Bapatla Engineering College

(*Autonomous*)

BAPATLA

B.Tech

Civil Engineering

Course Structure (w.e.f. 2020-21)

Bapatla Engineering College:: Bapatla

(Autonomous underAcharyaNagarjuna University)
(Sponsored by Bapatla Education Society)
BAPATLA - 522102 Guntur District, A.P.,India
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Bapatla Engineering College::BAPATLA

(Autonomous)
Academic Regulations
Regulations for Four Year Bachelor of Technology (B.Tech) Degree programme for the Batches admitted from the academic year 2020-21

B.Tech Regular Four Year Degree Programme
(Academic Regulations as amended in November 2021)

Preliminary Definitions and Nomenclature AICTE: Means All India Council for Technical Education, New Delhi.

Autonomous Institute: Means an institute designated as Autonomous by University GrantsCommission (UGC), New Delhi in concurrence with affiliating University (AcharyaNagarjuna University, Guntur).

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

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

Academic Year: It is the period necessary to complete an actual course of study within a year. It comprises two main semesters i.e., one odd and one even.

Branch: Means specialization in a program like B.Tech degree program in Civil Engineering, B.Techdegree program in Computer Science and Engineering etc.

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

Backlog Course: A course is considered to be a backlog course, if the student has obtained afailure grade in that course.

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

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

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

Certificate Course: It is a course that makes a student to have hands-on expertise and skills requiredfor holistic development in a specific area/field.

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

Internal Examination: It is an examination conducted towards sessional assessment.

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

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

Course Outcomes: The essential skills that need to be acquired by every student through a course.
Credit: A credit is a unit that gives weight to the value, level or time requirements of an academiccourse. The number of 'Contact Hours' in a week of a particular course determines its credit value. One credit is equivalent to one lecture/tutorial hour per week.

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

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

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

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

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

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

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

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

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

Institute: Means Bapatla Engineering College, Bapatla, unless indicatedotherwise by the context.

Massive Open Online Courses (MOOC): MOOCs inculcate the habit of self-learning. MOOCswould be additional choices in all the elective group courses.

Minor: Minors are coherent sequences of courses which may be taken in addition to the coursesrequired for the B.Tech degree.

Pre-requisite: A specific course or subject, the knowledge of which is required to complete beforestudent register another course at the next grade level.

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

Program: Means, UG degree program: Bachelor of Technology (B.Tech).

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

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

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

Regulations: The regulations, common to all B.Tech programs offered by Institute, are designatedas "BEC Regulations – R20" and are binding on all the stakeholders.

Semester: It is a period of study consisting of 16 to 18 weeks of academic work equivalent tonormally 90 working days. Odd semester commences usually in July and even semester in December of every year.

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

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

University: Means AcharyaNagarjuna University, Guntur.

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:

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

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.

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

iv. A student will be permitted to register either for Honours degree or additional minor engineeringbut not both.

1. 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

2. 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

4. Credits:

i. *Credit:* A unit by which the course work is measured. It determines the number of hours ofinstructions 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 theprescribed courses.

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

Description	Periods/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	-	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	Open Electives	Open Elective Courses- from other technical/ emerging and job oriented	OE	12
6	Professional Courses	Professional Elective Courses relevant to chosen specialization/ branch	PE	18
7	Project Work	Project Work, Seminar, Internship in industry elsewhere	PW	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	SC	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 150 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 50 marks for Internal Evaluation and 100 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
Drawing	30	70
Practical	30	70
Summer / Industrial / Research Internship	--	100
Project work	50	100

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 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.

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 (Approx. 35%) 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 (Approx. 35%) 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) In case of the Project work, the evaluation shall be based on CIE and SEE. The CIE for 50 marks consists of a minimum of two Seminars / presentations for 20 marks and the Project Report submitted at the end of the semester which is evaluated for 30 marks.

b) A minimum of 25 (50%) marks are to be secured exclusively in the Continuous Internal Evaluation (CIE) in order to be declared as passed in the Project Work and eligible to write the SEE in the Project Work.

c) SEE shall be evaluated in the form of a Viva- voce and the demonstration of the thesis work for 100 marks. Viva-voce Examination in Project Work shall be conducted by one internal examiner and one external examiner to be appointed by the Principal.

d) A minimum of 40 (40%) marks shall be obtained in SEE exclusively in order to be declared as passed in the Project and for the award of the grade.

NOTE : A student who is absent for any Test / Exam / Seminar / Presentation as a part of Continuous Internal Evaluation (CIE), for any reason whatsoever, shall be deemed to have scored zero marks in the respective component and no provision for make-up shall be provided.

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.

Summer semester: Further the students can register maximum three (theory + lab courses together) courses in the summer semester. Summer semester courses shall be of both even & odd semesters. Summer semester shall be conducted immediately after completion of even semester end examinations.

The HODs concerned have to allot a teacher related to that course to conduct class work. The minimum number of periods to be conducted should not be less than 75% of the total prescribed periods for that course. The classes will be conducted in the vacation period or in the weekends or in the afternoons as decided by the HOD concerned. Teacher has to evaluate the student for his performance in CIE as per the autonomous norms and the qualified students should appear for a semester end examination. The pass criteria in both CIE & SEE should be as per autonomous norms.

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 four be Open Electives / Job Oriented Courses common to all disciplines from V Semester to VII, where in the students shall choose the electives offered by various departments including his/her own department insuchamannerthathe/shehasnot studied the same course in any form during theProgramme.

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.

6.8 Thereshallbe a mandatory**inductionprogram**forthreeweeksbeforethecommencementoffirst semester.

6.9 Minor in a discipline (Minor degree/programme) concept is introduced in the curriculum for all conventional B. Tech programmes 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. programme.

a. i)Students who are desirous of pursuing their special interest areas other than the chosendisciplineofEngineeringmayoptforadditionalcoursesinminorspecialization 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 CivilEngineering

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 tracketc.

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,MEetc or industry tracks such as Artificial Intelligence (AI), Machine Learning (ML), Data Science (DS), Robotics, Electric vehicles, Robotics, VLSIetc.

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

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 theprogram.

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 studentsmaybepermittedtoregisterfortheequivalentMOOCcoursesasapprovedby the concerned Head of the department in consultation withBOS.

f. A student shall be permitted to register for Minors program at the beginning of 4thsemester subject to a maximum of two additional courses per semester, provided that the student must have acquired 8 SGPA (Semester Grade point average) upto the endof2ndsemesterwithoutanyhistoryofbacklogs.Itisexpectedthatthe3rdsemester resultsmaybeannouncedafterthecommencementofthe4thsemester.Ifastudentfails toacquire8SGPAupto3rdsemesterorfailedinanyofthecourses,hisregistrationfor Minors program shall stand cancelled. An SGPA of 8 has to be maintained in the subsequent semesters without any backlog in order to keep the Minors 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. 160credits).

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 theProgramme.

i. In addition to the 16 credits, students must pursue at least 2 courses through MOOCs.Thecoursesmustbeofminimum8weeksinduration.Attendancewillnotbe monitored for MOOC courses. Student has to acquire a certificate from the agencies

approvedbytheBOSwithgradingormarksorpass/failinordertoearn4credits.Ifthe MOOC course is a pass/fail course without any grades, the grade to be assigned as decided by the university/academiccouncil.

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 industrialdemand.

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 appropriategrades.

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)"gradeandalsochoosetoomitthementionofthecourseasforthefollowing: 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 thetranscript.

m. IncaseastudentfailstomeettheCGPArequirementforB.TechdegreewithMinorat 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 bythem.

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

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

p. Students fulfilling the stipulated criterion can register for a Minor by paying a prescribed registration fee.

6.10 Honors degree in a discipline:

StudentsofaDepartment/DisciplineareeligibletooptforHonorsProgrammeoffered by the sameDepartment/Discipline.

a. AstudentshallbepermittedtoregisterforHonorsprogramatthebeginningof4thsemester provided that the student must have acquired a minimum of 8.0 SGPA upto the end of 2 semester without any backlogs. In case of the declaration of the3rd semester results after the commencement of the 4thsemester and if a student fails to score the required minimum of 8 SGPA, his/her registration for Honors Programme

stands cancelled and he/she shall continue with the regular Programme.

b. Studentscanselecttheadditionalandadvancedcoursesfromtheirrespectivebranchin 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 Programme, a student shallearn20additionalcreditstobeeligiblefortheawardofB.Tech(Honors)degree. This is in addition to the credits essential for obtaining the Under Graduate Degree in Major Discipline (i.e. 160credits).

d. 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 ofstudies.

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 advancedcourses.

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 withBOS.

g. Each pool can have theory as well as laboratory courses. If a course comes with a lab component,thatcomponenthastobeclearedseparately.TheconcernedBOSshallexplor ethepossibilityofintroducingvirtuallabsforsuchcourseswithlabcomponent. (Model pool list is enclosed in theAnnexure-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 approvedbytheBOSwithgradingormarksorpass/failinordertoearncredits.Ifthe MOOCcourseisapass/failcoursewithoutanygrades,thegradetobeassignedwillbe as decided by the BOS/academiccouncil.

i. The concerned BOS shall also consider courses listed under professional electives of therespectiveB.TechprogramsfortherequirementsofB.Tech(Honors).However,a student shall be permitted to choose only those courses that he/she has not studied in any form during theProgramme.

j. If a student drops or is terminated from theHonors 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 DegreewithHonorsandtheywillreceiveregularB.Techdegreeonly.However,such students will receive a separate grade sheet mentioning the additional courses completed bythem.

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

m. Minimum enrollment for the Honors to be offered is 12.

n. Students fulfilling the stipulated criterion can register for Honors by paying a prescribed registration fee.

6.11 National Service Scheme (NSS)/YogaiscompulsoryforalltheUndergraduatestudents.Thestudentparticipationshallbefo raminimumperiodof45hoursduringthefirstyear. GradeswillbeawardedasVeryGood,Good,Satisfactory in the mark sheet on the basis of participation, attendance, performance and behaviour. If a student gets Un-satisfactory grade,he/shehastorepeat theaboveactivityinthesubsequentyears along with the next yearstudents.

6.12 Students shall undergo two summer internships eachfor a minimum of sixweeks durationattheendofsecondandthird years of the programme 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 Project 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 project 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 focussing 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 mandatoryfullinternshipinthefinalsemester (VIII Semester) oftheProgrammealongwiththeproject 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 50 marks by the departmental committee consisting of Head of the Department, Project supervisor and a senior faculty member. The Viva-Voce shall be conducted for 100 marks by a committee consisting of HOD, Project Supervisor 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 ofthefiveskillcourses,twoshallbeskill-orientedprogramsrelatedtothedomainand these two shallbe completedinsecondyear.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. Thecreditsassignedtotheskilladvancedcourseshallbeawardedtothestudentuponproducingthe Course Completion Certificatefromtheagencies /professionalbodies.

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 stipulatedfeeshallbepayabletowardscondonationofshortageofattendance 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.

And 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.

8.5 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)	4
< 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 denotedby 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	≥ 4.0 < 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 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.	Expulsion from the examination hall and cancellation of the performance in that 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	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.

	appearing.	
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 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.	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.
9	Leaves the exam hall taking away answer script or intentionally tears up the script or any part there of inside or	Expulsion from the examination hall and cancellation of performance in that course and all the other courses including practical

	outside the examination hall.	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.

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Civil Engineering

Effective From the Academic Year2020-2021

First Year B.Tech(SEMESTER – I)

Code No.	Category Code	Subject	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 ODE	3	0	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/HS01	HS	Communicative English	3	0	0	3	30	70	100	3
20CE105	ES	Electrical Technology& Mechanical Technology	3	0	0	3	30	70	100	3
20CEL101/CSL01	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/HSL01	HS	Communication Lab	0	0	3	3	30	70	100	1.5
		Induction Program								
TOTAL			**16**	0	**10**	**26**	**240**	**560**	**800**	**21**

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture, T: Tutorial, P: Practical

BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses

MC: Mandatory course

1 Hr. Lecture (L) per week - 1 credit

1 Hr. Tutorial (T) per week - 1 credit

1 Hr. Practical (P) per week - 0.5 credits

2 Hours Practical (Lab)/week - 1 credit

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Civil Engineering

Effective From the Academic Year2020-2021

First Year B.Tech (SEMESTER – II)

Code No.	Category Code	Subject	Scheme of Instruction (Periods 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	3	0	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	0	0	3	3	30	70	100	1.5
20CE01/MC01	MC	Environmental Studies	3	0	0	3	30	-	30	0
NCC/NSS										
TOTAL			**16**	**0**	10	**26**	**240**	**490**	**730**	**18**

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture, T: Tutorial, P: Practical

BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses

MC: Mandatory course

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Civil Engineering

Effective From the Academic Year2020-2021

Second Year B.Tech (SEMESTER – III)

Code No.	Category Code	Subject	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	3	0	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
20CE306/SOL01	SOC	MATLABProgramming for Civil Engineers	1	0	2	3	30	70	100	2
20CEL301	PCL	Building Drawing Lab	0	0	3	3	30	70	100	1.5
20CEL302	ESL	Engineering Geology Lab	0	0	3	3	30	70	100	1.5
20CEL303	PCL	Surveying Lab	0	0	3	3	30	70	100	1.5
20CE307/MC02	MC	Professional Ethics	2	0	0	2	30		30	0
TOTAL			**18**	0	**11**	**29**	**300**	**630**	**930**	***21.5***

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture, T: Tutorial, P: Practical

BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses

MC: Mandatory course PC: Professional Core courses SOC : Skill Oriented course

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Civil Engineering

Effective From the Academic Year2020-2021

Second Year B.Tech (SEMESTER – IV)

Code No.	Category Code	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CE401/HS02	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
20CE406/SOL02	SOC	Soft skills Lab	1	0	2	3	30	70	100	2.0
20CEL401	PCL	Environmental Engineering Lab	0	0	3	3	30	70	100	1.5
20CEL402	PCL	H & HM Lab	0	0	3	3	30	70	100	1.5
20CEL403	PCL	Materials Testing Laboratory	0	0	3	3	30	70	100	1.5
TOTAL			**16**	**0**	11	**27**	**270**	**630**	**900**	***21.5***
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)										***4***

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture, T: Tutorial, P: Practical

BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses

MC: Mandatory course PC: Professional Core courses SOC : Skill Oriented course

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Civil Engineering

Effective From the Academic Year2020-2021

Third Year B.Tech(SEMESTER – V)

Code No.	Category Code	Subject	Scheme of Instruction (Periods 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/	OPE/JOE	JOE-I	2	0	2	4	30	70	100	3
20CE505	PEC	PE-I	3	0	0	3	30	70	100	3
20CE5L1	PCL	Geo technical Engineering Laboratory	0	0	3	3	30	70	100	1.5
20CEL502/CSL	ESL PCL (Interdisciplinary	Python Programming Laboratory	0	0	3	3	30	70	100	1.5
	SOC (Advanced)	BIM	1	0	2	3	30	70	100	2
	MC	Indian Constitution	2	0	0	2	30	-	30	0
Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester										*1.5*
TOTAL			**17**	**0**	10	**27**	**270**	**560**	**830**	***21.5***
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)										***4***

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture, T: Tutorial, P: Practical

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Civil Engineering

Effective From the Academic Year2020-2021

Third Year B.Tech (SEMESTER – VI)

Code No.	Category Code	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CE601	PC	Estimation & Quantity Surveying	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/	PEC	PE-II	3	0	0	3	30	70	100	3
20CE605	OEC/JOE	JOE-II	2	0	2	4	30	70	100	3
20CE6L1	PCL	Advanced Surveying Laboratory	0	0	3	3	30	70	100	1.5
20CE6L2	PCL	Structural Analysis Design and Detailing Laboratory	0	0	3	3	30	70	100	1.5
20CE6L3	PCL	Transportation Engineering Laboratory	0	0	3	3	30	70	100	1.5
	SOC (Advanced)	Geographical Information System	1	0	2	3	30	70	100	2
	MC	Essence of Indian Traditional Knowledge	2	0	0	2	30	-	30	
TOTAL			**17**	**0**	13	**30**	**300**	**630**	**930**	***21.5***
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)										***4***
Industrial/Research Internship (Mandatory) 2 Months during summer vacation										

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture, T: Tutorial, P: Practical

BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses

MC: Mandatory course

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Civil Engineering

Effective From the Academic Year2020-2021

Final Year B.Tech (SEMESTER – VII)

Code No.	Category Code	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CE701	PC	Design of Steel Structures	3	0	0	3	30	70	100	3
20CE702	PE	PE-III	3	0	0	3	30	70	100	3
20CE703	PE	PE-IV	3	0	0	3	30	70	100	3
20CE704	PE	PE-V	3	0	0	3	30	70	100	3
20CE705	OEC/JOE	JOE-III	2	0	2	4	30	70	100	3
20CE706	OEC/JOE	JOE-IV	2	0	2	4	30	70	100	3
	SOC (Advanced)	Computer Aided Construction Management	1	0	2	3	30	70	100	2
Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester										3
TOTAL			**17**	**0**	6	**23**	**210**	**490**	**700**	***23***
Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)										***4***

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture, T: Tutorial, P: Practical

BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses

MC: Mandatory course

SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Civil Engineering

Effective From the Academic Year2020-2021

Final Year B.Tech (SEMESTER – VIII)

Code No.	Category Code	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
			L	T	P	Total	CIE	SEE	Total Marks	
20CE801	PC	Project Project work, seminar and internship in industry	0	0	0	0	30	70	100	12
INTERNSHIP (6 MONTHS)										
TOTAL			**0**	**0**	0	**0**	**30**	**70**	**100**	***12***
Honors/Minor Courses (MOOCs - I)										4
Honors/Minor Courses (MOOCs - II)										4

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture, T: Tutorial, P: Practical

BS: Basic Science courses HS: Humanities and Social science ES: Engineering Science Courses

MC: Mandatory course

Semester –V

Job Oriented Elective – I

1	Remote sensing & Drone Technology
2	
3	Rural Water supply distribution systems

Semester –VII

Job Oriented Elective – III

1	Construction Management
2	Health Audit of structures and Retrofitting of structures
3	Quality Control and Quality Assurance

Semester –VI &VII

Job Oriented Elective – II *

Job Oriented Elective – IV *

*Open Elective/ Job Oriented Elective II and IV are self-learning. Students may opt from any MOOCs platform. They have to submit the certificate before the last instruction day of VII semester.

Professional Elective-I :

	Advanced Environmental Engineering
	Low cost Housing Techniques
	Town planning and Architecture
	Sustainable Engineering & Technology

Professional Elective-II:

	Advanced structural Analysis
	Environmental Geotechnics
	Prefabricated structures
	Air Pollution & Control

Professional Elective-III:

	Advanced Design of Concrete structures
	Instrumentation and Sensor technology in Civil Engineering
	Watershed Management
	Ground Improvement Techniques

Professional Elective-IV

	Railway and Air Port Engineering
	Repair & Rehabilitation of Structures
	Geosynthetics
	Ground Water Development and Management

Professional Elective-V :

	Irrigation structures
	Pavement Analysis and Design
	Disaster preparedness and planning management
	Solid and Hazardous waste Management

LIST OF COURSES FOR MINOR

1. The student can opt any 4 subjects from each pool.

2. Concerned BOS can add or delete the subjects as per the decision of the board.

3. Pre requisites to be defined by the board for each course.

4. Compulsory MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each)

General Minor Tracks

S.No	Course Code	Course Title	L	T	P	C
1		Construction Materials and Planning	**3**	**1**		**4**
2		Fluid Mechanics	3		2	4
3		Surveying	3		2	4
4		Applied Mechanics	3		2	4
5		Water Resource Engineering	3		2	4
6		Environmental Engineering	3		2	4
7		Basic Design of Concrete and Steel structures	3	1		4
8		Geotechnical Engineering	3		2	4
9		Estimation & Quantity Surveying	3	1		4
10		Transportation Engineering	3		2	4

LIST OF COURSES FOR HONORS

1. The subjects opted for Honors should be Advanced type which are not covered in regular curriculum

2. Students has to acquire 16 credits with minimum one subject from each pool.

3. Concerned BOS can add or delete the subjects as per the decision of the board.

4. Pre requisites to be defined by the board for each course.

5. Compulsory MOOC/NPTEL Courses for 04 credits (02 courses@ 2 credits each)

S.No	Course Code	Course Title	L	T	P	C
POOL-I						
1		Advanced Surveying	3	1	-	4
2		Advanced Concrete Technology	3		2	4
3		Advanced Fluid Mechanics	3		2	4
4		Engineering Rock Mechanics	3	1		4
POOL-II						
1		Prefabricatedstructures	3	1	-	4
2		Water power Engineering	3	1		4
3		Industrial Waste water Treatment	3		2	4
4		Geospatial Data Processing	3		2	4
POOL-III						
1		Design and Detailing of Irrigation Structures	3	1	-	4
2		EnvironmentalImpact Assessment and Management	3	1		4
3		Advanced Foundation Engineering	3	1		4
4		Urban Transportation planning	3	1		4
POOL-IV						
1		Earthquake Resistant Design of Structures	3	1	-	4
2		Advanced Design of Steel structures	3		2	4
3		Soil Dynamics and Machine Foundation	3		2	4
4		Intelligent Transportation Systems	3	1		4

BAPATLA ENGINEERING COLLEGE : : BAPATLA
(Autonomous)
LINEAR ALGEBRA AND ODE
I B.Tech –I Semester (Code: 20CE101/MA01)

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

Course Objectives:

CO1: To learn about solving 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.

CO2: Identify the type of a given differential equation and select and apply the appropriate analyticaltechnique for finding the solution of first order and higher order ordinary differential equations.

CO3: Create and analyze mathematical models using first and second order differential equations
to solve application problems that arises in engineering.

CO4: To learn about solving linear Differential equations with constant coefficients with the given initial conditions using Laplace transform technique.

Course Outcomes: Students will be able to

CLO-1:Apply elementary row operations to find the rank of a matrix, to solve a system of linear equations and to find the inverse of a matrix.

CLO-2:Find the Eigen values and Eigen vectors of the given square matrix and also compute the higher
powers of the given matrix.

CLO-3: Solve separable, linear, exact differential equations with and without initial conditions.

CLO-4:Distinguish between linear and non-linear differential equation.

CLO-5: Write the piecewise continuous functions in terms of unit step functions and hence find its Laplace transforms.

CLO-6:Solve linear differential equation with constant coefficients and unit step input functions using
Laplace transforms technique.

UNIT - I

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.]

[12 Hours]

UNIT - II

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.

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] [12 Hours]

UNIT – III

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]

[12 Hours]

UNIT – IV

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]

[12 Hours]

TEXT BOOK:

B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.

REFERENCE BOOKS:

[1] ErwinKreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons.
[2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010

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

Course Objectives:

CO1: To circulate the knowledge about the advanced optics and know its Engineering applications.
CO2:Tofamilize the basis of quantum theory and to make students to solve the physical problems.
CO3: To classify solids and to have a basic idea about the structural determination of crystals.
CO4: To make aware of some of the analytical techniques for material testing.

Course Outcomes:
CLO1: Students ability to understand the principles in the production and application of lasers and their effective utilization in optical communications.
CLO2: Students demonstrate appropriate competence and working knowledge of laws of modern physics in understanding advanced technical engineering courses.
CLO3: Students demonstrate the ability to apply knowledge of band theory of solids and to make understand the concept of energy band gap and hole.
CLO4: Ability to understand the crystal geometrics and estimation of crystal structure by X-ray diffraction technique.
CLO5: Students ability to understand the principle in the production and applications of ultrasonics and extend it for material testing using various nuclear techniques.

UNIT I

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 II

Quantum Mechanics: Dual nature of light, de-Brogli'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 III

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 IV

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. A Text Book of Engineering Physics , M.N.Avadhanulu& P. Kshirsagar, S.Chand& Co., (Edition – 2013).
2, Engineering physics by S.O.Pillai

REFERENCE BOOKS:

1. Engineering physics by R.K.Gour and S.L.Gupta. Dhanpatrai publications.
2. Engineering physics by M.R.Sreenivasan. New age international publications.
3. Engineering physics by Palaniswamy. Scitech publications.
4. Basic Engineering physics– Dr.P.srinivasaRao, Dr.K.Muralidhar, Himalayapublication
5. Applied physics - Dr.P.srinivasaRao, Dr.K.Muralidhar, Himalaya publication
6. Engineering physics by Dr. D.Thirupathi Naidu, M. Veeranjaneyulu.

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

Course Objectives:

CO1: To provide a comprehensive overview of the component fields within civil engineering.

CO2: Expose students to current Civil Engineering projects and their societal implications.

CO3: Introduce students to professionalism through interaction with practicing professionals.

CO4: To give the students an illustration of the use and properties of various building materials and case studies of the construction materials.

CO5: To provide a sound foundation for the further study of measurement techniquesand building surveying case study.

Course Outcomes: Students will be able to

CLO-1: Importance of Civil Engineering in the infrastructural development of the society.

CLO-2: Illustrate the types, uses, and properties of various building materials.

CLO-3: Explain the method of construction of different components of the building.

CLO-4: To impart the knowledge of the basic principles of section of site for building and building materials and their applications.

CLO-5: To impart the knowledge on the case studies on surveying aspect.

UNIT I

History of Civil Engineering, Relevance of Civil Engineering in the overall infrastructural development of the country.Various domains of Civil Engineering and courses of Civil Engineering.Roles and responsibilities of Civil Engineer in the society, Responsibilities of civil engineer in the protection of environment and preservation of natural resources. Opportunities in Civil Engineering and Recent Trends in Civil Engineering

UNIT II

Types and classification of structures – buildings, towers, chimneys, bridges, dams, retaining walls, soil, water tanks, roads, railways, runways and pipelines (Brief description only). Definition and types of buildings as per National Building Code of India (brief description only).

UNIT III

National Building Code (NBC) - Salient features, Site selection for buildings. Civil Engineering Materials- properties - uses– bricks, stones, cement Aggregates: Fine and coarse aggregate –concrete –steel, roofing, flooring, plastering, Doors, Windows, Timber and Paints. Case studies on the materials employed for the aspect of construction.

UNIT IV

Surveying - Object and uses, Fundamental principles, Classification of surveying,Plans and maps, Scales, units of measure, Conventional symbols, measurement ofdistances angels levelling determination of areas. Case studies on surveying aspect.

Text Books:

2. Ramamrutham.S, Basic Civil Engineering, DhanapathiRai Publishing co.

3. Kandya.A.A., Elements of Civil Engineering.Charotar Publishing house.

Reference Books:

3. Rangwala S C and Ketki B Dalal, Building Construction, Charotar Publishing house.

McKay, W. B., and McKay, J. K., Building Construction Volumes 1 to 4, Person India Education Services.

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

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

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. SendurChelvi and T.R. Rangaswamy, New Age International Ltd.
TEXT BOOK : Elements of Mechanical Engineering by Mathur, Mehta&Tewari, Jain Brothers, New Delhi.

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

CO1: Geometrical Approach to the mean value theorems and their application to the mathematical problems.

CO2: Concept of Sequence and Series

CO3: Evaluation of improper integrals using Beta and Gamma functions

CO4: Evaluation of multiple integrals and their applications

CO5: Basic properties of vector point function and their applications to line, surface and volume integrals

Course Outcomes: Students will be able to

CLO-1: Solve problems involving mean value theorems

CLO-2: Analyze the nature of convergence of sequence and series

CLO-3: Evaluate integrals using special functions and change of variables

CLO-4: Evaluate double and triple integrals

CLO-5: Transform line integral to surface and surface to volume integrals

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 Engineeringformulae.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

BAPATLA ENGINEERING COLLEGE : : BAPATLA
(Autonomous)

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

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

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 appa□atus.
3. Determination of thickness of thin wire using air wedge interference bands.
4. Dete□□i□atio□ of □adius of □u□□atu□e of a Pla□o □o□□e□ le□s □□fo□□i□g Ne□to□'s □i□gs.
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 BOOK:

1. □Engineering physics laboratory manual□P.Srinivasarao&K.Muralidhar,Himalaya publications.

BAPATLA ENGINEERING COLLEGE : : BAPATLA
(Autonomous)

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

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

BAPATLA ENGINEERING COLLEGE : : BAPATLA
(Autonomous)

NUMERICAL METHODS AND ADVANCED CALCULUS
I B.Tech –II Semester (Code: 20CE201/MA002)

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

Course Objectives:

CO1: To learn about some advanced numerical techniques e.g. solving a nonlinear equation, linear system of equations, Interpolation and Approximation techniques.

CO2: To learn about evaluation of double and triple integrals and their applications.

CO3: To learn some basic properties of scalar and vector point functions and their applications to line,surface and volume integrals.

Course Outcomes: Students will be able to

CLO-1: Solve non-linear equations in one variable and system of linear equations using iteration methods.

CLO-2: Choose appropriate interpolation formulae based on the given data.

CLO-3: Compute the value of a definite integral using numerical integration techniques.

CLO-4: Predict the numerical solution of the derivative at a point from the given initial value problem using appropriate numerical method.

CLO-4 :Evaluate the double and triple integrals using change of variables.

CLO-5: Transformline integrals to surface and surface to volume integrals and evaluate them.

UNIT - I

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]. [12 Hours]

UNIT - II

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]. [12 Hours]

UNIT – III

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 integrals, Change of variables.

[Sections: 7.1; 7.2; 7.3; 7.4; 7.5; 7.6.2; 7.7.2]. [12 Hours]

UNIT – IV

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; 8.5.1; 8.5.3; 8.6; 8.11; 8.12; 8.13; 8.14; 8.16] [12 Hours]

TEXT BOOK:

B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.

REFERENCE BOOKS:

[1] ErwinKreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons.
[2] N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

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:

CO1: With the principles of water characterization and treatment of water for industrial purposes and methods of producing water for potable purposes.
CO2: To understand the thermodynamic concepts, energy changes, concept of corrosion & its control.
CO3: With the conventional energy sources, solid, liquid and gaseous Fuels & knowledge of knocking and anti-knocking characteristics.
CO4: 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:

CLO-1: Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.
CLO-2: Apply their knowledge in converting various energies of different systems and protection of different metals from corrosion.
CLO-3: Have the capacity of applying energy sources efficiently and economically for various needs.
CLO-4: Design economically and new methods of organic synthesisandsubstitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.

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.

BAPATLA ENGINEERING COLLEGE: : BAPATLA
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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

CO1: The concepts Force systems, free body diagrams, resultant of forces and equations of equilibrium, Supports and support reaction sand calculation of Centroid

CO2: The Concept of moment of inertia of plane figures, Laws and applications of friction

CO3: The Analysis of the truss and determination of axial forces by Method of Joints

CO4:Motion of a body and their relationships and application of D Alembert's principle in rectilinear and curvilinear motions

CO5:AboutMass moment of inertia of material bodies, Plane motion of a body about a fixed axis

Course Outcomes: Students will be able to

CLO-1:Construct free body diagrams and use appropriate equilibrium equations, Calculate unknown forces in a plane by resolution of force and equilibrium equations

CLO-2: Locate Centroid of composite figures and determine moment of plane figures

CLO -3: Analyze the systems with friction

CLO-4: Determine the axial forces in the members of determinate truss. Calculation of acceleration, velocity and displacement and forces

CLO-5: Determine moment of inertia of material bodies, Calculation of angular displacement, velocity and angular acceleration of rotational bodies.

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.

NOTE

Two questions of 10 marks each will be given from each unit out of which one is to be answered. Ten questions of one mark each will be given from entire syllabus which is a compulsory question.

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

BAPATLA ENGINEERING COLLEGE : : BAPATLA
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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

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 limestones; 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

BAPATLA ENGINEERING COLLEGE : : BAPATLA
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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

CO1: clear picture about the importance of engineering graphics in the field of engineering

CO2: the drawing skills and impart students to follow Bureau of Indian Standards

CO3: To give an idea about Geometric constructions, Engineering curves, orthographic projections and pictorial projections

CO4: imagination skills about orientation of points, lines, surfaces and solids

CO5: basic drafting skills of AutoCAD

Course Outcomes: Students will be able to

CLO-1: draw projections of points and projections of lines using Auto CAD

CLO-2: plot projections of surfaces like circle, square and rhombus

CLO-3: plot the Projections of solids like Prisms and pyramids

CLO-4: convert the of Orthographic views into isometric views of simple objects

CLO-5: generate the of pictorial views into orthographic views of simple castings

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.

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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		

LIST OF EXPERIMENTS

1. **Introduction to Chemistry Lab** (the teachers are expected to teach fundamentals likeCalibration of Volumetric Apparatus, Primary, Secondary Solutions, Normality, Molarity, Molality etc.anderror, 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.
    d. 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 (for Chemistry 1 and 2):

1. Practical Engineering Chemistry by K.Mukkanti, Etal, B.S. Publicaitons, Hyderabad, 2009.
2. Inorganic quantitative analysis, Vogel, 5^{th} edition, Longman group Ltd. London, 1979.

REFERENCE BOOKS:

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.

BAPATLA ENGINEERING COLLEGE : : BAPATLA
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WORKSHOP
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:

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

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

1. Make half lap joint, Dovetail joint and Mortise &Tenon joint
2. Produce Lap joint, Tee joint and Butt joint using Gas welding
3. Prepare trapezoidal tray, Funnel and T-joint using sheet metal tools
4. 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.

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ENVIRONMENTAL STUDIES
I B.Tech – II Semester (Code: 20CE01/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

CO1: To develop an awareness,knowledge, and appreciation for the naturalenvironment.

CO2: To understand different types of ecosystems exist in nature.

CO3: To know our biodiversity.

CO4: To understand different types of pollutants present in Environment.

CO5: To know the global environmental problems.

Course Outcomes: Students will be able to

CLO 1: Develop an appreciation for the local and natural history of the area.

CLO 2: Hope for the better future of environment in India which is based on many positive factors like Biodiversity, successive use of renewable energy resources and other resources, increasing number of people's movements focusing on environment.

CLO 3: Know how to manage the harmful pollutants.

CLO 4: Gain the knowledge of Environment.

CLO 5: Create awareness among the youth on environmental concerns important in the long-term interest of the society

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.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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PROBABILITY AND STATISTICS
II B.Tech – I Semester (Code : 20CE301/MA03)

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

UNIT – I

Probability Densities: Continuous Random Variables, The Normal Distribution, The Normal Approximation to the Binomial Distribution, The Uniform Distribution, The Gamma Distribution, The Beta Distribution, The Weibull distribution, Joint Distributions - Discrete and Continuous. (CO-1)

(Sections 5.1, 5.2, 5.3, 5.5, 5.7, 5.8, 5.9, 5.10 of the Text Book) [14 Periods]

UNIT – II

Sampling Distributions: 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.
Inferences Concerning a Mean: Point estimation, Interval estimation, Tests of Hypotheses, Null Hypotheses and Tests of hypotheses, Hypothesis concerning one mean. (CO-2)

(Sections 6.1, 6.2, 6.3, 6.4, 7.1, 7.2, 7.4, 7.5, 7.6 of the Text Book) [14 Periods]

UNIT-III

Comparing Two Treatments: Comparisons-Two independent Large samples, Comparisons-Two independent small samples, Matched pairs comparisons.
Inferences Concerning Variances: The estimation of variances, Hypotheses concerning one variance, Hypotheses concerning two variances. (CO-3)

(Sections 8.2, 8.3, 8.4, 9.1, 9.2, 9.3 of the Text Book) [14 Periods]

UNIT –IV

Inferences Concerning Proportions: Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning several proportions.
Regression Analysis: The method of least squares, Curvilinear regression, Multiple regression, Correlation

Analysis of Variance: Some general principles, Completely Randomized Designs. (CO-4)

(Sections 10.1, 10.2, 10.3, 11.1, 11.3, 11.4, 11.6, 12.1, 12.2 of the Text Book) [14 Periods]

Text Book: Miller & Freund's "Probability and Statistics for Engineers", Richard A. Johnson, 8th Edition, PHI.

Reference Book: Probability & Statistics for Engineers and Scientists', 6th Edition, PHI, R.E Walpole, R.H. Myers & S.L Myres.

BAPATLA ENGINEERING COLLEGE:: BAPATLA
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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.
- To introduce about EDM, Digital theodolite and total station.

Course Outcomes:

- Understand the relative positions of a point on the existing ground by conducting the survey.
- Understand the taking of the levels of existing ground to determine the reduced levels.
- Evaluate the areas and volumes using different methods.
- Apply the knowledge for laying out of curves for roads and railways, and know about the latest Surveying Instruments.

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. I, Surveying, Vol-I, II and II, Standard Book House, 2015.
2. Surveying Vol. I&II by B.C. Punmia ,Laxmi Publications,2005

REFERENCES:

1. Chandra A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.
2. C. Venkatramaiah, Text Book of Surveying, Universities Press Pvt Ltd, Hyderabad. Revised Edition 2011.
3. Madhu N., Sathikumar, R. and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.

BAPATLA ENGINEERING COLLEGE : : BAPATLA
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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:
The objective of this Course is:
1. To understand the basics of stress and strain along with the stress and strain pressure vessels
2. To understand the stresses and strains in thin cylinders and spherical shells.
3. To draw the shear force and bending moment diagrams for beams.
4.To understand simple bending theory, flexural stresses and shear stresses.
5. To understand torsion and stresses developed by torsion on circular shafts and application of strain energy principles on springs.

Student Learning Outcomes:
On completion of the course the student will be able to:
1. Analyse solids subjected to forces both direct and indirect, and understand their behavior by interpreting stress, strain, elastic constants etc.
2. Analyse and design thin walled pressure vessels.
3. Draw shear force and bending moment diagrams for beams subjected to different forces.
4. Apply simple bending theory to analyse and design beams of various sections and apply shear stress formula for members subjected to flexure.
5. Apply torsion formula to analyse and design circular shafts and springs

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

BAPATLA ENGINEERING COLLEGE: : BAPATLA
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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

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

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:
CO1: To familiarize with the properties of fluids and the applications of fluid mechanics
CO2: To formulate and analyze problems related to calculation of forces in fluid structure interaction.
CO3: Ability to understand types of flows and analyze fluid flow problems with the application of the energy equation.
CO4: To determine the losses in a flow system and flow through pipes.

Course Outcomes: Students will be able to
CLO-1: Get knowledge of basic principles of fluid mechanics
CLO-2: Understand about hydrostatic law, principle of buoyancy and stability of a floating body.
CLO-3: Analyze fluid flow problems with the application of the energy equation.
CLO-4: Analyze and design simple pipe systems.

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)

BAPATLA ENGINEERING COLLEGE : : BAPATLA
(Autonomous)

MAT LAB Programming for Civil Engineering
II B.Tech – I Semester (Code : 20CE306/SOL01)

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:

- Understand the main features of the MATLAB development environment.
- Use the MATLAB GUI effectively.
- Design simple algorithms to solve problems.
- Write simple programs in MATLAB to solve scientific and mathematical problems.

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

UNIT-IV

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.

BAPATLA ENGINEERING COLLEGE : : BAPATLA
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BUILDING DRAWING LABORATORY
II B.Tech – I Semester (Code : 20CEL301)

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

Course Objectives:

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

Course Outcomes:

1. Basic Auto CAD commands.
2. Various conventional signs, symbols of materials and building elements like door, window and foundation etc.
3. An ability to understand principles of planning, principles of building bye-laws and ability to draw the line diagrams as per National Building Code.
4. 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.

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

BAPATLA ENGINEERING COLLEGE : : BAPATLA
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ENGINEERING GEOLOGY 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 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

- Ability to categorize rocks and minerals by their origin and engineering properties.
- Ability to apply geological principles to rock masses and discontinuities for use in engineering design e.g. rock slopes, foundation.
- Measure strike and dip of the bedding planes
- Interpret geological maps
- To inspire the students to think clearly and critically the solution of the civil engineering
- Problems in the context of geological knowledge.

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)

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

SURVEYING LAB

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

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

Learning Outcomes

- Understand about basic field surveys.
- Analyze the H.A and V.A using theodolite
- Determine the levels of existing ground
- Prepare the plan or map showing the ground features from the data obtained by surveying.

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

BAPATLA ENGINEERING COLLEGE : : BAPATLA
(Autonomous)

PROFESSIONAL ETHICS
II B.Tech – I Semester (Code : 20CE307/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
- To have an adequate knowledge about MNC's, Business, Environmental, Computer Ethics, Honesty, Moral Leadership, sample Code of Conduct.

Learning Outcomes

- Students understand the core values that shape the ethical behaviour of an engineer and Exposed awareness on professional ethics and human values.
- The students will understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories
- The students will understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
- The students will be aware of responsibilities of an engineer for safety and risk benefit analysis, professional rights and responsibilities of an engineer.
- 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.

BAPATLA ENGINEERING COLLEGE : : BAPATLA
(Autonomous)

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

- make use of contextual clues to infer meanings of unfamiliar words from context
- understand how to apply technical information and knowledge in practical documents for a variety of purposes
- use grammatical, stylistic, and mechanical formats and conventions appropriate to various audiences and disciplines
- 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

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

- Able to assess the water quantity requirement for the supply water scheme.
- Able to design various units in water treatment plant and understood about distribution system
- studied about the various components of sewage system and capable to design sewers
- Able to design preliminary, primary and secondary treatment unit of sewage treatment plant

UNIT-I

WaterSupply: Objectivesofwatersupply 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;Methodsof Distribution,LayoutofDistributionsystem;Analysisof DistributionbyHardyCrossmethodand practice forsimplenetworks.

UNIT-III

Introduction to Sanitary Engineering: Conservancy and water carriage system; Sewerage systems; Relative meritsand 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 PrimaryTreatmentOperations:Screens,GritChambers,SkimmingTank and Sedimentation Tank

SecondaryTreatment:

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 Vol.I – Water supply engineering by S.K. Garg; Khanna Publishers, Delhi
3. EnvironmentalEngineeringvol.II– Sewage disposal and air pollution engineering by S.K.Garg; KhannaPublishers, Delhi
4. Water Supply and Sanitary Engineering by G.S. Bride; Dhanpatrai and sons, Delhi
5. Manual on Water Supply & Treatment; CPH and EEO, Ministry of Urban Development; Govt. of India, New Delhi.

REFERENCES:

1. MetcalfandEddy,WastewaterEngineering-Collection,Treatment,DisposalandReuse,McGrawHill Pub. Co.,1995.
2. H.M Raghunath,Hydrology-Principles,AnalysisandDesign,NewAgeInternationalPublishers,1996.
3. Michael,A.M,'IrrigationTheory&Practice,Vikas Publishing House,NewDelhi,1978
4. Benefield L.D. and Randall C.D. Biological Process Designs for Wastewater Treatment, Prentice Hall Pub. Co.,1980.

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:

The objective of this Course is:

1. To understand multi-axial stresses and principal stresses and principal strains;
2. Toanalyse structural members under compound stresses;
3. 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;
4. To determine deflections of beams using energy theorems;
5. To determine deflections of beams using geometrical methods.

LEARNING OUTCOMES:

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

1. Understand multi-axial stresses and principal stresses and principal strains;
2. Analyse structural members under compound stresses;
3. Derive expression for critical load carrying capacity of columns under different load conditions and apply various failure criteria for general stress states at points;
4. Determine deflections of beams using energy theorems;
5. Determine deflections of beams using 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

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:

CO1: Design of open channels for most economical sections like rectangular, trapezoidal and circular sections
CO2: Understand Gradually Varied flow and Rapidly Varied Flow though the channels and its applications
CO3: Understand the mechanics of impact of jet on various types of vanes, Impulse and Reaction Turbines
CO4: 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
CLO-1: Know the different types of channels and design of channels.
CLO-2: Get the skills to solve problems in uniform, gradually and rapidly varied flows in steady state conditions.
CLO-3: Will know the hydrodynamic forces acting on vanes, Performance characteristics of hydraulic turbines and pump.
CLO-4: Formulate and solve 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

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:

CO1: To enable the student to understand soil formation, structure, determination of index properties of soil and various soil classification systems.

CO2: 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

CO3: 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

CO4: 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

CLO1: Analyse different soil classifications understanding the concept of identifying various index properties of soils and their interrelationships.

CLO2: Determine permeability of soils and seepage of flow through soils, understanding the concept of effective stress principle and the validity of Darcy's law.

CLO3: Compute vertical stress distribution in soils under different loading conditions applying Boussinesq and Westerguard theories. Also determine degree of compaction in the field using various compaction methods.

CLO4: Evaluate consolidation settlement and shear strength of soil 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. **Classificationof 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. A Text book of Soil Mechanics and Foundation Engineering – B.C.PunmiaLaxmi Publications
4. A Text book of Soil Mechanics and Foundation Engineering – K.R.Arora, Standard Publishers &Distributors, New Delhi

5. A Text book of Soil Mechanics and Foundation Engineering – P.Purushotthama Raj, Pearson
Education
6 .Introduction to Soil Mechanics- Braja M Das

BAPATLA ENGINEERING COLLEGE : : BAPATLA
(Autonomous)

SOFT SKILLS LAB
II B.Tech – II Semester (Code : 20CE406/SOL02)

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

UNIT-I

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

BAPATLA ENGINEERING COLLEGE : : BAPATLA
(Autonomous)

ENVIRONMENTAL ENGINEERING LABORATORY
II B.Tech – II Semester (Code : 20CEL401)

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

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.

BAPATLA ENGINEERING COLLEGE : : BAPATLA
(Autonomous)

HYDRAULICS & HYDRAULIC MACHINES 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

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.

BAPATLA ENGINEERING COLLEGE: BAPATLA
(Autonomous)

MATERIALS TESTING 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:

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

Course Learning Outcomes:

1. The students are able to know properties of cement.
2. The students are able to know properties of fine aggregate.
3. The students are able to know properties of coarse aggregate.
4. The students are able to know how to design the concrete mix.
5. The students are able to know properties of concrete.
6. The students are able to know to find the strength of concrete using rebound hammer.
7. The students are able to find out the Stress-Strain characteristics of mild steel bar.
8. The students are able to find out the shear strength of mild steel bar.
9. The students are able to find out the Hardness of steel and brass specimen.
10. The students are able to find out the E for steel and wood by simply supported beam setup.

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)**