygen Demand (BOD) of waste water.

TEXT BOOKS:

1. Elements of public health engineering by K.N. Duggal; S.Chand& Company Ltd., New Delhi.
2. Manual on Water Supply & Treatment; CPH and EEO, Ministry of Urban Development; Govt. of India, New Delhi.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	-	2	-	2	3	-	-	1	1	-	3	-	-	2
CO2	2	2	-	2	-	2	3	-	-	1	2	-	3	-	-	2
CO3	3	3	-	2	-	3	3	-	-	-	-	-	3	-	-	1
CO4	3	2	-	2	-	2	3	-	-	-	1	-	3	-	-	1

HYDRAULICS & HYDRAULIC MACHINES LABORATORY
II B.Tech – II Semester (Code : 20CEL403)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

Course Objectives:

- To understand the flow measurement in a pipe and tanks.
- To identify various types of flows in pipe.
- To verify the equation of motion.
- To study the characteristics of turbine and pumps.
- To measure the discharge in an open channel flow.

Course Learning Outcomes:

CO1: Determining the Coefficient of Discharge using a Venturi meter, Orifice meter, Orifices, Mouth Pieces, Rectangular notch and V-Notch.

CO2: Understanding the Characterization of Laminar & Turbulent flows by Reynolds apparatus.

CO3: Determining the friction factor for pipes of different diameters and verifying Bernoulli's equation.

CO4: Understanding the Measurement of force due to impact of jet on vanes of different types.

CO5: Estimating the Performance studies on Pumps and Turbines.

Note: A minimum of twelve (12No) shall be done and recorded

1. Verification of Bernoulli's theorem.
2. Venturimeter: Determination of Coefficient of discharge.
3. Orificemeter: Determination of Coefficient of discharge.
4. Orifices: Determination of Coefficient of discharge.
5. Mouthpieces: Determination of Coefficient of discharge.
6. Characterization of laminar and turbulent flows by Reynold's apparatus.
7. Determination of friction factor of Pipes.
8. Determination of loss of head in pipes due to bends, sudden contractions and sudden expansion.
9. Determination of Coefficient of discharge for rectangular and V – notches.
10. Determination of Manning's and Chezy's coefficients in open channel.
11. Measurement of force due to impact of jets on vanes of different types.
12. Performance studies on Pelton turbine.

13. Performance studies on Francis turbine/Kaplan turbine.

14. Performance studies on single stage centrifugal pump.

15. Performance studies on Reciprocating pump.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	1	1	2	3	-	-	-	-	-	-	-	-	1	2	-	3
CO2	1	1	2	3	-	-	-	-	-	-	-	-	1	2	-	3
CO3	1	1	2	3	-	-	-	-	-	-	-	-	1	2	-	3
CO4	1	1	2	3	-	-	-	-	-	-	-	-	1	2	-	3
CO5	1	1	2	3	-	-	-	-	-	-	-	-	1	2	-	3

MATERIALS TESTING LABORATORY
II B.Tech – II Semester (Code : 20CEL404)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

Course Objectives:

The main objective of this laboratory is to make the students to know the basic tests on materials used for construction.

Course Learning Outcomes:

CO1: To determine the properties of concrete ingradients.

CO2: To determine the fresh and hardened properties of concrete.

CO3: To estimate the surface strength and quality of concrete by using NDT equipments.

CO4: To determine the properties of steel.

1. **Cement tests**
   a. Fineness of cement
   b. Normal consistency of cement
   c. Initial setting time of cement
   d. Compressive strength of cement.

2. **Fine aggregate tests**
   a) Specific gravity of fine aggregate
   b) Sieve analysis of fine aggregate
   c) Bulking of sand.

3. **Coarse aggregate tests**
   a) Specific gravity of coarse aggregate
   b) Sieve analysis of coarse aggregate.

4. **Concrete tests**
   a) Workability tests (Slump & Compaction factor)
   b) Compressive strength of concrete.
   c) Split tensile test.
   d) Modulus of rupture

5. **NDT – Rebound hammer testing & UPV**

6. **Stress-Strain characteristics of mild steel bar. & HYSD**

7. **Determining shear strength of mild steel bar and impact strength of steel specimen.**
8. **Determining Rigidity Modulus for steel bar & spring**
9. **Hardness test of Steel & Brass**
10. **Determining Young's Modulus of Steel and Wood (using simply supported beam)**

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	1	1	-	3	-	-	-	-	-	3	-	-	-	-	-	3
CO2	1	1	-	3	-	-	-	-	-	3	-	-	-	-	-	3
CO3	1	1	-	3	3	-	-	-	-	3	-	-	-	-	-	3
CO4	1	1	-	3	-	-	-	-	-	3	-	-	-	-	-	3

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

STRUCTURAL ANALYSIS
III B.Tech –V Semester (Code: 20CE501)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	70

Course Objectives

- Provide an analysis for three hinged arches and cables for different type of loads and their supports are at different levels.
- The concepts of moving loads and influence lines are imparted for assessment of maximum SF and BM at a given section when loads rolling on simply supported beams.
- To analyze the statically indeterminate beams by using method of Consistent deformation.
- To analyze the statically indeterminate beams by using displacement methods (Slope deflection method and Moment distribution method)

Course Outcomes: Upon successful completion of this course the student will be able to
CO1: Solve the Arches and Cable structures.
CO2: Understand the Concepts of Influence lines for determinate structures.
CO3: Apply the Method of Consistent Deformation to analyse indeterminate structures.
CO4: Apply the Slope deflection method and Moment distibution method to analyse beams and frames.

UNIT-I

1. Arches: Types, Eddy's Theorem; Analysis of three hinged Parabolic and Circular arches for Static loads. Effect of temperature change in arches.

2. Cables: Analysis of cables under uniformly distributed and concentrated loads; Shape of the cable under self-weight; Effect of temperature changes in suspension cables; Anchor cables.

UNIT-II

3. Influence Lines: For Statically Determinate Structures Moving loads and influence lines; Influence lines for beam reactions; Influence lines for shearing force; Influence lines for bending moment; Calculation of maximum shear force and bending moment at a section for rolling loads; Calculation of absolute maximum bending moment; Muller Breslaus principle.

UNIT-III

3. Analysis of indeterminate structures: Introduction to Force methods:

Statically indeterminate structures (method of consistent deformations): Applications for

i. Propped Cantilevers Analysis of propped cantilever by method of consistent deformations.

ii. Fixed Beams Fixed moments for a fixed beam of uniform section for different types of loading; Effect of sinking of support; Effect of rotation of a support; Bending moment diagram for fixed beams.
iii. Clapeyron's Theorem of Three Moments Analysis of continuous beams (Two span continuous beams).

UNIT-IV

5. Analysis of indeterminate structures: Introduction to Displacement methods:Kinematically indeterminate structures (slope-deflection method; moment distribution method), only for continuous beams

TEXT BOOKS:

1. S.B,Junnarkar and H.J.Shah,' Mechanics of Structures,Vol. I & Vol. II' Charotar Publications, Anand, India
2. Reddy . C.S., Basic Structural Analysis, Tata McGraw Hill, 3e, 2011
3. V. N. Vazirani& M. M. Ratwani ,Structural Analysis, Vol. II , Khanna Publishers, Delhi.

REFERENCE BOOKS:

1. Hibbeler, RC, Structural analysis, Pearson Education, 2012
2. Negi L. S. and Jangid R. S, Structural Analysis, Tata McGraw Hill, 1997
3. Rajasekaran S. and Sankarasubramanian G., Computational Structural Mechanics, PHI, 2008
4. S.S. Bhavikatti, Structural Analysis II, Vikas Publication Houses (P) Ltd, 2016
5. Timoshenko S. P. and Young D. H., Theory of Structures, McGraw Hill, 2e, 1965
6. Wang C. K., Intermediate Structural Analysis, Tata McGraw Hill, 1989

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	-	-	-	-	-	-	-	-	-	-	3	2	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-	3	2	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-	3	2	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-	3	2	-	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

FOUNDATION ENGINEERING
III B.Tech –V Semester (Code: 20CE502)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	70

COURSE OBJECTIVES:

- To enable the students to acquire proper knowledge about soil exploration and various principles of important field tests such as SPT, plate bearing test etc
- To enable the students to acquire knowledge of various earth pressure theories and determination of resultant thrust acting on earth retaining walls and various types of methods of slope stability analysis
- To impart the students' knowledge of shallow foundations and theories required for determination of bearing capacity of soils based on shear criterion and settlement criterion and also to compute settlement of foundations
- To enable the students to imbibe the concepts of pile foundations and determine their load carrying capacity based on suitability of soils and to know the various types of well foundations, foundations on expansive soils and their construction aspects.

Course Outcomes: Students will be able to:

CO1: Apply the knowledge of various principles of field tests for soil exploration and various earth pressure theories for determination of resultant thrust acting on earth retaining walls

CO2: Analyse the stability of slopes using various methods and the stress at any point below the ground surface due to both self weight and externally applied load.

CO3: Evaluate allowable bearing capacity of shallow foundations based on shear strength criteria and settlement criteria using different bearing capacity theories.

CO4: Analyse the forces acting on well foundations and problems of expansive soils and determine load carrying capacity of piles.

UNIT-1

Chapter-1SUB - SOIL EXPLORATION & SAMPLING

Introduction; Methods of exploration; Methods of boring; Soil samples; Soil samplers and Sampling; Number and deposition of trail pits and borings; Depth of exploration; Ground water observations.

Chapter-2 FIELD TESTING OF SOILS

Field tests vis-a-vis Laboratory tests; Plate load test; Penetrometer tests – SPT, CPT, DCPT; Geophysical methods – Seismic Refraction method, Electrical resistivity method; Bore logs; Site investigation report.

UNIT-II

Chapter-3LATERAL EARTH PRESSURE AND RETAINING WALLS

Introduction; Effect of wall movement on earth pressure; Earth pressure at rest; Rankines's theory of earth pressure; Coulomb's theory of earth pressure; Culmann's graphical method for active earth pressure; Types of retaining walls, Design considerations for retaining walls.

Chapter-4STABILITY OF SLOPES

Introduction; Infinite slopes and transitional slides; Definitions of factor of safety; Finite slopes-forms of slip surface; Total stress and effective stress methods of analysis; $\phi_u = 0$ analysis (total stress analysis); c-ϕ analysis – methods of slices; Location of most critical circle; Stability of earth dam slopes; Friction circle method; Taylor's stability number.

UNIT-III

Chapter-5BEARING CAPACITY OF SHALLOW FOUNDATIONS

Concept of foundations; Types of foundations and their applicability; General requirements of foundations; Location and depth of foundation; Terminology relating to bearing capacity; Types of shear failure; Bearing capacity of shallow foundations – Terzaghi's Bearing Capacity theory; Skempton's Bearing Capacity analysis for clayey soils; IS-Code recommendations for bearing capacity; Influence of water table on bearing capacity.

Chapter-6SETTLEMENT ANALYSIS

Settlement of shallow foundations – types; Methods to reduce differential settlements; Immediate settlement- Terzaghi's method; Allowable bearing pressure of granular soils based on Standard Penetration Test – Terzaghi and IS methods, Allowable bearing pressure on cohesive soils.

UNIT-IV

Chapter-7PILE FOUNDATIONS

Introduction; uses of piles; types of piles; cast – in – situ pile construction; selection of pile type; pile driving; pile load carrying capacity in compression – static pile load formula, load tests, dynamic pile formulae; correlations with penetration test data; group action of piles – load carrying capacity and settlement; negative skin friction.

Chapter-8WELL FOUNDATIONS

Types of wells; Shapes of wells; Components of well foundation; Depth of well foundation; Forces acting on well foundation; Construction of well foundations; Tilting and shifting of wells.

Chapter-9FOUNDATIONS IN EXPANSIVE SOILS

Parameters of expansive soils; Identification and classification of expansive soils; Field conditions that favour swelling; Consequences of swelling; Different alternative foundation practices in swelling soils; Construction practice of Under Reamed piles in swelling soils.

Text Books :

1. Gopal Ranjan and ASR Rao, "Basic and Applied Soil Mechanics", New age international Pvt. Ltd, New Delhi,2000.
2. B.N.D.Narasinga Rao, " Soil Mechanics and Foundation Engineering", Wiley Pulishers, India, 2015.

References :

1. C. Venkataramiah, "Geotechnical engineering", New Age International Pvt. Ltd,2002.
2. K.R .Arora, "Soil mechanics and foundation engineering", standard publishers and distributors, New Delhi,2005.
3. V.N.S Murthy, "Geotechnical Engineering: Principles and practices of soils mechanics and foundation engineering", Taylor &Francis Group,2002.
4. Braja M. Das, "Principles of geotechnical engineering" Cengage learning publishers,2002

Web References:http://nptel.ac.in/courses/105107120/1#

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	3	3	2	1	1	2	3	2	2	1	3	3	2	3
CO2	3	3	3	3	2	1	1	2	3	2	2	1	3	3	2	3
CO3	3	3	3	3	2	1	1	2	3	2	3	1	3	3	2	3
CO4	3	3	3	3	2	1	1	2	3	2	3	1	3	3	2	3

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

DESIGN OF CONCRETE STRUCTURES

III B.Tech –V Semester (Code: 20CE503)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	70

Course Objectives: The student will study and understand

- Introduce the design philosophies of RCC members and design of SRB and DRB by LSM.
- Flexure design of T-beams, design of beam for shear & bond. Complete Design of beams using LSM.
- Design of one-way slab and Two-way slabs by using LSM.
- Design of short columns for axial, uniaxial and biaxial loading using LSM.
- Design of isolated and strap footings using LSM.

Course Outcomes: Students will be able to

CO1: Apply the principles of analysis and design, utilizing both the working stress and limit state methods.
CO2: Apply the principles of analysis and design of flanged beams using the limit state method and ability to design rectangular beams for shear, bond, and torsion.
CO3: Analyze and design of slabs using the limit state method.
CO4: Analyze and design of RC short columns, applying the Limit State Method (LSM) and utilizing IS SP 16 charts for design.
CO5: Analyze and design of isolated footings.

**IS 456-200,SP-34 and IS SP-16Charts are to be referred.*

UNIT I

Introduction to Design of Beams

Objective of structural design, Type of Loads on RCC Structures and Load combinations, Code of practices and Specifications, Design philosophies

Introduction to working stress method and limit state method, Analysis and Design of singly and doubly reinforced rectangular beams by Limit State Method.

UNIT II

Design of Beams

Design of Flanged beams for Flexure, Behavior of RC members in Shear, Bond and Anchorage, Check for development length by limit state method, Design of rectangular beam (LSM).

UNIT III

Design of Slabs

Analysis and design of one-way simply supported slab (LSM), Design and Detailing of Two-way slabs (LSM).

UNIT IV

Design of Columns

Types of columns, Design of short Rectangular, Square and circular axially loaded columns (LSM), Design of Uniaxial and Biaxially loaded short columns usingSP16 charts.

UNIT V

Design of Footings

Types of footings, foundations based on soil properties, Design of isolated square and rectangular footings (LSM), Design of strap footing (LSM).

TEXT BOOKS:

1. Limit State Design of Reinforced Concrete, second edition (2008) by P.C.Varghese, Prentice Hall of India.
2. Reinforced Concrete Structures (2014) by N. Subramanian, Oxford University Press.

REFERENCEBOOKS:

1. Reinforced concrete design Fourth edition (2021) by Pillai and Menon, Tata McGraw-Hill
2. Limit state theory & Design of reinforced concrete, eighth edition by Dr.S.R.Karve and Dr.V.L.Shah;Pune Vidyarthi Griha Prakashan,Pune.
3. Reinforced concrete design: Principles and Practice by N. Krishna Raju., R. N. Pranesh, fouth edition (2019) New Age International Publishers.
4. Reinforced Concrete Structure by R.Park., T. Paulay, (2009) Wiley India Publishers
5. For Limit State Method: Reinforced Concrete (limit state design) by Ashok K. Jain; seventh edition (2012), NemChand &Bros.,Roorkee

6. For Working Stress Method: Reinforced concrete by H. J. Shah, charotar publishing house

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	1	2	-	-	1	-	-	-	-	-	1	1	2	-	-
CO2	2	1	3	-	-	1	-	-	-	-	-	1	2	1	-	1
CO3	2	1	3	-	-	1	-	-	-	-	-	1	2	1	-	1
CO4	2	1	3	-	-	1	-	-	-	-	-	1	2	1	-	1
CO5	2	1	3	-	-	1	-	-	-	-	-	1	2	1	-	1

ADVANCED ENVIRONMENTAL ENGINEERING
III B.Tech –V Semester (Code: 20CE504/PE1)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Course Objectives

- Describe about the concept of sewage disposal in streams.
- Learn about the available low-cost treatment methods.
- Design construction, operation and maintenance of industrial treatment plants.
- Explain about the sources, characteristics and control of Air Pollution and Noise Pollution.

Course Outcomes

CO1: Understand the importance of self-purification and estimate the degree of treatment required for wastewater.
CO2: Apply the knowledge on biological treatment of wastewater with low cost and advanced treatments.
CO3: Update and apply the knowledge on Emergency Sanitary Systems.
CO4: Study on Industrial wastewaters and safe disposal methods.

UNIT – I

1. Sewage Disposal

Objects; Methods; Disposal by dilution; Self-purification in streams; factors affecting self-purification; Dissolved Oxygen Balance in streams; Streeter-Phelps‘s Dissolved Oxygen Model (including problems); Zones of Self purification; Disposal by irrigation; Sewage sickness.

2. Sludge Treatment and Disposal

Characteristics of sewage sludge; Anaerobic sludge digestion process; Stages of sludge digestion; Factors affecting sludge digestion; Design of Sludge digestion tank; Methods of de-watering the sludge; Methods of sludge disposal.

UNIT – II

3. Low-Cost Wastewater Treatment Systems

Introduction; Stabilization ponds (including design aspects); Aerated lagoons; Oxidation ditch; Extended aeration process.

4. New Concepts in Biological Waste Treatment

Introduction; Nitrogen removal by biological nitrification and de-nitrification; Modelling and design of Rotating Disc Biological Contactor; U-Tube aeration systems.

UNIT – III

5. Special water supply and sanitary systems

Emergency sanitary system, Immediate and short term long term sanitation in emergencies- Basic types of toilets- Low cost toilets- Selections of toilets - Public gathering- gender based toilets in buildings- Source diversion, challenges in transportation systems- Noise reduction in water conveyance systems.

UNIT – IV

6. Industrial Wastewater Treatment

Introduction to Industrial Wastewater. Characteristics of industrial wastewater. Treatment methods for Industrial Wastewater.

7. Case Studies

Sugar Plant: Sources and characteristics of liquid waste; Methods of its treatment and disposal.

Pulp and Paper Industry: Sources and characteristics of liquid waste; Methods of its treatment and disposal.

TEXT BOOKS

1. Wastewater Treatment by M.N. Raoand A.K. Datta; Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. WastewaterEngineering,Treatment,DisposalandReusebyMetcalf&EddyInc.;TataMcGraw–Hill Publishing Co. Ltd., New Delhi.

REFERENCES.

1. Water Supply and Wastewater Disposal by G.M. Fair et all; John Wiley &Sons.

2. Sewage Disposal and Air Pollution Engineering by S.K.Garg; Khanna Publications, Delhi.

3. Sewage and Sewage Treatment by S.K. Kshirasagar; Roorkee Publishing House,Roorkee.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	2	2	3	3	3	2	-	2	-	-	3	-	1	2
CO2	2	1	2	-	-	-	-	-	-	-	-	-	1	-	-	1
CO3	3	1	2	-	-	-	-	-	-	-	-	-	1	-	2	2
CO4	2	2	1	2	1	3	3	2	1	**2**	-	1	-	2	1	2

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

LOW COST HOUSING TECHNIQUES

III B.Tech –V Semester (Code: 20CE504/PEC01B)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	70

Course Objectives:

- To examine the present housing scenario in India.
- To introduce the economic issues related to housing especially in developing countries like India.
- To know Building by-laws for housing and housing for urban poor.
- Introducing low-cost housing techniques
- Introducing building materials for low-cost housing
- Introducing traditional practices for low-cost housing
- To give an introduction on design concepts of seismic resistant structures and to understand earth quake resistant design.

Course Outcomes:

At the end of the course, the student will be able to,

CO1: Understand Housing Scenario and Housing Finance

CO2: Apply Building by-laws for urban planning and Housing for Poor

CO3: Apply Low Cost Housing Techniques

CO4: Use Building Materials for low cost Housing

CO5: Apply concepts of Traditional practices of Rural Housing Technology and design concepts of seismic resistant structures.

UNIT-I

1. Housing Scenario Introducing- Status of urban housing- Status of Rural Housing-

2. Housing Finance: Introducing- Existing finance system in India- Government role as facilitator- Status at Rural Housing Finance- Impedimental in housing finance and related issues

UNIT-II

3. Land use and physical planning for housing: Introduction- Planning of urban land- Urban land ceiling and regulation act- Effectincey of building bye laws- Residential Densities

4. Housing the urban poor: Introduction- Living conditions in slums- Approaches and strategies for housing urban poor

UNIT-III

5. Development and adopt on of low cost housing technology: Introduction- Adoption of innovative cost effective construction techniques- Adoption of precast elements in partial prefabrication- Adopting of total prefabrication of mass housing in India- General remarks on pre-cast rooting/flooring systems- Economical wall system- Single Brick thick loading bearing wall- 19cm thick load bearing masonry walls- Half brick thick load bearing wall- Flyashgrypsym thick for masonry- Stone Block masonry- Adoption of precast R.C. plank and join system for roof/floor in the building.

UNIT-IV

6. Alternative building materials for low-cost housing: Introduction- Substitute for scarce materials- Ferro cement- Gypsum boards- Timber substitutions- Industrial wastes- Agricultural wastes

7. Low-cost Infrastructure services: Introducing- Present status- Technological options- Low-cost sanitation's- Domestic wall- Water supply- energy

UNIT-V

8. Rural Housing: Introduction- traditional practice of rural housing continuous - Mud Housing technology- Mud roofs- Characteristics of mud- Fire resistant treatment for Thatched roof- Soil stabilization- Rural Housing programs

9. Housing in Disaster Prone areas: Introduction- Earthquake- Damages to houses- Traditional Houses in disaster prone areas Type of Damages and Railways of non-engineered buildings- Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions - Requirements of structural safety of thin precast roofing units against - Earthquake forces- Status of R& D in earthquake strengthening measures- Floods- cyclone- future safety

TEXT BOOKS

1. Building materials for low –income houses – International council for building research studies and documentations.
2. Hand book of low cost housing by A.K.Lal – Newage international publishers.

REFERENCE BOOKS:

1. Properties of Concrete – Neville A.M. Pitman publishing Limited- London.
2. Light weight concrete- Academic kiado- Rudhai .G – Publishing home of Hungarian Academy of Sciences 1963.

TOWN PLANNING AND ARCHITECTURE
III B.Tech –V Semester (Code: 20CE504/PEC01C)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Course Objectives:

- To discuss the history of architecture and design.
- To discuss the historical background of town planning
- To discuss the planning theory and principles of planning.
- To discuss development of smart cities

Course Outcomes:

Student will be able to
CO1: Understand the history of architecture and design.
CO2: Understand the historical background of town planning
CO3: Understand the planning theory and principles of planning
CO4: Understand the development of smart cities

UNIT–I

History of Architecture: Western Architecture: Egyptian, Greek, Roman Architectures. Indian Architecture: Vedicage, Indusvalley civilizationBuddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas Hindu temples: Dravidian and Indo Aryan Styles Temple of Aihole, Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic(Islamic) Architecture: Mosque -Palace - Fort-Tomb.
Architectural Design:
Principles of designing–Composition of Plan relationship between plan and elevation building elements, form, surface texture, mass, line, color, tone, Principles of Composition: Unity,contrast, proportion, scale, balance, circulation, rhythm, character and expression.

UNIT–II

HistoricalBackGroundofTownPlanning: Town planning in ancient- medieval, renaissance, industrial and post-industrial cities;Contribution of individuals to city planning-Lewis Mumford, Patric Geddes, Peter Hall etc; Acropolis(Greece), Jerusalem, Mecca, Rome, London.
Town planning in India–Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjo-Daro, Pataliputra, Delhi, Chandigarh etc;

UNIT–III

Planning Theory: Theories of urbanization including Concentric Zone Theory, Sector Theory, Multiple Nuclei Theory and other latest theories, Land use and land value theory of William Alonso; Ebenezer Howard's Garden City Concept; Green Belt Concept.

PrinciplesofPlanning: Principles of planning aresidence-site selection, site orientation-aspect, prospect, grouping, circulation, privacy, furniture requirements, services and otherfactors.Types of Development Plans.

UNIT–IV

Building Systems:HVAC, Acoustics, Lighting; LEED ratings;
Development of Smart cities: Definition, introduction, fundamentals, possible systems required for a typical Smart City, Case studies.

TEXTBOOKS:

1. 'The great ages of WorldArchitecture' byG.K. Hiraskar.
2. 'Planningand Design ofBuildingsbySectionofArchitecturebyY. S. Sane.
3. 'Textbook of town planning by abir bandyopadhyay

REFERENCES:

1. 'Drafting and Design for ArchitecturebyHepler, Cengage Learning
2. 'Architect's Portable HandbookbyJohnPattenGuthrie–McGraw Hill International Publications.
3. 'TownandCountyPlanning'byA.J.BrownandH.M.Sherrard.
4. 'TownDesign'byFederikGlbbard,Architecturalpress,London.
5. 'Fundamentals ofTownPlanning'byG.K. Haraskar.
6. Urban planning theory and practice by m.pratap rao

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

SUSTAINABLE ENGINEERING & TECHNOLOGY
III B.Tech –V Semester (Code: 20CE504/PEC01D)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Course Objectives:

- To develop an awareness on issues in areas of sustainability.
- To establish the role and impact of engineering activities and engineering decisions on environmental, societal, and economic well-being.
- To give familiarity with the methods and tools used for sustainable product-service system development
- To understand the role of engineering and technology within sustainable development.

Course Outcomes:

At the end of the course, the student will be able to,

CO1: Increased awareness on issues in the area of sustainability

CO2: Gain an understanding of the role and impact of engineering activities and engineering decisions on the environment, society, and economics

CO3: Gain familiarity with the methods and tools employed for sustainable product-service system development.

CO4: Understand the role of engineering and technology within sustainable development.

UNIT-I

1.Anintroduction to sustainability -Introduction -The Magnitude of the Sustainability ChallengeEnergy

2. Materials Use- Minerals, Metals, and Organics Water -

3.Environmental Emissions - Ozone Depletion in the Stratosphere- Global Warming-Regional and Local Air Quality -Summary ofAir Quality - Water Quality - Wastes

UNIT-II

4. Risk and life-cycle frameworks for sustainability - Introduction- Risk -Definitions- Risk Assessment -Risk-Based Environmental Law

5.Life-Cycle Frameworks- Defining Life Cycles- Life-Cycle Assessment- Life-Cycle-Based Environmental Law;

6. Life-Cycle Assessment Tools- Process-Based Life-Cycle Assessments Input-Output LCA - Hybrid Approaches

UNIT-III

7. Green, sustainable materials- Introduction- Environmental and Natural Resource Use Footprints of Material Extraction and Refining Tracking Material Flows in Engineered Systems

8.Introduction - Sustainable Engineering Design Principle; Economic Performance Indicators-Definitions -Estimates of Environmental Costs- A Frameworkfor Evaluating Environmental Costs; Environmental Performance Indicators- Life-Cycle Impact Assessment

UNIT-IV

9.CASE STUDIES -Introduction;Biofuels for Transportation-The Carbon Cycle and Biofuels-Feedstocks for Biofuels - Processing Routes for Biomass to Biofuels- Biofuel Life Cycles-Cautionary Tales and Biofuels- Summary ofSustainabilityofBiofuels

10.Sustainable Built Environments- Energy Consumed for Building Operation, Materials Usefor Building Construction and Maintenance, Design of Buildings for Sustainability, Conclusions on Sustainability of Buildings

TEXT BOOK:

1. SustainableengineeringConcepts, Design, and Case Studies by DAVID T. ALLENDAVID R. SHONNARD

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

REMOTE SENSING & DRONE TECHNOLOGY
III B.Tech –V Semester (Code: 20CE505/JOE01A)

Lectures	2	Tutorial	0	Practical	2	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

COURSE OBJECTIVES:

- Understand the fundamentals of aerial photography.
- Analyze the fundamental ideas of remote sensing and its properties, as well as satellite sensors and platforms. Understand satellite image processing and categorization techniques.
- Understanding the principles of Unmanned Aerial Vehicles (Drones) and their diverse uses in the age of artificial intelligence is the major goal of this course. The training will also teach students how to operate a drone while taking local laws and regulations into account.
- Understand the basic concepts GIS, spatial data and analysis.Know various remote sensing and GIS applications in civil engineering.

COURSE OUTCOMES:

CO1: Will demonstrate cognitive skills by analyzing various types of aerial photographs, applying principles of stereoscopy, and evaluating electromagnetic radiation interactions. Additionally, they will exhibit practical knowledge in flight planning, showcasing their ability to apply these concepts in real-world scenariosas environmental monitoring and land use planning.
CO2: Will demonstrate cognitive skills by categorizing and explaining the characteristics and applications of various Earth observation satellites. They will apply this knowledge practically in visual interpretation techniques for airborne and space-borne remote sensing data.
CO3: Will demonstrate cognitive understanding (Knowledge domain) of drone technology by explaining regulations, dynamics, and electronic components. They will apply practical skills (Application domain) through hands-on experiences, including flying experiments.
CO4: Will demonstrate cognitive skills (Understanding domain) by explaining GIS key components, map projections, and the differences between raster and vector data models. They will apply analytical skills (Application domain) to various fields like land use, agriculture, and hydrology through practical data manipulation and overlay operations.

UNIT- I: INTRODUCTION TO PHOTOGRAMMETRY & REMOTE SENSING

Introduction to Photogrammetry: Fundamentals of Photogrammetry and Photo interpretation – types of photographs; Vertical photographs – principal point; scale; Stereoscopy; flight planning-Overlap, side lap.

Introduction to Remote Sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, EMR interaction with Atmosphere – Scattering, Absorption – EMR interaction with Earth surfacefeatures reflection, absorption, emission and transmission

UNIT – II: REMOTE SENSING

Sensors and platforms: Introduction, types of sensors, airborne remote sensing, Space-borne remote sensing. Visual Interpretation Techniques.

Satellites: Land observation satellites, characters and applications, IRS series, LANDSAT series, SPOT series, High-resolution satellites, character and applications, CARTOSAT series, IKONOS Series, QUICKBIRD series, Weather/Meteorological satellites, INSAT series, NOAA, GOES, NIMBUS Applications, Marine observation satellites OCEANSAT

UNIT – III: INTRODUCTION TO DRONES

Introductions to drones and their applications in the age of AI, Drone regulations specific to India, Basics of drone dynamics for flying - frame types, propellers, types of drones, dynamics specific to a quad copter, Understanding UAV movements (Quadcopter), How to fly a drone, Introduction to drone electronic components, working principle behind each electronic component, Drone frames and electronic assembly, flying experiments.

UNIT – IV: GEOGRAPHIC INFORMATION SYSTEM (GIS)

Introduction, key components, map projections, data entry &preparation – Spatial data input, Raster Data Model, Vector Data Model, Raster vs Vector.Advantages and disadvantages of Raster & Vector, Basic Overlay operations. Data storage-vector data storage, attribute data storage, and an overview of the data manipulation and analysis.

Applications: Land use and Land cover, Watershed management for sustainable development, Agriculture, Forestry, Geology, Geomorphology, Urban Applications, Hydrology

TEXTBOOKS:

1. Bhatta B (2008), 'Remote sensing and GIS', Oxford University Press
2. Chang, K. T. (2006). Introduction to Geographic Information Systems. The McGraw-Hill.
3. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) 'Remote Sensing and Image Interpretation, Wiley India Pvt. Ltd., New Delhi
4. Garg, P. K. Unmanned Aerial Vehicles: An Introduction. Stylus Publishing, LLC, 2021

REFERENCE BOOKS:

1. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, 2013.
2. 'Fundamentals of Geographic Information Systems' by Demers, M.N, Wiley India Pvt.Ltd, 2013.
3. Jensen John R. Introduction to Digital Image Processing: A Remote Sensing Perspective Prentice hall, New Jersey
4. Paul Wolf, Elements of Photogrammetry, McGraw Hill.
5. Barnhart, R. Kurt, Douglas M. Marshall, and Eric Shappee, eds. Introduction tounmanned aircraft systems. Crc Press, 2021.

6. Syed Omar Faruk Towaha, Building Smart Drones with ESP8266 and Arduino: Build exciting drones byleveraging the capabilities of Arduino and ESP8266, Packt Publishing, 2018.
7. Burrough, P. P. &McDonnel, R. A. (1998). Principles of GIS. Oxford University Press.
8. Kimon P. Valavanis, Handbook of Unmanned Aerial Vehicles, Volume4, Springer Netherlands, 2014.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	1	2	-	-	-	-	2	-	-	-	-	-	-	-
CO2	3	2	-	2	3	-	-	-	3	-	3	-	3	-	-	3
CO3	3	2	-	2	3	-	-	-	2	-	3	-	3	-	-	3
CO4	3	2	-	-	3	-	-	-	3	-	1	-	3	-	-	3

PLUMBING AND FIRE SERVICES
III B.Tech –V Semester (20CE505/JOE01B)

Lectures	2	Tutorial	0	Practical	2	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	70

COURSE OBJECTIVES:

- Understand the fundamental of Plumber's tools and Pipe Fitting.
- Understand the applications of Sanitary Appliances and Heating System.
- Understand the importance of Fire Fighting Systems.
- Analyze the Fire Risk Assessment Schedules.

COURSE OUTCOMES:

CO1: To understand the basic plumbing systems and their applications in pipe fitting.

CO2: To understand the purpose of sanitary appliances and heating systems.

CO3: To understand the application of Fire Fighting Systems and the method of selection.

CO4: To analyze how to prepare Fire Risk Assessment Schedules.

UNIT-I

1. Plumber's Tools And Their Uses:

1. Holding tools (a) Bench vice (b) Pipe vice 2. Fitting tools (a) Wrenches (b) Water-pump pliers (c) Spanners 3. Cutting tools (a) Pipe cutter (b) Hacksaw 4. Pipe bending tools (a) Pipe bending machine (b) Threading dies 5. Other tools (a) Chisel (b) Hammer (c) Chain wrench (d) Rover jumper (e) Trowel (f) Screw driver (g) File (h) Plier (i) Caulking tools (j) Drill machine (k) Drill bit (l) Hanger (m) Measuring tape (n) Plumb rule and bob (o) Spirit level (p) Spade (q) Shovel (r) Pickaxe (s) Mortar pan (t) Masons' square (u) Water level tube

2. Pipes and Pipe Fitting

Selection and use of different pipes like GI Pipes, Plastic pipes, PVC pipes, HDPE pipes, Cast iron pipes, Plumbing symbols; Bends, Elbows, Sockets, Tees, Unions, Pipe cutting, Pipe bending, Pipe Threading, Pipe joints, Pipe fitting, Alignment of pipes, Branching of pipes, Safety precautions, relevant IS codes are to be taught.

UNIT-II

3. Sanitary Appliances

Flush toilet, Squat toilet, Wash basin, Sink, Floor traps, Urinal, Bathtub, Shower, Bidet, Mixing tap, Popup waste, water efficient appliance.

4. Heating System

Heat transfer, Water heater, Geyser, Domestic hot water supply system, Central heating, Solar water heater

UNIT-III

5. Fire Fighting System

Provisions & applicable standards of detection and alarm system, Introduction of detection devices, alarm and detection system, Type of detectors, Method of selection. Cost analysis, design, installation, testing and commissioning of alarm and detectionsystem.Provisions& applicable standards of foam, gases and dry chemical powder based systems.

UNIT-IV

6. Fire Risk Assessment Schedules

Introduction, Taxonomy of Methods for Fire Risk Assessment, Schedules, Insurance Rating, Dow's Fire and Explosion Index.

TEXTBOOKS:

1. Plumbing, 2Nd Edition by Muscroft Steve, T and F India.

2. Principles Of Fire Safety Engineering Understanding Fire And Fire Protection 2Nd Edition by DAS, AKHIL KUMAR , PHI Learning

REFERENCE BOOKS:

1. IS Code of practice for Plumbing in Multistoried Buildings. IS 12183-1 (1987)
2. National Building Code Part 4 – Fire and Life Safety.

RURAL WATER SUPPLY DISTRIBUTION SYSTEMS
III B.Tech –V Semester (20CE505/JOE01C)

Lectures	2	Tutorial	0	Practical	2	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

UNIT I

Rural Water Supply: Issues of rural water supply –Various techniques for rural water supply-merits, National rural drinking water program- operation and maintenance of rural water supplies

UNIT II

Scope of water supply in rural areas, magnitude of problem of water supply, population to be covered, various approaches for planning of water supply systems in rural areas. Selection and development of preferred sources of water, springs, wells and infiltration galleries, collection of raw water from surface source.

UNIT III

General requirements of a Distribution system, arrangement of distribution pipes and other accessories, layout of distribution networks – Dead end system, Grid iron System, Ring System and radial System, Advantages and Disadvantages of these systems. Methods of distribution – Gravity System, Pumping System and combined gravity and pumping system, Design of water distribution networks by Hardy Cross Method.

UNIT IV

Function & Types of distribution reservoirs – Surface reservoirs and Elevated reservoirs, Stand Pipes, Storage Capacity of distribution reservoirs by mass curve method, Location and Height of the Distribution reservoirs.
Appurtenances in the distribution system – fire hydrants – requirements of a good hydrant, types of fire hydrants, water meter – requirement of a good water meter, Types of water meter.

Reference Books:

1. Eulers, V.M., and Steel, E.W., Municipal and Rural Sanitation, 6th Ed., McGraw Hill Book Company, .
2. Wright, F.B., Rural Water Supply and Sanitation, E. Robert Krieger Publishing Company, Huntington, New York.
3. Rijswijk (the Haque). Wagner, E.G. and Lanoik, J.N. water supply for rural areas and small communities, Geneva: W.H.O.1959.
4. Manual of water supply and treatment, 3rd edition, CPHEEO, GOI, New delhi
5. Qasim, Syed R., Motley, Edward M., and Zhu, Guang (2000) Water works engineering: planning, design and operation. New Jersey: Prentice Hall.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

BUILDING INFORMATION MODELING LAB

III B.Tech –V Semester (Code: 20CEL501/SOC3)

Lectures	1	Tutorial	0	Practical	2	Credits	2
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Course Outcomes

CO1: Understand about Building Information Modeling

CO2: Understand Various features comands in Revit.

CO3: Prepare plan, 3D model of buildings and various building components

CO4: Prepare rendering and topography of buildings

Ex. No	Name of the experiment
1	Prepare and Present on BIM concepts as per given guidelines.
2	Write a short note on Role of Digital model in BIM, Different softwares used for different stages of Project in BIM.
3	Develop the centreline wall layout using Revit.
4	Submit the layout with annotation detailing.
5	Submit detail layout of monolithic stair.
6	Prepare the structural BIM model.
7	Submit the sheet for floorplan.
8	Develop 3D visuals of model for client meeting.
9	Submit sheets for footing, column, plinth beam layouts.
10	Generate quantity details for categories from the BIM model.

Text Books :

1. Mastering Autodesk Revit 202 by Robert Yori, Marcus Kim and Lance Kirby published by Sybex – a Wiley Brand.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	-	-	3	-	3	-	-	-	3	-	-	3	-	-	-	-
CO2	-	-	3	-	3	-	-	-	3	-	-	3	-	-	-	-
CO3	2	-	3	-	3	-	-	2	3	-	-	3	-	3	2	-
CO4	-	-	3	-	3	-	-	2	3	-	-	3	-	3	2	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

GEO TECHNICAL ENGINEERING LABORATORY
III B.Tech –V Semester (Code: 20CEL502)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Course Objectives

The objective of this course is:

- To impart knowledge of determination of index properties required for classification of soils.
- To teach how to determine compaction characteristics and consolidation behavior from relevant lab tests;
- To determine permeability of soils.
- To teach how to determine shear parameters of soil through different laboratory tests.

Course Outcomes

Upon successful completion of this course, student will be able to

CO1: To determine Index properties of soils

CO2: To determine shrinkage and swelling chararcteristics of soils.

CO3: To determine Engineering properties of soils.

CO4: To determine the C.B.R of soils.

List of Experiments:

1. Determination of water content by oven drying method.
2. Determination of specific gravity by (a) Density bottle method (b) Pycnometer method.
3. Gradation analysis a) Mechanical Sieve analysis b) Hydrometer analysis.
4. Determination of Atterberg limits
5. Determination of free swell index
6. Determination of field unit weight by a) Core cutter method. b) Sand replacement method.
7. Determination of permeability by a)Constant head permeameter. b) Variable head permeameter.
8. Direct shear test.
9. Vane shear test.
10. Unconfined compression test
11. IS - Light compaction test
12. IS - Heavy compaction test
13. Triaxial shear test (Demonstration only)
14. Consolidation test.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes

	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	1	3	3	3	2	1	1	1	3	3	3	2	3	3	2	3
CO2	1	3	3	3	2	1	1	1	3	3	3	2	3	3	2	3
CO3	1	3	3	3	2	1	1	1	3	3	3	2	3	3	2	3
CO4	1	3	3	3	2	1	1	1	3	3	3	2	3	3	2	3

PYTHON PROGRAMMING LABORATORY
III B.Tech –V Semester (Code: 20CEL503)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Course Objectives:

- Understand and write code using the basics of Python, Statements, Expressions, Conditional Executions, and Functions
- Write code for Iteration, Strings, File I/O.
- Write code in creating, usage of Lists, Dictionaries, and Tuples.
- Understand the concepts of Object Orientation, Databases and write code implementing them.

Course Outcomes: Students will be able to:

CO1: Read and write simple Python programs.

CO2: Develop Python programs with conditionals and loops.

CO3: Define Python functions and to use Python data structure- lists, tuples, dictionaries.

CO4: Apply the basics of python to solve the problems related to civil engineering.

LIST OF EXPERIMENTS

1. Write a python program to check if the number is positive or negative or zero and display an appropriate message.

2. Write a python program to take a string from user and count number of vowels presentand percentage of vowels in it.

3. Write a python program to find the most frequent words in a text file.

4. Write a Python Program to Find the Sum of first Natural Numbers.

5. Write a Python Program to Find HCF or GCD.

6. Write a Python Program to Find LCM.

7. Write a python function to find the maximum and minimum of a list of numbers.

8. Determination of the height of the building when base is accessible.

9. Determination of included angles from the given bearing and check for local attraction.

10.Design an irrigation channel by using Lacey's and Kennedy's theory.

11. Classification of soil by Indian standard classification system.

12. Determination of permeability coefficient by constant head and falling permeability tests.

13. Design of Reinforced Beam for flexure by working stress method.

14. Design of T- Beam for flexure by limit state method.

15. Design of Reinforced beam for Shear by limit state method.

16. Design of simply supported one-way slab.

Note: A minimum of twelve (12No) shall be done and recorded

Text Books :

1. A Python Book: Beginning Python, Advanced Python, and Python Exercises, Dave Kuhlman, Open Source MIT License.
2. Python for Data Analysis, Wes McKinney, O' Reilly.

References :

1. Python Data Science Handbook-Essential Tools for Working with
2. Data Science from Scratch, JoelGrus, O'Reilly.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	3	-	-	-	-	-	-	-	-	2	-	3	2	-
CO2	3	3	3	-	-	-	-	-	-	-	-	2	-	3	3	-
CO3	3	3	3	-	-	-	-	-	-	-	-	2	-	3	3	-
CO4	3	3	3	-	-	-	-	-	-	-	-	2	-	3	2	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

INDIAN CONSTITUTION
III B.Tech –V Semester (Code: 20CE506/MC03)

Lectures	2	Tutorial	0	Practical	0	Credits	0
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	-

Course Objectives:

- To provide basic information about fundamental law of the country.
- To educate the student about fundamental Rights and fundamental duties of citizens.
- To educate the students about Government organs, methods of functioning
- To motivate students to leave narrow selfish outlook and inculcate broad national, human outlook.

Course Learning Outcomes: Upon the successful completion of the course the student will be able to
CO1: Able to understand the importance of the constitution in a Democratic Society.
CO2: Understand the Fundamental Rights and understand the duties of a citizen and discharge his duties and became a good citizen.
CO3: Know about Judicial supremacy and Independence of judiciary and fight for his legitimate Rights through court of law.
CO4: As a citizen he can participate in the democratic process of governance.
CO5: Participate in nation building activities and be away from destructive outfits.

UNIT-I

1. Meaning of the constitutional law and constitutionalism.

2. Historical perceptive of the constitution of India

3. Salient features and characteristics of the constitution of India.

4. Preamble, union and its territory and citizenship.

UNIT – II

5. Fundamental rights principles.

6. Directive principles of state policy.

7. Fundamental Duties.

8. The government of the union, the president, The Prime Minister, and the council of ministers, The parliament of India, The supreme court, the union judiciary.

UNIT – III

9. The Machinery of Government in the states, The Governor, The Chief Minister and council of Ministers, The State legislature, High court, Judiciary in the states

10. Union territories.

11. The Federal System, Division of powers between centre and states, Legislative, Administration and Financial relation.

12. Emergency Provisions, President Rule, National Emergency, Financial Emergency

UNIT IV

13. Local self-Government, Panchayat Raj, Municipalities and Municipal Corporation

14. The comptroller and Audito general of India, The Public Service Commission, Special Provisions relating to certain classes, Elections – Political parties.

15. Amendment of the Constitution.

TEXTBOOKS:

1. Laxmikanth, M. (2019). Indian polity. McGraw-Hill Education.
2. Constitutional Government in India - M V Pylee – Asia Publishing House

REFERENCE BOOKS:

1. D C Dasgupta, Indian Government and Politics. Vikas Publishing house
2. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
3. Constitutional of India by Dr. B R Ambedkar
4. Indian Constitution and its features – Astoush Kumar, Anmol Publishers
5. The Constitution of India – Bakshi P M – Universal Law Publishers
6. Legelect's the constitution of India – RamnarainYadav, K KLegelest Publication

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

DESIGN OF STEEL STRUCTURES
III B.Tech –VI Semester (Code: 20CE601)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	70

(Using Limit State Method)

Course Objective:

- To understand the behavior and design of simple connections.
- To design Tension and compression members efficiently and economically.
- To design column bases along with connections.
- To design beams efficiently and economically.
- To understand the behavior and design of eccentric connections.

Course Outcomes:

CO1: Understand the design philosophies and classify the different connections.
CO2: Understand the behaviour and design aspects of tension and compression members.
CO3: Understand the behaviour and design aspects of different column bases.
CO4: Apply the design principles to laterally supported beams and unsupported beams.
CO5: Clasify different connections in steel structures along with their suitability.

UNIT – I

1.Introduction

Types of steels; Constructional steels; Mechanical properties; Design concepts; Fatigue behavior; Brittle fracture; Corrosion; Hot rolled sections;

2. Simple Connections

Advantages of welding; Welds; Types of welded joints; Weld specifications; Allowable stresses;Bolts; Black bolts; Failure modes of a joint; Pitch requirements of bolts; Allowable stresses;Efficiency of joint; High strength bolts; Lap andbutt joints, Truss joint connections;

UNIT – II

3. Tension Members

Introduction; Types of sections; Net area; Net effective area for angles and Tees; Design of tension members;

4. Compression Members

Introduction; Angle Struts; Effective length of a column; Allowable stresses; Types of sections; Built-up columns(using welding); Column splice (using welding)

UNIT – III

5. Column Bases

Slab base; Gusseted base; Eccentric bases;

UNIT – IV

6. Beams

Introduction; Laterally supported beams; Built-up beams (using welding); lateral buckling ofbeams; Design of laterally supported beams; Secondary design considerations; Grillagebeams;
Design of laterally unsupported beams;

UNIT – V

7. Eccentric Connections

Simple beam end connections – Seat connections; Bracket connections;

TEXT BOOKS

1. Limit state design of steel structures by S.K.Duggal, Tata McGrawhill,Publishing company Ltd.
2. Design of Steel structures by N.Subramanian, Oxford University press,2009

REFERENCE BOOKS

1. Design of Steel Structures by Limit state method as per IS800-2007 by K.S. Sairam, Pearson Education India
2. Design of Steel Structures by Limit state method as per IS800-2007 by S.S.Bhavakatti, IK International Publishing Housing Pvt.Ltd.
3. Analysis and Design Practice of Steel Structures by Karuna Moy Ghosh, Prentice Hall of India Publishers.
4. Structural steel design by M.L.Gambhir , Tata McGraw-Hill Education

Codes

1. IS 800-2007

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	1	-	-	-	-	-	-	-	-	-	1	2	-	-
CO2	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-	-
CO3	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-	-
CO4	2	3	3	-	-	-	-	-	-	-	-	-	2	3	-	-
CO5	2	3	3	-	-	-	-	-	-	-	-	-	2	2	-	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

WATER RESOURCES ENGINEERING

III B.Tech –VI Semester (Code: 20CE602)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Prerequisites: Fluid Mechanics [20CE305]
Hydraulics & Hydraulic Machines [20CE404]

Course Objectives:

- To explain components of hydrology and use of hydrographs in measuring rainfall & runoff
- To determine various parameters in ground water hydrology
- To describe measurement of discharge in anopen well and relevant tests.
- To demonstrate design of irrigation channels
- To explain various water logging causes and remedial methods
- To demonstrate design of lined canal
- To describe various canal regulation works
- To explain various water requirements of irrigation

Course Outcomes: Student will be able to

CO1: Interpretation of components of hydrological cycle and application of hydrographs
CO2: Demonstrate various parameters of ground water and design of irrigation channels.
CO3: Apply the various concepts of canal lining and Canal regulation works.
CO4: Differentiate various types and methods of Irrigation and determine various water requirements of crops.

UNIT – I

1. **Hydrology**
   Hydrologic cycle; Precipitation types; Rain gauges; Computation of average rain fall over a basin; factors affecting evaporation, infiltration and Run off; Computation of run off.
2. **Hydrographs**
   Hydrograph analysis; Unit hydrograph; Application of Unit hydrograph to the construction of a flood hydrograph resulting from rainfall of unit duration; Application of Unit hydrograph to construction of a flood hydrograph resulting from two or more periods of rainfall; Construction of unit hydrograph of different unit duration from a unit hydrograph of some given unit duration by superposition method and S-curve method.

UNIT – II

3. **Ground Water – Well Irrigation**
   Introduction; Aquifer; Aquiclude; Aquifuge; Specific yield; Specific retention; Divisions of sub– surface water; Water table; Types of aquifers; Well hydraulics; Steady radial flow to a well–Dupuit's theory for confined and unconfined aquifers; Yield of an open well– Constant level pumping test, Recuperation test.

4. Channels – Silt Theories & Design Procedure

Cross section of a channel; Balancing depth; Silt theories–Kennedy's theory, Lacey's regime theory; Kennedy's method of channel design; Lacey's theory applied to channel design.

UNIT – III

5. Water logging & Canal Lining

Effects of water logging; Causes of water logging; Remedial measures; Lining of irrigation channels – necessity, advantages and disadvantages; Design of lined canal.

6. Canal outlets and regulation works

Types of outlets; Canal falls; Necessity and location of falls; Classification of falls. Types of regulators and functions of cross and head regulators.

UNIT – IV

7. Introduction to Irrigation:

Types and Methods of irrigation, Benefits of irrigation; Ill-effects of irrigation;

8. Water Requirement of Crops:

Functions of irrigation water; Classes and availability of soil water; Saturation capacity; Field capacity; Wilting point; Available moisture and readily available moisture; Moisture equivalent; Soil moisture deficiency; Limiting soil moisture conditions; Depth and frequency of irrigation; Duty and Delta; Base period; Relation between Duty and Delta; Factors affecting duty; Methods of improving duty; Gross command area; Culturable command area; Culturable cultivated and uncultivated area; kor depth and kor period; Determination of irrigation requirements of crops; crop rotation.

TEXT BOOKS:

1. Irrigation and water power Engineering by Dr. B.C. Punmia& Dr. Pande B.B. Lal; Laxmi Publications Pvt. Ltd., New Delhi.
2. Irrigation Engineering and Hydraulic structures by S. K. Garg; Khanna Publishers, Delhi.

REFERENCE BOOKS:

1. Irrigation, Water Resources & Water Power Engineering by Dr. P.N. Modi; Standard Book House, New Delhi.
2. Irrigation, water power and water resources Engineering by K R Arora, Standard Publishers, New Delhi
3. Engineering Hydrology by K. Subramanya, TMH Publishers
4. Engineering Hydrology by P. Jayarami Reddy, Laxmi Publications
5. Irrigation Engineering and Hydraulic Structures by S.R. SahasraBudhe; Katson Publishing House, Ludhiana

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	1	2	-	-	1	-	-	-	-	-	-	3	2	-	1
CO2	3	1	2	-	-	1	-	-	-	-	-	-	3	2	-	1
CO3	3	2	1	-	-	1	-	-	-	-	-	-	3	2	-	1
CO4	3	2	1	-	-	1	-	-	-	-	-	-	3	2	-	1

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

HIGHWAY ENGINEERING
III B.Tech –VI Semester (Code: 20CE603)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	70

Course Objectives:

- To discuss the principles of planning and geometric design of highways.
- To discuss the traffic flow characteristics.
- To assess the properties of highway construction materials and design the flexible and rigid pavements.
- To explain the construction and maintenance techniques used in the different pavement layers.

.

Course Outcomes: Student will be able to

CO1: Understand the various design aspects of road geometric elements.

CO2: Interpret the traffic flow characteristics and traffic operations.

CO3: Select the suitability of pavement materials and determine the crust thickness of the pavement.

CO4: Analyze the causes for distresses in the pavement layers.

UNIT-I

1. Highway Network Planning and Alignment

Introduction to Transportation Systems and Different Modes of Transportation, Road Classification, Road Patterns, 20 Year Road Development plans. Current road projects in India; Highway Alignment: Requirements, factors controlling, Engineering Surveys.

2. Highway Geometric Design

Geometric Design: Highway Cross Section Elements - Friction, Unevenness, Camber, Carriageway Width, Kerbs, road margins, formation width, right of way, Sight Distance- Stopping Sight Distance, Overtaking Sight Distance, Intermediate Sight Distance, Design of Horizontal Alignment- Super elevation, transition curves, extra widening, set back distance, Design of Vertical Alignment-Grades and Grade Compensation, Types of Vertical curves and design.

UNIT-II

3. Traffic Studies

Introduction, Road User Characteristics, Vehicle Characteristics, Traffic Volume Studies, Speed Studies, Origin and Destination Studies, Traffic Flow Characteristics, Traffic Capacity and Level of Service.

4. Design Of Traffic Control Devices

Traffic Operations-Traffic Regulation, Traffic Control Devices- Markings, Signs, Signals, Rotary Intersection.

UNIT-III

5. Pavement Materials

Pavement types and components of a pavement structure; characterization of different pavement materials including: sub-grade soil, aggregates, bitumen, modified bitumen, cutback bitumen, and emulsion; Different grading systems for bitumen; Marshall method of bituminous mix design.

6. Design of Pavements

Design of pavements- Introduction; flexible pavements, factors affecting design and performance; design of flexible pavements as per IRC-37; rigid pavement components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC-58.

UNIT-IV

7. Highway Construction and Maintenance

Construction Steps of Embankment, Sub Grade, Granular Sub Base (GSB), Wet Mix Macadam (WMM), Dense Bituminous Macadam (DBM), Bituminous Concrete (BC), Dry Lean Concrete (DLC), Pavement Quality Concrete (PQC), failures in flexible pavement, failures in rigid pavements, maintenance of Bituminous pavements and concrete pavements.

TEXT BOOKS

1. Khanna, S. K., C. E. G. Justo, A.Veeraragavan"Text book on Highway Engineering." Nem Chand Bros, Roorkee (2014).10th Edition.
2. Principles and practices of Highway Engineering (2013), L R Kadiyali; N B Lal,Khanna Publishers, NaiSarak, Delhi

REFERENCE BOOKS

1. Principles of Transportation Engineering by ParthaChakroborthy&Animesh Das; Prentice Hall of India, New Delhi.
2. Ministry of Road Transport and Highways- Specifications for Roads and Bridge Works, Fifth Revision, IRC, New Delhi, India-2013
3. IRC 37:2018- Guidelines For The Design of Flexible Pavements(Third Revision)
4. IRC58-2015 Guidelines for the Design of Plain Jointed Rigid Pavements for Highways

NPTEL :

http://nptel.ac.in/courses/105101087/
http://nptel.ac.in/courses/105105107/

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	3	2	2	-	-	-	-	-	-	-	2	3	-	3
CO2	2	3	3	3	3	2	-	-	-	-	-	-	3	3	-	3
CO3	2	3	2	3	3	2	-	-	-	-	-	-	2	3	-	3
CO4	-	3	2	3	3	2	-	-	-	-	-	-	2	3	-	3

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

ADVANCED STRUCTURAL ANALYSIS
III B.Tech –VI Semester (Code: 20CE604/PE2)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	70

Course Objectives:

- To analyze the indeterminate structures by kani'sMethod.
- To understand the analysis of indeterminate structures using strain energy concept.
- To study the analysis of continues beams using matrix approach.
- To understand the plastic behavior of beams and rigid jointed frames.

Course Outcomes: At the end of the course, the student will be able to:
CO1: Analyze the indeterminate structures by strain Energy method.
CO2: Apply plastic analysis principles to Indeterminate beams and portal frames.
CO3: Apply Approximate method for analysis of multistoried frames and Analyze the indeterminate beams and Frames by Kani's Method.
CO4: Analyze the indeterminate beams by Stiffness matrix method and Flexibility matrix method.

UNIT – I

1. **Kani's Method** Principles of the method; Application to continuous beams and portal frames (single bay, single storey with vertical legs only) without and with side-sway.

UNIT-II

2. **Strain Energy Method:** Strain energy method for analysis of continuous beams and rigid joined plane frames (DOF: 2). (Castigliano's theorem-II).

3. **Redundant Pin Jointed Frames:** Analysis of pin jointed frames (one degree redundancy); Forces in indeterminate pin jointed frames due to temperature variation and lack of fit;

UNIT-II

4. Introduction to Matrix Methods
Flexibility and stiffness; Flexibility matrix; Stiffness matrix; Relationship between flexibility matrix and stiffness matrix.

5. Analysis of Continues beams
Analysis of continuous beams by Flexibility method and stiffness matrix method, (up to 2 DOF).

UNIT – IV

4. Plastic Behavior of Structures

Idealized stress - strain curve for mild steel; Ultimate load carrying capacity of members carrying axial forces; Moment - Curvature relationship for flexural members; Evaluation of fully plastic moment; Shape factor; Collapse load factor; Upper and lower bound theorems; Collapse load analysis of indeterminate beams and single bay, single storied portal frames.

TEXT BOOKS :

.

1. V. N. Vazirani& M. M. Ratwani ,Structural Analysis, Vol. II , KhannaPublishers,Delhi.
2. Structural Analysis – A matrix approach by G. S. Pandit& S. P. Gupta; Tata Mc. Graw – Hill Publishing Co. Ltd., New Delhi.
3. Limit Analysis of Structures by Manicka&Selvam , DhanpatRai Publications,2012.

REFERENCES:

1. Matrix analysis of framed structures by Weaver &Ger
2. Basic Structural Analysis by C. S. Reddy, Tata McGraw-Hill

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	1	-	-	1	-	-	-	-	-	-	3	1	-	-
CO2	2	3	2	-	-	1	-	-	-	-	-	-	2	3	-	-
CO3	2	3	1	-	-	1	-	-	-	-	-	-	2	3	-	-
CO4	3	3	1	-	-	1	-	-	-	-	-	-	3	2	-	-

ENVIRONMENTAL GEOTECHNICS
III B.Tech –VI Semester (Code: 20CE604/PEC02B)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	70

Course Objectives:

- To introduce soil structure and clay minerals.
- To know characteristics and classification of wastes
- Introducing hydrology of contaminants.
- Introducing methods of disposal and site remediation

Course Outcomes: At the end of the course, the student will be able to,
CO1: Understand soil structure and clay minerals
CO2: Understand characteristics and classification of wastes
CO3: Understand characteristics and classification of wastes
CO4: Understand methods of disposal and site remediation

UNIT-I

CLAY MINERALOGY AND SOIL STRUCTURE
Clay mineralogy and soil structure: Gravitational and surface forces-inter sheet and inter layer bonding in the clay minerals- Basic structural units of clay minerals- isomorphous substitution – kaolinite mineral- montmorillonite mineral- illite mineral- electric charges on clay minerals – base exchange capacity- diffused double layer- adsorbed water- soil structure- methods for the identification of minerals (introduction only).

UNIT-II

CHARACTERISTICS AND CLASSIFICATION OF WASTES
Wastes and Contaminants (introduction only): sources of wastes-types of wastes-composition of different wastes- characteristics and classification of hazardous wastes- generation rates- Soil water environment interaction relating to geotechnical problems-Effect of pollution on soil water behaviour-Case studies of foundation failures by ground contamination.

UNIT-III

HYDROLOGY OF CONTAMINANTS
Transport phenomena in saturated and partially saturated porous media-contaminant migration and contaminant hydrology- Ground water-pollution downstream for landfills due to Leachate migration-Passive containment systems – Containment control systems- liners and covers for waste disposal- rigid liners- flexible liners.

UNIT-IV

METHODS OF DISPOSAL AND SITE REMEADIATION

Criteria for selection of sites for waste disposal – Surface and subsurface waste disposal techniques-Ground modification techniques in waste management – Physical modification-Thermal modification-chemical modification-Bioremediation-Geotechnical properties of wastes-Bearing capacity of landfill sites-foundation for waste fill ground.

TEXT BOOKS

1.Mitchell, J (1976), "Fundamentals of soil behaviour", John Wiley and sons, New York

2. Daniel,B.E., " Geotechnical Practice for Waste disposal ", Chapman and Hall, London, 1993.

3. Iqbal,H.Khan "Text book of Geotechnical Engineering" Second Edition

REFERENCES

1. Lambe, T. W & Whitman, R. V (1979), "Soil Mechanics ", John Wiley and Sons, New York.

2. GopalRanjan& A.S.R Rao (1991), "Basic and Applied Soil Mechanics, Wiley Eastern Ltd., New Delhi.

3. Wilson, M. J (1987), "A Hand book of Determinative methods in Clay Mineralogy", Chapman and Hall, New York.

4. Robert M. Koerner (1984), "Construction and Geotechnical methods in FoundationEngineering", McGraw Hill Book Co., New York.

5. Yong R. N. (1992), "Principles of contaminant Transport in Soils, "Elsevier, New York. RamanathaIyer T. S (2000), "Soil Engineering Related to Environment", LBS centre.

6.Lagrega, M.D., Buckingham, P.L. and Evans, J.B., " Hazardous Waste Management McGraw Hill, Inc., Singapore, 1994.

PRE STRESSED CONCRETE
III B.Tech –VI Semester (Code: 20CE604/PEC02C)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	70

Course Objectives:

- To highlight the concepts of pre-stressing in concrete and materials used for pre-stressing.
- To analyze the general mechanical behavior of pre-stressed concrete members on comparison with those of RCC members.
- To understand various losses of pre-stress and estimate the deflection in pre-stressed concrete members.
- To design pre-stressed concrete beams.
- To analyze and design of end anchorages for pre-stressed concrete members.

Course Outcomes:

CO1: Understand the concepts of pre-stressing in concrete and state the necessity for high strength steel and concrete in PSC and explanation of the various types of pre-stressing systems.

CO2: Understand the difference in the analysis of general mechanical behavior of PSC and RCC members.

CO3: Evaluate the total losses allowed for design of PSC members and estimating the deflection in PSC members.

CO4: Design pre-stressed concrete beams using IS1343.

CO5: Analyzing and designing the end anchorages for pre-stressed concrete members.

UNIT – I

1. Introduction Basic concepts of prestressing; Need for High strength steel and High strength concrete; Advantages of prestressed concrete.
2. Materials For Prestressed Concrete High strength concrete; High tensile steel.
3. Prestressing Systems Tensioning devices; Hoyer's long line system of pretensioning; Post tensioning systems; Detailed study of Freyssinetsystem, Lee-McCall System and Gifford – Udall system;
4. Analysis Of Prestress And Bending Stresses Basic assumptions; Analysis of prestress; Resultant stresses at a section; Pressure (Thrust) line and internal resisting couple; Concept of Load balancing; Stresses in tendons; Cracking moment.

UNIT – II

5. Losses of Prestress Nature of losses of prestress; Loss due to elastic deformation of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, friction and anchorage slip; Total losses allowed for in design.
6. Deflections of Prestressed Concrete Members; Importance of control of deflections; Factors influencing deflections; Short term deflections of uncracked members

UNIT – III

7. Elastic Design of Prestressed Concrete Sections for Flexure Permissible compressive stresses in concrete as per IS 1343; Design of rectangular and I – sections of TYPE 1, TYPE 2 (Elastic Design only).

UNIT – IV

8. Shear Resistance Shear and Principal Stresses; Ultimate shear resistance of prestressedconcrete members; Design of shear reinforcement.
9. Transfer of Prestress in Pre–Tensioned Members & Flexural Bond Stresses Transmission of prestressing force by bond; Transmission length; Bond stresses; Transverse tensile stresses; End zone reinforcement; Flexural bond stresses in pre –tensioned and post – tensioned grouted beams.
10. Anchorage Zone Stresses in Post-Tensioned Members Stress distribution in end block; Anchorage zone reinforcements; Design of anchorage and end block as per IS 1343.

TEXT BOOKS:

Prestressed Concrete by N. Krishna Raju; Tata McGraw - Hill Publishing Company Limited, NewDelhi.

REFERENCE BOOKS:

1. Design of Prestressed Concrete Structures by T.Y. Lin & Ned H. Burns; John Wiley & Sons.
2. Prestressed Concrete by P.Dayaratnam. Oxford & IBH
3. Prestressed Concrete by N.RajaGopalan. PH

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

AIR AND NOISE POLLUTION CONTROL
III B.Tech –VI Semester (Code: 20CE604/PEC02D)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	70

COURSE OBJECTIVES:

- Tomakethestudentsawareof sources, effects of airpollutants and also study on recentproblemsconcerningwithglobalwarming,ozonedepletion, andacid rains.
- To make the students aware of the air quality model, its definition, types and description of Gaussian based air quality model for point, area sources and also covering meteorological parameters , stability of atmosphere and corresponding plume shapes.
- To abletounderstandtheairpollutioncontrolmethods for particulate and gaseous pollutants.
- To make the students aware of sources, effects and control measures of Noise Pollution.

COURSE OUTCOMES:

CO1: Identify and understand the sources and effects ofairpollution on Human, Plants, Animals, and Materials.

CO2: Understandthemeteorologicalparametersinfluencingtheairpollution and pollutant dispersion model studies.

CO3: Describetheengineeringsolutionsto control theairpollutionproblems.

CO4: Understand the sources,effects and control measures of Noise Pollution.

UNIT 1

Air pollution and its effects (8 contact hours)

Air Pollutants: sources, classification, effect on animal health, vegetation, materials, and atmosphere. Chemical and photochemical reactions in the atmosphere and their effects: smoke, smog, acid rain and ozone layer depletion. Greenhouse gases, global warming and its implications.

UNIT II

Air pollution dispersion and modelling

Meteorology and air pollution: atmospheric stability and inversions, behaviour of air pollutant plumes as effected by nature of source, meteorology, obstacles and terrain; maximum mixing depth. Effluent dispersion theories: models for point and line sources based on Gaussian plume dispersion and their limitations: Box model for area sources. Prediction of effective stack height: Holland's and Briggs equations.

UNIT III

Particulate emission and its controls

Reduction in the generation of particulate matter by process modification. Control of SPM: concepts and the design elements of gravitational settlers, centrifugal collectors, wet collectors, electrostatic precipitators, fabric filters, condensers.

Gaseous emissions and its control

Sources of air pollution from fossil fuels and industrial processes. Prevention and reduction of emissions, cleaner production. Air pollution control by absorption, adsorption, condensation, incineration, etc.

UNIT IV

Noise pollution and its control

Generation and propagation of sound; sound power, sound intensity and sound pressure levels; plane, sources; outdoor and indoor noise propagation; psycho-acoustics and noise criteria. Noise standards and limit values. Effects of noise on health. Noise pollution measuring instrumentation and monitoring procedure. Noise pollution prevention and control.

Text Books:

1 Air Pollution Control Engineering, N. de Nevers, 2nd Edition. McGraw Hill, Singapore, 2000.
2. Environmental Noise Pollution, P. E. Cunniff, McGraw Hill, New York, 1987.

Reference Books:

1. Air pollution control Equipments, Louis Theodore, Wiley Publication. Year
2. Fundamentals of Air pollution, R. W. Boubel, D. L. Fox, and A. C. Stern, Academic Press, NY, 1994.
3. Air pollution M N Rao & H V N Rao, Tata Mc Graw – Hill Education Private Limited., New Delhi.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

ESTIMATION & QUANTITY SURVEYING
III B.Tech –VI Semester (Code: 20CE605/JO2)

Lectures	2	Tutorial	0	Practical	2	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Pre-requisite: Building Planning and Drawing.

Course Objectives:

- To Estimate the various types of Buildings.
- To Prepare the Detailed Estimation for RCC, Road.
- To Construct the Specifications for a Building and Evaluate the Rate per unit item of different works.
- To discuss the PWD accounts and Procedures of works.

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

CO1: Acquire the knowledge of the drawings, procedures and different estimating methods of Buildings.
CO2: Acquire the knowledge of Estimate the Quantities of RCC, Road Works.
CO3: Recognize and Realise the importance of specifications and Estimate the unit Rate for different Engineering Works.
CO4: To Gain the Knowledge on PWD accounts and Procedures of works and Tendering Process.

UNIT – I

1. Procedure of Estimation

Methods of estimating; Main items of work; Deduction for openings; Degree of accuracy; Unitsof measurement.

2. Methods of building estimates

Individual wall method; Centre line method; Arch masonry calculation; Estimate of steps.

UNIT – II

3. Estimate of RCC works

Standard hooks and cranks; Estimate of RCC slab; RCC beam; RCC T–beam slab and RCC column with foundation.

4. Road Estimating

Estimate of earthwork; Estimate of pitching of slopes; Estimate of earthwork of road from longitudinal sections.

UNIT – III

5. Specifications

Purpose and method of writing specifications; General specifications. Detailed Specifications forBrick work; R.C.C; Plastering; Mosaic Flooring.

6. Analysis of Rates

Task or out – turn work; Labour and materials required for different works; Rates of materialsandlabour; Preparing analysis of rates for the following items of work:
i) Concrete ii) RCC Works iii) Brick work in foundation and super structure iv) Plastering.

UNIT – IV

7. PWD Accounts and Procedure of Works

Organization of Engineering department; Work charged establishment; Contract; Tender; Tendernotice; Tender Schedule; Earnest money; Security money; Measurement book; Administrative approval; Technical sanction; Plinth area; Floor Area; Carpet area; Approximate Estimate; Plintharea estimate; Revised Estimate; Supplementary estimate.

8. Miscellaneous:

Gross income; Net income; Scrap value; Salvage value; Obsolescence; Annuity; Capitalized value; Years purchase; Life of structures; Sinking fund; Standard rent; Process of fixing standardrent; Mortgage, brief outlines of valuation process.

TEXT BOOKS

1. Estimating & Costing in Civil Engineering by B.N. Dutta; U. B. S. Publishers & Distributors, New Delhi.
2. Valuation of Real properties by S. C. Rangwala; Charotar Publishing House, Anand.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	3	-	-	-	-	-	2	3	3	-	2	-	-	2	-
CO2	3	3	-	-	-	-	-	2	3	3	-	2	-	-	2	-
CO3	3	2	-	-	-	2	2	2	3	3	-	2	-	-	2	-
CO4	-	2	-	-	-	-	-	3	2	3	-	2	-	-	2	-

HEALTH AUDIT OF STRUCTURES AND RETROFITTING OF STRUCTURES
III B.Tech –VI Semester (Code: 20CE605/JOE02B)

Lectures	2	Tutorial	0	Practical	2	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	70

Course Objectives:

- Analyze the Structural Health and Monitoring Procedures.
- Understand the Static and Dynamic Procedures.
- Acquire the knowledge of Data Acquisition in a structural building.
- Understand the Retrofitting techniques for a damaged building.

Course Outcomes:

CO1: To acquire the knowledge of monitoring the health of the Structures.

CO2: To know the testing procedures for Static and dynamic field tests.

CO3: To learn the methodology of Data Acquisition.

CO4: To apply the knowledge of retrofitting techniques for damaged buildings.

UNIT – I

Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance.
Structural Health Monitoring: Concepts, Various Measures, Structural Safety in Alteration.
Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

UNIT-II

Static Testing - Static field testing- types of static tests- loading methods - Behavioral / Diagnostic tests - Proof tests - Static response measurement – strain gauges, LVDTs, dial gauges - case study. Dynamic field testing - Types of dynamic tests - Stress history data - Dynamic load allowance tests - Ambient vibration tests - Forced Vibration Method - Dynamic response methods - Impact hammer testing - Shaker testing - Periodic and continuous monitoring.

UNIT-III

Data Acquisition - Static data acquisition systems - Dynamic data acquisition systems - Components of Data acquisition system - Hardware for Remote data acquisition systems.
Remote Structural health monitoring - Remote Structural Health Monitoring - Importance and Advantages – Methodology - RF/PSTN/GSM/Satellite Communications - Networking of sensor - Data compression technique - Case Studies

UNIT-IV

Plate bonding technique, Ferro cement jacketing, RCC jacketing, propping and supporting - Repair methods- fiber wrap technique, foundation rehabilitation methods, chemical and electrochemical method of repair - Repair/Rehabilitation strategies- Stress reduction technique, repair and strengthening of columns and beams - Rehabilitation strategies-Compressive strength of concrete, cracks/joints, masonry, foundation, base isolation - Guidelines for framing terms and conditions for repair and rehabilitation works contracts- engagement of consultants, contractors, execution of work, post repair inspection. Discussion of case studies-RCC buildings, water tanks, industrial structures, identifying a suitable repair option for certain damage in a structure.

TEXT BOOKS:

1.Santhakumar A.R., "Concrete Technology" Oxford University Press, New Delhi, 2007.
2. Repair and Rehabilitation of structures by P N Modi and Chirag N Patel, PHI Publishers.

Reference Books:

1. "CPWD Handbook on Repair and Rehabilitation of RCC buildings", Govt of India Press, New Delhi, 2002.

OFFSHORE RENEWABLE ENERGY

III B.Tech –VI Semester (Code: 20CE605/JOE02C)

Lectures	2	Tutorial	0	Practical	2	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Course Objectives:

- To learn the basics of ocean wave mechanics
- Understand the various methods used in analyzing wave energy transport.
- To understand the significance of offshore floating structures in extracting wave energy.
- To understand the extraction of offshore wind energy and tidal energy.

Course Outcomes: Students will be able to

CO1: Get the knowledge ofthebasics of ocean wave mechanics.

CO2: Get the skills in analyzing the wave energy transport.

CO3: Know the various types of offshore floating devices and wave energy converters.

CO4: In a position to understand the extraction of offshore wind energy and tidal energy.

UNIT – I

Introduction to Wave Mechanics: Potential Flow, Laplace equation, Boundary value problem, small amplitude waves, Linearized boundary Conditions, Periodic, progressive, and Standing waves,

Wave Kinematics: Wave kinematics, basic dispersion relation, Shallow and Deep-water waves.

UNIT – II

Transport of Wave Energy: Description of wave oscillation, Wave power, energy Transport, Resonance absorption, wave transport of energy, and Momentum;

Methods of Approach: Description and operation of various wave energy converters for onshore and offshore applications. Analysis based on analytical and numerical methods.

UNIT – III

Integrated Offshore Floating Structures: Design of wave environment, maximum power absorption from ocean waves using floating structures, the response of floating structures, Overtopping Devices, Wave absorbing devices, Time and frequency domain of numerical methods.

Wave Energy Converters: Global energy demand, Hydrodynamic characteristics of wave energy converters, Oscillating Water Columns (OWC), Point absorbers, Terminators, Wave attenuators,Pelamis Wave Energy Converter, Wave Dragon, Wave Roller.

UNIT – IV

Offshore Wind Turbines: Design of offshore wind turbines, Mounting/mooring arrangements, installation, Design of wind turbine, aerodynamic characteristics of horizontal and vertical axis wind turbines, Aero-foil Theory.

Tidal Energy Converters: Tidal energy, Current stream devices, Barrage systems, hydrodynamic characteristics of tidal devices, wave and current effects, energy storage, Transmission and Distribution issues, and solutions.

BOOKS:

1. Johannes Falnes, "Ocean waves and Oscillation Systems", Cambridge University Press, 2002.
2. J.S. Mani, "Coastal Hydrodynamics", WIT Press, 2012

REFERENCE BOOKS:

1. V. Sundar, "Ocean wave Mechanics", Wiley Publication, 2015.
2. R. H. Charlier, C.W. Finkl., "Ocean Energy", Tidal and Tidal Power, Springer Verlag, 2009.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

GEOGRAPHICAL INFORMATION SYSTEM LAB
III B.Tech –VI Semester (Code: 20CEL601/SOC4)

Lectures	1	Tutorial	0	Practical	2	Credits	2
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Laboratory Objectives:

- Understand the process of Digitization of maps
- creation of various features thematically
- Develop the DEM
- Learn external data linkages to internal features
- Learn GIS analysis.
- Learn GIS data base quarries

Laboratory Outcomes:

CO1: Knowledge Acquisition: Understand the basics of digitization, thematic mapping, and GIS tools for geospatial data handling.

CO2: Application Proficiency: Apply GIS techniques to create Digital Elevation Models, link external databases, and perform spatial analysis.

CO3: Spatial Interpretation: Analyze complex spatial patterns, interpret maps, and query geospatial data effectively.

CO4: Data Transformation Mastery: Demonstrate expertise in vector-to-raster and raster-to-vector conversions, showcasing advanced geospatial data manipulation skills.

List of Experiments:

1. Digitization of Topo sheet
2. Creation of thematic maps.
3. Estimation of features and interpretation
4. Developing Digital Elevation Model (DEM)
5. Linking external data base (.CSV, or. EXCEL, or .Txt) to internal features
6. Buffers creation around (Point, line, and polygon) Features
7. Create point features using excel data
8. Querying on attribute data
9. Overlay Operations (Identity, or Intersect or Union or erase)any two
10. Vector to raster creation (Features conversion, Point, polyline and polygon)
11. Raster to vector conversion (Line or polygon options)
12. Preparation of Flow Accumulation, Flow direction maps (using DEM)

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	-	-	2	3	-	-	-	-	-	3	-	-	-	2	3
CO2	3	-	-	2	3	-	-	-	-	-	3	-	-	-	2	3
CO3	3	-	-	2	3	-	-	-	-	-	3	-	-	-	2	3
CO4	3	-	-	2	3	-	-	-	-	-	3	-	-	-	2	3

ADVANCED SURVEYING LABORATORY
III B.Tech –VI Semester (Code: 20CEL602)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	70

Course Objectives:

- To determine distances and relative positions using trigonometric leveling
- To deal with various methods employed for the measurement of areas and volumes.
- To build the knowledge on different methods of setting & design of simple circular curves.
- To develop the concepts on usage of EDM, Digital Theodolite and total station.

Course Outcomes:

By the end of the course, the students will be able

CO1: Determine the reduced level of different structures when base is inaccessible and accessible.

CO2: Design and layout curves for a roads and railways.

CO3: Prepare contour maps for the given area.

CO4: Understand applications related to the Total station.

Experiments

1. To determine the elevation of the top of the object when the base is accessible
2. To determine the elevation of the top of the object when the base is inaccessible when the instruments are in same vertical plane.
3. To determine the elevation of the top of the object when the base is inaccessible when the instruments are in not in the same vertical plane.
4. To set Simple circular curve by using offsets from Long Chord method.
5. To set Simple circular curve by using radial, perpendicular offsets from tangents.
6. To set Simple circular curve by Rankine's method or Tape and theodolite method.
7. To set Simple circular curve by Two theodolite method.
8. To Prepare Contour maps for given area by grid method using leveling Instrument.
9. To develop the knowledge on usage of Total station.
10. To perform RDM application and find the distance between inaccessible points by Total station.
11. To perform REM application to find the elevation by Total station.
12. To Calculate area for given plot by Total station.

TEXT BOOKS AND REFERENCES:

1. Advanced surveying by R. Agor
2. Advanced surveying by SateeshGopi, R. Satish Kumar, N. Madhu

Note: Survey Camp is to be conducted for a minimum period of seven days Using Total Station to train in one of the following areas:

i. Preparation of a contour Plan/ Map.
ii. Earth work Computations for a high way / canal projects
iii. Marking of a Sewer line/ Water supply line.
iv. Any type of Execution works.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	-	-	-	-	-	-	1	-	1	-	1	-	3	2
CO2	3	2	-	-	-	-	-	-	1	-	1	-	1	-	3	2
CO3	3	2	-	-	-	-	-	-	1	-	1	-	1	-	3	2
CO4	3	2	-	-	-	-	-	-	1	-	1	-	1	-	3	2

STRUCTURAL ANALYSIS DESIGN AND DETAILING LABORATORY
III B.Tech –VI Semester (Code: 20CEL603)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	70

Students are required to analyze and design the following structures using software package like STAAD/ETABS/GTSTRUDL/STRAP etc. and detailing of structures using SP-34 & AUTO CAD.

COURSE OBJECTIVES:

- To understand the modeling and analysis of indeterminate structures like continuous beams and frames using STAAD and ETABS.
- To learn the basic concepts in analysis and design of slabs, footing and truss using different software's like STAAD and ETABS.
- To know the detailing concepts and usage of SP-34
- To learn the commands to draw the detailing of indeterminate beams, slabs, footings, retaining walls and plate girder using AUTO CAD

COURSE OUTCOMES

Upon successful completion of this course, student will be able to
CO1: Understand the application of computer softwares in civil engineering field.
CO2: Understand structural modeling techniques and different tools available.
CO3: Compare the modelling techniques of steel and RCC structure.
CO4: Sketch the deatilings of beams ,columns and slabs.

1. Indeterminate beams.
2. Plane roof truss.
3. Plane frame subjected to gravity loads and lateral load (wind load).
4. SPACE(3D) frame analysis for gravity and lateral loading.
5. One-way slab.
6. Two way slab.
7. Isolated footing.
8. Pile foundation.
9. Combined footing.
10. Cantilever Retaining wall.

11. Plate girder.
12. Column base.

TEXT BOOKS:

1. Limit State Design of Reinforced Concrete by P. C. Varghese, Prentice Hall of India.
2. For Limit State Method: Reinforced Concrete (limit state design) by Ashok K. Jain; Nem Chand &Bros.,Roorkee
3. For Working Stress Method: Reinforced concrete by H. J. Shah, charotar publishing house
4. Reinforced Concrete Structures by N. Subramanian, Oxford University Press.

REFERENCE BOOKS:

1. Reinforced concrete design by Pillai and Menon, Tata McGraw-Hill
2. Limit state theory & Design of reinforced concrete by Dr. S. R. Karve and Dr.V.L.Shah; Pune VidyarthiGrihaPrakashan, Pune.
3. Reinforced concrete design: Principles and Practice by N. Krishna Raju., R. N. Pranesh, New Age International Publishers.
4. Reinforced Concrete Structure by R. Park., T. Paulay, Wiley India Publishers

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	3	-	-	-	2	-	-	-	-	-	-	-	-	3	2
CO2	2	3	-	-	-	2	-	-	-	-	-	-	-	-	3	2
CO3	2	3	-	-	-	2	-	-	-	-	-	-	-	-	3	2
CO4	2	3	-	-	-	2	-	-	-	-	-	-	-	-	3	2

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

TRANSPORTATION ENGINEERING LABORATORY
III B.Tech –VI Semester (Code: 20CEL604)

Lectures	0	Tutorial	0	Practical	3	Credits	1.5
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

Prerequisites: Geotechnical Engineering Lab (18CEL63)

Course Objectives:

- To assess the physical properties of aggregates and bitumen for road construction.
- To assess the properties of bituminous mix.
- To evaluate the sub-grade soil properties.
- To measure the unevenness of the pavement surface.

Course Outcomes: Student will be able to

CO1: Calculate the physical properties of aggregate and bitumen for road construction.
CO2: Develop the Job mix formula for Bituminous mixes.
CO3: Examine the feasibility of soil as a suitable material in road construction.
CO4: Analyze the roughness of pavement surface.

A. Tests on Aggregates

1. Aggregate Crushing value test.
2. Aggregate impact value test.
3. Los Angele's abrasion test.
4. Deval's attrition value test.
5. Shape test a) Flakiness index test b) Elongation index test c) Angularity number test. .
6. Specific gravity Test.

B. Tests on Bituminous Materials

7. Penetration test.
8. Softening point test.
9. Flash and fire point test.
10. Ductility test.
11. Viscosity test.
12. Bitumen Extractions Test.
13. Specific gravity of Bitumen.

C. Test on Bituminous Mixes

14. Marshall stability test.

D. Test on Soil Sub grade

15. California bearing ratio test.
16. Dynamic cone penetrometer test

E. Pavement Evaluation

17. Roughness of pavement by using MERLIN

F. Traffic Studies

18. Traffic Volume studies
19. Spot Speed studies

TEXT/REFERENCE BOOKS:

1. S.K. Khanna, C. E. G. Justo, A.Veeraragavan" Manual on Highway Materials and Pavement Testing" Nem Chand Bros, Roorkee (2013). Revised 5th Edition.
2. Laboratory Manual in Highway Engineering by Ajay K. Duggal and Vijay P. Puri - New age Publishers.

Relevant Code Books:

1. Bureau of Indian standards, Indian standard methods of test for soils, Part-16, Laboratory determination of CBR, IS:2720(part-16)-1987 Reaffirmed 1997.
2. Bureau of Indian standards, Indian standard methods of test for aggregate for concrete, mechanical properties, IS:2386-1963 (Reaffirmed 1997).
3. Bureau of Indian standards, Indian standard specification of coarse and fine aggregate from Natural sources for concrete, IS:383-1970 (Reaffirmed 1997).
4. Bureau of Indian standards, IS: 1201-1220(1978), Indian standard methods for testingTar and Bituminous materials.
5. Bureau of Indian standards IS: 73-2013, Indian standard Paving Bitumen -Specification.
6. Ministry of Road Transport and Highways- Specifications for Roads and Bridge Works, Fifth Revision, IRC, New Delhi, India-2013

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	1	-	3	-	-	-	-	-	2	-	-	-	-	2	3
CO2	2	2	-	2	-	-	-	-	-	2	-	-	-	-	2	3
CO3	2	1	-	3	-	-	-	-	-	2	-	-	-	-	2	3
CO4	2	2	-	1	-	-	-	-	-	2	-	-	-	-	2	2

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE
III B.Tech –VI Semester (Code: 20CE606/MC04)

Lectures	2	Tutorial	0	Practical	0	Credits	0
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)			:	-

Course Objectives:

- This course gives a broad range description of Indian Knowledge system and associated perspective of modern scientific world-view
- The course aims at imparting basic principles of thought process, reasoning and inferencing as well as sustainability of Indian traditional knowledge systems connecting society and nature.
- Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
- The course focuses on the study of various case studies in Indian Traditional knowledge system.

Course Outcomes:

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

CO1: Understand the structure of Indian knowledge and its importance

CO2: Compare the Indian traditional knowledge Systems with Other Global systems. .

CO3: Know the concept of yoga and its correlations to science.

CO4: Recognise various case studies related to Indian Traditional knowledge.

UNIT I

- Historical Background: TKS during the Pre-colonial and Colonial Period
- Indian Traditional Knowledge System
- Traditional Medicine: Ayurveda, Simple Definition, Origin, Texts, The Great Three Classics of Ayurveda, The Lesser Three Classics of Ayurveda, The Branches of Ayurveda, Basic Concepts of Ayurveda, Purusha/Prakruti, Manifestation of Creation, Space, Air, Fire, Water, Earth, Mental Constitution, Satvic Mental Constitutions, Rajasic Mental Constitutions, Tamasic Mental Constitutions, Vata, Pitta and Kapha: The Three Doshas

UNIT II

- **TraditionalProductionandConstructionTechnology:**SocialConditionsandTechnological Progress, The Impetus for Metallurgy, Social Needs and

TechnologicalApplications, Scientific Rationalism and Technological Efficacy, Cultural Mores andTechnological Innovation, State Support of Technology, Limitations of Pre-IndustrialManufacturing, Indiaandthe IndustrialRevolution.

- **HistoryofPhysicsandChemistry:**Philosophy and Physical Science, Particle Physics, Optics and Sound, Astronomy and Physics, The Laws of Motion, Experimentation versus Intuition, The Social Milieu, The Five Basic Physical Elements, Indian Ideas about Atomic Physics.
- **Traditional Art and Architecture and Vastu Shashtra:** Vastu, The Principles of VastuareSimple.

UNIT III

- **OriginofMathematics**
- **AstronomyandAstrology**
- **TKS and the Indian Union:** Protection and the Legislative Frameworks in India,Comment, Sui Generis System, TradeSecrets andKnow-how, Geographical Indications Bill, Protection of Plan varieties and Farmers Rights Bill, Rights of Communities, Monitoring Information on Patent Applications World-wide, Frameworks for Supporting R&D Activities in the Area of TKS

UNIT IV

- Yoga, The fundamentals of Yoga, Traditional Schools of Yoga, Yogic practices for health and wellness General Guidelines for Yoga Practice: Before the practice, During the Practice, After the Practice, Food for Thought, How Yoga can Help.
- Case Studies: Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, Traditional knowledge and biotechnology, Traditional knowledge in agriculture, Traditional societies dependence on traditional knowledge for their food and healthcare needs, Importance of conservation and sustainable development of environment.

TEXT BOOKS:

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course material, BharatiyaVidyaBhavan, Mumbai, 5th Edition, 2014.
2. Swami Jitatmanand, Modern Physics and Vedant, BharatiyaVidyaBhavan
3. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta.
4. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, PratibhaPrakashan 2012.
5. Traditional Knowledge System in India by AmitJha Atlantic publishers, 2002.

REFERENCE BOOKS :

1. G N Jha, (ENG. Trans.), Ed. R N Jha, Yoga-darshanam with VyasaBhashya, VidyanidhiPrakasam, Delhi, 2016.
2. R N Jha, Science of consciousness Psychotherapy and yoga practices, Vidyanidhiprakasham, Delhi, 2016.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

CONSTRUCTION MANAGEMENT
IV B.Tech – VII Semester (Code: 20CE701)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3Hours)	:	70		

COURSE OBJECTIVES : The subject provides

- To provide a knowledge on project failures, planning and scheduling of a project.
- Have knowledge on network techniques like PERT,CPM and Cost Control.
- Exposure to the different types of Resources in Construction.
- Will provide importance of Quality control and Safety Management.

COURSE LEARNING OUTCOMES : At the end of the course student will be able to

CO1: Understand the project failures and the basic concepts of Project Planning and Scheduling.
CO2: Analyzing a network diagram for a project and calculating the cost control.
CO3: Understand the uses and importance of Resources.
CO4: Understand the importance of different Divisions of Construction Management like Quality, safety.

UNIT – I

1. Introduction

Construction projects; Project management; Main causes of project failure.

2. Planning And Scheduling

Steps involved in planning; Objectives; Principles; Advantages; Limitations; Stages of planning;Scheduling, Preparation of construction schedules; Methods of scheduling; Bar charts; Mile stone charts; Controlling; Job layout; Factors affecting job layout; Project work break down; Activities involved; Assessing activity duration.

UNIT – II

3. Project Management Through Networks

Objectives of network techniques; Fundamentals of network analysis; Events; Activities; Dummies; Types of networks; Choice of network type; Advantages of network techniques over conventional techniques.

4. Program Evaluation And Review Technique (PERT)

Introduction; Time estimates; Earliest expected time; Latest allowable occurrence time; Slack; Critical path; Probability of completion time for a project.

5. Critical Path Method (CPM)

Introduction; Difference between CPM and PERT; Earliest event time; Latest event time; Activity time; Float; Critical activities and critical path.

6. Cost Control

Direct cost; Indirect cost; Total project cost; Optimization of cost through networks; Steps involved in optimization of cost.

UNIT – III

7. Resource Management (Manpower)

Introduction; Resource smoothing; Resource levelling; Establishingworkers' productivity.

8. Resource Management (Materials)

Objectives of material management; Costs; Functions of material management department; ABC classification of materials; Inventory of materials; Material procurement; Stores management.

9. Resource Management (Machinery)

Classification of construction equipment; Earth moving equipment; Excavation equipment; Hauling equipment, Earth compaction equipment; Hoisting equipment; Concreting plant and equipment; Time and motion study; Selection of equipment– Task consideration, Cost consideration; Factors affecting the selection; Factors affecting cost owning and operating the equipment; Equipment maintenance.

UNIT – IV

10. Quality Control

Importance of quality; Elements of quality; Organization for quality control; Quality assurance techniques; Documentation; Quality control circles; Total quality management; ISO – 9000.

11. Safety Management

Accident prevention programme; immediate attention in case of accident; Approaches to improve safety in construction; Safety benefits to employers, employees and customers; Prevention of fires in construction industries; Safety budgeting.

NOTE

Two questions of 14 marks each will be given from each unit out of which one is to be answered. Fourteen questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOKS

1. Construction Engineering and Management by Dr. S. Seetharaman; Umesh Publications, Nai Sarark, Delhi.
2. Fundamentals of PERT/CPM and Project Management by S. K. Bhattacharjee; Khanna Publishers, NaiSarak; Delhi.

REFERENCE BOOKS

1. Construction Management & Planning by B. Sengupta& H. Guha; Tata McGraw – Hill Publishing Co. Ltd., New Delhi.
2. Construction Planning, Equipment & Methods by Peurifoy R. L.; McGraw – Hill International Book Company.
3. PERT & CPM Principles and applications by L. S. Srinath; Affiliated East West Press.
4. Project Planning & Control with PERT & CPM by Dr. B.C. Punmia and K.K. Khandelwal

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	-	-	-	-	-	-	2	2	-	3	2	-	-	-	-	-
CO2	3	-	-	-	2	-	-	-	2	2	-	-	2	2	-	-
CO3	2	2	-	-	2	-	2	2	2	2	2	-	-	-	-	-
CO4	-	2	2	-	2	2	-	3	2	3	-	2	-	-	-	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

ADVANCED DESIGN OF STRUCTURES
IV B.Tech – VII Semester (Code: 20CE702/PE3)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30		Semester End Examination (3Hours)		:	70

CourseObjectives: The student will study and understand:

- Stability requirements and design of cantilever type retainingwall
- Design of pile and raft foundation.
- Design of Gantry Girder and its connections using LSM
- Design of plate girder
- Understand and design of roof truss and purlins

Course Outcomes:Students will be able to

CO1: Understand the design aspects of retaining wall.
CO2: Understand the design aspects of pile and raft foundation.
CO3: Identify the different loads on gantry girder and its design principles
CO4: Apply the design concepts to plate girder under moving loads.
CO5: Understand the wind loads on structures with emphasis to roof trusses

UNIT I

Retaining Walls

Types of Retaining walls, Forces on retaining walls, Stability requirements, Design and detailing of Cantilever type retainingwall.

UNIT II

Design of Pile Foundation

Introduction to Pile foundation, Design of Pile and Pile cap.

Design of Raft Foundation

Introduction to Raft foundation; Design of raft Foundation.

UNIT III

Gantry Girder

Introduction; Loads on Gantry girders; Fatigue effects; Design of gantry girder;

UNIT IV

Plate Girder

Introduction, Design of flanges and web, stiffeners and their connections

UNIT V

ROOF TRUSSES

Type of trusses for different spans; Components of a roof trusses; Live loads and wind loads on trusses as per I.S Codes; Design of Purlins.

TEXT BOOKS:

1. For Limit State Method: Reinforced Concrete (limit state design) by Ashok K. Jain; Nem Chand & Bros., Roorkee.
2. Limit state design of steel structures by S.K.Duggal, TataMcGrawhill,Publishingcompany Ltd.
3. Design of Steel structures by N.Subramanian, Oxford University press,2009

REFERENCE BOOKS:

1. Reinforced concrete design by Pillai and Menon, Tata McGraw-Hill
2. Limit state theory & Design of reinforced concrete by Dr. S. R. KarveandDr.V.L.Shah;
3. Pune VidyarthiGrihaPrakashan,Pune.
4. Design of reinforced concrete structures by S. Ramamrutham; DhanpatRai&Sons.
5. Design of Steel Structures by Limit state method as per IS800-2007 by S.S.Bhavakatti, IKInternational Publishing Housing Pvt.Ltd.
6. Design of Steel Structures by Limit state method as per IS800-2007 by K.LSairam, PearsonEducation India
7. Structural steel design by M.L.Gambhir , Tata McGraw-Hill Education

Code Books:

1. IS 456-2000
2. IS 800-2007, IS 875 Part-III

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO2	2	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO3	2	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO4	3	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-
CO5	2	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-

INSTRUMENTATION AND SENSOR TECHNOLOGY IN CIVIL ENGINEERING
IV B.Tech – VII Semester (Code: 20CE702/PEC03B)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30		Semester End Examination (3Hours)		:	70

UNIT – I

Introduction: Basic definitions related to measurements/ Instrumentation, Block diagram ofgeneralized measurement / Instrumentation system.

Static characteristics of instruments: Introduction, static characteristics: accuracy, precision, resolution, static sensitivity, Linearity,Threshold, Hysteresis, Dead Zone, span, Range Loading effect.

Dynamic characteristics: Generalised Mathematical model of measurement system,operational & sinusoidal transfer functions zero, first and second order instruments & their responseto step, ramp, and impulse inputs.

UNIT – II

Errors in Measurements: Static error, Types of errors, estimation of static errors: limiting errors &their combinations, error estimates from the normal distribution, probable errors& theircombinations statistical analysis of measurement data uncertainty analysis curve fitting: Method ofleast squares.

Introduction: Definition of Transducer, Classification of transducers.

Resistive Transducers: Potentiometers, straingauges & their types, RTD's, thermistors, Hotwireanemometers.

Inductive Transducers: Transducers type, electromagnetic type, Magnetostrictivetype, Variable reluctance type, (or) Variable permeability type.

Capacitive Transducers: Variabledielectric, Variable gap, Variable area type Capacitive devices, Differential type.

UNIT – III

Piezo-electric Transducers: Piezo-electric effect, Piezo-electric Materials, Piezo-electric transducer &its characteristics.

Radiation Transducers: Radiation Pyrometry, Radiation fundamentals Radiation Pyrometer, Totalradiation pyrometer, selective radiation pyrometer, Two colour radiation pyrometers.

UNIT-IV

Signal and System Analysis: Introduction, Analog Filters and frequency analysers, Frequency analysis for various input signals, digital frequency analysers, system analysis by Harmonic testing, system analysis by Transient testing

Condition Monitoring and Signature Analysis Applications: Introduction, Vibration and Noise Monitoring, Temperature Monitoring, Wear Behaviour Monitoring, Corrosion Monitoring, Performance Trend Monitoring, Selection of Condition Monitoring Techniques.

TEXT BOOKS:

1. BC Nakra&KKChaudhry, Instrumentation, Measurement and Analysis 2nd Edition,TMH
2. AK Ghosh, Introduction to Instrumentation and Control (PHI)

REFERENCE BOOKS:

1. Allan s Morris, Principles of Measurement systems (PHI)
2. A.K.Sawheny, Electrical & Electronic Measurements and InstrumentationDhanpath Rai
3. JB Guptha, Electrical & Electronic Measurements and Instrumentation, S.K.Kataria
4. E.O.Doeblin, Measurement systems: Applications and Design,TMH
5. D.V.S Murthy, Transducers & Instrumentation, PHI
6. D.S.Kumar, Mechanical Measurements, Metro Politan

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

WATERSHED MANAGEMENT

IV B.Tech – VII Semester (Code: 20CE702/PEC03C)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30		Semester End Examination (3Hours)		:	70

UNIT – I

Introduction: Concept of watershed development, objectives of water shed development, Integrated and multidisciplinary approach for watershed management.

UNIT – II

Characteristics of watershed: size, shape, slope, climate, drainage, land use, vegetation, geology and soils, hydrology and hydrogeology, socio-economic characteristics, basic data on water sheds.

UNIT – III

Principles of erosion: factors affecting erosion, estimation of soil loss due to erosion, universal soil loss equation, measures to control erosion.

UNIT – IV

Land management: Land use and land capability, management of forest, agricultural, grassland and wild land, reclamation of saline and alkaline soils, horticulture, social forestry and afforestation, planning of watershed management activities, preparation of action plan, administrative requirements.

TEXT BOOKS

1. Watershed management by J V S Murty, 2nd Edition, New Age International Publishers.
2. Watershed management by Pawar Rajendra, Sonawana Akash and Leena Tribhuvan, Notion Press.

REFERENCES

3. Watershed management by Madan Mohan Das, Mimi Das Saikia, Prentice Hall India Learning Pvt Ltd.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

GROUND IMPROVEMENT TECHNIQUES
IV B.Tech – VII Semester (Code: 20CE702/PEC03D)

Lectures	3	Tutorial	0		Practical	0	Credits	3
Continuous Internal Assessment			:	30	Semester End Examination (3Hours)		:	70

UNIT-I

1. **Introduction**

Need for engineered ground improvement, classification of ground modification techniques; suitability, feasibility and desirability of ground improvement technique; objectives of improving soil.

2. **In-situ densification methods in granular soils**

Introduction, Vibration at the ground surface, impact at the ground surface, vibration at depth, impact at depth.

UNIT-II

3. **In-situ densification methods in cohesive soils**

Introduction, preloading, sand drains, sand wicks, band drains, stone and lime columns.

4. **Reinforced earth**

Principles, components of reinforced earth, governing design of reinforced earth walls, design principles of reinforced earth walls.

UNIT-III

5. Geotextiles

Introduction, types of geotextiles, functions and their applications, tests for geotextiles, geogrids and its functions.

6. **Mechanical Stabilization**

Soil aggregate mixtures, properties and proportioning techniques, soft aggregate stabilization, compaction, field compaction control.

UNIT-IV

7.Cement Stabilization

Mechanism, factors affecting and properties, use of additives, design of soil cement mixtures, construction techniques.

8. Lime and Bituminous Stabilization

Type of admixtures, mechanism, factors affecting, design of mixtures, construction methods.

TEXT BOOK

1. Hausmann M.R(1990) Engineering Principles of ground modification, McGraw-Hill International edition.

REFERENCES

1. Ground improvement Techniques, P.Purushothama Raju, Laxmi Publications Pvt. Ltd., New Delhi.
2. Robert M. Koerner, Designing with Geosynthatics, Prentice Hall New Jercy, USA.
3. Construction and Geotechnical methods in Foundation Engineering, R.M.Koerner, McGraw-Hill Book Company.
4. Current Practices in Geotechnical Engineering Vol.-I, Alam Singh and Joshi, International Book Traders, New Delhi.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

RAILWAY AND AIR PORT ENGINEERING
IV B.Tech – VII Semester (Code: 20CE703/PE4)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30		Semester End Examination (3Hours)		:	70

Course Objectives:

- To discuss various components of railway track and their requirements.
- To design the geometrics of railway track.
- To design the runway geometric.
- To design the runway pavement and discuss various facilities of a harbor and port.

.

Course Outcomes: Student will be able to

CO1: Explain the various components for laying a railway track.
CO2: Identify the various geometrical elements required for a railway track.
CO3: Understanding the Planning and design runway geometrics.
CO4: Outline the various components and their features of harbor and port.

UNIT-I

1. INTRODUCTION TO RAILWAYS

Comparison of railway and highways transportation; Classification of Indian railways.

2. COMPONENTS OF RAILWAY TRACK

Gauges in Railway Track, Coning of Wheels, Permanent way-Rails-Types, Rail Joints-Types of Joints, Sleepers-Types, Comparison of sleepers, Ballast -Types of Ballast materials.

UNIT-II

3. GEOMETRIC DESIGN OF RAILWAY TRACK

Geometric Design Of Track-Necessity; Gradients & Gradient Compensation; Elements of horizontal alignment; Super elevation; Cant deficiency and cant excess; Negative Super elevation; Length of Transition Curve.

4. POINTS AND CROSSINGS & SIGNALLING

Switches, Components and types of crossing, Turnouts and its working principle, Classification of signals.

UNIT-III

5. AIRPORT PLANNING AND DESIGN

Classification of Airports; Aero plane components; Air–craft characteristics; Selection of site for airport.

6. RUNWAY DESIGN

Runway Design-Runway orientation; Basic runway length; Corrections for elevation; Temperatureand gradient; Runway geometric design.

UNIT-IV

7 .AIRFIELD PAVEMENT DESIGN

Design of Airport Pavements- Factors Affecting Pavement thickness, Design methods for flexible airfield Pavement- CBR Method, Mcleod Method and Rigid pavement Design-Westergaard's Method, FAA Method.

8. HARBOUR ENGINEERING

Introduction to water transportation, advantages and disadvantages of water transportation, Ports and Harbours: Definition of Basic Terms Harbour, Port, Docks; Requirements of a port and harbour; Harbour classification; Harbour works: Types of breakwaters, Jetty, Dock fenders, Piers, Wharves, Dolphins, Navigational Aids: Types of navigational aids; Port facilities: Transit sheds, Ware houses

Text Books

1. Railway Engineering by S.C.Saxena and S.AroraDhanpatRai Publications (P) Ltd.
2. Airport Planning and Design by S. K. Khanna& M. G. Arora; Nemchand& Bros, Roorkee
3. Dock And Harbour Engineering by Dr. S.P. Bindra, DhanpatRai& Sons

Reference Books

1. Railway Engineering by M.M.Agarwal; Prabha& Co, New Delhi
2. Airport Engineering by G.V.Rao; Tata McGraw Hill, New Delhi.
3. Dock And Harbour Engineering by Hasmukh P. Oza, Gautam H. Oza, Charotar Publishing House, 8th Revised Edition : 2016.

NPTEL :

http://nptel.ac.in/courses/105107123/
http://nptel.ac.in/courses/105101008/
http://nptel.ac.in/courses/114106025/

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	2	-	-	-	-	-	-	-	-	-	2	3	-	-
CO2	3	2	3	-	-	-	-	-	-	-	-	-	2	3	-	-
CO3	2	2	3	-	-	-	-	-	-	-	-	-	2	2	-	-
CO4	2	2	3	-	-	-	-	-	-	-	-	-	2	3	-	-

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

EARTHQUAKE RESISTANT DESIGN OF STRUCTURES
IV B.Tech – VII Semester (Code: 20CE703/PE5)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30		Semester End Examination (3Hours)		:	70

COURSE OBJECTIVES

- Understand the basic concepts of structural dynamics under free vibration and forced vibration.
- Know the geo technical factors which are affecting the earthquake engineering.
- Analysis of buildings subjected to earthquake forces by using equivalent static method as per the IS:1893 – 2016
- Design and Detailing of buildings as per IS: 13920 – 1993 and few concepts of masonry structures to make earthquake resistant.

COURSE OUTCOMES

CO1: Comprehensive analysis of structures subjected to free and forced vibration of single degree of freedom systems.
CO2: Learning earthquake engineering fundamentals and elements of Geo-technical engineering such as liquefaction and slope stability analysis.
CO3: Analysis of single storey and single bay RCC plane frames subjected to lateral forces.
CO4: Design of single storey and single bay RCC plane frames and its sub parts like beam, column, footing and Detailing as per IS: 13920 – 1993.

UNIT-I

1) Elements of structural dynamics

Sources of vibrations; Types of vibrations; Degrees of freedom; Spring action and damping; Free vibration of undamped system having single degree of freedom; Free vibration of viscous damped system having single degree of freedom; Forced vibration of a viscous damped single degree freedom system subjected to harmonic excitation; Earthquake excitation (Base excitation) of a single degree freedom system.

UNIT-II

2) Elements of Earth Quake Ground motion

Earthquake size- Intensity and magnitude; Seismic Zoning-Introduction; Strong Motion Earthquakes - Introduction; Response spectrum (elastic); Local site effect (Effect of type of soil).

3) Elements of GeotechnicalEarthquake Engineering

Liquefaction – Definition and types, Effect of liquefaction on built environment, Evaluation of liquefaction susceptibility, Liquefaction hazard mitigation

Seismic slope stability – Introduction, Pseudo-static analysis, Sliding block methods

UNIT III

4) Analysis of single storey and single bay RCC Plane Frame (Columns vertical) : (As per IS:1893(part-I)-2016)

Calculation of lateral force due to earthquake using equivalent static method ; Analysis for different load combinations; Design forces and moments in beam and columns.

UNIT-IV

5)Design of single storey and single bay RCC plane frames (Columns vertical)

(As per IS:456-2000 and IS13920-2016) Design of column; Design of beam; Design of footing ; Detailing of entire frame

6) Masonry Structures

House types and damages, cause and location of damage, Understanding the knowledge hidden in your existing houses, Making houses earthquake resistant, Earthquake resistant features, Retrofitting-some examples, Technology choice, summary of earthquake resistant features, improving housing designs.

NOTE

Two questions of 14 marks each will be given from each unit out of which one is to be answered. Fourteen questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXT BOOKS

1)Elements of Earthquake Engineering by Jai Krishna, A.R.Chandrasekaran and Brijesh Chandra, Second Edition(1994), South Asian Publishers, New Delhi.

2) Geotechnical Engineering - S.K.Gulati&ManojDatta, Tata McGraw-Hill Publishing Company Ltd.

3)Earthquake Resistant Design of Structures by PankajAgarwal, Manish Shrikhande , First edition(2006), Prentice Hall of India Private Ltd., New Delhi .

4) Earthquakes and Buildings – A.S.Arya, A.Revi, Pawan Jain

CODES

IS:1893(part-I)-2016-
IS13920-2016 -
IS:456-2000 -
SP16

REFERENCE BOOK

1) Dynamics of Structures by A.K.Chopra, Second edition (2001), Prentice Hall India Private Ltd

GEOSYNTHETICS

IV B.Tech – VII Semester (Code: 20CE703/PEC04C)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3Hours)	:	70		

COURSE OBJECTIVES

- To understand the history and mechanism of reinforced soil
- To know the various types of geo-synthetics, their functions and applications.
- To know the Bearing Capacity improvement techniques.
- To enable the design of reinforced soil retaining structures.

COURSE OUTCOMES

CO1: Understand the history and mechanism of reinforcedsoil
CO2: Become aware about situations where geo-synthetics can be used.
CO3: Know about various types of geo-synthetics and their functions
CO4: Be able to do simple design of reinforced soil retaining walls and reinforced earth beds.

UNIT I

Introduction-history–ancient and modern structures-Types of geo-synthetics, advantages, disadvantages. Functions of geo-synthetics and application areas where these functions are utilizedsuch as in retaining walls, slopes, embankments, railway tracks, pavements etc. (general overview).Raw materials used for geo-synthetics, manufacturing process of woven and non-woven geotextiles,geo-membranes,geo-grids.

UNIT II

Properties of geo-synthetics. Creep and long term performance. Reinforced soil Advantages and disadvantages. Fills, Types of facings, Factors affecting the performance and behaviour of reinforcedsoil. Mechanism of reinforcement action - Equivalent Confining Stress Concept, Pseudo Cohesion Concept, Concept of Expandingsoil mass.– Simple problems.

UNIT III

Design and analysis of vertically faced reinforced soil retaining walls- External stability and Internalstability – Tie back wedge analysis and coherent gravity analysis with metallic strip and continuousgeo-synthetic reinforcements. Assumptions, limitations and numerical problems. Construction methods of reinforced retaining walls. Geo-synthetics in pavements, function and benefits.

UNITIV

Bearing capacity improvement using soil reinforcement – Binquet and Lee's analysis – Assumptions, failure mechanisms. Simple problems in bearing capacity.Geo-synthetics for short term stability of embankments on soft soils.Natural geotextiles, Advantages and disadvantages, functions, erosioncontrol-types of erosion control products, installation methods.

TEXTBOOKS:

1. Jones,C.J.F.P.(1985).Earthreinforcementandsoilstructures.Butterworth, London.
2. Rao, G.V. (2007). Geo-synthetics – An Introduction. Sai Master Geo-environmental ServicesPvt.Ltd., Hyderabad

REFERENCES:

1. Koerner, R.M. (1999). Designing with Geosynthetics, Prentice Hall, New Jersey, USA, 4thedition.

2. Rao, G.V., Kumar, S. J. and Raju, G.V.S.S. (Eds.).Earth Reinforcement – Design andConstruction.PublicationNo.314,CentralBoardofIrrigationandPower,New Delhi,2012.

3. Sivakumar Babu, G.L. (2006). An introduction to Soil reinforcement and geosynthetics. UnitedPress(India)Pvt.Ltd. COURSE

Ground Water Development and Management
IV B.Tech – VII Semester (Code: 20CE703/PEC04D)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30		Semester End Examination (3Hours)		:	70

COURSE OBJECTIVES:

- To provide knowledge on groundwater availability and distribution in different types of rocks
- To demonstrate the groundwater movement and groundwater reservoir parameters
- To develop the skills needed for ground water investigation
- To study the concept of artificial recharge of ground water
- To estimate the groundwater management concepts

COURSE OUTCOMES:

The student will be able to

CO1: Understand the location of ground water and the relationship with the rock type.
CO2: Assess the ground water movement and reservoir parameters
CO3: Use of the different techniques of ground water investigation
CO4: Apply RS & GIS techniques for artificial recharge of groundwater.
CO5: Apply conjunctive use technique for effective management of groundwater.

UNIT I

Introduction:

Ground Water Occurrence, Ground water hydrologic cycle, origin of ground water, rock properties effecting ground water, vertical distribution of ground water, zone of aeration and zone of saturation, geologic formation as Aquifers, types of aquifers, porosity, Specific yield and Specific retention.

Ground Water Movement:

Permeability, Darcy's law, storage coefficient, Transmissivity, differential equation governing ground water flow in three dimensions derivation, Ground water flow contours and their applications.

UNIT II

Analysis of Pumping Test Data – Steady flow

Steady flow towards a well in confined and unconfined aquifers – Dupit's and Theim's equations, Assumptions, Formation constants, yield of an open well and well tests.

Analysis of Pumping Test Data- Unsteady flow

Unsteady flow towards a well – Non equilibrium equations – Theis solution – Jocob and Chow's simplifications, Leaky aquifers.

UNIT III

Surface and Subsurface Investigation

Surface methods of exploration - Electrical resistivity and Seismic refraction methods.Subsurface methods – Geophysical logging and resistivity logging.Aerial Photogrammetry applications along with Case Studies in Subsurface Investigation.

Artificial Recharge of Ground Water

Concept of artificial recharge – recharge methods, relative merits. Applications of GIS and RemoteSensing in Artificial Recharge of Ground water along with Case studies.

UNIT IV

Saline Water Intrusion

Occurrence of Saline Water intrusion– Relation between fresh and saline waters – Ghyben–Herzberg equation – Shape and structure of fresh–salt water interface – Upcoming of saline water – Control of saline water intrusion – Examples of seawater intrusion.

Groundwater Modelling and Management Basic principles of groundwater modelling-Analog models-viscous fluid models and membrane models, digital models-Finite difference and finite element models, Concepts of groundwater management, basin management by conjunctive use-case studies.

LEARNING RESOURCES:

TEXT BOOKS

1 Groundwater by H.M. Raghunath, New Age International, 2008.
2 Ground water Hydrology by David Keith Todd, John Wiley & Sons, 1980

REFERENCES:

1. Fundamentals of Ground Water by Franklin W. Schwartz and Hubao Zhang, Wiley India Pvt.Ltd., 2012.
2. Groundwater System Planning & Management by R. Willis & W.W.G. Yeh, Printice Hall,1987.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

IRRIGATION STRUCTURES
IV B.Tech – VII Semester (Code: 20CE704/PEC05A)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	30		Semester End Examination (3Hours)	:	70	

Prerequisites: Fluid Mechanics [20CE305]
Hydraulics & Hydraulic Machines [20CE404]
Water Resources Engineering [20CE602]

Course Objectives:

- To study various methods measurement of water and Reservoir planning
- To design a Gravity dam
- To understand various types of earth dams and spillways
- To describe various types of cross drainage works and head works

Course Outcomes: Student will be able to

CO1: Interpretation of the stream gauging techniques and planning of reservoir
CO2: Determination of stability of the gravity dam using various methods
CO3: Interpretation of various types of earth dams and spillways
CO4: Interpretation ofvarious types of cross drainage works and diversion head works

UNIT – I

1.Stream gauging - Discharge measurement: Area velocity method, Slope area method, Chemical method, Ultrasonic method, Electromagnetic method; Measurement of velocity: Surface float, Sub–surface float, Velocity rod, Pitot tube, Current meter.

2. Reservoir Planning: Introduction; Investigations for reservoir planning; Selection of site for a reservoir; Zones of storage in a reservoir; Storage capacity and yield; Mass inflow curve and demand curve; Calculation of reservoir capacity for a specified yield from the mass inflow curve; Determination of safe yield from a reservoir of a given capacity; Sediment flow in streams; Reservoir sedimentation; Life of reservoir; Reservoir sediment control.

UNIT – II

3. Dams in General: Introduction; Classification; Physical factors governing selection of type of dam.

4.Gravity Dams - Introduction; Forces acting on a gravity dam; Modes of failure and criteria for stability requirements; Stability analysis; Elementary Profile of a gravity dam; Practical profile of a gravity dam; Limiting height of a gravity dam; High and low gravity dams; Design of gravity dams.

UNIT – III

5. Earth dams: Introduction; Types of earth dams; Causes of failure of earth dams; Criteria for safe design of earth dams.

6. Spillways: Introduction; Types of spillways; Energy dissipation below spillways.

UNIT – IV

7. Diversion Head Works- Component parts of a Diversion Head work; Weirs and barrages- Types of weirs; Causes of failure of weirs and their remedies; Design of weirs on permeable foundations –Bligh's creep theory.

8. **Cross Drainage Works -**Introduction; Types of cross drainage works; Selection of suitable type of cross - drainage work; Classification of Aqueducts and Syphon Aqueducts.

TEXT BOOKS:

1. Irrigation and water power engineering by Dr. B.C. Punmia& Dr. Pande B.B. Lal; Laxmi Publications Pvt. Ltd., New Delhi.
2. Irrigation Engineering and Hydraulic structures by S. K. Garg; Khanna Publishers, Delhi.

REFERENCE BOOKS:

1. Irrigation, Water Resources & Water Power Engineering by Dr. P.N. Modi; Standard Book House, New Delhi.
2. Irrigation, water power and water resources engineering by K R Arora, Standard Publishers,New Delhi
3. Irrigation Engineering and Hydraulic Structures by S.R. SahasraBudhe; Katson Publishing House, Ludhiana

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	-	-	-	1	-	-	-	-	-	-	3	2	-	1
CO2	3	2	1	-	-	1	-	-	-	-	-	-	3	2	-	1
CO3	3	1	-	-	-	1	-	-	-	-	-	-	3	2	-	1
CO4	3	2	-	-	-	1	-	-	-	-	-	-	3	2	-	1

PAVEMENT ANALYSIS AND DESIGN
IV B.Tech – VII Semester (Code: 20CE704/PEC05B)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

Course Objectives:

- To discuss the Variables Considered in Pavement Design.
- To discuss the various stresses induced in pavements.
- To assess the properties of materials and mixes.
- To design the flexible and rigid pavements.

.

Course Outcomes: Student will be able to

CO1: Assess the factors Considered in Pavement Design.
CO2: Analyse the stresses induced flexible and rigid pavements.
CO3: Characterize the response characteristics of soil, aggregate, asphalt, and asphalt mixes.
CO4: Determine the crust thickness of the flexible and rigid pavement.

UNIT – I

Factors Affecting Pavement Design: Variables Considered in Pavement Design, Types of Pavements, Functions of Individual Layers, Classification of Axle Types of Rigid Chassis and Articulated Commercial Vehicles, Legal Axle and Gross Weights on Single and Multiple Units, Tire Pressure, Contact Pressure, EAL and ESWL Concepts, Traffic Analysis: ADT, AADT, Truck Factor, Growth Factor, Lane, Directional Distributions & Vehicle Damage Factors, Effect of Transient & Moving Loads.

UNIT – II

Stresses in Pavements: Stress Inducing Factors in Flexible and Rigid pavements. Stresses in Flexible Pavements: Visco-Elastic Theory and Assumptions, Layered Systems Concepts, Stress Solutions for One, Two and Three Layered Systems, Fundamental Design Concepts. Stresses In Rigid Pavements: Westergaard's Theory and Assumptions, Stresses due to Curling, Stresses and Deflections due to Loading, Frictional Stresses, Stresses in Dowel Bars & Tie Bars.

UNIT – III

Material Characteristics: Modulus of Subgrade Reaction of Soil, Mineral aggregates – Blending of aggregates, binders, polymer and rubber modified bitumen, Resilient and Complex (Dynamic) Moduli of Bituminous Mixes, Permanent Deformation Parameters and other Properties, Effects and Methods of Stabilization and Use of Geo Synthetics.

UNIT – IV

Design of Pavements: Flexible Pavement Design by IRC Method, Concepts of Asphalt Institute's Methods with HMA and other Base Combinations, AASHTO.
Rigid Pavements: IRC Method of Design,Concepts of PCA & AASHTO method.
Pavement design for low volume roads, rural road designs – code of practice.
Design of Overlays: Types of Overlays, Suitability, Design of overlays.

Text/Reference Books:

1. Pavement Analysis & Design, Yang H. Huang, Prentice Hall Inc
2. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, 'Highway Engineering', Revised 10th Edition, Nem Chand & Bros.
3. Relevant codes from Indian Roads Congress (IRC:37-2018)for design of Flexible and Rigid Pavements(IRC:58-2015) and overlay design, Bureau of Indian standards (BIS), Ministry of Road Transport and Highways (MoRT&H-2013), and Asphalt Institute Manuals (AI).

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

Disaster Preparedness & Planning Management
IV B.Tech – VII Semester (Code: 20CE704/PEC05D)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

Course Objectives:

- To Understand basic concepts in Disaster Management
- To Understand Definitions and Terminologies used in Disaster Management
- To Understand Types and Categories of Disasters
- To Understand the Challenges posed by Disasters
- To understand Impacts of Disasters Key Skills

Learning Outcomes:

CO1: The application of Disaster Concepts to Management.

CO2: Analyzing Relationship between Development and Disasters.

CO3: Ability to understand Categories of Disasters.

CO4: Realization of the responsibilities to society

Course Syllabus:

Unit 1: Introduction - Concepts and definitions: disaster, hazard, vulnerability, risk severity, frequency and details, capacity, impact, prevention, mitigation). Disasters - Disasters classification; natural disasters (floods, drought, cyclones, volcanoes, earthquakes, tsunami, landslides, coastal erosion, soil erosion, forest fires etc.); manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills, transportation accidents, terrorist strikes, etc.); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

Unit 2: Disaster Impacts - Disaster impacts (environmental, physical, social, ecological, economic, political, etc.); health, psycho-social issues; demographic aspects (gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

Unit 3: Disaster Risk Reduction (DRR) - Disaster management cycle – its phases; prevention, mitigation, preparedness, relief, and recovery; structural and non-structural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post disaster environmental response (water, sanitation, food safety, waste management, disease control, security, communications); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programs in India and the activities of National Disaster Management Authority.

Unit 4: Disasters, Environment and Development - Factors affecting vulnerability such as the impact of developmental projects and environmental modifications (including dams, land-use changes, urbanization, etc.), sustainable and environmentally friendly recovery; reconstruction, and development methods.

Text/Reference Books:

- http://ndma.gov.in/ (Home page of National Disaster Management Authority)
- http://www.ndmindia.nic.in/ (National Disaster management in India, Ministry of Home Affairs).
- Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
- Singh B.K., 2008, Handbook of Disaster Management: Techniques & Guidelines, Rajat Publication.
- Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation
- Disaster Medical Systems Guidelines. Emergency Medical Services Authority, State of California, EMSA no.214, June 2003
- Inter-Agency Standing Committee (IASC) (Feb. 2007). IASC Guidelines on Mental Health and Psychosocial Support in Emergency Settings. Geneva: IASC

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

SOLID AND HAZARDOUS WASTE MANAGEMENT
IV B.Tech – VII Semester (Code: 20CE704/PEC05D)

Lectures	3	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

COURSE OBJECTIVES:

- To explain brief introduction about suitable methods for collection, transport, recovery, reuse and disposal of solid waste.
- To explain brief introduction about various functional elements of hazardous waste management.
- To introduce various physicochemical methods of solid and hazardous waste treatment with special emphasis on recovery and reuse of solid waste.
- To introduce various biological methods of solid and hazardous waste treatment.

COURSE OUTCOMES:

CO1: Explain municipal solid waste management systems with respect to its physical properties, types and composition of solid waste with methods of handling, sampling and storage of solid waste.

CO2: Explain hazardous waste management systems with respect to its physical properties, types, composition of waste and their health effects.

CO3: Appraise the current practices available and physicochemical methods of handling, sampling and disposal of solid and hazardous waste

CO4: Select the appropriate biological methods for solid waste collection, transportation, redistribution and disposal.

UNIT –I

Municipal Solid Waste Management – Fundamentals

Introduction of solid waste;Sources; composition; generation rates; collection of waste; separation, transfer and transport of waste; treatment and disposal options

UNIT-II

Hazardous Waste Management – Fundamentals

Characterization of waste; compatibility and flammability of chemicals; fate and transport of chemicals; health effects

UNIT- III

Physicochemical Treatment of Solid and Hazardous Waste

Chemical treatment processes for MSW (combustion, stabilization and solidification of hazardous wastes); physicochemical processes for hazardous wastes (soil vapor extraction, air stripping, chemical oxidation); ground water contamination and remediation

UNIT – IV

Biological Treatment of Solid and Hazardous Waste

Composting; bioreactors; anaerobic decomposition of solid waste; principles of biodegradation of toxic waste; inhibition; co-metabolism; oxidative and reductive processes; slurry phase bioreactor; in-situ remediation

References/Text Books:

1. VesilindP.A.,WorrellW.andReinhartD.R.,"SolidWasteEngineering",Thomson Books.
2. BhideA.D.andSundaresanB.B.,"SolidWasteManagement,Collection,Processingand Disposal",Nagpur.
3. Pichtel,John.WasteManagementPractices:Municipal,HazardousandIndustrial.CRC Press, Taylor and Francis Group,2005.
4. LaGrega,MichaelD.,Buckingham,PhilipL.andEvans,JeffreyC.HazardousWaste Management. Waveland Press Inc., Reissue Edition,2010.

Video Lectures (Web Links):

1. http://nptel.ac.in/courses/105106056/

BRIDGE ENGINEERING
IV B.Tech – VII Semester (Code : 20CE705/JOE03A)

Lectures	2	Tutorial	0	Practical	2	Credits	3
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

(Working stress method is to be adopted for all designs)

COURSE OBJECTIVES

- The main aim of this course is to enable students to choose the appropriate bridge type for a given project and to analyses and design the main components of the chosen bridge.
- Discuss the IRC standard live loads and design the deck slab type bridges.
- Design of T-Beam bridges using various methods.
- Design of sub structure parts of the bridge.
- Design of various bridge foundations and discuss the different types of bridge bearings.

LEARNING OUTCOMES:

Upon successful completion of this course the student will be able to
CO1: Classify the different bridges and surveys to be conducted.
CO2: Apply design aspects of culvert subjected to different IRC loads
CO3: Apply design aspects of T-beam bridge subjected to different IRC loads
CO4: Describe different loads on piers and abutments
CO5: Understand the design aspects of bridge foundations and bearings

UNIT – 1

1. Introduction & Investigation for Bridges

Components of a Bridge; Classification; Need for Investigation; Selection of Bridge Site; Preliminary Data to be Collected; Preliminary Drawings; Economical Span; Location of Piers and Abutments; Vertical clearance above HFL; Scour depth; Choice of Bridge type; Importance of Proper Investigation.

UNIT – II

2. Standard specification for road bridges

IRC Bridge code: width of carriageway: clearances: loads to be considered – dead load: IRC standard live loads: impact effect.

3. Design of Culverts

Design of Reinforced concrete slab culvert.

UNIT – III

4. Design of T – Beam Bridge

Pigeaud's method for computation of slab moments; Courbon's method for computation of moments in girders; Design of simply supported T – beam bridge.

UNIT – IV

5. Sub Structure for Bridges

Pier and abutment caps; Materials for piers and abutments; Design of pier; Design of abutment; Backfill behind abutment.

UNIT – V

6. Foundations for Bridges

Scour at abutments and piers; Grip length; Types of foundations; Design of well foundation.

7. Bearings for Bridges

Importance of bearings; Bearings for slab bridges; Bearings for girder bridges; Expansion bearings; Fixed bearings; Design of elastomeric pad bearing.

NOTE

Two questions of 14 marks each will be given from each unit, out of which one is to be answered.

TEXT BOOKS

1. Essentials of Bridge Engineering by Dr. Johnson Victor; Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Design of Bridge Engineering by T.R Jagadeesh, M.A Jayaram, PHI Learning Pvt. Ltd, New Delhi
3. Bridge Engineering by Rangwala, Charotar Publishing House Pvt. Ltd.,

REFERENCE BOOKS

1. Design of Bridges by N. Krishna Raju, Publisher: Oxford & IBH Publishing Co Pvt. Ltd.
2. Bridge Engineering by S. Punnuswamy, (Third Edition 2017) Mcgrawhill Education Pvt. Ltd.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	2	-	-	-	1	-	-	-	-	-	-	3	2	-	1
CO2	3	2	1	-	-	1	-	-	-	-	-	-	3	2	-	1
CO3	3	1	-	-	-	1	-	-	-	-	-	-	3	2	-	1
CO4	3	2	-	-	-	1	-	-	-	-	-	-	3	2	-	1
CO5																

OPEN ELECTIVE

REMOTE SENSING &GIS

IV B.Tech – VII Semester (Code: 20CE706/OEC01)

Lectures	2	Tutorial	0	Practical	2	Credits	3
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

COURSE OBJECTIVES:

- Learn basic concepts of Aerial Photographs.
- Learn basic concepts of remote sensing and its characteristics, satellite sensors andplatforms.
- Know about satellite digital image processing and classification techniques.
- Understand the basic concepts GIS, spatial data and analysis.
- applications of GPS in surveying.
- Know various remote sensing and GIS applications in civil engineering.

COURSE OUTCOMES:

CO1: Analyse the principles and components of photogrammetry & Interpret Information from Aerial Photographs.

CO2: Exposure on Basics of Remote Sensing, Satellite Sensors and Platforms, Practical Knowledge on Satellite Image Classification.

CO3: Know Basics of GIS And Map Making. Exposure About Spatial Analysis Using Overlay Tools.

CO4: Exemplying GeoTag Assets Using GPS And Add Attribute & MetaData, Get the Knowledge on Various Remote Sensing and GIS Applications in Civil Engineering.

UNIT- I

PHOTOGRAMMETRY:

Fundamentals of Photogrammetry and Photo interpretation – types of photographs;Vertical photographs – principal point; scale; Stereoscopy; Overlap, side lap and flight planning.

UNIT – II

REMOTE SENSING:

Introduction to Remote Sensing: Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, interaction with atmosphere and target –

Sensors and platforms: Introduction, types of sensors, airborne remote sensing, Space-borne remote sensing. Visual Interpretation Techniques.

Overview of Indian Remote sensing satellites and sensors, satellite definition and types, characteristics of satellite, characteristics of satellite orbit

UNIT – III

GEOGRAPHIC INFORMATION SYSTEM (GIS)

Introduction, key components, data entry &preparation – Spatial data input, Raster Data Model, Vector Data Model, Raster Vs Vector.advantages and dis advantages of Raster & Vectornetwork analysis - concept and types, Data storage-vector data storage, attribute data storage.

UNIT - IV

GLOBAL POSITIONING SYSTEM (GPS)&RS AND GISAPPLICATIONS:

GPS definition, components of GPS, GPS receivers.Space, Control and User segments of GPS.Advantages and disadvantages of GPS, Limitations and applications of GPS Indian Systems (IRNSS, GAGAN)Development of GPS surveying techniques, Navigation with GPS, Applications of GPS.

Applications: Photogrammetry, Remote Sensing and Geographical information Systems

TEXT BOOKS:

1. Bhatta B (2008), 'Remote sensing and GIS', Oxford University Press
2. Chang, K. T. (2006). Introduction to Geographic Information Systems. The McGraw-Hill.
3. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) 'Remote Sensing and Image Interpretation', Wiley India Pvt. Ltd., New Delhi
4. Schowenger, R. A (2006) 'Remote Sensing' Elsevier publishers.
5. Parkinson,B. W., Spilker, J. J. (Jr.) (1996). Global Positioning System: Theory & Applications (Volume-I). AIAA, USA

REFERENCE BOOKS:

1. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, 2013.
2. 'Fundamentals of Geographic Information Systems' by Demers, M.N, Wiley India Pvt.Ltd, 2013.
3. Jensen John R. Introduction to Digital Image Processing: A Remote Sensing Perspective Prentice hall, New Jersey
4. Paul Wolf, Elements of Photogrammetry, McGraw Hill.
5. Leick Alfred, 1995: GPS Satellite Surveying, Wiley Interscience
6. Burrough, P. P. &McDonnel, R. A. (1998). Principles of GIS. Oxford University Press.

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-
CO2	3	1	3	3	3	-	-	-	-	-	-	-	2	-	1	-
CO3	3	-	3	3	3	-	-	-	2	-	-	-	-	-	1	2
CO4	3	1	3	3	3	-	-	-	2	-	-	-	2	-	2	2

OPEN ELECTIVE

AIR POLLUTION & CONTROL

IV B.Tech – VII Semester (Code: 20CE706/OEC02)

Lectures	2	Tutorial	0	Practical	2	Credits	3
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

COURSE OBJECTIVES:

- To take up the basic concepts of sources and effects of Air Pollution
- The contents involved the knowledge of the effect of metrological parameters on air pollution
- The contents involved the knowledge of the control of air pollution from particulates
- To develop skills relevant to control of gaseous pollution and also introduce about Air Quality Management

COURSE OUTCOMES: On the completion of the course one should be able to understand:

CO1: The concepts ofsources of air and effects of Air Pollution.
CO2: Be able to understand the effects of Air Pollution with meterological factors.
CO3: The knowledge about particulate control by different devices.
CO4: Be able to develop gaseous pollution control technologies.

UNIT –I

Air Pollution –Definitions, Air Pollutants–Classifications –Natural and Artificial– Primary and Secondary, point and Non-Point, Line and Areal Sources of air pollution-stationary and mobile sources.

Effects of Air pollutants on man, material land vegetation: Global effects of air pollution – Green House effect ,Heat Islands, Acid Rains, Ozone Holes etc.

UNIT –II

Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomenon Air Quality-wind rose diagrams.

UNIT – III

Lapse Rates, Pressure Systems, Winds and moisture plume behavior and plume Rise Models; Theory and problem related to Gaussian dispersion model.

Control of particulates –Control at Sources, Process Changes, Equipment modifications, Design and operation of control. Equipment's–Settling Chambers, Centrifugal separators, filters Dry and Wetscrubbers, Electrostatic precipitators.

UNIT – IV

General Methods of Control of NOx and Sox emissions–In-plant Control Measures, process changes, dry and wet methods of removal and recycling.
Air Quality Management–Monitoring of SPM, SO;NO and CO Emission Standards.

NOTE:
Two questions of 12 marks each will be given from each unit out of which one is to be answered. Twelve questions of one mark each will be given from entire syllabus which is a compulsory question.

TEXTBOOKS:

1. Air pollution By M.N.Rao and H.V.N.Rao –Tata Mc.Graw Hill Company.
2. Air pollution by Warkand Warner.- Harper & Row, New York.

REFERENCE BOOK:

1.An introduction to Air pollution by R.K.Trivedy and P.K.Goel,B.S.Publications

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	2	3	-	1	-	3	3	1	-	-	-	-	3	3	1	2
CO2	3	2	3	1	2	1	2	-	-	-	-	-	2	2	1	1
CO3	3	3	3	2	2	1	3	-	-	-	-	1	2	3	2	2
CO4	2	3	3	3	2	1	3	1	-	-	-	1	2	3	2	1

BAPATLA ENGINEERING COLLEGE:: BAPATLA
(Autonomous)

QUANTITY ESTIMATION & PROJECT MANAGEMENT LABORATORY
IV B.Tech – VII Semester (Code: 20CEL701/SOC05)

Lectures	1	Tutorial	0	Practical	2	Credits	2
Continuous Internal Assessment		:	30	Semester End Examination (3 Hours)			70

Note: A minimum of twelve (12No) shall be done and recorded

UNIT – I

*(At least **SIX** of the following using softwares like MS Excel/ Qty./Road Estimate/Super Rate analysis etc.)*

1.Quantity estimation of a single storey residential building (different items).
2. Cost estimation of a single storey residential building.
3. Quantity estimation of a B.T.Road(different items).
4. Cost estimation of a B.T.Road.
5. Quantity estimation of a Canal (different items).
6. Cost estimation of a Canal.
7. Find out the labour requirement and preparing the Rate Analysis for different items of work. a) C.C b) R.C.C c) Brick work d) Flooring

Unit- II

*(Any **THREE** of the following using softwares like MS Project / Primavera etc.)*

8.Preparing the Project management report for a single storey residential building/Road/Canal by using the Bar Chart/Mile stone chart.
9. Preparing the Project management report for a single storey residential building by using the network technique (PERT/CPM).
10. Preparing the Project management report for a B.T.Road by using the network technique (PERT/CPM).
11. Preparing the Project management report for a Canal by using the network technique (PERT/CPM).

Unit- III

*(At least **THREE** of the following by using soft ware's like MS Excel)*

12. Quantity estimation of RCC roof slab and preparing schedule of bars
13. Quantity estimation of RCC beam and preparing schedule of bars
14. Quantity estimation of RCC Column with foundation footing and preparing schedule of bars.
15. Quantity estimation of RCC retaining wall and preparing schedule of bars

Mapping of Course Outcomes with Program Outcomes & Program Specific Outcomes																
	PO's												PSO's			
CO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**
CO1	3	-	-	-	2	-	-	3	3	3	-	2	-	2	2	-
CO2	3	-	-	-	3	-	-	3	3	3	2	2	-	2	2	-
CO3	3	-	-	-	2	-	-	3	3	3	-	2	-	2	2	-