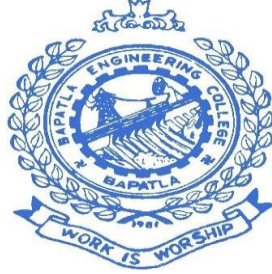




# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

**BAPATLA**



**B.Tech**

**Civil Engineering**

**Curriculum Effective from A.Y. 2020-21 (R20 Regulations)**



## **Bapatla Engineering College:: Bapatla**

**(Autonomous under Acharya Nagarjuna University)**

**(Sponsored by Bapatla Education Society)**

**BAPATLA-522102, Guntur District, A.P.**

**[www.becbapatla.ac.in](http://www.becbapatla.ac.in)**

**Department of  
Civil Engineering**



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

## SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

*Civil Engineering*

Effective From the Academic Year 2020-2021

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								
<b>TOTAL</b>			<b>16</b>	<b>0</b>	<b>10</b>	<b>26</b>	<b>240</b>	<b>560</b>	<b>800</b>	<b>21</b>

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



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

## SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

*Civil Engineering*

Effective From the Academic Year 2020-2021

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										
<b>TOTAL</b>			<b>16</b>	<b>0</b>	<b>10</b>	<b>26</b>	<b>240</b>	<b>490</b>	<b>730</b>	<b>18</b>

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



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

## SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

*Civil Engineering*

Effective From the Academic Year 2020-2021

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	MATLAB Programming 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
<b>TOTAL</b>			<b>18</b>	<b>0</b>	<b>11</b>	<b>29</b>	<b>300</b>	<b>630</b>	<b>930</b>	<b>21.5</b>

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



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

## SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

*Civil Engineering*

Effective From the Academic Year 2020-2021

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
<b>TOTAL</b>			<b>16</b>	<b>0</b>	<b>11</b>	<b>27</b>	<b>270</b>	<b>630</b>	<b>900</b>	<b>21.5</b>
<b>Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)</b>										<b>4</b>

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



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

## SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

*Civil Engineering*

Effective From the Academic Year 2020-2021

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/PEC01	PEC	PE-I	3	0	0	3	30	70	100	3
20CE505/JOE01	JOE	JOE-I	2	0	2	4	30	70	100	3
20CE506/SOL03	SOC (Advanced)	BIM	1	0	2	3	30	70	100	2
20CEL501	PCL	Geo technical Engineering Laboratory	0	0	3	3	30	70	100	1.5
20CEL502	ESL	Python Programming Laboratory	0	0	3	3	30	70	100	1.5
20CE507/MC03	MC	Indian Constitution	2	0	0	2	30	-	30	0
<b>Summer Internship 2 Months (Mandatory) after second year (to be evaluated during V semester)</b>										1.5
<b>TOTAL</b>			<b>17</b>	<b>0</b>	<b>10</b>	<b>27</b>	<b>270</b>	<b>560</b>	<b>830</b>	<b>21.5</b>
<b>Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)</b>										<b>4</b>

CIE: Continuous Internal Evaluation

SEE: Semester End Examination

L: Lecture,

T: Tutorial,

P: Practical



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

**SCHEME OF INSTRUCTION & EXAMINATION (Semester System)**

For

*Civil Engineering*

**Effective From the Academic Year 2020-2021**

**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	Design of steel structures	3	0	0	3	30	70	100	3
20CE602	PC	Water Resource Engineering	3	0	0	3	30	70	100	3
20CE603	PC	Highway Engineering	3	0	0	3	30	70	100	3
20CE604/PEC02	PEC	PE-II	3	0	0	3	30	70	100	3
20CE605/JOE02	JOE	JOE-II	2	0	2	4	30	70	100	3
20CE606/SOC04	SOC (Advanced)	Geographical Information System	1	0	2	3	30	70	100	2
20CEL601	PCL	Advanced Surveying Laboratory	0	0	3	3	30	70	100	1.5
20CEL602	PCL	Structural Analysis Design and Detailing Laboratory	0	0	3	3	30	70	100	1.5
20CEL603	PCL	Transportation Engineering Laboratory	0	0	3	3	30	70	100	1.5
20CE607/MC04	MC	Essence of Indian Traditional Knowledge	2	0	0	2	30	-	30	
<b>TOTAL</b>			<b>17</b>	<b>0</b>	<b>13</b>	<b>30</b>	<b>300</b>	<b>630</b>	<b>930</b>	<b>21.5</b>
<b>Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)</b>										<b>4</b>
<b>Industrial/Research Internship (Mandatory) 2 Months during summer vacation</b>										

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



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

## SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

*Civil Engineering*

Effective From the Academic Year 2020-2021

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	Construction Management	3	0	0	3	30	70	100	3
20CE702/PEC03	PE	PE-III	3	0	0	3	30	70	100	3
20CE703/PEC04	PE	PE-IV	3	0	0	3	30	70	100	3
20CE704/PEC05	PE	PE-V	3	0	0	3	30	70	100	3
20CE705/JOE03	JOE	JOE-III	2	0	2	4	30	70	100	3
20CE706/OEC01	OEC	Open Elective	2	0	2	4	30	70	100	3
20CE707/SOC05	SOC (Advanced)	Quantity Estimation & Project Management Laboratory	1	0	2	3	30	70	100	2
<b>Industrial/Research Internship 2 Months (Mandatory) after third year (to be evaluated during VII semester)</b>										3
<b>TOTAL</b>			<b>17</b>	<b>0</b>	<b>6</b>	<b>23</b>	<b>210</b>	<b>490</b>	<b>700</b>	<b>23</b>
<b>Honors/Minor courses (The hours distribution can be 3-0-2 or 3-1-0 also)</b>										<b>4</b>

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





# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

## SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

*Civil Engineering*

Effective From the Academic Year 2020-2021

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
<b>INTERNSHIP (6 MONTHS)</b>										
<b>TOTAL</b>			<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>30</b>	<b>70</b>	<b>100</b>	<b>12</b>
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



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **Semester –V**

### **Job Oriented Elective – I**

20CE505/JOE01A	Remote sensing & Drone Technology
20CE505/JOE01B	Plumbing and Fire Services
20CE505/JOE01C	Rural Water supply distribution systems

## **Semester –VI**

### **Job Oriented Elective – II**

20CE605/JOE02A	Estimation and quantity surveying
20CE605/JOE02B	Health Audit of structures and Retrofitting of structures
20CE605/JOE02C	Offshore Renewable Energy

## **Semester –VII**

### **Job Oriented Elective – III**

20CE705/JOE03A	Bridge Engineering
20CE705/JOE03B	Green Buildings and Sustainability
20CE705/JOE03C	Quality Control and Quality Assurance

20CE706/OEC01\* - Open Elective

\*The students of CE will choose an Inter department Elective offered by other Departments



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

## Professional Elective-I :

20CE504/PEC01A	Advanced Environmental Engineering
20CE504/PEC01B	Low cost Housing Techniques
20CE504/PEC01C	Town planning and Architecture
20CE504/PEC01D	Sustainable Engineering & Technology

## Professional Elective-II:

20CE604/PEC02A	Advanced structural Analysis
20CE604/PEC02B	Environmental Geotechnics
20CE604/PEC02C	Pre stressed concrete
20CE604/PEC02D	Air and Noise Pollution & Control

## Professional Elective-III:

20CE702/PEC03A	Advanced Design of Concrete structures
20CE702/PEC03B	Instrumentation and Sensor technology in Civil Engineering
20CE702/PEC03C	Watershed Management
20CE702/PEC03D	Ground Improvement Techniques

## Professional Elective-IV

20CE703/PEC04A	Railway and Air Port Engineering
20CE703/PEC04B	Earthquake Resistant Design of Structures
20CE703/PEC04C	Geosynthetics
20CE703/PEC04D	Ground Water Development and Management

## Professional Elective-V :

20CE704/PEC05A	Irrigation structures
20CE704/PEC05B	Pavement Analysis and Design
20CE704/PEC05C	Disaster preparedness and planning management
20CE704/PEC05D	Solid and Hazardous waste Management



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **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**

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



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

## 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 Title	L	T	P	C
<b>POOL-I</b>					
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
<b>POOL-II</b>					
1	Repair and Rehabilitation of Structures	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
<b>POOL-III</b>					
1	Prefabricated Structures	3	1	-	4
2	Environmental Impact Assessment and Management	3	1		4
3	Advanced Foundation Engineering	3	1		4
4	Urban Transportation planning	3	1		4
<b>POOL-IV</b>					
1	Design and Detailing of Irrigation 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 analytical technique 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]



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **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", 44<sup>th</sup> edition, Khanna publishers, 2017.

### **REFERENCE BOOKS:**

- [1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9<sup>th</sup> 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: To familiarize 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-Broglie's concept of matter waves, Davisson-Germer electron diffraction experiment, Heisenberg Uncertainty principle and applications (non-existence of electron in a nucleus and finite width of spectral lines), one dimensional time-independent and dependent Schrödinger wave equations, physical significance of wave function, applications of time-independent Schrödinger wave equation to particle in a box (one dimensional), tunneling, the scanning tunneling microscope.





# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **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 (Bravais), 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  $\alpha, \beta, \gamma$ -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, Himalaya publication
5. Applied physics - Dr.P.srinivasaRao, Dr.K.Muralidhar, Himalaya publication
6. Engineering physics by Dr. D.Thirupathi Naidu, M. Veeranjanyulu.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

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

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

**Prerequisites:** None

### **Course Objectives:**

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: To learn about different branches of geology.

CO4: To provide a sound foundation for the further study of measurement techniques and 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 different geological process.

CLO-4: 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. Roles and responsibilities of Civil Engineer.

### **UNIT II**

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

### **UNIT III**

Engineering Geology –

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



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **UNIT IV**

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

### **Text Books:**

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

### **Reference Books:**

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



# **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

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#### Reference Books

- ❖ Communication Skills, Sanjay Kumar & Pushpa Latha. 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, Kirchoff current and voltage laws, Direct Current; Alternating Current; Comparison between Half wave & Full wave Rectifiers, Advantages of Alternating Current. Half 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; sag and stress in overhead conductors at level supports; sag span curves, effect of wind 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 Engineering formulae. Finding the largest of the three given numbers. Computation of discount amount on different types of products with different discount percentages. Finding the class of an input character, finding the type of triangle formed with the given sides, computation of income-tax, computation of electricity bill and conversion of lower case character to its upper case.

### **UNIT II**

Decision Making and Branching, Decision Making and Looping

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



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## **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 apparatus.
3. Determination of thickness of thin wire using air wedge interference bands.
4. Determination of radius of curvature of a Plano convex lens using Newton's rings.
5. Determination of wavelengths of mercury spectrum using grating normal incidence method.
6. Determination of dispersive power of a given material of prism using prism minimum deviation method.
7. Draw the resonant characteristic curves of L.C.R. series circuit and calculate the resonant frequency.
8. Draw the characteristic curves of a photocell and calculate the maximum velocity of electron.
9. Verify the laws of transverse vibration of stretched string using sonometer.
10. Determine the rigidity modulus of the given material of the wire using Torsional pendulum.
11. Draw the load characteristic curves of a solar cell.
12. Determination of Hall coefficient of a semiconductor.
13. Determination of voltage and frequency of an A.C. signal using C.R.O.
14. Determination of Forbidden energy gap of Si & Ge.
15. Determination of wavelength of laser source using Diode laser.

**Any three experiments are virtual**

#### **TEXT 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

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#### **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: Transform line 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]



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **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", 44<sup>th</sup> edition, Khanna publishers, 2017.

### **REFERENCE BOOKS:**

- [1] Erwin Kreyszig, "Advanced Engineering Mathematics", 9<sup>th</sup> 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 synthesis and substitute 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 numerical 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 process

WHO Guidelines, Potable water, Sedimentation, Coagulation, Filtration. Disinfection methods: Chlorination, ozonization and UV treatment.

Salinity – Treatment of Brackish water by Reverse Osmosis and Electrodialysis.



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## **(Autonomous)**

### **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) & electroless 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-Markownikoff'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, Bakelite and PVC.

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

#### **TEXT BOOKS:**

1. P.C. Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi 17<sup>th</sup> edition (2017).
2. Seshi Chawla, "Engineering Chemistry" Dhanpat Rai Pub, Co LTD, New Delhi 13<sup>th</sup> edition, 2013.

#### **REFERENCES:**

- 1 Essential Of Physical Chemistry by Arun Bahl, B.S. Bahl, G.D. Tuli, by Arun Bahl, B.S. Bahl, G.D. Tuli, Published by S Chand Publishers, 12<sup>th</sup> 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** **(Autonomous)**

## **ENGINEERING MECHANICS** **I B.Tech – II Semester (Code: 20CE203)**

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

**Course Objectives:** To learn

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 and the Analysis of the truss and determination of axial forces by Method of Joints.

CO3: Motion of a body and their relationships and application of D Alembert's principle in rectilinear and curvilinear motions

CO4: About Mass 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 and Determine the axial forces in the members of determinate truss. Calculation of acceleration, velocity and displacement and forces.

CLO-4: 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.



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## **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**

## **(Autonomous)**

### **BUILDING MATERIALS, PLANNING AND CONSTRUCTION**

**I B.Tech – II Semester (Code :20CE204)**

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

#### COURSEOBJECTIVES

1. Tomakethestudentsawareof selection of good building construction materials such as bricks, stones, timber etc.
2. Tomakethestudentsawareofthe construction of various stages of buildings as floors, roofs, brick and stone masonry walls.
3. Tomakethestudentawareof staircases, dampness and temporary supporting structures used in construction.
4. Tomakethestudentsawareofthe building bye laws and planning rules.

#### OUTCOMES

1. Understand the students about the characteristics of construction materials used in civil engineering.
2. Understand the students about the various stages of building construction steps of masonry work, floors, roofs etc.
3. Understand the students about the staircases types, dampness and about the temporary supporting structures used while construction of a building.
4. Understand the inputs required to help them attain professional expertise and establish themselves as building planners.

#### **UNIT – I**

##### **1. Stones**

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

##### **2. Bricks**

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

##### **3. Lime**

General; Some definitions; Sources of lime; Constituents of 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





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## **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. Punmia et al; 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** **(Autonomous)**

## **ENGINEERING GRAPHICS** **I B.Tech – II Semester (Code: 20CEL201/MEL01)**

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

**Course Objectives:** To learn

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 projection of 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.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **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.



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

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

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

### LIST OF EXPERIMENTS

- 1. Introduction to Chemistry Lab** (the teachers are expected to teach fundamentals like Calibration of Volumetric Apparatus, Primary, Secondary Solutions, Normality, Molarity, Molality etc. and error, accuracy, precision, theory of indicators, use of volumetric titrations).
- 2. Volumetric Analysis:**
  - a. Estimation of Washing Soda.
  - b. Estimation of Active Chlorine Content in Bleaching Powder
  - c. Estimation of Mohr's salt by permanganometry.
  - 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<sup>th</sup> 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**

## **(Autonomous)**

### **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.



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

## 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 natural environment.

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. 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. 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 Bachao Andolan case studies* *8 periods*

**Sustainability:** Definition, Concept and Equitable use of resources for sustainable development; Rain water harvesting and Watershed management. Fieldwork on Rain water



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harvesting and Watershed management.  
*work/Demonstration*

*6 periods + 6 hours field*

## **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 (Autonomous)

## 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 ( $\sigma$  known), The sampling distribution of the mean ( $\sigma$  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, 8<sup>th</sup> Edition, PHI.

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





# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **SURVEYING**

#### **II B.Tech – I Semester (Code : 20CE302)**

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

#### **Course Objectives:**

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

#### **Course Outcomes:**

1. Understand the relative positions of a point on the existing ground by conducting the survey.
2. Understand the taking of the levels of existing ground to determine the reduced levels.
3. Evaluate the areas and volumes using different methods.
4. 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.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **TEXT BOOKS:**

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

## **REFERENCES:**

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



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **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:**

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

#### **Student Learning Outcomes:**

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

1. Identify and analyze normal stress, shear stress and temperature stress in axially loaded elastic members
2. Construct shear force diagram and bending moment diagram and identify critical sections wherever absolutely necessary.
3. Understand flexure formula, shear formula and utilize them to examine strength of members that are subjected to bending
4. Analyze and design circular sections and closely coiled helical springs for torsion effects includes the strain energy concept.

### **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.**



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **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**

## **(Autonomous)**

### **CONCRETE TECHNOLOGY**

#### **II B.Tech – I Semester (Code : 20CE304)**

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

#### **Course Objectives**

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

#### **Learning Outcomes :**

1. Understand the basic physical and chemical properties of cement, admixtures and aggregates
2. Understand the properties and factors influencing the workability of fresh concrete
3. Understand various tests for determining strength of concrete and effect of water/cement ratio on the strength of hardened concrete
4. Apply the basic concepts and applications of concretes and special concretes, determine various mix proportions of concretes

### **UNIT-I**

#### **1. Cement**

Approximate Oxide composition of cement, Bogue's compounds, Hydration of cement, Gel formation, Types of cement, Quality tests on cement as per Indian standards

#### **2. Aggregates and Water**

Classification and Characteristics of Aggregates, bulking of sand, Grading of Aggregates, Tests on aggregates as per Indian standards, Tolerable concentrations of some impurities in mixing water, Permissible limits of solids in water as per IS 456:2000.

### **UNIT-II**

#### **3. Fresh Concrete**

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

#### **4. Hardened Concrete**

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



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **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.



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## **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 Wylie, McGraw-Hill 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**

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

### **Course outcomes:**

1. Understand the main features of the MATLAB development environment.
2. Use the MATLAB GUI effectively.
3. Design simple algorithms to solve problems.
4. 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.



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## **Text Books:**

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

## **Reference Books:**

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



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA** **(Autonomous)**

## **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.
- (7) Drawing plan, sections and Elevation of a public building.

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

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



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **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:

1. To Identify the Formation of Minerals.
2. To Understand the Megascopic Identification of Rocks and Minerals.
3. To Understand Geological Maps.
4. 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

1. Ability to categorize rocks and minerals by their origin and engineering properties.
2. Ability to apply geological principles to rock masses and discontinuities for use in engineering design e.g. rock slopes, foundation.
3. Measure strike and dip of the bedding planes
4. Interpret geological maps
5. To inspire the students to think clearly and critically the solution of the civil engineering
6. 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)

#### Text Books

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



# **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**

1. Understand about basic field surveys.
2. Analyze the H.A and V.A using theodolite
3. Determine the levels of existing ground
4. 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

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

### Learning Outcomes

1. Students understand the core values that shape the ethical behaviour of an engineer and Exposed awareness on professional ethics and human values.
2. The students will understand the basic perception of profession, professional ethics, various moral issues & uses of ethical theories
3. The students will understand various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
4. 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



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

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

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

### Course Outcomes

The student would be able to

1. Make use of contextual clues to infer meanings of unfamiliar words from context
2. Understand how to apply technical information and knowledge in practical documents for a variety of purposes
3. Use grammatical, stylistic, and mechanical formats and conventions appropriate to various audiences and disciplines
4. 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





# **BAPATLA ENGINEERING COLLEGE:: BAPATLA** **(Autonomous)**

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**

1. To estimate the quantity of drinking water and domestic wastewater generated
2. To explain the various types of water and wastewater characteristics
3. To demonstrate the common physical, chemical and biological unit operations encountered in treatment processes
4. To identify and design various methods available for the treatment of water and wastewater

### **COURSE OUTCOMES**

1. Able to assess the water quantity requirement for the supply water scheme.
2. Able to design various units in water treatment plant and understand about distribution system
3. Studied about the various components of sewage system and capable to design sewers
4. Able to design preliminary, primary and secondary treatment unit of sewage treatment plant

### **UNIT-I**

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

### **UNIT-II**

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

### **UNIT-III**

**Introduction to Sanitary Engineering:** Conservancy and water carriage system; Sewerage systems; Relative merits and 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;



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **UNIT-IV**

### **Preliminary and Primary Treatment of Sewage**

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

### **Secondary Treatment:**

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

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

### **TEXT BOOKS:**

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

### **REFERENCES:**

1. Metcalf and Eddy, Wastewater Engineering - collection, Treatment, Disposal and Reuse, McGraw Hill Pub. Co., 1995.
2. Environmental Engineering volume I & II – by S.K. Garg: Water Supply and Wastewater engineering, Khanna Publishers, Delhi .
3. Water Supply and Sanitary Engineering by G.S. Bride; Dhanpatrai and sons, Delhi



# **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:**

1. To understand multi-axial stresses and principal stresses and principal strains;
2. To analyse 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 geometrical and strain energy methods.

#### **LEARNING OUTCOMES:**

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

1. Understand the members subjected to multi-axial stresses, principal stresses, compound stresses.
2. Derive expression for critical load carrying capacity of columns under different load conditions and apply various failure criteria for general stress states at points. Determine deflections of beams using geometrical methods and strain energy concept.
3. Determine the deflections of beams using geometrical methods.
4. Determine deflections of beams using strain energy concept.

### **UNIT-I**

#### **1. Analysis of Plane Stress**

Introduction; The basic problem; Equations for transformation of plane stress; Principle planes and principal stresses; Maximum shear stress; 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



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **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. Gunneswara Rao 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 through 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  $\pi$  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.



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## **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 Wylie, 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. Classification of Soils**

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





# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **UNIT II**

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

## **UNIT III**

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

## **UNIT IV**

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

### **TEXT BOOKS:**

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

### **REFERENCES:**

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



# **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

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#### **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

### **Course Objectives:**

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

### **Course Outcomes:**

1. Identify the practical significance of the characteristics, the relevant codes of practice for examination and permissible limits for the characteristics of water and wastewater
2. Conduct tests for physical, chemical, biological quality of water/sewage.
3. Conduct jar test to determine the exact quantity of alum needed at treatment plant based on the turbidity of the given sample.
4. Conclude whether the given water is fit for drinking or not by comparing the quality parameters with BIS standards (IS 10500 – 1991)

*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)**

## **TEXT BOOKS:**

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



# **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

### **Course Objectives:**

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

### **Course Learning Outcomes:**

1. The students are able to know measure discharge in pipes.
2. The students are able to know identification of types of flow.
3. The students are able to know determine the equation of motion.
4. The students are able to know analyze the characteristics of turbine and pumps.
5. The students are able to know calculate the discharge in open channel flow.

### **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**



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- 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)**



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

## STRUCTURAL ANALYSIS

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

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

#### Course Objectives

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

**Course Outcomes:** Upon successful completion of this course the student will be able to

1. Analyze the arches and Cables
2. Analyze the Indeterminate beams using Slope deflection method and Moment distribution method.
3. Analyze the Indeterminate beams using method of Consistent deformation
4. Draw the influence lines for the determinate beams and also determine the maximum quantities using ILDs.

#### UNIT-I

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

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

#### UNIT-II

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

#### UNIT-III

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

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

- i. Propped Cantilevers Analysis of propped cantilever by method of consistent deformations.
- ii. Fixed Beams Fixed moments for a fixed beam of uniform section for different types of loading; Effect of sinking of support; Effect of rotation of a support; Bending moment diagram for fixed beams.





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iii. Clapeyron's Theorem of Three Moments Analysis of continuous beams (Two span continuous beams).

## **UNIT-IV**

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

### **TEXT BOOKS:**

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

### **REFERENCE BOOKS:**

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



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

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

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

**Course Outcomes:** Students will be able to:

- 20CE502/CE01.1     **Understand** the knowledge of various principles of sub-soil exploration and field tests for soil exploration.
- 20CE502/CE01.2     **Analyse** the stability of slopes using various methods and understand various earth pressure theories for determination of resultant thrust acting on earth retaining walls.
- 20CE502/CE01.3     **Evaluate** allowable bearing capacity of shallow foundations based on shear strength criteria and settlement criteria using different bearing capacity theories.
- 20CE502/CE01.4     **Analyse** the forces acting on well foundations and problems of expansive soils and determine load carrying capacity of piles.

### UNIT-1

#### Chapter-1     SUB - SOIL EXPLORATION & SAMPLING

**Classes:**  
00

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

#### Chapter-2     FIELD TESTING OF SOILS

**Classes:**  
07

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

### UNIT-II

#### Chapter-3     LATERAL EARTH PRESSURE AND RETAINING WALLS

**Classes:**  
07

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

#### Chapter-4     STABILITY OF SLOPES

**Classes:**  
00

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



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## **UNIT-III**

### **Chapter-5 BEARING CAPACITY OF SHALLOW FOUNDATIONS Classes**

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

### **Chapter-6 SETTLEMENT ANALYSIS Classes:0**

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

## **UNIT-IV**

### **Chapter-7 PILE FOUNDATIONS Classes:0**

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

### **Chapter-8 WELL FOUNDATIONS Classes:0**

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

### **Chapter-9 FOUNDATIONS IN EXPANSIVE SOILS Classes:0**

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

- Text Books :**
1. GopalRanjanand ASR Rao, "Basic and Applied Soil Mechanics", New age international Pvt. Ltd, New Delhi,2000.
  2. B.N.D.Narasinga Rao, " Soil Mechanics and Foundation Engineering", Wiley Pulishers, India, 2015.

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

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



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **DESIGN OF CONCRETE STRUCTURES III B.Tech –V Semester (Code: 20CE503)**

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

**Course Objectives :** The student will study and understand

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

**Course Out Comes :** Students will be able to

1. Understand the various design methodologies and able to design of RC beam elements.
2. Know the analysis and design of flanged beams by limit state method and design of beams for shear and bond (LSM).
3. Design of One-way and Two-way slabs by limit state method.
4. Design of axial, uniaxial and biaxially loaded short columns.
5. Design of Isolated square and rectangular footings, strap footings by limit state method.

*\*IS 456-200, SP-34 and IS SP-16 Charts are to be referred.*

## **UNIT I**

### **Introduction to Design of Beams**

Objective of structural design, Type of Loads on RCC Structures and Load combinations, Code of practices and Specifications, Design philosophies

Introduction to working stress method and limit state method, Analysis and Design of singly and doubly reinforced rectangular beams by Limit State Method.



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## **UNIT II**

### **Design of Beams**

Design of Flanged beams for Flexure, Behavior of RC members in Shear, Bond and Anchorage, Check for development length by limit state method, Design of rectangular beam (LSM).

## **UNIT III**

### **Design of Slabs**

Analysis and design of one-way simply supported slab (LSM), Design and Detailing of Two-way slabs (LSM).

## **UNIT IV**

### **Design of Columns**

Types of columns, Design of short Rectangular, Square and circular axially loaded columns (LSM), Design of Uniaxial and Biaxially loaded short columns using SP16 charts.

## **UNIT V**

### **Design of Footings**

Types of footings, foundations based on soil properties, Design of isolated square and rectangular footings (LSM), Design of strap footing (LSM).

### **TEXT BOOKS:**

1. Limit State Design of Reinforced Concrete, second edition (2008) by P.C. Varghese, Prentice Hall of India.
2. Reinforced Concrete Structures (2014) by N. Subramanian, Oxford University Press.

### **REFERENCE BOOKS:**

1. Reinforced concrete design Fourth edition (2021) by Pillai and Menon, Tata McGraw-Hill
2. Limit state theory & Design of reinforced concrete, eighth edition by Dr.S.R.Karve and Dr.V.L.Shah; Pune Vidyaarthi Griha Prakashan, Pune.
3. Reinforced concrete design: Principles and Practice by N. Krishna Raju., R. N. Pranesh, fourth edition (2019) New Age International Publishers.
4. Reinforced Concrete Structure by R.Park., T. Paulay, (2009) Wiley India Publishers
5. For Limit State Method: Reinforced Concrete (limit state design) by Ashok K. Jain; seventh edition (2012), NemChand & Bros., Roorkee
6. For Working Stress Method: Reinforced concrete by H. J. Shah, charotar publishing house



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA** **(Autonomous)**

## **ADVANCED ENVIRONMENTAL ENGINEERING** **III B.Tech –V Semester (Code: 20CE504/PEC01A)**

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

### **Course Objectives**

1. Describe about the concept of sewage disposal in streams.
2. Learn about the available low-cost treatment methods.
3. Design construction, operation and maintenance of industrial treatment plants.
4. Explain about the sources, characteristics and control of Air Pollution and Noise Pollution.

### **Course Outcomes**

1. Acquaint the knowledge of protection of water bodies against Contamination on disposal of wastewater.
2. Acquaint new concepts of waste water treatment & design of low-cost treatment units.
3. Plan suitable treatment process for selected industrial effluents.

### **UNIT – I**

#### **1. Sewage Disposal**

Objects; Methods; Disposal by dilution; Self-purification in streams; factors affecting self-purification; Dissolved Oxygen Balance in streams; Streeter-Phelps's Dissolved Oxygen Model (including problems); Zones of Self purification; Disposal by irrigation; Sewage sickness.

#### **2. Sludge Treatment and Disposal**

Characteristics of sewage sludge; Anaerobic sludge digestion process; Stages of sludge digestion; Factors affecting sludge digestion; Design of Sludge digestion tank; Methods of de-watering the sludge; Methods of sludge disposal.

### **UNIT – II**

#### **3. Low-Cost Wastewater Treatment Systems**

Introduction; Stabilization ponds (including design aspects); Aerated lagoons; Oxidation ditch; Extended aeration process.

#### **4. New Concepts in Biological Waste Treatment**

Introduction; Nitrogen removal by biological nitrification and de-nitrification; Modelling and design of Rotating Disc Biological Contactor; U-Tube aeration systems.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **UNIT – III**

### **5. Special water supply and sanitary systems**

Emergency sanitary system, Immediate and short term long term sanitation in emergencies- Basic types of toilets- Low cost toilets- Selections of toilets - Public gathering- gender based toilets in buildings- Source diversion, challenges in transportation systems- Noise reduction in water conveyance systems.

## **UNIT – IV**

### **6. Industrial Wastewater Treatment**

Introduction to Industrial Wastewater. Characteristics of industrial wastewater. Treatment methods for Industrial Wastewater.

### **7. Case Studies**

**Sugar Plant:** Sources and characteristics of liquid waste; Methods of its treatment and disposal.

**Pulp and Paper Industry:** Sources and characteristics of liquid waste; Methods of its treatment and disposal.

## **TEXT BOOKS**

1. Wastewater Treatment by M.N. Rao and A.K. Datta; Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
2. Wastewater Engineering, Treatment, Disposal and Reuse by Metcalf & Eddy Inc.; Tata McGraw-Hill Publishing Co. Ltd., New Delhi.

## **REFERENCES.**

1. Water Supply and Wastewater Disposal by G.M. Fair et al; John Wiley & Sons.
2. Sewage Disposal and Air Pollution Engineering by S.K. Garg; Khanna Publications, Delhi.
3. Sewage and Sewage Treatment by S.K. Kshirasagar; Roorkee Publishing House, Roorkee.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **LOW COST HOUSING TECHNIQUES**

#### **III B.Tech –V Semester (Code: 20CE504/PEC01B)**

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

#### **Course Objectives:**

1. To examine the present housing scenario in India.
2. To introduce the economic issues related to housing especially in developing countries like India.
3. To know Building by-laws for housing and housing for urban poor.
4. Introducing low-cost housing techniques
5. Introducing building materials for low-cost housing
6. Introducing traditional practices for low-cost housing
7. To give an introduction on design concepts of seismic resistant structures and to understand earth quake resistant design.

#### **Course Outcomes:**

At the end of the course, the student will be able to,

1. Understand Housing Scenario and Housing Finance
2. Apply Building by-laws for urban planning and Housing for Poor
3. Apply Low Cost Housing Techniques
4. Use Building Materials for low cost Housing
5. Apply concepts of Traditional practices of Rural Housing Technology and design concepts of seismic resistant structures.

### **UNIT-I**

1. Housing Scenario Introducing- Status of urban housing- Status of Rural Housing-

2. Housing Finance: Introducing- Existing finance system in India- Government role as facilitator- Status at Rural Housing Finance- Impedimental in housing finance and related issues

### **UNIT-II**

3. Land use and physical planning for housing: Introduction- Planning of urban land- Urban land ceiling and regulation act- Effectincy of building bye laws- Residential Densities

4. Housing the urban poor: Introduction- Living conditions in slums- Approaches and strategies for housing urban poor





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## **UNIT-III**

5. Development and adopt on of low cost housing technology: Introduction- Adoption of innovative cost effective construction techniques- Adoption of precast elements in partial prefabrication- Adopting of total prefabrication of mass housing in India- General remarks on pre-cast roofing/flooring systems- Economical wall system- Single Brick thick loading bearing wall- 19cm thick load bearing masonry walls- Half brick thick load bearing wall- Flyashgrypsym thick for masonry- Stone Block masonry- Adoption of precast R.C. plank and join system for roof/floor in the building.

## **UNIT-IV**

6. Alternative building materials for low-cost housing: Introduction- Substitute for scarce materials- Ferro cement- Gypsum boards- Timber substitutions- Industrial wastes- Agricultural wastes

7. Low-cost Infrastructure services: Introducing- Present status- Technological options- Low-cost sanitation's- Domestic wall- Water supply- energy

## **UNIT-V**

8. Rural Housing: Introduction- traditional practice of rural housing continuous - Mud Housing technology- Mud roofs- Characteristics of mud- Fire resistant treatment for Thatched roof- Soil stabilization- Rural Housing programs

9. Housing in Disaster Prone areas: Introduction- Earthquake- Damages to houses- Traditional Houses in disaster prone areas Type of Damages and Railways of non-engineered buildings- Repair and restore action of earthquake Damaged non-engineered buildings recommendations for future constructions - Requirements of structural safety of thin precast roofing units against - Earthquake forces- Status of R& D in earthquake strengthening measures- Floods- cyclone- future safety

### **TEXT BOOKS**

1. Building materials for low –income houses – International council for building research studies and documentations.
2. Hand book of low cost housing by A.K.Lal – Newage international publishers.

### **REFERENCE BOOKS:**

1. Properties of Concrete – Neville A.M. Pitman publishing Limited- London.
2. Light weight concrete- Academic kiado- Rudhai .G – Publishing home of Hungarian Academy of Sciences 1963.



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

## TOWN PLANNING AND ARCHITECTURE III B.Tech –V Semester (Code: 20CE504/PEC01C)

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

### Course Objectives:

1. To discuss the history of architecture and design.
2. To discuss the historical background of town planning
3. To discuss the planning theory and principles of planning.
4. To discuss development of smart cities

### Course Outcomes:

Student will be able to

1. Understand the history of architecture and design.
2. Understand the historical background of town planning
3. Understand the planning theory and principles of planning
4. Understand the development of smart cities

### UNIT-I

**History of Architecture:** Western Architecture: Egyptian, Greek, Roman Architectures. Indian Architecture: Vedic age, Indus valley civilization Buddhist period: Stambas, Stupa, Toranas, Chaityas, Viharas Hindu temples: Dravidian and Indo Aryan Styles Temple of Aihole, Madurai, Bhuvaneshwar, Mount Abu. Indo Sarsanic (Islamic) Architecture: Mosque -Palace - Fort-Tomb.

#### Architectural Design:

Principles of designing—Composition of Plan relationship between plan and elevation building elements, form, surface texture, mass, line, color, tone, Principles of Composition: Unity, contrast, proportion, scale, balance, circulation, rhythm, character and expression.

### UNIT-II

**Historical Background of Town Planning:** Town planning in ancient- medieval, renaissance, industrial and post-industrial cities; Contribution of individuals to city planning-Lewis Mumford, Patric Geddes, Peter Hall etc; Acropolis (Greece), Jerusalem, Mecca, Rome, London.  
**Town planning in India**—Town plans of mythological Manasa-Town plans of ancient towns: Harappa, Mohenjo-Daro, Pataliputra, Delhi, Chandigarh etc;

### UNIT-III

**Planning Theory:** Theories of urbanization including Concentric Zone Theory, Sector Theory, Multiple Nuclei Theory and other latest theories, Land use and land value theory of William Alonso; Ebenezer Howard's Garden City Concept; Green Belt Concept.

**Principles of Planning:** Principles of planning a residence-site selection, site orientation-aspect, prospect, grouping, circulation, privacy, furniture requirements, services and other factors. Types of Development Plans.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **UNIT-IV**

**Building Systems:** HVAC, Acoustics, Lighting; LEED ratings;

**Development of Smart cities:** Definition, introduction, fundamentals, possible systems required for a typical Smart City, Case studies.

### **TEXTBOOKS:**

1. 'The great ages of World Architecture' by G.K. Hiraskar.
2. 'Planning and Design of Buildings by Section of Architecture' by Y. S. Sane.
3. 'Textbook of town planning' by Abir Bandyopadhyay

### **REFERENCES:**

1. 'Drafting and Design for Architecture' by Hepler, Cengage Learning
2. 'Architect's Portable Handbook' by John Patten Guthrie—McGraw Hill International Publications.
3. 'Town and County Planning' by A.J. Brown and H.M. Sherrard.
4. 'Town Design' by Federik Glbbard, Architectural Press, London.
5. 'Fundamentals of Town Planning' by G.K. Haraskar.
6. Urban planning theory and practice by m. prataprao



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **SUSTAINABLE ENGINEERING & TECHNOLOGY**

#### **III B.Tech –V Semester (Code: 20CE504/PEC01D)**

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

#### **Course Objectives:**

1. To develop an awareness on issues in areas of sustainability.
2. To establish the role and impact of engineering activities and engineering decisions on environmental, societal, and economic well-being.
3. To give familiarity with the methods and tools used for sustainable product-service system development
4. To understand the role of engineering and technology within sustainable development.

#### **Course Outcomes:**

At the end of the course, the student will be able to,

1. Increased awareness on issues in the area of sustainability
2. Gain an understanding of the role and impact of engineering activities and engineering decisions on the environment, society, and economics
3. Gain familiarity with the methods and tools employed for sustainable product-service system development.
4. Understand the role of engineering and technology within sustainable development.

#### **UNIT-I**

1. An introduction to sustainability -Introduction -The Magnitude of the Sustainability Challenge Energy
2. Materials Use- Minerals, Metals, and Organics Water -
3. Environmental Emissions - Ozone Depletion in the Stratosphere- Global Warming-Regional and Local Air Quality -Summary of Air Quality - Water Quality - Wastes

#### **UNIT-II**

4. Risk and life-cycle frameworks for sustainability - Introduction- Risk -Definitions- Risk Assessment -Risk-Based Environmental Law
5. Life-Cycle Frameworks- Defining Life Cycles- Life-Cycle Assessment- Life-Cycle-Based Environmental Law;
6. Life-Cycle Assessment Tools- Process-Based Life-Cycle Assessments Input-Output LCA - Hybrid Approaches



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## **UNIT-III**

7. Green, sustainable materials- Introduction- Environmental and Natural Resource Use Footprints of Material Extraction and Refining Tracking Material Flows in Engineered Systems

8. Introduction - Sustainable Engineering Design Principle; Economic Performance Indicators- Definitions - Estimates of Environmental Costs- A Framework for Evaluating Environmental Costs; Environmental Performance Indicators- Life-Cycle Impact Assessment

## **UNIT-IV**

9. CASE STUDIES - Introduction; Biofuels for Transportation- The Carbon Cycle and Biofuels- Feedstocks for Biofuels - Processing Routes for Biomass to Biofuels- Biofuel Life Cycles- Cautionary Tales and Biofuels- Summary of Sustainability of Biofuels

10. Sustainable Built Environments- Energy Consumed for Building Operation, Materials Use for Building Construction and Maintenance, Design of Buildings for Sustainability, Conclusions on Sustainability of Buildings

### **TEXT BOOK:**

1. Sustainable Engineering Concepts, Design, and Case Studies by DAVID T. ALLEN  
DAVID R. SHONNARD



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **REMOTE SENSING & DRONE TECHNOLOGY**

#### **III B.Tech –V Semester (Code: 20CE505/JOE01A)**

Lectures	2	Tutorial	0	Practical	2	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

#### **COURSE OBJECTIVES:**

1. Understand the fundamentals of aerial photography.
2. Analyze the fundamental ideas of remote sensing and its properties, as well as satellite sensors and platforms. Understand satellite image processing and categorization techniques.
3. Understanding the principles of Unmanned Aerial Vehicles (Drones) and their diverse uses in the age of artificial intelligence is the major goal of this course. The training will also teach students how to operate a drone while taking local laws and regulations into account.
4. Understand the basic concepts GIS, spatial data and analysis. Know various remote sensing and GIS applications in civil engineering.

#### **COURSE OUTCOMES:**

1. Interpret Information from Aerial Photographs.
2. Exposure to Basics of Remote Sensing, Satellite Sensors and Platforms, Practical Knowledge on Satellite Image Classification.
3. Understand the several applications of drones and unmanned aerial vehicles in the age of AI. To construct the drone, investigate the operating principle of various electronic components. Apply the concept of drone dynamics and various flying manoeuvres. Detect and illustrate UAV flying in the environment.
4. Know Basics of GIS And Map Making. Exposure about Spatial Analysis Using Overlay Tools. Get the Knowledge on Various Remote Sensing and GIS Applications in Civil Engineering.

#### **UNIT- I: INTRODUCTION TO PHOTOGRAMMETRY & REMOTE SENSING**

**Introduction to Photogrammetry:** Fundamentals of Photogrammetry and Photo interpretation – types of photographs; Vertical photographs – principal point; scale; Stereoscopy; flight planning- Overlap, side lap.

**Introduction to Remote Sensing:** Basic concepts of remote sensing, electromagnetic radiation, electromagnetic spectrum, EMR interaction with Atmosphere – Scattering, Absorption – EMR interaction with Earth surface features reflection, absorption, emission and transmission

#### **UNIT – II: REMOTE SENSING**

**Sensors and platforms:** Introduction, types of sensors, airborne remote sensing, Space-borne remote sensing. Visual Interpretation Techniques.

**Satellites:** Land observation satellites, characters and applications, IRS series, LANDSAT series, SPOT series, High-resolution satellites, character and applications, CARTOSAT series, IKONOS Series, QUICKBIRD series, Weather/Meteorological satellites, INSAT series, NOAA, GOES, NIMBUS Applications, Marine observations satellites OCEANSAT



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

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### **UNIT – III: INTRODUCTION TO DRONES**

Introductions to drones and their applications in the age of AI, Drone regulations specific to India, Basics of dronedynamics for flying - frame types, propellers, types of drones, dynamics specific to a quadcopter, Understanding UAV movements (Quadcopter), How to fly a drone, Introduction to drone electronic components, working principle behind each electronic component, Drone frames and electronic assembly, flying experiments.

### **UNIT – IV: GEOGRAPHIC INFORMATION SYSTEM (GIS)**

Introduction, key components, map projections, data entry & preparation – Spatial data input, Raster Data Model, Vector Data Model, Raster vs Vector. Advantages and disadvantages of Raster & Vector, Basic Overlay operations. Data storage-vector data storage, attribute data storage, and an overview of the data manipulation and analysis.

**Applications:** Land use and Land cover, Watershed management for sustainable development, Agriculture, Forestry, Geology, Geomorphology, Urban Applications, Hydrology

#### **TEXTBOOKS:**

1. Bhatta B (2008), 'Remote sensing and GIS', Oxford University Press
2. Chang, K. T. (2006). Introduction to Geographic Information Systems. The McGraw-Hill.
3. Lillesand, T.M, R.W. Kiefer and J.W. Chipman (2013) 'Remote Sensing and Image Interpretation, Wiley India Pvt. Ltd., New Delhi
4. Garg, P. K. Unmanned Aerial Vehicles: An Introduction. Stylus Publishing, LLC, 2021

#### **REFERENCE BOOKS:**

1. 'Fundamentals of Remote Sensing' by George Joseph, Universities Press, 2013.
2. 'Fundamentals of Geographic Information Systems' by Demers, M.N, Wiley India Pvt.Ltd, 2013.
3. Jensen John R. Introduction to Digital Image Processing: A Remote Sensing Perspective Prentice hall, New Jersey
4. Paul Wolf, Elements of Photogrammetry, McGraw Hill.
5. Barnhart, R. Kurt, Douglas M. Marshall, and Eric Shappee, eds. Introduction to unmanned aircraft systems. Crc Press, 2021.
6. Syed Omar Faruk Towaha, Building Smart Drones with ESP8266 and Arduino: Build exciting drones by leveraging the capabilities of Arduino and ESP8266, Packt Publishing, 2018.
7. Burrough, P. P. & McDonnel, R. A. (1998). Principles of GIS. Oxford University Press.
8. Kimon P. Valavanis, Handbook of Unmanned Aerial Vehicles, Volume 4, Springer Netherlands, 2014.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **PLUMBING AND FIRE SERVICES**

#### **III B.Tech –V Semester (20CE505/JOE01B)**

Lectures	2	Tutorial	0	Practical	2	Credits	3
Continuous Internal Assessment			: 30	Semester End Examination (3 Hours)			: 70

#### **COURSE OBJECTIVES:**

1. Understand the fundamental of Plumber's tools and Pipe Fitting.
2. Understand the applications of Sanitary Appliances and Heating System.
3. Understand the importance of Fire Fighting Systems.
4. Analyze the Fire Risk Assessment Schedules.

#### **COURSE OUTCOMES:**

1. To understand the basic plumbing systems and their applications in pipe fitting.
2. To understand the purpose of sanitary appliances and heating systems.
3. To understand the application of Fire Fighting Systems and the method of selection.
4. To analyze how to prepare Fire Risk Assessment Schedules.

### **UNIT-I**

#### **1. Plumber's Tools And Their Uses:**

1. Holding tools (a) Bench vice (b) Pipe vice 2. Fitting tools (a) Wrenches (b) Water-pump pliers (c) Spanners 3. Cutting tools (a) Pipe cutter (b) Hacksaw 4. Pipe bending tools (a) Pipe bending machine (b) Threading dies 5. Other tools (a) Chisel (b) Hammer (c) Chain wrench (d) Rover jumper (e) Trowel (f) Screw driver (g) File (h) Plier (i) Caulking tools (j) Drill machine (k) Drill bit (l) Hanger (m) Measuring tape (n) Plumb rule and bob (o) Spirit level (p) Spade (q) Shovel (r) Pickaxe (s) Mortar pan (t) Masons' square (u) Water level tube

#### **2. Pipes and Pipe Fitting**

Selection and use of different pipes like GI Pipes, Plastic pipes, PVC pipes, HDPE pipes, Cast iron pipes, Plumbing symbols; Bends, Elbows, Sockets, Tees, Unions, Pipe cutting, Pipe bending, Pipe Threading, Pipe joints, Pipe fitting, Alignment of pipes, Branching of pipes, Safety precautions, relevant IS codes are to be taught.

### **UNIT-II**

#### **3. Sanitary Appliances**





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Flush toilet, Squat toilet, Wash basin, Sink, Floor traps, Urinal, Bathtub, Shower, Bidet, Mixing tap, Popup waste, water efficient appliance.

## **4. Heating System**

Heat transfer, Water heater, Geyser, Domestic hot water supply system, Central heating, Solar water heater

## **UNIT-III**

## **5. Fire Fighting System**

Provisions & applicable standards of detection and alarm system, Introduction of detection devices, alarm and detection system, Type of detectors, Method of selection. Cost analysis, design, installation, testing and commissioning of alarm and detectionsystem.Provisions& applicable standards of foam, gases and dry chemical powder based systems.

## **UNIT-IV**

## **6. Fire Risk Assessment Schedules**

Introduction, Taxonomy of Methods for Fire Risk Assessment, Schedules, Insurance Rating, Dow's Fire and Explosion Index.

### **TEXTBOOKS:**

1. Plumbing, 2Nd Edition by Muscroft Steve, T and F India.
2. Principles Of Fire Safety Engineering Understanding Fire And Fire Protection 2Nd Edition by DAS, AKHIL KUMAR , PHI Learning

### **REFERENCE BOOKS:**

1. IS Code of practice for Plumbing in Multistoried Buildings. IS 12183-1 (1987)
2. National Building Code Part 4 – Fire and Life Safety.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **RURAL WATER SUPPLY DISTRIBUTION SYSTEMS**

#### **III B.Tech –V Semester (20CE505/JOE01C)**

Lectures	2	Tutorial	0	Practical	2	Credits	3	
Continuous Internal Assessment			:	30	Semester End Examination (3 Hours)		:	70

#### **UNIT I**

Rural Water Supply: Issues of rural water supply –Various techniques for rural water supply- merits, National rural drinking water program- operation and maintenance of rural water supplies

#### **UNIT II**

Scope of water supply in rural areas, magnitude of problem of water supply, population to be covered, various approaches for planning of water supply systems in rural areas. Selection and development of preferred sources of water, springs, wells and infiltration galleries, collection of raw water from surface source.

#### **UNIT III**

General requirements of a Distribution system, arrangement of distribution pipes and other accessories, layout of distribution networks – Dead end system, Grid iron System, Ring System and radial System, Advantages and Disadvantages of these systems. Methods of distribution – Gravity System, Pumping System and combined gravity and pumping system, Design of water distribution networks by Hardy Cross Method.

#### **UNIT IV**

Function & Types of distribution reservoirs – Surface reservoirs and Elevated reservoirs, Stand Pipes, Storage Capacity of distribution reservoirs by mass curve method, Location and Height of the Distribution reservoirs.

Appurtenances in the distribution system – fire hydrants – requirements of a good hydrant, types of fire hydrants, water meter – requirement of a good water meter, Types of water meter.

#### Reference Books:

1. Eulers, V.M., and Steel, E.W., Municipal and Rural Sanitation, 6th Ed., McGraw Hill Book Company, .
2. Wright, F.B., Rural Water Supply and Sanitation, E. Robert Krieger Publishing Company, Huntington, New York.
3. Rijswijk ( the Haque ). Wagner, E.G. and Lanoik, J.N. water supply for rural areas and small communities, Geneva: W.H.O.1959.
4. Manual of water supply and treatment, 3rd edition, CPHEEO, GOI, New delhi
5. Qasim, Syed R., Motley, Edward M., and Zhu, Guang (2000) Water works engineering: planning, design and operation. New Jersey: Prentice Hall.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **BUILDING INFORMATION MODELING LAB III B.Tech –V Semester (Code: 20CE506/SOL03)**

Lectures	1	Tutorial	0	Practical	2	Credits	2
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

### **Ex. No**

### **Name of the experiment**

- 1 Prepare and Present on BIM concepts as per given guidelines.
- 2 Write a short note on Role of Digital model in BIM, Different softwares used for different stages of Project in BIM.
- 3 Develop the centreline wall layout using Revit.
- 4 Submit the layout with annotation detailing.
- 5 Submit detail layout of monolithic stair.
- 6 Prepare the structural BIM model.
- 7 Submit the sheet for floorplan.
- 8 Develop 3D visuals of model for client meeting.
- 9 Submit sheets for footing, column, plinth beam layouts.
- 10 Generate quantity details for categories from the BIM model.

### **Text Books :**

1. Mastering Autodesk Revit 202 by Robert Yori, Marcus Kim and Lance Kirby published by Sybex – a Wiley Brand.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **GEO TECHNICAL ENGINEERING LABORATORY**

#### **III B.Tech –V Semester (Code: 20CEL501)**

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

#### **Course Objectives**

The objective of this course is:

1. To impart knowledge of determination of index properties required for classification of soils.
2. To teach how to determine compaction characteristics and consolidation behavior from relevant lab tests;
3. To determine permeability of soils.
4. To teach how to determine shear parameters of soil through different laboratory tests.

#### **Course Outcomes**

Upon successful completion of this course, student will be able to

1. Determine index properties of soil and classify them.
2. Determine permeability of soils.
3. Determine Compaction and Consolidation characteristics of soils
4. Determine shear characteristics of soils

#### **List of Experiments:**

1. Determination of water content by oven drying method.
2. Determination of specific gravity by (a) Density bottle method (b) Pycnometer method.
3. Gradation analysis a) Mechanical Sieve analysis b) Hydrometer analysis.
4. Determination of Atterberg limits
5. Determination of free swell index
6. Determination of field unit weight by a) Core cutter method. b) Sand replacement method.
7. Determination of permeability by a) Constant head permeameter. b) Variable head permeameter.
8. Direct shear test.
9. Vane shear test.
10. Unconfined compression test
11. IS - Light compaction test
12. IS - Heavy compaction test
13. Triaxial shear test (Demonstration only)
14. Consolidation test.



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

## PYTHON PROGRAMMING LABORATORY III B.Tech –V Semester (Code: 20CEL502)

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

### Course Objectives:

- CO1 Understand and write code using the basics of Python, Statements, Expressions, Conditional Executions, and Functions.
- CO2 Write code for Iteration, Strings, File I/O.
- CO3 Write code in creating, usage of Lists, Dictionaries, and Tuples.
- CO4 Understand the concepts of Object Orientation, Databases and write code implementing them.

### Course Outcomes: Students will be able to:

- CLO-1 Understanding of scripting and the contributions of python language.
- CLO-2 Understanding of Python especially the object-oriented concepts, using databases.
- CLO-3 Able to design and implement machine learning solutions to classification, regression.
- CLO-4 Able to design and implement machine learning solutions to clustering problems and features of various data.

### LIST OF EXPERIMENTS

1. Write a python program to check if the number is positive or negative or zero and display an appropriate message.
2. Write a python program to take a string from user and count number of vowels present and percentage of vowels in it.
3. Write a python program to find the most frequent words in a text file.
4. Write a Python Program to Find the Sum of first Natural Numbers.
5. Write a Python Program to Find HCF or GCD.
6. Write a Python Program to Find LCM.
7. Write a python function to find the maximum and minimum of a list of numbers.
8. Determination of the height of the building when base is accessible.
9. Determination of included angles from the given bearing and check for local attraction.
10. Design an irrigation channel by using Lacey's and Kennedy's theory.
11. Classification of soil by Indian standard classification system.
12. Determination of permeability coefficient by constant head and falling permeability tests.
13. Design of Reinforced Beam for flexure by working stress method.
14. Design of T- Beam for flexure by limit state method.
15. Design of Reinforced beam for Shear by limit state method.
16. Design of simply supported one-way slab.

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

- Text Books :**
1. A Python Book: Beginning Python, Advanced Python, and Python Exercises, Dave Kuhlman, Open Source MIT License.
  2. Python for Data Analysis, Wes McKinney, O' Reilly.

- References :**
1. Python Data Science Handbook-Essential Tools for Working with
  2. Data Science from Scratch, Joel Grus, O'Reilly.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA** **(Autonomous)**

## **INDIAN CONSTITUTION**

### **III B.Tech –V Semester (Code: 20CE507/MC03)**

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

#### **Course Objectives:**

1. To provide basic information about fundamental law of the country.
2. To educate the student about fundamental Rights and fundamental duties of citizens.
3. To educate the students about Government organs, methods of functioning
4. To motivate students to leave narrow selfish outlook and inculcate broad national, human outlook.

**Course Learning Outcomes:** Upon the successful completion of the course the student will be able to

1. Able to understand the importance of the constitution in a Democratic Society.
2. Understand the Fundamental Rights and understand the duties of a citizen and discharge his duties and became a good citizen.
3. Know about Judicial supremacy and Independence of judiciary and fight for his legitimate Rights through court of law.
4. As a citizen he can participate in the democratic process of governance.
5. Participate in nation building activities and be away from destructive outfits.

#### **UNIT-I**

1. Meaning of the constitutional law and constitutionalism.
2. Historical perspective of the constitution of India
3. Salient features and characteristics of the constitution of India.
4. Preamble, union and its territory and citizenship.

#### **UNIT – II**

5. Fundamental rights principles.
6. Directive principles of state policy.
7. Fundamental Duties.
8. The government of the union, the president, The Prime Minister, and the council of ministers, The parliament of India, The supreme court, the union judiciary.



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## **UNIT – III**

9. The Machinery of Government in the states, The Governor, The Chief Minister and council of Ministers, The State legislature, High court, Judiciary in the states
10. Union territories.
11. The Federal System, Division of powers between centre and states, Legislative, Administration and Financial relation.
12. Emergency Provisions, President Rule, National Emergency, Financial Emergency

## **UNIT IV**

13. Local self-Government, Panchayat Raj, Municipalities and Municipal Corporation
14. The comptroller and Auditor general of India, The Public Service Commission, Special Provisions relating to certain classes, Elections – Political parties.
15. Amendment of the Constitution.

### **TEXTBOOKS:**

1. Laxmikanth, M. (2019). Indian polity. McGraw-Hill Education.
2. Constitutional Government in India - M V Pylee – Asia Publishing House

### **REFERENCE BOOKS:**

1. D C Dasgupta, Indian Government and Politics. Vikas Publishing house
2. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
3. Constitutional of India by Dr. B R Ambedkar
4. Indian Constitution and its features – Astoush Kumar, Anmol Publishers
5. The Constitution of India – Bakshi P M – Universal Law Publishers
6. Legelect's the constitution of India – RamnarainYadav, K KLegelest Publication



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **DESIGN OF STEEL STRUCTURES**

#### **III B.Tech –VI Semester (Code: 20CE601)**

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

**(Using Limit State Method)**

#### **Course Objective:**

1. To understand the behavior and design of simple connections.
2. To design Tension and compression members efficiently and economically.
3. To design column bases along with connections.
4. To design beams efficiently and economically.
5. To understand the behavior and design of eccentric connections.

#### **Course Outcomes:**

1. The students are able to understand the behavior and design of simple connections efficiently and economically.
2. The students are able to design Tension and compression members efficiently and economically.
3. The students are able to design column bases along with connections.
4. The students are able to design flexural members (Laterally supported and unsupported) efficiently and economically.
5. The students are able to understand the behavior and design of eccentric connections.

### **UNIT – I**

#### **1.Introduction**

Types of steels; Constructional steels; Mechanical properties; Design concepts; Fatigue behavior; Brittle fracture; Corrosion; Hot rolled sections;

#### **2. Simple Connections**

Advantages of welding; Welds; Types of welded joints; Weld specifications; Allowable stresses; Bolts; Black bolts; Failure modes of a joint; Pitch requirements of bolts; Allowable stresses; Efficiency of joint; High strength bolts; Lap and butt joints, Truss joint connections;

### **UNIT – II**

#### **3. Tension Members**

Introduction; Types of sections; Net area; Net effective area for angles and Tees; Design of tension members;

#### **4. Compression Members**

Introduction; Angle Struts; Effective length of a column; Allowable stresses; Types of sections; Built-up columns (using welding); Column splice (using welding)





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## **UNIT – III**

### **5. Column Bases**

Slab base; Gusseted base; Eccentric bases;

## **UNIT – IV**

### **6. Beams**

Introduction; Laterally supported beams; Built-up beams (using welding); lateral buckling of beams; Design of laterally supported beams; Secondary design considerations; Grillage beams; Design of laterally unsupported beams;

## **UNIT – V**

### **7. Eccentric Connections**

Simple beam end connections – Seat connections; Bracket connections;

### **TEXT BOOKS**

1. Limit state design of steel structures by S.K.Duggal, Tata McGrawhill, Publishing company Ltd.
2. Design of Steel structures by N.Subramanian, Oxford University press, 2009

### **REFERENCE BOOKS**

1. Design of Steel Structures by Limit state method as per IS800-2007 by K.S. Sairam, Pearson Education India
2. Design of Steel Structures by Limit state method as per IS800-2007 by S.S.Bhavakatti, IK International Publishing Housing Pvt.Ltd.
3. Analysis and Design Practice of Steel Structures by Karuna Moy Ghosh, Prentice Hall of India Publishers.
4. Structural steel design by M.L.Gambhir , Tata McGraw-Hill Education

### **Codes**

1. IS 800-2007



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA** **(Autonomous)**

## **WATER RESOURCE ENGINEERING** **III B.Tech –VI Semester (Code: 20CE602)**

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

### **UNIT – I**

#### **1. Hydrology**

Hydrologic cycle; Precipitation types; Rain gauges; Computation of average rain fall over a basin; factors affecting evaporation, infiltration and Run off; Computation of run off.

#### **2. Hydrographs**

Hydrograph analysis; Unit hydrograph; Application of Unit hydrograph to the construction of a flood hydrograph resulting from rainfall of unit duration; Application of Unit hydrograph to construction of a flood hydrograph resulting from two or more periods of rainfall; Construction of unit hydrograph of different unit duration from a unit hydrograph of some given unit duration by superposition method and S-curve method.

### **UNIT – II**

#### **3. Ground Water – Well Irrigation**

Introduction; Aquifer; Aquiclude; Aquifuge; Specific yield; Specific retention; Divisions of sub– surface water; Water table; Types of aquifers; Well hydraulics; Steady radial flow to a well–Dupuit’s theory for confined and unconfined aquifers; Yield of an open well–Constant level pumping test, Recuperation test.

#### **4. Channels – Silt Theories & Design Procedure**

Cross section of a channel; Balancing depth; Silt theories–Kennedy’s theory, Lacey’s regime theory; Kennedy’s method of channel design; Lacey’s theory applied to channel design.

### **UNIT – III**

#### **5. Water logging & Canal Lining**

Effects of water logging; Causes of water logging; Remedial measures; Lining of irrigation channels – necessity, advantages and disadvantages; Design of lined canal.

#### **6. Canal outlets and regulation works**

Types of outlets; Canal falls; Necessity and location of falls; Classification of falls. Types of regulators and functions of cross and head regulators.

### **UNIT – IV**

**7. Introduction to Irrigation:** Types and Methods of irrigation, Benefits of irrigation; Ill-effects of irrigation;

**8. Water Requirement of Crops:** Functions of irrigation water; Classes and availability of soil water; Saturation capacity; Field capacity; Wilting point; Available moisture and readily available moisture; Moisture equivalent; Soil moisture deficiency; Limiting soil moisture conditions; Depth and frequency of irrigation; Duty and Delta; Base period; Relation between Duty and Delta; Factors affecting duty; Methods of improving duty; Gross command area; Culturable command area; Culturable cultivated and uncultivated area; kor depth and kor period; Determination of irrigation requirements of crops; crop rotation.



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## **TEXT BOOKS:**

1. Irrigation and water power Engineering by Dr. B.C. Punmia & Dr. Pande B.B. Lal; Laxmi Publications Pvt. Ltd., New Delhi.
2. Irrigation Engineering and Hydraulic structures by S. K. Garg; Khanna Publishers, Delhi.

## **REFERENCE BOOKS:**

1. Irrigation, Water Resources & Water Power Engineering by Dr. P.N. Modi; Standard Book House, New Delhi.
2. Irrigation, water power and water resources Engineering by K R Arora, Standard Publishers, New Delhi
3. Engineering Hydrology by K. Subramanya, TMH Publishers
4. Engineering Hydrology by P. Jayarami Reddy, Laxmi Publications
5. Irrigation Engineering and Hydraulic Structures by S.R. Sahasrabudhe; Katson Publishing House, Ludhiana



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **HIGHWAY ENGINEERING**

#### **III B.Tech –VI Semester (Code: 20CE603)**

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

#### **Course Objectives:**

1. To discuss the principles of planning and geometric design of highways.
2. To discuss the traffic flow characteristics.
3. To assess the properties of highway construction materials and design the flexible and rigid pavements.
4. To explain the construction and maintenance techniques used in the different pavement layers.

#### **Course Outcomes:** Student will be able to

1. Design various road geometric elements.
2. Assess the traffic flow characteristics and traffic operations.
3. Evaluate suitability of pavement materials and determine the crust thickness of the pavement.
4. Identify the causes for distresses in the pavement layers.

### **UNIT-I**

#### **1. Highway Network Planning and Alignment**

Introduction to Transportation Systems and Different Modes of Transportation, Road Classification, Road Patterns, 20 Year Road Development plans. Current road projects in India; Highway Alignment: Requirements, factors controlling, Engineering Surveys.

#### **2. Highway Geometric Design**

Geometric Design: Highway Cross Section Elements - Friction, Unevenness, Camber, Carriageway Width, Kerbs, road margins, formation width, right of way, Sight Distance- Stopping Sight Distance, Overtaking Sight Distance, Intermediate Sight Distance, Design of Horizontal Alignment- Super elevation, transition curves, extra widening, set back distance, Design of Vertical Alignment- Grades and Grade Compensation, Types of Vertical curves and design.

### **UNIT-II**

#### **3. Traffic Studies**

Introduction, Road User Characteristics, Vehicle Characteristics, Traffic Volume Studies, Speed Studies, Origin and Destination Studies, Traffic Flow Characteristics, Traffic Capacity and Level of Service.

#### **4. Design Of Traffic Control Devices**

Traffic Operations-Traffic Regulation, Traffic Control Devices- Markings, Signs, Signals, Rotary Intersection.



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## **UNIT-III**

### **5. Pavement Materials**

Pavement types and components of a pavement structure; characterization of different pavement materials including: sub-grade soil, aggregates, bitumen, modified bitumen, cutback bitumen, and emulsion; Different grading systems for bitumen; Marshall method of bituminous mix design.

### **6. Design of Pavements**

Design of pavements- Introduction; flexible pavements, factors affecting design and performance; design of flexible pavements as per IRC-37; rigid pavement components and functions; factors affecting design and performance of CC pavements; stresses in rigid pavements; design of concrete pavements as per IRC-58.

## **UNIT-IV**

### **7. Highway Construction and Maintenance**

Construction Steps of Embankment, Sub Grade, Granular Sub Base (GSB), Wet Mix Macadam (WMM), Dense Bituminous Macadam (DBM), Bituminous Concrete (BC), Dry Lean Concrete (DLC), Pavement Quality Concrete (PQC), failures in flexible pavement, failures in rigid pavements, maintenance of Bituminous pavements and concrete pavements.

### **TEXT BOOKS**

1. Khanna, S. K., C. E. G. Justo, A.Veeraragavan"Text book on Highway Engineering." Nem Chand Bros, Roorkee (2014).10<sup>th</sup>Edition.
2. Principles and practices of Highway Engineering (2013), L R Kadiyali; N B Lal,Khanna Publishers, NaiSarak, Delhi

### **REFERENCE BOOKS**

1. Principles of Transportation Engineering by ParthaChakroborthy&Animesh Das; Prentice Hall of India, New Delhi.
2. Ministry of Road Transport and Highways- Specifications for Roads and Bridge Works, Fifth Revision, IRC, New Delhi, India-2013
3. IRC 37:2018- Guidelines For The Design of Flexible Pavements(Third Revision)
4. IRC58-2015 Guidelines for the Design of Plain Jointed Rigid Pavements for Highways

### **NPTEL :**

<http://nptel.ac.in/courses/105101087/>

<http://nptel.ac.in/courses/105105107/>



# BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)

## ADVANCED STRUCTURAL ANALYSIS III B.Tech –VI Semester (Code: 20CE604/PEC02A)

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

### Course Objectives:

1. To analyze the indeterminate structures by kani's Method.
2. To understand the analysis of indeterminate structures using strain energy concept.
3. To study the analysis of continuous beams using matrix approach.
4. To understand the plastic behavior of beams and rigid jointed frames.

### Course Outcomes: At the end of the course, the student will be able to:

1. Analyze the indeterminate beams and framed by Kani's method
2. Analyze the indeterminate structures using strain energy method.
3. Analyze the continuous beams using matrix methods.
4. Analyze the continuous beams, Frames carrying ultimate loads using plastic analysis.

### UNIT – I

1. **Kani's Method** Principles of the method; Application to continuous beams and portal frames (single bay, single storey with vertical legs only) without and with side-sway.

### UNIT-II

2. **Strain Energy Method:** Strain energy method for analysis of continuous beams and rigid jointed plane frames (DOF: 2). (Castigliano's theorem-II).

3. **Redundant Pin Jointed Frames:** Analysis of pin jointed frames (one degree redundancy); Forces in indeterminate pin jointed frames due to temperature variation and lack of fit;

### UNIT-II

#### 4. Introduction to Matrix Methods

Flexibility and stiffness; Flexibility matrix; Stiffness matrix; Relationship between flexibility matrix and stiffness matrix.

#### 5. Analysis of Continuous beams

Analysis of continuous beams by Flexibility method and stiffness matrix method, (up to 2 DOF).

### UNIT – IV

#### 4. Plastic Behavior of Structures

Idealized stress - strain curve for mild steel; Ultimate load carrying capacity of members carrying axial forces; Moment - Curvature relationship for flexural members; Evaluation of fully plastic moment; Shape factor; Collapse load factor; Upper and lower bound theorems; Collapse load analysis of indeterminate beams and single bay, single storied portal frames.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **TEXT BOOKS :**

1. V. N. Vazirani & M. M. Ratwani, Structural Analysis, Vol. II, Khanna Publishers, Delhi.
2. Structural Analysis – A matrix approach by G. S. Pandit & S. P. Gupta; Tata Mc. Graw – Hill Publishing Co. Ltd., New Delhi.
3. Limit Analysis of Structures by Manicka & Selvam, Dhanpat Rai Publications, 2012.

## **REFERENCES:**

1. Matrix analysis of framed structures by Weaver & Ger
2. Basic Structural Analysis by C. S. Reddy, Tata McGraw-Hill



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **ENVIRONMENTAL GEOTECHNICS III B.Tech –VI Semester (Code: 20CE604/PEC02B)**

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

### **Course Objectives:**

1. To introduce soil structure and clay minerals.
2. To know characteristics and classification of wastes
3. Introducing hydrology of contaminants.
4. Introducing methods of disposal and site remediation

### **Course Outcomes:**

At the end of the course, the student will be able to,

1. Understand soil structure and clay minerals
2. Understand characteristics and classification of wastes
3. Understand characteristics and classification of wastes
4. Understand methods of disposal and site remediation

### **UNIT-I**

#### **CLAY MINERALOGY AND SOIL STRUCTURE**

Clay mineralogy and soil structure: Gravitational and surface forces-inter sheet and inter layer bonding in the clay minerals- Basic structural units of clay minerals- isomorphous substitution – kaolinite mineral- montmorillonite mineral- illite mineral- electric charges on clay minerals – base exchange capacity- diffused double layer- adsorbed water- soil structure- methods for the identification of minerals (introduction only).

### **UNIT-II**

#### **CHARACTERISTICS AND CLASSIFICATION OF WASTES**

Wastes and Contaminants (introduction only): sources of wastes-types of wastes-composition of different wastes- characteristics and classification of hazardous wastes- generation rates- Soil water environment interaction relating to geotechnical problems-Effect of pollution on soil water behaviour-Case studies of foundation failures by ground contamination.

### **UNIT-III**

#### **HYDROLOGY OF CONTAMINANTS**

Transport phenomena in saturated and partially saturated porous media-contaminant migration and contaminant hydrology- Ground water-pollution downstream for landfills due to Leachate migration-Passive containment systems – Containment control systems- liners and covers for waste disposal- rigid liners- flexible liners.





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## **UNIT-IV**

### **METHODS OF DISPOSAL AND SITE REMEDIATION**

Criteria for selection of sites for waste disposal – Surface and subsurface waste disposal techniques-Ground modification techniques in waste management – Physical modification-Thermal modification-chemical modification-Bioremediation-Geotechnical properties of wastes-Bearing capacity of landfill sites-foundation for waste fill ground.

### **TEXT BOOKS**

1. Mitchell, J (1976), “Fundamentals of soil behaviour”, John Wiley and sons, New York
2. Daniel, B.E., " Geotechnical Practice for Waste disposal ", Chapman and Hall, London, 1993.
3. Iqbal, H.Khan “Text book of Geotechnical Engineering” Second Edition

### **REFERENCES**

1. Lambe, T. W & Whitman, R. V (1979), “Soil Mechanics “, John Wiley and Sons, New York.
2. GopalRanjan& A.S.R Rao (1991), “Basic and Applied Soil Mechanics, Wiley Eastern Ltd., New Delhi.
3. Wilson, M. J (1987), “A Hand book of Determinative methods in Clay Mineralogy”, Chapman and Hall, New York.
4. Robert M. Koerner (1984), “Construction and Geotechnical methods in FoundationEngineering”, McGraw Hill Book Co., New York.
5. Yong R. N. (1992), “Principles of contaminant Transport in Soils, “Elsevier, New York.
- RamanathaIyer T. S (2000), “Soil Engineering Related to Environment”, LBS centre.
6. Lagrega, M.D., Buckingham, P.L. and Evans, J.B., " Hazardous Waste Management McGraw Hill, Inc., Singapore, 1994.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **PRE STRESSED CONCRETE**

**III B.Tech –VI Semester (Code: 20CE604/PEC02C)**

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

#### **Course Objectives:**

1. To highlight the concepts of pre-stressing in concrete and materials used for pre-stressing.
2. To analyze the general mechanical behavior of pre-stressed concrete members on comparison with those of RCC members.
3. To understand various losses of pre-stress and estimate the deflection in pre-stressed concrete members.
4. To design pre-stressed concrete beams.
5. To analyze and design of end anchorages for pre-stressed concrete members.

#### **Course Outcomes:**

1. Understand the concepts of pre-stressing in concrete and state the necessity for high strength steel and concrete in PSC and explanation of the various types of pre-stressing systems.
2. Understand the difference in the analysis of general mechanical behavior of PSC and RCC members.
3. Evaluate the total losses allowed for design of PSC members and estimating the deflection in PSC members.
4. Design pre-stressed concrete beams using IS1343.
5. Analyzing and designing the end anchorages for pre-stressed concrete members.

### **UNIT – I**

1. Introduction Basic concepts of prestressing; Need for High strength steel and High strength concrete; Advantages of prestressed concrete.
2. Materials For Prestressed Concrete High strength concrete; High tensile steel.
3. Prestressing Systems Tensioning devices; Hoyer's long line system of pretensioning; Post tensioning systems; Detailed study of Freyssinet system, Lee-McCall System and Gifford – Udall system;
4. Analysis Of Prestress And Bending Stresses Basic assumptions; Analysis of prestress; Resultant stresses at a section; Pressure (Thrust) line and internal resisting couple; Concept of Load balancing; Stresses in tendons; Cracking moment.



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## **UNIT – II**

5. Losses of Prestress Nature of losses of prestress; Loss due to elastic deformation of concrete, shrinkage of concrete, creep of concrete, relaxation of stress in steel, friction and anchorage slip; Total losses allowed for in design.
6. Deflections of Prestressed Concrete Members; Importance of control of deflections; Factors influencing deflections; Short term deflections of uncracked members

## **UNIT – III**

7. Elastic Design of Prestressed Concrete Sections for Flexure Permissible compressive stresses in concrete as per IS 1343; Design of rectangular and I – sections of TYPE 1, TYPE 2 (Elastic Design only).

## **UNIT – IV**

8. Shear Resistance Shear and Principal Stresses; Ultimate shear resistance of prestressed concrete members; Design of shear reinforcement.
9. Transfer of Prestress in Pre-Tensioned Members & Flexural Bond Stresses Transmission of prestressing force by bond; Transmission length; Bond stresses; Transverse tensile stresses; End zone reinforcement; Flexural bond stresses in pre – tensioned and post – tensioned grouted beams.
10. Anchorage Zone Stresses in Post-Tensioned Members Stress distribution in end block; Anchorage zone reinforcements; Design of anchorage and end block as per IS 1343.

### **TEXT BOOKS:**

Prestressed Concrete by N. Krishna Raju; Tata McGraw - Hill Publishing Company Limited, New Delhi.

### **REFERENCE BOOKS:**

1. Design of Prestressed Concrete Structures by T.Y. Lin & Ned H. Burns; John Wiley & Sons.
2. Prestressed Concrete by P. Dayaratnam. Oxford & IBH
3. Prestressed Concrete by N. Raja Gopalan. PH



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **AIR AND NOISE POLLUTION AND CONTROL**

#### **III B.Tech –VI Semester (Code: 20CE604/PEC02D)**

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

#### **UNIT 1**

##### **Air pollution and its effects (8 contact hours)**

Air Pollutants: sources, classification, effect on animal health, vegetation, materials, and atmosphere. Chemical and photochemical reactions in the atmosphere and their effects: smoke, smog, acid rain and ozone layer depletion. Greenhouse gases, global warming and its implications.

#### **UNIT II**

##### **Air pollution dispersion and modelling**

Meteorology and air pollution: atmospheric stability and inversions, behaviour of air pollutant plumes as effected by nature of source, meteorology, obstacles and terrain; maximum mixing depth. Effluent dispersion theories: models for point and line sources based on Gaussian plume dispersion and their limitations: Box model for area sources. Prediction of effective stack height: Holland's and Briggs equations.

#### **UNIT III**

##### **Particulate emission and its controls**

Reduction in the generation of particulate matter by process modification. Control of SPM: concepts and the design elements of gravitational settlers, centrifugal collectors, wet collectors, electrostatic precipitators, fabric filters, condensers.

##### **Gaseous emissions and its control**

Sources of air pollution from fossil fuels and industrial processes. Prevention and reduction of emissions, cleaner production. Air pollution control by absorption, adsorption, condensation, incineration, etc.

#### **UNIT IV**

##### **Noise pollution and its control**

Generation and propagation of sound; sound power, sound intensity and sound pressure levels; plane, sources; outdoor and indoor noise propagation; psycho-acoustics and noise criteria. Noise standards and limit values. Effects of noise on health. Noise pollution measuring instrumentation and monitoring procedure. Noise pollution prevention and control.



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## **Text Books:**

- 1 Air Pollution Control Engineering, N. de Nevers, 2nd Edition. McGraw Hill, Singapore, 2000.
2. Environmental Noise Pollution, P. E. Cunniff, McGraw Hill, New York, 1987.

## **Reference Books:**

1. Air pollution control Equipments, Louis Theodore, Wiley Publication. Year
2. Fundamentals of Air pollution, R. W. Boubel, D. L. Fox, and A. C. Stern, Academic Press, NY, 1994.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **ESTIMATION & QUANTITY SURVEYING**

#### **III B.Tech –VI Semester (Code: 20CE605/JOE02A)**

Lectures	2	Tutorial	0	Practical	2	Credits	3	
Continuous Internal Assessment			:	30	Semester End Examination (3 Hours)		:	70

**Pre-requisite:** Building Planning and Drawing.

**Course Objectives:**

- 1 To Estimate the various types of Buildings.
- 2 To Prepare the Detailed Estimation for RCC, Road.
- 3 To Construct the Specifications for a Building and Evaluate the Rate per unit item of different works.
- 4 To discuss the PWD accounts and Procedures of works.

**Course Outcomes:** At the end of the course student will be able to

- 1 Acquire the knowledge of the drawings, procedures and different estimating methods of buildings.
- 2 Estimate Quantities of RCC and Road works.
- 3 Recognise the importance of specifications and estimate the unit Rate for different engineering works.
- 4 Gain knowledge on PWD accounts and Procedure of works like tendering.

### **UNIT – I**

#### **1. Procedure of Estimation**

Methods of estimating; Main items of work; Deduction for openings; Degree of accuracy; Units of measurement.

#### **2. Methods of building estimates**

Individual wall method; Centre line method; Arch masonry calculation; Estimate of steps.

### **UNIT – II**

#### **3. Estimate of RCC works**

Standard hooks and cranks; Estimate of RCC slab; RCC beam; RCC T-beam slab and RCC column with foundation.

#### **4. Road Estimating**

Estimate of earthwork; Estimate of pitching of slopes; Estimate of earthwork of road from longitudinal sections.



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## **UNIT – III**

### **5. Specifications**

Purpose and method of writing specifications; General specifications. Detailed Specifications for Brick work; R.C.C; Plastering; Mosaic Flooring.

### **6. Analysis of Rates**

Task or out – turn work; Labour and materials required for different works; Rates of materials and labour; Preparing analysis of rates for the following items of work:

- i) Concrete
- ii) RCC Works
- iii) Brick work in foundation and super structure
- iv) Plastering.

## **UNIT – IV**

### **7. PWD Accounts and Procedure of Works**

Organization of Engineering department; Work charged establishment; Contract; Tender; Tender notice; Tender Schedule; Earnest money; Security money; Measurement book; Administrative approval; Technical sanction; Plinth area; Floor Area; Carpet area; Approximate Estimate; Plinth area estimate; Revised Estimate; Supplementary estimate.

### **8. Miscellaneous:**

Gross income; Net income; Scrap value; Salvage value; Obsolescence; Annuity; Capitalized value; Years purchase; Life of structures; Sinking fund; Standard rent; Process of fixing standard rent; Mortgage, brief outlines of valuation process.

## **TEXT BOOKS**

1. Estimating & Costing in Civil Engineering by B.N. Dutta; U. B. S. Publishers & Distributors, New Delhi.
2. Valuation of Real properties by S. C. Rangwala; Charotar Publishing House, Anand.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **HEALTH AUDIT OF STRUCTURES AND RETROFITTING OF STRUCTURES**

**III B.Tech –VI Semester (Code: 20CE605/JOE02B)**

Lectures	2	Tutorial	0	Practical	2	Credits	3	
Continuous Internal Assessment			:	30	Semester End Examination (3 Hours)		:	70

Course Objectives:

1. Analyze the Structural Health and Monitoring Procedures.
2. Understand the Static and Dynamic Procedures.
3. Acquire the knowledge of Data Acquisition in a structural building.
4. Understand the Retrofitting techniques for a damaged building.

Course Outcomes:

1. To acquire the knowledge of monitoring the health of the Structures.
2. To know the testing procedures for Static and dynamic field tests.
3. To learn the methodology of Data Acquisition.
4. To apply the knowledge of retrofitting techniques for damaged buildings.

### **UNIT – I**

Structural Health: Factors affecting Health of Structures, Causes of Distress, Regular Maintenance.

Structural Health Monitoring: Concepts, Various Measures, Structural Safety in Alteration.

Structural Audit: Assessment of Health of Structure, Collapse and Investigation, Investigation Management, SHM Procedures.

### **UNIT-II**

Static Testing - Static field testing- types of static tests- loading methods - Behavioral / Diagnostic tests - Proof tests - Static response measurement – strain gauges, LVDTs, dial gauges - case study. Dynamic field testing - Types of dynamic tests - Stress history data - Dynamic load allowance tests - Ambient vibration tests - Forced Vibration Method - Dynamic response methods - Impact hammer testing - Shaker testing - Periodic and continuous monitoring.

### **UNIT-III**

Data Acquisition - Static data acquisition systems - Dynamic data acquisition systems - Components of Data acquisition system - Hardware for Remote data acquisition systems. Remote Structural health monitoring - Remote Structural Health Monitoring - Importance and Advantages – Methodology - RF/PSTN/GSM/Satellite Communications - Networking of sensor - Data compression technique - Case Studies

### **UNIT-IV**

Plate bonding technique, Ferro cement jacketing, RCC jacketing, propping and supporting - Repair methods- fiber wrap technique, foundation rehabilitation methods, chemical and electrochemical method of repair - Repair/Rehabilitation strategies- Stress reduction technique,





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repair and strengthening of columns and beams - Rehabilitation strategies-Compressive strength of concrete, cracks/joints, masonry, foundation, base isolation - Guidelines for framing terms and conditions for repair and rehabilitation works contracts- engagement of consultants, contractors, execution of work, post repair inspection. Discussion of case studies-RCC buildings, water tanks, industrial structures, identifying a suitable repair option for certain damage in a structure.

## **TEXT BOOKS:**

- 1.Santhakumar A.R., “Concrete Technology” Oxford University Press, New Delhi, 2007.
2. Repair and Rehabilitation of structures by P N Modi and Chirag N Patel, PHI Publishers.

## **Reference Books:**

1. “CPWD Handbook on Repair and Rehabilitation of RCC buildings”, Govt of India Press, New Delhi, 2002.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **OFFSHORE RENEWABLE ENERGY**

**III B.Tech –VI Semester (Code: 20CE605/JOE02C)**

Lectures	2	Tutorial	0	Practical	2	Credits	3
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

### **Course Objectives:**

1. To learn the basics of ocean wave mechanics
2. Understand the various methods used in analyzing wave energy transport.
3. To understand the significance of offshore floating structures in extracting wave energy.
4. To understand the extraction of offshore wind energy and tidal energy.

### **Course Outcomes:** Students will be able to

1. Get the knowledge of the basics of ocean wave mechanics.
2. Get the skills in analyzing the wave energy transport.
3. Know the various types of offshore floating devices and wave energy converters.
4. In a position to understand the extraction of offshore wind energy and tidal energy.

### **UNIT – I**

**Introduction to Wave Mechanics:** Potential Flow, Laplace equation, Boundary value problem, small amplitude waves, Linearized boundary Conditions, Periodic, progressive, and Standing waves,

**Wave Kinematics:** Wave kinematics, basic dispersion relation, Shallow and Deep-water waves.

### **UNIT – II**

**Transport of Wave Energy:** Description of wave oscillation, Wave power, energy Transport, Resonance absorption, wave transport of energy, and Momentum;

**Methods of Approach:** Description and operation of various wave energy converters for onshore and offshore applications. Analysis based on analytical and numerical methods.

### **UNIT – III**

**Integrated Offshore Floating Structures:** Design of wave environment, maximum power absorption from ocean waves using floating structures, the response of floating structures, Overtopping Devices, Wave absorbing devices, Time and frequency domain of numerical methods.

**Wave Energy Converters:** Global energy demand, Hydrodynamic characteristics of wave energy converters, Oscillating Water Columns (OWC), Point absorbers, Terminators, Wave attenuators, Pelamis Wave Energy Converter, Wave Dragon, Wave Roller.



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## **UNIT – IV**

**Offshore Wind Turbines:** Design of offshore wind turbines, Mounting/mooring arrangements, installation, Design of wind turbine, aerodynamic characteristics of horizontal and vertical axis wind turbines, Aero-foil Theory.

**Tidal Energy Converters:** Tidal energy, Current stream devices, Barrage systems, hydrodynamic characteristics of tidal devices, wave and current effects, energy storage, Transmission and Distribution issues, and solutions.

### **BOOKS:**

1. Johannes Falnes, “Ocean waves and Oscillation Systems”, Cambridge University Press, 2002.
2. J.S. Mani, “Coastal Hydrodynamics”, WIT Press, 2012

### **REFERENCE BOOKS:**

1. V. Sundar, “Ocean wave Mechanics”, Wiley Publication, 2015.
2. R. H. Charlier, C.W. Finkl., “Ocean Energy”, Tidal and Tidal Power, Springer Verlag, 2009.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **GEOGRAPHICAL INFORMATION SYSTEM**

#### **III B.Tech –VI Semester (Code: CE606/SOC04 )**

Lectures	1	Tutorial	0	Practical	2	Credits	2
Continuous Internal Assessment	:	30	Semester End Examination (3 Hours)	:	70		

#### **Laboratory Objectives:**

1. Understand the process of Digitization of maps
2. creation of various features thematically
3. Develop the DEM
4. Learn external data linkages to internal features
5. Learn GIS analysis.
6. Learn GIS data base quarries

#### **Laboratory Outcomes:**

- 1: Exposure of Geospatial data base creation and Map features
- 2: Thematic maps Preparation
- 3: Assess the various digitized features
- 4: Exposure of creating features from external data.
- 5: Know how to make a query's in GIS environment.
- 6: Know the overlay use ages in GIS.

#### **List of Experiments:**

1. Digitization of Topo sheet
2. Creation of thematic maps.
3. Estimation of features and interpretation
4. Developing Digital Elevation Model (DEM)
5. Linking external data base (.CSV, or. EXCEL, or .Txt) to internal features
6. Buffers creation around (Point, line, and polygon) Features
7. Create point features using excel data
8. Querying on attribute data
9. Overlay Operations (Identity, or Intersect or Union or erase)any two
10. Vector to raster creation (Features conversion, Point, polyline and polygon)
11. Raster to vector conversion (Line or polygon options)
12. Preparation of Flow Accumulation, Flow direction maps (using DEM)



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **ADVANCED SURVEYING LABORATORY**

#### **III B.Tech –VI Semester (Code: 20CEL601)**

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

#### **Course Objectives:**

1. To determine distances and relative positions using trigonometric leveling
2. To deal with various methods employed for the measurement of areas and volumes.
3. To build the knowledge on different methods of setting & design of simple circular curves.
4. To develop the concepts on usage of EDM, Digital Theodolite and total station.

#### **Course Outcomes:**

By the end of the course, the students will be able

1. To determine the reduced level of different structures when base is inaccessible and accessible.
2. To design and layout curves for a roads and railways.
3. To prepare contour maps for the given area

To do applications related to the instruments EDM and Total station.

#### **Experiments**

1. To determine the elevation of the top of the object when the base is accessible
2. To determine the elevation of the top of the object when the base is inaccessible when the instruments are in same vertical plane.
3. To determine the elevation of the top of the object when the base is inaccessible when the instruments are in not in the same vertical plane.
4. To set Simple circular curve by using offsets from Long Chord method.
5. To set Simple circular curve by using radial, perpendicular offsets from tangents.
6. To set Simple circular curve by Rankine's method or Tape and theodolite method.
7. To set Simple circular curve by Two theodolite method.
8. To Prepare Contour maps for given area by grid method using leveling Instrument.
9. To develop the knowledge on usage of Total station.
10. To perform RDM application and find the distance between inaccessible points by Total station.
11. To perform REM application to find the elevation by Total station.
12. To Calculate area for given plot by Total station.

#### **TEXT BOOKS AND REFERENCES:**

1. Advanced surveying by R. Agor
2. Advanced surveying by SateeshGopi, R. Satish Kumar, N. Madhu

**Note: Survey Camp is to be conducted for a minimum period of seven days Using Total Station to train in one of the following areas:**

- i. Preparation of a contour Plan/ Map.
- ii. Earth work Computations for a high way / canal projects
- iii. Marking of a Sewer line/ Water supply line.
- iv. Any type of Execution works.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **STRUCTURAL ANALYSIS DESIGN AND DETAILING LABORATORY**

#### **III B.Tech –VI Semester (Code: 20CEL602)**

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

Students are required to analyze and design the following structures using software package like STAAD/ETABS/GTSTRUDL/STRAP etc. and detailing of structures using SP-34 & AUTO CAD.

#### **Course Objectives:**

1. To understand the modeling and analysis of indeterminate structures like continuous beams and frames using STAAD and ETABS.
2. To learn the basic concepts in analysis and design of slabs, footing and truss using different software's like STAAD and ETABS.
3. To know the detailing concepts and usage of SP-34
4. To learn the commands to draw the detailing of indeterminate beams, slabs, footings, retaining walls and plate girder using AUTO CAD

#### **COURSE OUTCOMES**

Upon successful completion of this course, student will be able to

1. Compare the manual results and software results
2. Analyse and design the different structural elements using software's like STAAD and ETABS
3. Draw the detailing of different structural elements using SP34 and AUTO CAD
4. Design and detailing the steel structural elements like truss , column bases and plate girder using STAAD and AUTOCAD

1. Indeterminate beams.
2. Plane roof truss.
3. Plane frame subjected to gravity loads and lateral load (wind load).
4. SPACE(3D) frame analysis for gravity and lateral loading.
5. One-way slab.
6. Two way slab.
7. Isolated footing.
8. Pile foundation.
9. Combined footing.
10. Cantilever Retaining wall.
11. Plate girder.
12. Column base.



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA (Autonomous)**

## **TEXT BOOKS:**

1. Limit State Design of Reinforced Concrete by P. C. Varghese, Prentice Hall of India.
2. For Limit State Method: Reinforced Concrete (limit state design) by Ashok K. Jain; Nem Chand & Bros., Roorkee
3. For Working Stress Method: Reinforced concrete by H. J. Shah, Charotar Publishing House
4. Reinforced Concrete Structures by N. Subramanian, Oxford University Press.

## **REFERENCE BOOKS:**

1. Reinforced concrete design by Pillai and Menon, Tata McGraw-Hill
2. Limit state theory & Design of reinforced concrete by Dr. S. R. Karve and Dr. V. L. Shah; Pune Vidyarthi Griha Prakashan, Pune.
3. Reinforced concrete design: Principles and Practice by N. Krishna Raju., R. N. Pranesh, New Age International Publishers.
4. Reinforced Concrete Structure by R. Park., T. Paulay, Wiley India Publishers



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **TRANSPORTATION ENGINEERING LABORATORY**

**III B.Tech –VI Semester (Code: 20CEL603)**

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

**Prerequisites:** Geotechnical Engineering Lab (18CEL63)

#### **Course Objectives:**

1. To assess the physical properties of aggregates and bitumen for road construction.
2. To assess the properties of bituminous mix.
3. To evaluate the sub-grade soil properties.
4. To measure the unevenness of the pavement surface.

**Course Outcomes:** Student will be able to

1. Evaluate the physical properties of aggregate and bitumen for road construction
2. To design the Job mix formula for Bituminous mixes
3. To examine the feasibility of soil as a suitable material in road construction.
4. Evaluate the roughness of pavement surface.

#### **A. Tests on Aggregates**

1. Aggregate Crushing value test.
2. Aggregate impact value test.
3. Los Angeles' abrasion test.
4. Deval's attrition value test.
5. Shape test a) Flakiness index test b) Elongation index test c) Angularity number test. .
6. Specific gravity Test.

#### **B. Tests on Bituminous Materials**

7. Penetration test.
8. Softening point test.
9. Flash and fire point test.
10. Ductility test.
11. Viscosity test.
12. Bitumen Extractions Test.
13. Specific gravity of Bitumen.

#### **C. Test on Bituminous Mixes**

14. Marshall stability test.

#### **D. Test on Soil Sub grade**

15. California bearing ratio test.
16. Dynamic cone penetrometer test

#### **E. Pavement Evaluation**

17. Roughness of pavement by using MERLIN

#### **TEXT/REFERENCE BOOKS:**

1. S.K. Khanna, C. E. G. Justo, A.Veeraragavan" Manual on Highway Materials and Pavement Testing" Nem Chand Bros, Roorkee (2013). Revised 5<sup>th</sup> Edition.
2. Laboratory Manual in Highway Engineering by Ajay K. Duggal and Vijay P. Puri - New age Publishers.

#### **Relevant Code Books:**





# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

1. Bureau of Indian standards, Indian standard methods of test for soils, Part-16, Laboratory determination of CBR, IS:2720(part-16)-1987 Reaffirmed 1997.
2. Bureau of Indian standards, Indian standard methods of test for aggregate for concrete, mechanical properties, IS:2386-1963 (Reaffirmed 1997).
3. Bureau of Indian standards, Indian standard specification of coarse and fine aggregate from Natural sources for concrete, IS:383-1970 (Reaffirmed 1997).
4. Bureau of Indian standards, IS: 1201-1220(1978), Indian standard methods for testing Tar and Bituminous materials.
5. Bureau of Indian standards IS: 73-2013, Indian standard Paving Bitumen - Specification.
6. Ministry of Road Transport and Highways- Specifications for Roads and Bridge Works, Fifth Revision, IRC, New Delhi, India-2013



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

### **ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE**

#### **III B.Tech –VI Semester (Code: 20CE607/MC04 )**

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

#### **Course Outline:**

This Course is to facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

#### **Course Objectives:**

1. This course gives a broad range description of Indian Knowledge system and associated perspective of modern scientific world-view
2. The course aims at imparting basic principles of thought process, reasoning and inferencing as well as sustainability of Indian traditional knowledge systems connecting society and nature.
3. Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.
4. The course focuses on the study of various case studies in Indian Traditional knowledge system.

#### **Course Outcomes:**

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

1. Understand the structure of Indian knowledge and its importance
2. Compare the Indian traditional knowledge Systems with Other Global systems. .
3. Know the concept of yoga and its correlations to science.
4. Recognise various case studies related to Indian Traditional knowledge.

#### **Course Contents:**

##### **UNIT I**

Basic Structure of Indian Knowledge System (i) वेद, (ii) उपवेद (आयुर्वेद, धनुर्वेद, गन्धर्वेद, स्थापत्य आदि) (iii) वेदांग (शिक्षा, कल्प, निरुत, व्याकरण, ज्योतिष छंद), (iv) उपाङ्ग (धर्म शास्त्र, मीमांसा, पुराण, तर्कशास्त्र)

(8)

##### **UNIT II**

**Modern Science and Indian Knowledge System**



# **BAPATLA ENGINEERING COLLEGE:: BAPATLA**

## **(Autonomous)**

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, The historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge Vs indigenous knowledge, traditional knowledge Vs western knowledge. (8)

### UNIT III

#### **Yoga and Holistic Health care**

Science of Yoga, Yoga as a tool for healthy Life style, 8 limbs of Yoga (Yama, Niyama, Aasana, Pranayama, Pratyahara, Dharana, Dhyana, Samadhi). (8)

### UNIT IV

#### **Case Studies**

Traditional knowledge in different sectors: Traditional knowledge in Engineering and Architecture, Traditional Medicinal systems, TK in Agriculture, Traditional Harvesting methods, Traditional food and healthcare needs (8)

#### **TEXT BOOKS:**

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014.
2. Swami Jitatanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta.
4. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
5. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.

#### **REFERENCE BOOKS :**

1. G N Jha, (ENG. Trans.), Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakasham, Delhi, 2016.
2. R N Jha, Science of consciousness Psychotherapy and yoga practices, Vidyanidhi Prakasham, Delhi, 2016.