ANNAMACHARYA INSTITUTE OF TECHNOLOGY AND SCIENCES, TIRUPATI
(Autonomous)
Course structure for Four Year Regular B.Tech. Degree Program
(Effective for the batches admitted from 2020-21)
CIVIL ENGINEERING (CE)
Semester III (Second year)

Sl. No.	Category	Course Code	Course Title	Hours per week			Credits	Scheme of Examination (Max. Marks)		
				L	T	P	C	CIE	SEE	Total
1	Basic Science courses	20ABS9913	Probability & Statistics, Partial differential equations	3	0	0	3	30	70	100
2	Professional core course	20APC0101	Mechanics of Materials	3	0	0	3	30	70	100
3	Professional core course	20APC0102	Surveying	3	0	0	3	30	70	100
4	Professional core course	20APC0103	Fluid Mechanics	3	0	0	3	30	70	100
5	Humanities and social science	20AHSMB01	Managerial Economics and Financial Analysis	3	0	0	3	30	70	100
6	Professional core courses (LAB)	20APC0104	Strength of Materials Lab	0	0	3	1.5	30	70	100
7	Professional core courses (LAB)	20APC0105	Surveying Lab	0	0	3	1.5	30	70	100
8	Professional core courses (LAB)	20APC0106	Fluid Mechanics Lab	0	0	3	1.5	30	70	100
9	**Skill Oriented Course***	20APC0107	Basics of CAD	1	0	2	2	100	-	100
10	Mandatory course (AICTE suggested)	20AMC9903	Environmental Studies	2	0	0	0	30	-	30
Total credits							**21.5**	**370**	**560**	**930**

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Year : II B.Tech	**Semester: I**	**Branch of Study: CE and ME**

Subject Code:20ABS9913	**SubjectName:** Probability & Statistics, Partial differential equations	**L T P** **3 0 0**	**Credits** **3**

Course Outcomes:

1) Understand the concepts of Central Tendency, Correlation, Regression concepts.
2) Apply discrete and continuous probability distributions
3) Design the components of a classical hypothesis test for large samples.
4) Infer the statistical inferential methods based on small sampling tests.
5) Find the general solution of the PDEs bearing applications

Unit I: Descriptive statistics:
Measures of Central tendency, Measures of Variability (spread or variance), correlation, correlation coefficient, rank correlation, regression coefficients, method of least squares, regression lines

Unit II: Probability
probability axioms, addition law and multiplicative law of probability, conditional probability, Baye's theorem, random variables (discrete and continuous)**,** probability distribution: Binomial - Poisson approximation to the binomial distribution and normal distribution-their properties.

Unit III: Testing of Hypothesis
Formulation of null hypothesis, critical regions, level of significance. Large sample tests: test for single proportion, difference of proportions, test for single mean and difference of means.

Unit IV: Small Sample Tests
Student t-distribution (single mean, two means and paired t-test), Testing of equality of variances (F-test), $\chi 2$ - test for goodness of fit.

Unit V: Applications of Partial Differential Equations
Method of separation of variables, solution of 1D-wave, 1D-heat and 2D-Laplace's equation in Cartesian coordinates

Text Books:
1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 43/e, 2010.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9/e, John Wiley & Sons, 2006.

References:
1. S.Chand ,Engineering Mathematics-II by Dr.T.K.V.Iyengar, Dr.B.Krishna Gandhi, S.Ranganatham, Dr.M.V.S.S.N.Prasad
2. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9/e, Wiley India, 2009.
3. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India,1995.
4. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, 2008.

List of COs	PO no. and keyword	Competency Indicator	Performance Indicator
CO1	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO2	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO3	PO1: Apply the knowledge of mathematics	1.1	1.1.1
CO4	**PO1: Knowledge of Engineering fundamentals**	**1.2**	**1.2.2**
CO5	PO2: First principles of mathematics	2.4	2.4.1

Year: II   **Semester: I**

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Subject Code	Subject Name	L	T	P	Credits
20APC0101	Mechanics of Materials	3	0	0	3

Course Outcomes:
1: Understand the system of forces on bodies.
2: Determine the centroid and moment of inertia for different cross-sections.
3: Understand the concepts of stress, strain, generalized Hooke's law, elastic modulii
4: Develop shear force and bending moment diagrams for different load cases.
5: Compute the slope and deflection of simple beams

UNIT - I
Introduction to Mechanics: Basic Concepts, system of Forces Coplanar Concurrent Forces - Components in Space Resultant -Moment of Forces and its Application - Couples and Resultant of Force Systems. Equilibrium of system of Forces: Free body diagrams and Equations of Equilibrium of Coplanar Systems, support reactions for simply supported beam.

UNIT - II
Centroid and Center of Gravity: Introduction – Centroids of rectangular, triangular, circular, I, L and T sections. **Area moment of Inertia**: Introduction – Definition of Moment of Inertia of rectangular, triangular, circular, I, L and T sections - Radius of gyration, perpendicular axis theorem and parallel axis theorem.

UNIT – III
Simple Stresses and Strains:
Types of stresses and strains – Hooke's law – Stress – strain diagram for mild steel – working stress – Factor of safety – lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of Varying section – Composite bars – Temperature stresses.

UNIT – IV
Shear Force and Bending Moment:
Definition of beam – types of beams – Concept of Shear force and bending moment – S.F and B.M diagrams for cantilever, simply supported and over changing beams subjected to point loads, uniformly distributed load, uniformly varying loads and combination of these loads – point of contra flexure – Relation between S.F, B.M and rate of loading at section of a beam.

UNIT – V
Deflection of Beams: Uniform bending – slope, deflection and radius of curvature - Determination of slope and deflection for cantilever and simply supported beams under point loads and U.D.L. -Mohr's theorems – Moment area method –Conjugate beam method.

TEXT BOOKS:
1. R.K Bansal, Engineering Mechanics, Lakshmi Publications.
2. R. K. Bansal, Strength of Materials, Lakshmi Publications House Pvt. Ltd.
3. R. Subramanian, Strength of Materials, Oxford University Press.
REFERENCES:
1. S.S. Bhavakatti, Engineering Mechanics, New Age Publishers.

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Year: II   **Semester: I**

Subject Code	Subject Name	L	T	P	Credits
20APC0102	Surveying	3	0	0	3

Course Outcomes:
1: Understand basic principles of surveying, Prismatic compass
2: Understand basic concepts of leveling and contouring and Theodolite survey
3. Understand Computation of Areas and Volumes
4: Understand and able to set the curves on field.
5: Understand modern techniques in the survey systems.

UNIT – I:
Basics of Surveying: Definition, principles and classification of surveying - Principles of chain survey –Types of chains - Tape corrections – types of Ranging - Construction and working of prismatic compass – Types of bearing - Declination, local attraction.

UNIT – II:
Levelling - Basics definitions, types of levels and levelling staves, temporary adjustments, methods of levelling, booking and Determination of levels- HI Method-Rise and Fall method.
Contouring- Characteristics and uses of Contours - methods of contour surveying, interpolation and sketching of Contours.
Theodolite Surveying: Measurement of horizontal and vertical angles-reiteration and repetition methods.

UNIT – III:
Computation of Areas and Volumes: Areas - Determination of areas consisting of irregular boundary and regular boundary - Volume- trapezoidal and prismoidal formula-
 Determination of volume of earth work in cutting and embankments.

UNIT – IV:
Curves: Types of curves and their necessity, elements of simple circular curve, setting out of simple horizontal circular curves-problems.
Construction surveys: Introduction-setting out of buildings-highways culverts.

UNIT – V:
Modern Field Survey Systems:
EDM and Total Station: Measurement principle of EDM - EDM instrument characteristics - Accuracy in EDM - Total station – Introduction – Advantages - Types and applications of total station - Field procedure.
Differential Global Positioning System (DGPS): Introduction - Working principle - DGPS receivers -Applications of DGPS.

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Text Books:

1. Arora, K.R. I, Surveying, Vol-I, II and II, Standard Book House, 2015.

2. C. Venkatramaiah, Text Book of Surveying, Universities Press Pvt Ltd, Hyderabad. Revised Edition 2011.

3. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain, Surveying (Vol – 1,2 &3), by – Laxmi Publications (P) Ltd., New Delhi.

4. N.N. Basak, Surveying and Levelling- Tata McGraw-Hill Education, 2017.

References :

1. Manoj K., Arora and Badjatia, Geomatics Engineering, Nem Chand & Bros, 2011.

2. Madhu N., Sathikumar, R. and Satheesh Gobi, Advanced Surveying: Total Station, GIS and Remote Sensing, Pearson India, 2006.

3. Chandra A.M., Higher Surveying, Third Edition, New Age International (P) Limited, 2002.

4. Anji Reddy M., Remote sensing and Geographical information system, B.S. Publications, 2001.

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Year: II   **Semester: I**

Subject Code	Subject Name	L	T	P	Credits
20APC0103	Fluid Mechanics	3	0	0	3

Course Outcomes:
1: Understand basic characteristics and behavior of fluids
2: Understand concepts of fluid statics, different equipment and their applications stability of floating bodies
3: Understand fundamentals of fluid kinematics and Differentiate types
of fluid flows
4: Understand and apply experiments with different equipments under fluid flow
5: Estimate Energy losses in pipelines and Determine flow characteristics Through closed conduits.

UNIT – I:
Basic concepts and definitions: Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Newton law of viscosity, Kinematic and dynamic viscosity; variation of viscosity with temperature,; vapor pressure, surface tension, capillarity, Bulk modulus of elasticity, compressibility.

UNIT – II:
Fluid statics: Fluid Pressure: Pressure at a point, Pascal's law, and pressure variation with temperature. Piezometer, U-Tube Manometer, Single Column Manometer, U Tube Differential Manometer. Pressure gauges, Hydrostatic pressure force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

UNIT – III:
Fluid kinematics: Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One, two and three -dimensional continuity equations in Cartesian coordinates.

UNIT – IV:
Fluid Dynamics: Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation : Venturimeter, orifice meter; Momentum principle; Forces exerted by fluid flow on pipe bend; Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number;

UNIT -V:
Analysis of Pipe Flow: Energy losses in pipelines; Friction factor for pipe flow, Darcy – Weisbach equation; Minor losses in pipelines; Hydraulic Grade Line and Total Energy Line; Concept of equivalent length- Pipes in series and parallel

Text Books:
1. R. K. Bansal, A text of Fluid mechanics and hydraulic machines, Laxmi Publications (P) Ltd., New Delhi.
2. K. Subrahmanya, Theory and Applications of Fluid Mechanics, Tata McGraw Hill.

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REFERENCES:

1. N. Narayana Pillai, Principles of Fluid Mechanics and Fluid Machines, Universities Press Pvt Ltd, Hyderabad. 3rd Edition 2009.

2. P. M. Modi and S. M. Seth, Hydraulics and Fluid Mechanics, Standard Book House

3. C. S. P. Ojha, R. Berndtsson and P. N. Chadramouli, Fluid Mechanics and Machinery, Oxford University Press, 2010.

4. K. Subramanya, Open Channel flow, Tata Mc.Grawhill Publishers

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Year: II **Semester: I**

Subject Code	Subject Name	L	T	P	Credits
20AHSMB01	Managerial Economics and Financial Analysis	3	0	0	3

Course Outcomes:
- Understand the fundamentals of Economics and Managerial economics viz., Demand, Production, cost, revenue and markets.
- Apply the Concept of Production cost and revenues for effective Business decision
- Analyze how to invest their capital and maximize returns.
- Evaluate the capital budgeting techniques.
- Define the concepts related to financial accounting and management and able to develop the accounting statements and evaluate the financial performance of business entity.

UNIT – I Managerial Economics
Introduction – meaning, nature, meaning, significance, functions, and advantages, ME and its role in other fields. Demand **-** Concept, Function, Law of Demand - Demand Elasticity- Types – Measurement. Demand Forecasting- Factors governing forecasting, Methods.

UNIT – II Production and Cost Analysis
Introduction – Nature, meaning, significance, functions and advantages. Production Function– Least- cost combination– Short run and Long run Production Function- Isoquants and Isocosts, MRTS - Cobb-Douglas Production Function - Laws of Returns - Internal and External Economies of scale. Cost & Break-Even Analysis - Cost concepts and Cost behavior- Break-Even Analysis (BEA) - Determination of Break-Even Point (Simple Problems)-Managerial significance and limitations of Break-Even Analysis.

UNIT III Business Organizations and Markets
Introduction – Nature, meaning, significance, functions and advantages. Forms of Business Organizations- Sole Proprietary - Partnership - Joint Stock Companies - Public Sector Enterprises. Types of Markets - Perfect and Imperfect Competition - Features of Perfect Competition Monopoly- Monopolistic Competition–Oligopoly-Price-Output Determination - Pricing Methods and Strategies

UNIT IV Capital Budgeting
Introduction to Capital, Sources of Capital. Short-term and Long-term Capital : Working capital, types, Estimating Working capital requirements. Capital Budgeting – Features, Proposals, Time value of money. Methods and Evaluation of Projects – Pay Back Method, Accounting Rate of Return (ARR), Net Present Value (NPV), and Internal Rate Return (IRR) Method (simple problems).

UNIT V Financial Accounting and Analysis
Introduction – Nature, meaning, significance, functions and advantages. Concepts and Conventions- Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments).
Financial Analysis - Analysis and Interpretation of Liquidity Ratios, Activity Ratios, and Capital structure Ratios and Profitability.

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Textbooks:
1. Varshney&Maheswari: Managerial Economics, Sultan Chand, 2013.
2. Aryasri: Business Economics and Financial Analysis, 4/e, MGH, 2019
3.

Reference Books:
1. Ahuja Hl Managerial economics Schand,3/e,2013
2. S.A. Siddiqui and A.S. Siddiqui: Managerial Economics and Financial Analysis, New Age International, 2013.
3. Joseph G. Nellis and David Parker: Principles of Business Economics, Pearson, 2/e, NewDelhi.
4. Domnick Salvatore: Managerial Economics in a Global Economy, Cengage,2013.

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Year: II   **Semester: I**

Subject Code	Subject Name	L	T	P	Credits
20APC0104	Strength of Materials Lab	0	0	3	1.5

Course Outcomes:

1: Determine the properties of material
2: Determine the compressive strength of wood or concrete
3: Examine the Polygon law of Co-planar forces and principle of moments
4: Solve the Reactions at the supports.
5: Determine the bending and deflection of beam

LABORATORY EXPERIMENTS:
1. Support reactions test on simply supported beam
2. Bell Crank Lever test
3. Tension test   .
4. Bending test on (Steel/Wood) Cantilever beam.
5. Bending test on simply supported beam.
6. Torsion test.
7. Hardness test.
8. Compression test on Open coiled springs
9. Compression test on Closely coiled springs
10. Compression test on wood/ concrete
11. Izod / Charpy Impact test on metals
12. Shear test on metals
13. Continuous beam – deflection test.

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Year: II   **Semester: I**

Subject Code	Subject Name	L	T	P	Credits
20APC0105	Surveying Lab	0	0	3	1.5

Course Outcomes:

1: Understand basic principles of plane table surveying and fly leveling.

2: Understand basic concepts of theodolite survey and trigonometric leveling

3: Understand basic concepts of total station

4:Uunderstand the components of simple curve and able to set the curve on field.

5: Understand modern techniques in the survey systems.

LIST OF FIELD WORKS:

1. Chain Survey: Finding the area of a given boundary
2. Plane table survey: Finding the area of a given boundary
3. Compass Survey: Determining the Horizontal Angles and Area
4. Fly levelling: Height of the instrument method and rise and fall method.
5. Measurement of Horizontal and vertical angle by Theodolite
6. Determination of height of building using Theodolite
7. Total Station: Determination of Remote height and distance.
8. Total Station: Determination of area.
9. Total Station: Preparation of contour maps for small area
10. Stake out using total station

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Year: II   **Semester:I**

Subject Code	Subject Name	L	T	P	Credits
20APC0106	Fluid Mechanics Lab	0	0	3	1.5

Course Outcomes:

1. Verify Bernoulli's theorem
2. Calibrate flow measuring devices such as Venturimeter, orifice meter and notch
3. Determine friction factor in pipes
4. Determine minor losses in the pipes
5. Determination of Coefficient of discharge for orifice and mouth piece

LABORATORY EXPERIMENTS
1. Verification of Bernoulli's equation.
2. Calibration of Venturimeter
3. Calibration of Orifice meter
4. Determination of Coefficient of discharge for a small orifice by constant head method.
5. Determination of Coefficient of discharge for an external mouth piece by variable head method.
6. Calibration of contracted Rectangular Notch
7. Calibration of contracted Triangular Notch
8. Determination of friction factor

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Year: II   **Semester: I**

Subject Code	Subject Name	L	T	P	Credits
20AMC9903	Environmental Studies	0	0	3	1.5

Course Outcomes:
1. Students get sufficient information that clarifies modern environmental concepts like equitable use of natural resources, more sustainable life styles etc.
2. Students realize the need to change their approach, so as to perceive our own environmental issues correctly, using practical approach based on observation and self learning.
3. Students become conversant with the fact that there is a need to create a concern for our environment that will trigger pro-environmental action; including simple activities we can do in our daily life to protect it.
4. . Interpretation of different types of environmental pollution problems and designing of new solid waste management techniques usage
5. To get knowledge on various environmental acts and to engage all the students life - long learning of rain water harvesting

UNIT – I
Multidisciplinary Nature o**f Environmental Studies:** Introduction − Multidisciplinary Nature of Environmental Studies − Definition, Scope and Importance – Need for Public Awareness.
Natural Resources: Renewable and non-renewable energy resources − Natural resources and associated problems.
Forest resources: Use and over – exploitation, deforestation, case studies − Timber extraction – Mining, dams and other effects on forest and tribal people.
Water resources: Use and over utilization of surface and sub-surface − Floods, drought, conflicts over water, dams − benefits and problems.
Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticides problems, water logging, salinity, case studies.
Energy resources: Renewable and non-renewable energy resources.
UNIT – II
Ecosystems: Concept of an ecosystem. − Structure and functions of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, Desert ecosystem and Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).
Biodiversity And Its Conservation : Introduction- Definition: genetic, species and ecosystem diversity – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values − Biodiversity at global, National and local levels − India as a mega-diversity nation − Hot-sports of biodiversity − Threats to biodiversity: habitat loss, poaching of wildlife, man − wildlife conflicts − Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.
UNIT – III

AK20 Regulations
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Environmental Pollution: Definition, Causes, effects and its control measures of : Air Pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution and Nuclear hazards.

Solid Waste Management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone, Tsunami and landslides.

UNIT – IV

Social Issues and the Environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting and watershed management – Resettlement and rehabilitation of people − Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies– Wasteland reclamation. – Consumerism and waste products. – Environment Protection Act. – Air (Prevention and Control of Pollution) Act. – Water (Prevention and control of Pollution) Act – Wildlife Protection Act – Forest Conservation Act − Public awareness.

UNIT – V

Human Population and the Environment: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

TEXT BOOKS:
1. Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission, Universities Press.
2. Environmental Studies by Kaushik, New Age Publishers.
3. Environmental Studies by Sri Krishna Hitech publishing Pvt. Ltd.

REFERENCES:
1. Environmental studies by R.Rajagopalan, Oxford University Press.
2. Comprehensive Environmental studies by J.P.Sharma, Laxmi publications.
3. Introduction to Environmental engineering and science by Gilbert M. Masters and Wendell P. Ela - Printice hall of India Private limited.
4. Environmental studies by A. Ravi Krishnan, G. Sujatha Sri Krishna Hitech publications.