NETAJI SUBHAS UNIVERSITY

SCHOOL OF ENGINEERING

DEPARTMENT OF CIVIL ENGINEERING

B.TECH PROGRAMME

DETAILED SYLLABUS

Under AICTE Curriculum

(W.E.F. 2024)

B.Tech Program Outline

The B.Tech in Civil Engineering is a undergraduate program that focuses on the design, construction, and maintenance of infrastructure. Students will learn about structural analysis, geotechnical engineering, transportation planning, and environmental considerations. This program prepares students for career in areas like building construction, bridge design, and urban planning.

Program Structure

1. Duration:

- The B.Tech program spans four years, divided into eight semesters.

2. Core Courses & Labs

- There are forty-two core courses covering fundamentals engineering disciplines.
- Additionally, students undertake:
  - Fifteen laboratory classes focused on engineering principals.
  - One personality development course to enhance soft skills and leadership qualities.
  - Two software labs for technological proficiency and structural designing.

3. Summer Internship Program (SIP):

- After the completion of Semester VI, students must undergo 8-week Summer Training in a professional organization. The students are required to complete a Summer Internship Project (SIP), which integrates academic knowledge with industry exposure.
- Upon completion, students must submit and present a detailed report based on their industry experience.

4. Elective Courses:

- Each student must select four electives from each of the chosen specialization.
- This results in a total of thirty-six elective courses, with

- One elective course in semester VI for each specialization.
- Two elective courses in semester VII for each specialization.
- One elective course in semester VIII for each specialization

5. Evaluation Criteria

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	**Internal Examination**	**20**
	Attendance	**05**
	Assignment	**05**
End Term Exam (Summative)	**End Term Examination**	**70**
	-	**100**

Attendance Requirement (Formative Assessment):

- A **minimum of 75% attendance** is required for students to qualify for **End Semester Examination.**
- The **allowance of 25% includes all types of leaves,** including **medical leave,** as per university evaluation criteria.

BACHELORS OF TECHNOLOGY IN CIVIL ENGINEERING

NETAJI SUBHAS UNIVERSITY

1st to 8th Semester

First semester

CODE NO	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BT 101	Engineering Mathematics-I	3	1	-	4	30	70	100
BT 102	Engineering Physics	4	-	-	4	30	70	100
BT 103	Programming in C	4	-	-	4	30	70	100
BT 104	Elements of Mechanical Engineering	3	-	-	4	30	70	100
BT 105	Basic of Electrical Engineering	3	-	-	4	30	70	100
BT 106	Professional Communication Skill	3	-	-	3	30	70	100
	Practical							
BT 107L	Engineering Physics Lab	-	-	4	2	15	35	50
BT 108L	Programming in C Lab	-	-	4	2	15	35	50
	Total	**20**	**1**	**8**	**27**	**210**	**490**	**700**

Second semester

CODE NO	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BT 201	Engineering Mathematics-II	3	1	-	4	30	70	100
BT 202	Engineering Chemistry	4	-	-	4	30	70	100
BT 203	Basic Elements of Civil Engineering and Mechanics	4	-	-	4	30	70	100
BT 204	Computer Aided Engineering Drawing	4	-	-	4	30	70	100
BT 205	Basic Electronic	4	-	-	3	30	70	100
BT 206	Software Engineering	3	1	-	3	30	70	100

	Practical							
BT 207 L	Engineering Chemistry Lab	-	-	4	2	15	35	50
BT 208L	Workshop Practice	-	-	4	2	15	35	50
	Total	**22**	**1**	**8**	**27**	**210**	**490**	**700**

Third semester

CODE NO	**Name of the Subjects**	**Periods**			**Credits**	**Marks**		
		L	**T**	**P**		**IA**	**TE**	**TM**
BTCE301	Engineering Mathematics-III	3	1	-	4	30	70	100
BTCE302	Building Material	4	-	-	3	30	70	100
BTCE303	Building Construction	4	-	-	3	30	70	100
BTCE304	Strength of Material-I	4	-	-	4	30	70	100
BTCE305	Fluid Mechanics	3	1	-	4	30	70	100
BTCE306	Surveying-I	4	-	-	4	30	70	100
	Practical							
BTCE307 L	Surveying Lab-I	-	-	4	2	30	70	100
BTCE308L	Strength of Material Lab-I	-	-	4	2	30	70	100
	Total	**22**	**2**	**8**	**26**	**240**	**560**	**800**

Fourth semester

CODE NO	**Name of the Subjects**	**Periods**			**Credits**	**Marks**		
		L	**T**	**P**		**IA**	**TE**	**TM**
BTCE401	Engineering Mathematics-IV	3	1	-	4	30	70	100
BTCE402	Concrete Technology	4	-	-	3	30	70	100
BTCE403	Engineering Geology	4	-	-	3	30	70	100
BTCE404	Strength of Material-II	4	-	-	4	30	70	100
BTCE405	Hydraulics and Hydraulics Machinery	3	1	-	4	30	70	100
BTCE406	Surveying-II	4	-	-	4	30	70	100
	Practical							

BTCE407 L	Surveying Lab-II	-	-	4	2	30	70	100
BTCE408L	Engineering Geology Lab-II	-	-	4	2	30	70	100
	Total	**22**	**2**	**8**	**26**	**240**	**560**	**800**

Fifth semester

CODE NO	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE501	Engineering Hydrology	4	-	-	4	30	70	100
BTCE502	Structural Analysis-I	4	-	-	4	30	70	100
BTCE503	Geotechnical Engineering-I	4	-	-	4	30	70	100
BTCE504	Environmental Engineering-I	3	1	-	3	30	70	100
BTCE505	Transportation Engineering-I	4	-	-	4	30	70	100
BTCE506	Water Resource Engineering	3	1	-	3	30	70	100
	Practical							
BTCE507 L	Geotechnical Engineering Lab	-	-	4	2	30	70	100
BTCE508L	Fluid Mechanics Lab	-	-	4	2	30	70	100
	Total	**22**	**2**	**8**	**26**	**240**	**560**	**800**

Sixth semester

CODE NO	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE601	Structural Analysis-II	3	1	-	4	30	70	100
BTCE602	Geotechnical Engineering-II	4	-	-	3	30	70	100
BTCE603	Environmental Engineering-II	4	-	-	3	30	70	100
BTCE604	Reinforced Cement Concrete-I	4	-	-	4	30	70	100
BTCE605	Transportation Engineering-II	3	1	-	4	30	70	100
BTCE606X	Elective I	4	-	-	4	30	70	100
	Practical							

BTCE607 L	Environmental Engineering Lab	-	-	4	2	30	70	100
BTCE608L	Computer Aided Design Lab	-	-	4	2	30	70	100
	Total	**22**	**2**	**8**	**26**	**240**	**560**	**800**

Seventh semester

CODE NO	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE701	Engineering Economics	4	-	-	4	30	70	100
BTCE702	Reinforced Cement Concrete II	4	-	-	4	30	70	100
BTCE703	Estimation and Costing	3	1	-	4	30	70	100
BTCE704 X	Elective-II	4	-	-	3	30	70	100
BTCE705	Design of Steel Structures-I	4	-	-	4	30	70	100
BTCE706X	Elective-III	4	-	-	3	30	70	100
BTCE707	Industrial Visits /Trainings				2	100		
	Practical							
BTCE708L	Concrete Technology and Highway Engineering Lab	-	-	4	2	30	70	100
	Total	**24**	**1**	**4**	**26**	**310**	**490**	**800**

Eighth semester

CODE NO	Name of the Subjects	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE801	Construction Management	4	1	-	4	30	70	100
BTCE802	Disaster Mitigation & Management	4	-	-	4	30	70	100
BTCE803	Design of Steel Structure-II	4	-	-	4	30	70	100
BTCE804 X	Elective-IV	4	-	-	4	30	70	100
BTCE805	Seminar	1	-	-	2	100	-	100
BTCE806	Comprehensive Viva Voce	-	-	3	2	-	100	100

BTCE807	Project Work	-	-	12	6	50	50	100
	Total	**17**	**0**	**15**	**26**	**270**	**430**	**700**

List of Electives to be offered in VI Semester

Code	Name of the Subject	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE6061	Pre-stressed Concrete Structures	4	-	-	3	30	70	100
BTCE6062	Coastal Engineering	4	-	-	3	30	70	100
BTCE6063	Industrial Waste Disposal and Treatment	4	-	-	3	30	70	100
BTCE6064	Irrigation and Drainage Engineering	4	-	-	3	30	70	100
BTCE6065	Architecture and Town Planning	4	-	-	3	30	70	100
BTCE6066	Mass Transportation System	4	-	-	3	30	70	100
BTCE6067	Construction Methods and Equipment	4	-	-	3	30	70	100

List of Electives to be offered in VII Semester

Code	Name of the Subject	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE7041	Experimental Measurements and Analysis	4	-	-	3	30	70	100
BTCE7042	Geotechnical Processes and Application	4	-	-	3	30	70	100
BTCE7043	Geographical Information System	4	-	-	3	30	70	100
BTCE7044	Hydraulic Structures	4	-	-	3	30	70	100
BTCE7045	Finite Element Analysis	4	-	-	3	30	70	100

BTCE7046	Advance Structural Design – RCC	4	-	-	3	30	70	100
BTCE7047	Failure Analysis and Rehabilitation of Structures	4	-	-	3	30	70	100
BTCE7048	Ground Water Hydrology	4	-	-	3	30	70	100

Code	**Name of the Subject**	**Periods**			**Credits**	**Marks**		
		L	**T**	**P**		**IA**	**TE**	**TM**
BTCE7061	Bridge Engineering	4	-	-	3	30	70	100
BTCE7062	Hydro Power Engineering	4	-	-	3	30	70	100
BTCE7063	Site Investigation Methods and Practices	4	-	-	3	30	70	100
BTCE7064	Highway and Airport Pavement Design	4	-	-	3	30	70	100
BTCE7065	Matrix Methods of Structural Analysis	4	-	-	3	30	70	100
BTCE7066	Water Resources System Engineering	4	-	-	3	30	70	100

List of Electives to be offered in VII Semester

Code	Name of the Subject	Periods			Credits	Marks		
		L	T	P		IA	TE	TM
BTCE8041	Advanced Structural Design - Steel	4	-	-	3	30	70	100
BTCE8042	Optimization Techniques for Civil Engineering	4	-	-	3	30	70	100
BTCE8043	Machine Foundations	4	-	-	3	30	70	100
BTCE8044	Earth Retaining Structures	4	-	-	3	30	70	100
BTCE8045	Air and Noise Pollution	4	-	-	3	30	70	100
BTCE8046	Environmental Impact Assessment	4	-	-	3	30	70	100
BTCE8047	Dock and Harbor Engineering	4	-	-	3	30	70	100
BTCE8048	Traffic Engineering and Management	4	-	-	3	30	70	100
BTCE8049	Photogrammetry and Construction Techniques	4	-	-	3	30	70	100
BTCE80410	Prefabrication and Construction Techniques	4	-	-	3	30	70	100

BTCE80411	Earthquake Resistant Design of Structure	4	-	-	3	30	70	100
BTCE80412	Structural Dynamics	4	-	-	3	30	70	100
BTCE80413	Theory of Elasticity and Plasticity	4	-	-	3	30	70	100
BTCE80414	Design of Industrial Structures	4	-	-	3	30	70	100
BTCE80415	Advance Open Channel Flow	4	-	-	3	30	70	100

Program Specific Outcomes (PSOs)

(PSO1): Graduates will apply engineering mechanics and structural analysis principles to design and evaluate civil engineering structures, ensuring they meet essential safety, functionality, and sustainability standards across various projects.

(PSO2): Graduates will effectively manage construction projects through skills in planning, scheduling, resource allocation, and quality control, while strictly adhering to safety regulations and industry standards throughout the construction process.

(PSO3): Graduates will demonstrate proficiency in geotechnical engineering by analyzing soil and rock properties for foundation design, understand environmental engineering principles for sustainable practices, and design transportation systems considering traffic flow, safety, and environmental impacts.

Program Outcomes (POs)

(PO1) Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

(PO2) Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

(PO3) Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

(PO4) Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

(PO5) Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

(PO6) The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice**.**

(PO7) Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

(PO8) Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

(PO9) Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

(PO10) Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

(PO11) Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

(PO12) Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

First Semester

Paper – BT101

Engineering Mathematics I

Introduction: To apprise students with covering calculus, linear algebra, differential equations, and numerical methods. It equips students with the mathematical tools essential for solving engineering problems.

Course Outcome

CO-1. Use partial derivatives to calculate rates of change of multivariate functions.
CO-2. Analyze position, velocity, and acceleration in two or three dimensions using the calculus of vector valued functions.
CO-3. Recognize and solve first-order ordinary differential equations, Newton's law of cooling
CO-4. Use matrices techniques for solving systems of linear equations in the different areas of Linear Algebra.
CO-5. Solution of system of linear equations, quadratic forms.

Unit 1	Differential Calculus -1: Determination of nth order derivatives, Leibnitz"s theorem (without proof)- problems. Taylor"s and Maclaurin"s theorems for function of one variable (statement only)- problems. Evaluation of Indeterminate forms. Partial derivatives – Definition and simple problems, Euler"s theorem (without proof) – problems, total derivatives, partial differentiation of composite functions problems. Definition and evaluation of Jacobian
Unit 2	Differential Calculus -2 Polar Curves - angle between the radius vector and tangent, angle between two curves, Pedal equation of polar curves. Derivative of arc length - Cartesian, Parametric and Polar forms (without proof)- problems. Curvature and Radius of Curvature – Cartesian, Parametric, Polar and Pedal forms (without proof) -problems
Unit 3	Integral Calculus: Reduction formulae - $\int Sinnx\ dx, \int Cos\ nx\ d, \int Sinmx\ Cos\ nx\ dx$, (m and n are positive integers), evaluation of these integrals

	with standard limits (0 to π/2) and problems. First order Differential Equations: Exact, reducible to exact and Bernoulli‟s differential equations. Orthogonal trajectories in Cartesian and polar form. Simple problems on Newton's law of cooling.
Unit 4	Linear Algebra-Rank of a matrix by elementary transformations, solution of system of linear equations - Gauss-elimination method, Gauss–Jordan method and Gauss Seidel method, Linear transformation, Eigen values and Eigen vectors. diagonalization of a square matrix. Reduction of Quadratic form.

Reference Books:

1. B.V. Ramana, "Higher Engineering Mathematics", Tata Mc Graw-Hill, 2006
2. N.P. Bali and Manish Goyal, "A text book of Engineering mathematics", Laxmi publications, latest edition.
3. H.K. Dass and Er. Rajnish Verma, "Higher Engineering Mathematics", S.Chand publishing, 1st edition, 2011.

Course Articulation Matrix - BT101 (Engineering Mathematics I)

COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3
CO5:	3	3	3	2	2	3	3	2	2	3	3	3	2	2	2

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper – BT102

Engineering Physics

Introduction: Engineering Physics is a foundational course covering fundamental physics concepts like mechanics, waves, optics, and electricity. It provides the physical principles essential for understanding and applying engineering concepts.

Course Outcome

CO-1. Learn and understand more about basic principles and to develop problem solving skills and implementation in technology.

CO-2. Gain Knowledge about Modern physics and quantum mechanics will update the basic concepts to implement the skills.

CO-3. Study of material properties and their applications is the prime role to understand and use in engineering applications and studies.

CO-4. Study Lasers and Optical fibers and its applications are to import knowledge and to develop skills and to use modern instruments in the engineering applications.

CO-5. Understand Crystal structure and applications are to boost the technical skills and its applications.

Unit 1	Quantum Mechanics Introduction to quantum physics, Black body radiation, Planck‟s law, Photoelectric effect, Compton effect, de-Broglie‟s hypothesis, Wave-particle duality, Davisson and Germer experiment, Heisenberg‟s Uncertainty principle, Born‟s interpretation of the wave function, Schrodinger‟s time independent wave equation, Particle in one dimensional box
Unit 2	Semiconductor Physics Intrinsic and Extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall effect, p-n junction diode, Zener diode and their V-I Characteristics, Bipolar Junction Transistor (BJT): Construction, Principle of operation.
Unit 3	Optoelectronics Radiative and non-radiative recombination mechanisms in semiconductors, LED and semiconductor lasers: Device structure, Materials, Characteristics and figures of merit, Semiconductor

	photodetectors: Solar cell, PIN and Avalanche and their structure, Materials, working principle and Characteristics.
Unit 4	Lasers and Fibre Optics Lasers: Introduction to interaction of radiation with matter, Coherence, Principle and working of Laser, Population inversion, Pumping, Types of Lasers: Ruby laser, Carbon dioxide (CO^2) laser, HeNe laser, Applications of laser. Fibre Optics: Introduction, Optical fibre as a dielectric wave guide, Total internal reflection, Acceptance angle, Acceptance cone and Numerical aperture, Step and Graded index fibres, Losses associated with optical fibres, Applications of optical fibres.
Unit 5	Electromagnetism and Magnetic Properties of Materials Laws of electrostatics, Electric current and the continuity equation, Ampere‟s and Faraday‟s laws, Maxwell‟s equations, Polarisation, Permittivity and Clausius-Mossotti equation, Ferroelectrics and Piezoelectrics. Magnetisation, permeability and susceptibility, Classification of magnetic materials, Ferromagnetism and ferromagnetic domains, Hysteresis, Applications of magnetic materials. Dielectric constant, Internal fields in a solid,

Reference Books:

1. Wiley precise Text, Engineering Physics, Wiley India Private Ltd., New Delhi. Book series – 2014,
2. Dr. M.N. Avadhanulu, Dr. P.G.Kshirsagar, Text Book of Engineering Physics, S Chand Publishing, New Delhi – 2012

Course Articulation Matrix - BT102 (Engineering Physics)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3
CO5:	3	3	3	2	2	3	3	2	2	3	3	3	2	2	2

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper – BT103
Programming in C

Introduction: Programming in C is a foundational course for students, teaching the fundamentals of programming using the C language. It equips students with the skills to write efficient and effective code for various applications.

Course Outcome

CO-1. Illustrate and explain the basic computer concepts and programming principles of C language.

CO-2. Develop C programs to solve simple mathematical and decision-making problems.

CO-3. Develop C programs to solve simple engineering problems using looping constructs.

CO-4. Develop C programs to demonstrate the applications of derived data types such as arrays, pointers, strings and functions.

Unit 1	Basics of Computer Hardware and Software Basics of Computer Architecture: processor, Memory, Input& Output devices Application Software & System software: Compilers, interpreters, High level and low level languages, Introduction to structured approach to programming, Flow chart Algorithms, Pseudo code (bubble sort, linear search - algorithms and pseudo code)
Unit 2	Program Basics Basic structure of C program: Character set, Tokens, Identifiers in C, Variables and Data Types, Constants, Console IO Operations, printf and scanf Operators and Expressions: Expressions and Arithmetic Operators, Relational and Logical Operators, Conditional operator, size of operator, Assignment operators and Bitwise Operators. Operators Precedence, Preprocessor directive Control Flow Statements: If Statement, Switch Statement, Unconditional Branching using goto statement, While Loop, Do While Loop, For Loop, Break and Continue

	statements.(Simple programscovering control flow)
Unit 3	Arrays and strings Arrays Declaration and Initialization, 1-Dimensional Array, 2-Dimensional Array String processing: In built String handling functions (strlen, strcpy, strcat and strcmp, puts, gets). Linear search program, bubble sort program, simple programs covering arrays and strings
Unit 4	Pointers Basics of Pointer: declaring pointers, accessing data though pointers, NULL pointer, array accessusing pointers, pass by reference effect Structure & Union Introduction, Declaration and Initialization, Array of Structures, Unions.
Unit 5	Working with functions Introduction to modular programming, writing functions, formal parameters, actual parameters Pass by Value, Recursion, Arrays as Function Parameters structure, union, Storage Classes, Scope and life time of variables, simple programs using functions File Handling File Operations: open, close, read, write, append Sequential access and random access to files: In built file handling functions (rewind() ,fseek(), ftell(),feof(), fread(), fwrite()), simple programs covering pointers and files.

Reference Books:

1. Schaum Series, Gottfried B.S.,Tata McGraw Hill,Programming with C
2. E. Balagurusamy, Mcgraw Hill,Programming in ANSI C
3. Asok N Kamthane, Pearson,Programming in C
4. Anita Goel, Pearson, Computer Fundamentals

Course Articulation Matrix - BT103 (Programming In C)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper – BT104

Elements of Mechanical Engineering

Introduction: Elements of Mechanical Engineering is a foundational course, introducing students to the basic principles and applications of mechanical engineering. It covers topics like mechanics, thermodynamics, materials science, and manufacturing processes.

Course Outcome

CO-1: Various Energy sources, Boilers, Prime movers such as turbines and IC engines, refrigeration and air-conditioning systems.

CO-2: Metal removal process using Lathe, drilling, Milling Robotics and Automation.

CO-3: Fair understanding of application and usage of various engineering materials.

Unit 1	Energy Resources: Non-renewable and renewable energy resources, Petroleum based solid, liquid and gaseous fuels, Calorific values of fuels, Combustion and combustion products of fuels. Solar Power: Solar Radiation, Solar constant (definition only), Solar Thermal energy harvesting, ex: liquid flat plate collectors, solar ponds (principle of operation only), Solar photovoltaic principle. Wind Power: principle of operation of a typical windmill. Hydro Power: Principles of electric power generation from hydro power plants, Nuclear Power: Principles of Nuclear power plants, Bio Fuels: introduction to bio fuels, examples of various

	biofuels used in engineering applications, Comparison of biofuels with petroleum fuels in terms of calorific value and emission.
Unit 2	Turbines and IC Engines and Pumps Steam turbines: Classification, Principle of operation of Impulse and reaction turbines, Gas turbines: Classification, Working principles and Operations of Open cycle and closed cycle gas turbines. Water turbines: Classification, Principles and operations of Pelton wheel, Francis turbine and Kaplan turbine Internal Combustion Engines: Classification, I.C. Engines parts, 2 Stroke and 4 stroke Petrol engines, 4 stroke diesel engines. P-V diagrams of Otto and Diesel cycles. Problems on indicated power, brake power, indicated thermal efficiency, brake thermal efficiency, mechanical efficiency, andspecific fuel consumption.
Unit 3	Machine Tools Operations: Turning, facing, knurling, Thread cutting, Taper Turning , Drilling, Boring, Reaming, Tapping, Counter Sinking, Counter Boring, -Plane milling, End milling, Slot milling. (No sketches of Machine tools, sketches to be used only for explaining operations.)
Unit 4	Engineering materials and joining processes: Engineering Materials: Types and applications of Ferrous & Nonferrous metals and alloys, Composites: Definition, Classification and applications(Air craft and Automobiles) Soldering, Brazing and Welding: Definitions, classification and method of soldering, Brazing and welding. Differences between soldering, Brazing and Welding. Description of Electric Arc Welding and Oxy-Acetylene Welding.
Unit 5	Refrigeration, Air-Conditioning: Refrigerants: properties of refrigerants, list of commonly used refrigerants. Refrigeration – Definitions – Refrigerating effect, Ton of Refrigeration, Ice making capacity, COP, Relative COP, unit of Refrigeration. Principle and working of vapor compression refrigeration and vapour absorption refrigeration: Principles and applications of air conditioners, Room air conditioner.

Reference Books:

1. V.K.Manglik, “Elements of Mechanical Engineering”, PHI Publications, 2013. (Module-1,2,4,5)
2. Mikell P.Groover, “Automation, Production Systems & CIM”, 3rd Edition, PHI

(Module -3)

3. K.R.Gopalkrishna, "A text Book of Elements of Mechanical Engineering"- Subhash Publishers, Bangalore. (Module -1,2,3,4,5)

Course Articulation Matrix - BT104 (Elements of Mechanical Engineering)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper – BT105

Basics of Electrical Engineering

Introduction: Basics of Electrical Engineering is a foundational course covering fundamental concepts like circuits, electromagnetism, and power systems. It equips students with the knowledge to understand and apply electrical principles in various engineering fields.

Course Outcome

CO-1. To predict the behavior of electrical and magnetic circuits.
CO-2. Select the type of generator / motor required for a particular application.
CO-3. Realize the requirement of transformers in transmission and distribution of electric power and other applications.
CO-4. Practice Electrical Safety Rules & standards.
CO-5. To function on multi-disciplinary teams.

Unit 1	Ohm‟s law and Kirchhoff‟s laws, analysis of series, parallel circuit by independent voltage sources, concept of power and energy, definition of magnetic circuit and analogy between electric and magnetic circuits, faradays laws of electromagnetic induction, concept of Network Theorem.
Unit 2	Single Phase A.C. Circuits: Average value, R.M.S. value, form factor and peak factor for sinusoidal wave form, Steady State Analysis of series R-L-C circuits. Concept of Reactance, Impedance, Susceptance, Admittance, Concept of Power Factor, Real, Reactive and Complex power, Illustrative Problems
Unit 3	Single phase transformers: principle of operation, constructional features and emf equation. DC. Generator: principle of operation, constructional features, emf equation. DC Motor: principle of operation, Back emf, torque equation.
Unit 4	Three phase Induction Motor: principle of operation, types; Synchronous Machines: principle of operation of Synchronous generator and motor. EMF equation, Voltage regulation, Applications and starting of Synchronous motor. Introduction to single-phase induction Motor.
Unit 5	Electrical Installations: Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, Types of Wires and Cables, Earthing. Elementary calculations for energy consumption and battery backup. Measuring Instruments: Construction and Principle of operation of dynamometer type wattmeter and single-phase induction type energy meter

Reference Books:

1. Electronic Principles, Albert Malvino and David J Bates, 7th Edition, Tata McGraw –Hill.
2. Electronic Devices and Circuits Theory, Boyelstad, Pearson Education, 8th Edition, September 2011.
3. Op-Amps and Linear Integrated Circuits , - Ramakanth A. Gayakwad, PHI, 4th Edition, 2009

Course Articulation Matrix - BT105 (Basics of Electrical Engineering)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3
CO5:	3	3	3	2	2	3	3	2	2	3	3	3	2	2	2

3 = High Relevance
2 = Moderate Relevance
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Blank = No Direct Mapping

Paper – BT106

Professional Communication Skills

Introduction: Professional Communication Skills is a foundational course student, focusing on developing effective communication abilities in professional settings. It covers written, oral, and visual communication, enhancing students' ability to convey technical information clearly and persuasively.

Course Outcome

CO-1. Develop knowledge, skills, and judgment around human communication that facilitate their ability to work collaboratively with others.
CO-2. Understand and practice different techniques of communication.
CO-3. Practice and adhere to the 7Cs of Communication.
CO-4. Familiarize with different types of Communication.

Unit 1	Concepts of Communications Introduction: Definition and Process of Communication - Forms of Verbal and Non-verbal Communication. Barriers of Communication: Communication Barriers and Overcoming Communication Barriers - Guidelines for Effective Communication. Business Writing: Direct and Indirect approaches to Business Writing - Five Main Stages of Writing Business Messages. Exercise: Role Play, Square Talk Activity
Unit 2	Written Business Communication External Communication: The Seven C"s of Letter writing - Kinds of Business Letters - Business Reports and Proposals - Purpose of Business Reports. Internal Communication: Format and Principles of Writing Memos - General Warning - Cautions. Exercise: Preparation of Reports on different issues.
Unit 3	Oral Communication Public Speaking: Types of Public Speaking - importance of Public Speaking. Power Point Presentation: Planning the

	Presentation - Delivering the Presentation - Developing & Displaying Visual Aids - Handling Questions from the Audience. Listening: Definition - Types of Listening Skills - Features of a Good Listener - Causes and effects of Poor Listening. Exercise: Elocution and Extempore
Unit 4	Behavioral Techniques Body Language: Facial Expressions - Body Posture - Gestures - Eye Movement - Touch and the use of Personal Space. Business Attire and Grooming: Different types of Attire - Guidelines for Business Attire. Exercise: Power of Body Language, Charades.
Unit 5	Etiquettes: Greeting Etiquette - Corporate Etiquette - Telephone Etiquette - E-mail Etiquette – Meeting Etiquette - Netiquette - Personal Etiquette - Social Etiquette - Dining Etiquette. Exercise: Introduction and Art of Conversation, Telephonic Activity.

Reference Books:

1. Meenakshi Raman and Prakash Singh, Business Communication, Oxford
2. Lesikar: Basic Business Communication, TMH
3. David Irwin: Effective Business Communications, Viva- Thorogood. Rajendra Pal, J S Korlaha
4. HI: Essentials of Business Communication: Sultan Chand & Sons, New Delhi

Course Articulation Matrix - BT106 (Professional Communication Skills)

COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

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Blank = No Direct Mapping

Second Semester

Paper – BT201

Engineering Mathematics II

Introduction: Engineering mathematics builds on calculus, linear algebra, and different equations, focusing on advanced topics like vector calculus, complex analysis, and numerical methods, essential for solving complex engineering problems.

Course outcome

CO-1: Solve differential equations of electrical circuits, forced oscillation of mass spring and elementary heat transfer.
CO-2: Solve partial differential equations fluid mechanics, electromagnetic theory and heat transfer.
CO-3: Evaluate double and triple integrals to find area, volume, mass and moment of inertia of plane and solid region.
CO-4: Use curl and divergence of a vector valued functions in various applications of electricity, magnetism and fluid flows.

Unit 1	Linear differential equations with constant coefficients: Solutions of second and higher order differential equations - inverse differential operator method, method of undetermined coefficients and method of variation of parameters.
Unit 2	Linear differential equations with variable coefficients: Solution of Cauchy‟s and Legendre‟s linear differential equations. Nonlinear differential equations - Equations solvable for p, equations solvable for y, equations solvable for x, general and singular solutions, Clairauit‟s equations and equations reducible to Clairauit‟s form.
Unit 3	Partial Differential equations: Formulation of Partial differential equations by elimination of arbitrary constants/functions, solution of non-homogeneous Partial differential equations by direct integration, solution of homogeneous Partial differential equations involving derivative with respect

	to one independent variable only. Derivation of one dimensional heat and wave equations and their solutions by variable separable method.
Unit 4	Multiple integrals: Beta and Gamma functions: definitions, Relation between beta and gamma functions and simple problems. Evaluation of double and triple integrals. evaluation of double integrals by changing the order of integration and by changing into polar co-ordinates .Applications of multiple integrals to find area and volume.
Unit 5	Laplace Transform Definition and Laplace transforms of elementary functions. Laplace transforms of e$atf(t)$, $tnf(t)$ and f(t) (without proof), t periodic functions and unit-step function- problems Inverse Laplace Transform Inverse Laplace Transform - problems, Convolution theorem to find the inverse Laplace transforms (without proof) and problems, solution of linear differential equations using Laplace Transforms.

Reference Books:

1. B.V.Ramana "Higher Engineering M athematics" Tata Mc Graw-Hill, 2006

2. N P Bali and Manish Goyal, "A text book of Engineering mathematics" , Laxmi publications, latest edition.

3. H. K Das and Er. Rajnish Verma ,"Higher Engineering Mathematics", S. Chand publishing,1st edition, 2011.

Course Articulation Matrix - BT201 (Engineering Mathematics II)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance

Blank = No Direct Mapping

Paper – BT202

Engineering Chemistry

Introduction: Engineering chemistry is a fundamental chemical principle and their applications in engineering fields, covering topics like materials science, thermodynamics, electrochemistry, and environmental chemistry.

Course outcome:

CO-1: Electrochemical and concentration cells. Classical & modern batteries and fuel cells.
CO-2: Causes & effects of corrosion of metals and control of corrosion. Modification of surface properties of metals to develop resistance to corrosion, wear, tear, impact etc. by electroplating and electro less plating.
CO-3: Production & consumption of energy for industrialization of country and living standards of people. Utilization of solar energy for different useful forms of energy.
CO-4: Replacement of conventional materials by polymers for various applications.
CO-5: Boiler troubles; sewage treatment and desalination of sea water.
CO-6: Over viewing of synthesis, properties and applications of nanomaterial.

Unit 1	Electrochemistry and Battery Technology Electrochemistry: Introduction, Derivation of Nernst equation for electrode potential. Reference electrodes: Introduction, construction, working and applications of calomel and Ag / AgCl electrodes. Measurement of electrode potential using calomel electrode. Ion selective electrode: Introduction; Construction and working of glass electrode, determination of pH using glass electrode. Concentration cells: Electrolyte concentration cells, numerical problems. Battery Technology: Introduction, classification - primary, secondary and reserve batteries. Characteristics - cell potential, current, capacity, electricity storage density, energy efficiency, cycle life and shelf life. Construction, working and applications of Zinc- Air, Nickel- metal hydride batteries. Lithium batteries: Introduction, construction, working and applications of Li-MnO2 and Li-ion batteries. Fuel Cells: Introduction, difference between conventional cell and fuel cell, limitations & advantages. Construction, working & applications of methanol-oxygen fuel cell with H2SO4 electrolyte.
Unit 2	Corrosion and Metal Finishing: Corrosion: Introduction, electrochemical theory of corrosion, galvanic series. Factors affecting the rate of corrosion: ratio of anodic to cathodic areas, nature of metal, nature of corrosion product, nature of medium – pH,

	conductivity, and temperature. Types of corrosion- Differential metal, differential aeration (Pitting and water line) and stress. Corrosion control: Inorganic coatings- Anodizing of Al and phosphating; Metal coatings-Galvanization and Tinning. Cathodic protection (sacrificial anodic and impressed current methods). Metal Finishing: Introduction, Technological importance. Electroplating: Introduction, principles governing- Polarization, decomposition potential and overvoltage. Factors influencing the nature of electro deposit-current density, concentration of metal ion & electrolyte; pH, temperature & throwing power of plating bath; additives- brighteners, levellers, structure modifiers & wetting agents. Electroplating of Nickel (Watt‟s Bath) and Chromium(decorative and hard). Electro less plating: Introduction, distinction between electroplating and electro less plating, electro less plating of copper & manufacture of double sided Printed Circuit Board with copper.
Unit 3	Fuels and Solar Energy: Fuels: Introduction, classification, calorific value- gross and net calorific values, determination of calorific value of fuel using bomb calorimeter, numerical problems. Cracking: Introduction, fluidized catalytic cracking, synthesis of petrol by Fishcher-Tropsch process, reformation of petrol, octane and cetane numbers., anti knocking agents, power alcohol & biodiesel. Solar Energy: Introduction, utilization and conversion, photovoltaic cells- construction and working. Design of PV cells: modules, panels & arrays. Advantages & disadvantages of PV cells. Production of solar grade silicon: Union carbide process, purification of silicon (zone refining), doping of silicon-diffusion technique (n&p types).
Unit 4	Polymers: Introduction, types of polymerization: addition and condensation, mechanism of polymerization- free radical mechanism taking vinyl chloride as an example. Molecular weight of polymers: number average and weight average, numerical problems. Glass transition temperature (Tg): Factors influencing Tg-Flexibility, inter molecular forces, molecular mass, branching & cross linking and stereo regularity. Significance of Tg. Structure property relationship: crystallinity, tensile strength, elasticity & chemical resistivity. Synthesis, properties and applications of PMMA (plexi glass), Polyurethane and polycarbonate. Elastomers: Introduction, synthesis, properties and applications of Silicone rubber.
Unit 5	Water Technology and Nanomaterials: Water Technology: Introduction, boiler troubles with disadvantages & prevention methods-scale and sludge formation, priming and foaming, boiler corrosion(due to dissolved O2, CO2 and MgCl2). Determination of DO, BOD and COD, numerical problems on COD. Sewage treatment: Primary, secondary (activated sludge method) and tertiary methods. Softening of water by ion exchange process Nano Materials: Introduction, properties (size dependent). Synthesis-bottom up approach (sol-gel, precipitation, gas condensation & chemical vapour condensation processes). Nano scale materials- carbon nano tubes, nano wires, fullerenes, dendrimers, nano rods, & nano composites.

Reference Books:

1. O.G.Palanna,"Engineering Chemistry",Tata McGraw Hill Education Pvt. Ltd. New Delhi, Fourth Reprint.

2. G.A.Ozin & A.C. Arsenault, "Nanochemistry A Chemical Approach to Nanomaterials", RSC publishing, 2005.

3. "Wiley Engineering Chemistry", Wiley India Pvt. Ltd. New Delhi. Second Edition.

Course Articulation Matrix - BT202 (Engineering Chemistry)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3
CO5:	3	3	3	2	2	3	3	2	2	3	3	3	2	2	2
CO6:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper – BT203

BASIC ELEMENTS OF CIVIL ENGINEERING AND MECHANICS

Introduction: Basic elements of civil engineering and mechanics is fundamental concepts like statics, dynamics, materials science, and structural analysis, forming the foundation for understanding the design and construction of civil infrastructure.

Course Outcome

CO-1: Know basics of Civil Engineering, its scope of study, knowledge about Roads, Bridges and Dams

CO-2: Comprehend the action of Forces, Moments and other loads on systems of rigid bodies

CO-3: Compute the reactive forces and the effects that develop as a result of the external loads.

CO-4: Locate the Centroid and compute the Moment of Inertia of regular cross- sections.

Unit 1	Introduction to Civil Engineering & Engineering Mechanics Introduction to Civil Engineering Scope of different fields of Civil Engineering - Surveying, Building Materials, Construction Technology, Geotechnical Engineering, Structural Engineering, Hydraulics, Water Resources and Irrigation Engineering, Transportation Engineering, Environmental Engineering. Infrastructure: Types of infrastructure, Role of Civil Engineer in the Infrastructural Development, Effect of the infrastructural facilities onsocio-economic development of a country. Roads: Classification of Roads and their functions, Comparison of Flexible and Rigid Pavements (Advantages and Limitations) Bridges: Types of Bridges and Culverts, RCC, Steel and Composite Bridges Dams: Different types of Dams based on Material, Structural behavior and functionality with simple sketches. Introduction to Engineering Mechanics: Basic idealizations - Particle, Continuum and Rigid body; Newton‟s laws-Force and its characteristics, types of forces-Gravity, Lateral and its distribution on surfaces, Classification of force systems, Principle of physical independence, superposition, transmissibility of forces, Introduction to SI units. Couple, Moment of a couple, Characteristics of couple, Moment of a force, Equivalent force - Couple system; Numerical problems on moment of forces and couples, on equivalent force - couple system
Unit 2	Analysis of Concurrent Force Systems Concepts: Resultants and Equilibrium Composition of forces - Definition of Resultant; Composition of coplanar concurrent force system, Parallelogram Law of forces, Principle of resolved parts; Numerical problems on composition of coplanar concurrent force systems. Equilibrium of forces -

	Definition of Equilibrant; Conditions of static equilibrium for different force systems, Lami's theorem; Numerical problems on equilibrium of coplanar – concurrent and non-concurrent force systems. Application- Static Friction in rigid bodies in contact Types of friction, Laws of static friction, Limiting friction, Angle of friction, angle of repose; Impending motion on horizontal and inclined planes; Numerical Problems on single and two blocks on inclined planes
Unit 3	Analysis of Non-Concurrent Force Systems Concepts: Resultants and Equilibrium Composition of coplanar - non-concurrent force system, Varignon's principle of moments; Numerical problems on composition of coplanar non-concurrent Force system. Application-Support Reaction in beams Types of Loads and Supports, statically determinate beams, Numerical problems onsupport reactions for statically determinate beams with Point load (Normal and inclined) and uniformly distributed and uniformly varying loads and Moments.
Unit 4	Centroids and Moments of Inertia of Engineering Sections: Centroids Introduction to the concept, centroid of line and area, centroid of basic geometrical figures, computing centroid for–T,L,I,Z and full/quadrant circular sections and their built up sections. Numerical problems Moment of Inertia Introduction to the concept, Radius of gyration, Parallel axis theorem, Perpendicular axis theorem, Moment of Inertia of basic planar figures, computing moment of Inertia for – T, L, I, Z and full/quadrant circular sections and their built up sections. Numerical problems
Unit 5	Kinematics Concepts and Applications Definitions – Displacement – Average velocity – Instantaneous velocity – Speed – Acceleration - Average acceleration – Variable acceleration – Acceleration due to gravity – Newton‟s Laws of Motion. Rectilinear Motion–Numerical problems. Curvilinear Motion – Super elevation – Projectile Motion – Relative motion – Numerical problems. Motion under gravity – Numerical problems.

Reference Books

1. Engineering Mechanics by S.Timoshenko, D.H.Young, and J.V.Rao, TATA McGraw-Hill Book Company, New Delhi

2. Beer FP and Johnson ER, “Mechanics for Engineers- Dynamics and Statics”- 3rd SI Metric edition, Tata McGraw Hill. - 2008

Course Articulation Matrix - BT203 (Basics of Civil Engineering & Mechanics)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3

CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
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Paper- BT204

COMPUTER AIDED ENGINEERING DRAWING

Introduction: Computer Aided Engineering Drawing introduce the use of software like AutoCAD and SoildWorks for creating and manipulating 2D and 3D engineering drawings, essential for visualizing and communicating design ideas.

Course outcome

CO-1. Students will be able to demonstrate the usage of CAD software.
CO-2. Students will be able to visualize and draw Orthographic projections, Sections of solids and Isometric views of solids.
CO-3. Students are evaluated for their ability in applying various concepts to solve practical problems related to engineering drawing

Unit 1	Introduction to Computer Aided Sketching Introduction, Drawing Instruments and their uses, BIS conventions, Lettering, Dimensioning and free hand practicing. Computer screen, layout of the software, standard tool bar/menus and description of most commonly used tool bars, navigational tools. Co-ordinate system and reference planes. of HP, VP, RPP & LPP. of 2D/3D environment. Selection of drawing size and scale. Commands and creation of Lines, Co-ordinate points, axes, poly-lines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet, curves, constraints viz. tangency, parallelism, inclination and perpendicularity. Dimensioning, line conventions, material conventions and lettering.
Unit 2	Orthographic projections Introduction, Definitions - Planes of projection, reference line and conventions employed, Projections of points in all the four quadrants, Projections of straight lines (located in First quadrant/first angle only), True and apparent lengths, True and apparent inclinations to reference planes (No application problems).Orthographic Projections of Plane Surfaces (First Angle Projection Only) Introduction, Definitions–

	projections of plane surfaces–triangle, square, rectangle, rhombus, pentagon, hexagon and circle, planes in different positions by change of position method only (No problems on punched plates and composite plates).
Unit 3	Projections of Solids (First angle Projection only) Introduction, Definitions – Projections of right regular tetrahedron, hexahedron (cube), prisms, pyramids, cylinders and cones in different positions (No problems on octahedrons and combination solid).
Unit 4	Sections and Development of Lateral Surfaces of Solids Introduction, Section planes, Sections, Section views, Sectional views, Apparent shapes and True shapes of Sections of right regular prisms, pyramids, cylinders and cones resting with base on HP. (No problems on sections of solids) Development of lateral surfaces of above solids, their frustums and truncations. (No problems on lateral surfaces of trays, tetrahedrons, spheres and transition pieces).
Unit 5	Isometric Projection (Using Isometric Scale Only) Introduction, Isometric scale, Isometric projection of simple plane figures, Isometric projection of tetrahedron, hexahedron(cube), right regular prisms, pyramids, cylinders, cones, spheres, cut spheres and combination of solids (Maximum of three solids)

Reference Books

1. Computer Aided Engineering Drawing – S. Trymbaka Murthy, - I.K. International Publishing House Pvt. Ltd., New Delhi, 3rd revised edition-2006.

2. Engineering Graphics - K.R. Gopalkrishna, 32nd edition, 2005- Subash Publishers Bangalore.

Course Articulation Matrix - BT204 (Computer Aided Engineering Drawing)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper- BT205

BASIC ELECTRONIC

Introduction: It introduces fundamental electronic components like diodes, transistors, and integrated circuits, covering their characteristics, applications, and basic circuit deign principles.

Course outcome:

CO-1: Understand the semiconductor physics of the intrinsic, p and n materials.
CO-2: Understand the function and operation of diodes, transistors and amplifiers.
CO-3: Students will be aware of the architecture, functions & their applications of IC 741 OP-Amp

Unit 1	Semi Conductors and Diodes: Conductors, Semiconductors, Intrinsic Semiconductors, Extrinsic Semi-Conductors. Diode Theory: Basic Ideas, The ideal Diode, Forward and Reverse Bias, Diode Equation, Volt-Ampere Characteristic. Special diodes: symbol of zener diode, operation, V-I characteristics, symbol of photo diode, working principle, LED symbol and principle.
Unit 2	Rectifiers: Half-wave Rectifier, Full-wave and Bridge Rectifier, derivation of Ripple factor, efficiency of Half wave, full-wave and Bridge rectifiers. Merits and demerits of Half-wave, full-wave and Bridge rectifiers, Comparisons of rectifiers.
Unit 3	Bipolar Junction Transistors: Symbols of pnp and npn transistors and their working principles, Transistor currents, input and output characteristics of Common base configuration, Common Emitter configuration Transistor Switch, Amplifiers: working principles of Common base amplifier, Common Emitter amplifier, Common collector amplifier and their applications.
Unit 4	Characteristics of Op-Amps: Introduction to OP-amp, Op-amp Block Diagram, ideal and practical Op-amp specifications, 741 op amp & its features, Op-Amp parameters & Measurement, Input & Out put off set voltages & currents, slew rates, CMRR, PSRR.
Unit 5	Applications of Op-Amps: Inverting and Non-inverting amplifier, Integrator and differentiator, Comparators.

Reference Books

1. Electronic Principles, Albert Malvino and David J Bates, 7th Edition, Tata McGraw –Hill.
2. Electronic Devices and Circuits Theory, Boyelstad, Pearson Education, 8th Edition, September 2011.
3. Op-Amps and Linear Integrated Circuits , - Ramakanth A. Gayakwad, PHI, 4th Edition, 2009
4. Linear Integrated Circuits – D. Roy Chowdhury, New Age International Pvt.Ltd., 2nd Edition, 2003.

Course Articulation Matrix - BT205 (Basic Electronics)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper- BT206

SOFTWARE ENGINEERING

Introduction: Software engineering introduces the principles and practices of designing, developing, and maintaining software systems, covering topics like programming languages, software design patterns, and software testing methodologies.

Course outcome

CO 1: Identify the need for engineering approach to software development and various processes of requirements analysis for software engineering problems.
CO 2: Analyze various software engineering models and apply methods for design and development of software projects.
CO 3: Work with various techniques, metrics and strategies for testing software projects.

Unit 1	Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Software Quality Attributes. Software Development Life Cycle (SDLC) Models: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.
Unit 2	Software Requirement Specifications (SRS) Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS. Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model.
Unit 3	Software Design: Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Pseudo Codes, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Object Oriented Design, Top-Down and Bottom-Up Design. Software Measurement and Metrics: Various Size Oriented Measures: Halestead‟s Software Science, Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs.
Unit 4	Software Testing: Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top-Down and Bottom Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Compliance with Design and Coding

	Standards.
Unit 5	Software Maintenance and Software Project Management Software as an Evolutionary Entity, Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management.

Reference Books

1. R. S. Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.

2. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.

3. K. K. Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.

4. Pankaj Jalote, Software Engineering, Wiley

5.Deepak Jain,"Software Engineering:Principles and Practices", Oxford University Press.

Course Articulation Matrix - BT206 (Software Engineering)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Third Semester

Paper – BTCE301

Engineering Mathematics III

Introduction: Engineering mathematics III delves deeper into advance mathematical concepts like differential equations, linear algebra, and numerical methods, providing tools for solving complex engineering problems.

Course outcome

CO-1. Apply advance mathematics concepts to solve engineering problems.
CO-2. Develop analytical and problem solving skills using mathematical tools.
CO-3. Understand the theoretical foundations of advance mathematical concept.
CO-4. Communicate mathematics ideas effectively in written and oral form.
CO-5. Work independently and collaboratively on mathematical problems.
CO-6. Apply mathematical software and tools to solve engineering problems.

Unit 1	VECTOR DIFFERENTIATION Scalar and vector point functions – Del applied to scalar point functions – Directional derivative – Del applied to vector point functions – Physical interpretation of divergence and curl – Del applied twice to point functions – Del applied to products of point functions.
Unit 2	VECTOR INTEGRATION Integration of vectors – Line integral, circulation, work done – Surface integral, flux – Green's theorem in the plane – Stoke's theorem – Volume integral – Gauss divergence theorem (all theorems without proofs) – Irrotational and solenoidal fields.
Unit 3	PARTIAL DIFFERENTIAL EQUATIONS AND THEIR APPLICATIONS Introduction – Formation of partial differential equations by eliminating arbitrary constants and functions – Solutions of a partial differential equations by direct Integration – Linear equations of the first order (Lagrange's linear equations). Applications: Method of separation of variables – Vibrations of a stretched string: Wave equation – One dimensional heat flow equation (∂u/∂t=c^(2) (∂^2 u)/(∂x^2)), and two dimensional heat flow equation (i.e. Laplace equation : (∂^2 u)/(∂x^2)+(∂^2 u)/(∂y^2)=0).
Unit 4	FOURIER SERIES Introduction – Euler's formulae – Conditions for a Fourier expansion – Functions having points of discontinuity – Change of interval – Even and odd functions – Half range series – Parseval's formula.
Unit 5	FOURIER TRANSFORMS Introduction – Definition – Fourier integral theorem (without proof) - Fourier sine and cosine integrals – Fourier transforms – Properties of Fourier transforms – Convolution theorem – Parseval's identity for Fourier transforms – Relation

	between Fourier and Laplace transforms – Fourier transforms of the derivatives of a function – Applications of transforms to boundary value problems.

Reference Books

1. Bali N.P. & Manish Goel, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi 2008.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd. (2005).
3. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, Delhi (2008).

Course Articulation Matrix - BTCE301 (Engineering Mathematics III)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3
CO5:	3	3	3	2	2	3	3	2	2	3	3	3	2	2	2
CO6:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper- BTCE302

BUILDING MATERIALS

Introduction: Building materials introduces the properties, characteristics, and applications of various materials used in construction, including concrete, steel, timber, and masonry, emphasizing their suitability for different structural and architectural purposes.

Course outcome:

CO-1. Identify and classify different types of building based on their properties and applications.
CO-2. Evaluate the characteristics of building materials in relation to durability, strength, fire resistance, and environmental impact.

CO-3. Apply knowledge of building materials to design and construct sustainable and cost-effective structures.
CO-4. Develop an understanding of the manufacturing processes and sustainability considerations associated with different building materials.

Unit 1	Bricks – classification and testing of bricks-Fire bricks-Building blocks- solid, hollow and paving blocks- types and applications. Lime –types and applications. Pozzolanic materials – fly ash, rice husk ash and GGBFS – Industrial wastes for concrete making.
Unit 2	Tiles – ceramic, terrazzo and clay tiles – types and uses. Materials of finish for residential, commercial and industrial floors. Materials of wall finish – interior and exterior. Wall paneling materials. Materials for architectural finishes.
Unit 3	Materials for building services-Timber-Market forms-Industrial Timber-Plywood Veneer-Thermo Cole-Panels of laminates-Steel-composition-Uses-Market forms Mechanicall Treatment- Aluminium and plastics - Paints-Varnishes-Distemper
Unit 4	Pavement Grade bitumen – Asphalt - cut back bitumen - Bituminous Emulsion - Mastic Bitumen - Bituminous felt – Joint filler compound – Joint sealant compound – Anti-stripping compound – Polymer modified bitumen – Latex modified bitumen – crumb rubber modified bitumen
Unit 5	Glass-Ceramics-Sealants for joints-Sheets for pitched roof coverings-Fibre glass reinforced plastic-Clay products-Refractories –Composite materials-Types- application of laminar composites-Fibre textiles- Mats and pads for earth reinforcement- Polymers and

	resins for building repair.

Reference Books

1. Surendra Singh, Building Materials, Vikas Publishing Company, New Delhi, 2002.

2. Rajput,R.K., Engineering Materials, S.Chand & Co. Ltd., New Delhi, 2000.

3. Khanna, S.K., Justo, C.E.G, Highway Engineering, Nem Chand & Bros, Roorkee, 2007.

4. Kadiyali, L. R, Highway Engineering, Khanna Publishers, New Delhi, 2007

Course Articulation Matrix - BTCE302 (Building Materials)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance

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Paper- BTCE303

BUILDING CONSTRUCTION

Introduction: Building construction introduces the principles and practices of constructing buildings, covering topics like site planning, foundation design, structural systems, and building services, providing a comprehensive understanding of the construction process.

Course outcome

CO-1. Understanding building construction principles, foundations, structure, services, and materials.

CO-2. Apply knowledge to analyze and design building projects, considering site conditions, loads, and regulations.

CO-3. Effectively communicate technical information about building construction through drawings, specifications, and reports.

CO-4. Identify and solve complex problems related to building construction, utilizing design principles, methods, and codes.

Unit 1	Introduction-basic functions of building-building component and their basic requirements. Foundation-need for foundation-Concept of bearing capacity-types of foundation-recommended foundation for different soils.
Unit 2	Masonry construction- Stone masonry –types. Brick masonry-bonds-types. hollow block masonry-reinforced masonry-composite masonry. Walls-types and their uses. Floors and roofs-different types of floors and their suitability. floor finishes- Roofs-different types of flat, pitched and curved roofs- roof coverings.
Unit 3	Vertical transportation-stair cases-types- layout design. Lifts-ramps – escalators. Doors and windows-location and size specifications-types-fixtures and fastenings for doors and windows-ventilators.
Unit 4	Building finishes-plastering-methods and types- special external finishes for plastered surfaces- defects in plastering- pointing- white washing-colour washing – painting, varnishing and distempering. Proofing for dampness and fire-anti termite protection.
Unit 5	Temporary structures- form work-scaffolding- shoring-underpinning. Acoustics of buildings – sound absorbent material and sound insulation Ventilation, air conditioning and thermal insulation-functional requirement of ventilation system-system of ventilation

	and their choice. Air conditioning-purposes and classification- systems of air conditioning. Thermal insulation-principles-heat insulating materials and methods of heat insulation

Reference Books

1. Arora . S.P. Bindra S.P . A Test of Building Construction, Dhanpat rai & Sons, New Delhi,2002.

2. Punmia, B.C, Building Construction, Lakshmi Publications Pvt. Ltd., New Delhi, 2002.

Course Articulation Matrix - BTCE303 (Building Construction)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
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Paper- BTCE304

STRENGTH OF MATERIAL -I

Introduction: Strength of material introduces the fundamental principles of stress, strain, and material behavior under various loads, providing a foundation for understanding how materials respond to forces and designing safe and efficient structure.

Course outcome:

CO-1. Apply fundamental concepts of stress, strain, and deformation to analyze the behavior of materials under various loading conditions.
CO-2. Analyze the strength and stiffness of structural elements such as beams, columns, and shafts using different theories of failure.
CO-3. Design and evaluate the performance of structural components considering factors such as material properties, load distribution, and safety margins.
CO-4. Develop an understanding of impact of material imperfections and environmental factors on the strength and reliability of structural elements.

Unit 1	Simple Stresses and Strains – Tension, compression and shear stresses - Hooke's law - compound stresses - thermal stresses – Compound bars. Analysis of trusses by methods of joints and sections.
Unit 2	Shear force and bending moment diagrams for beams and simple frames - Theory of simple bending – Bending stress distribution at sections.
Unit 3	Theory of simple Torsion – Torsional rigidity – Composite shafts in series and parallel. Thin cylinders and shells – Thick cylinders.
Unit 4	Shear stress distribution due to bending – Shear center. Springs – Closed and open coiled springs – Leaf springs. Complex stresses – Principal planes and stresses-Mohr‟s circle.
Unit 5	Columns – Euler‟s theory – Rankine – Jordon formula – Columns with initial curvature and eccentric loads –Long columns- Laterally loaded columns. Masonry dams and retaining walls – Middle Thrird rule – Stability Check.

Reference Books

1. Bhavikatti. S. S., Strength of Materials, Vikas Publishing House (P) Ltd., New Delhi, SecondEdition, 2002.

2. Punmia. B. C., Jain, A. K., and Jain, A. K., Strength of Materials and Theory of Structures,Vols. I & II, XI Edition, Laxmi Publications (P) Ltd, New Delhi, 2002.

3. Hearn, E. J., Strength of Materials, Pergamon Press, Oxford, 1997.

Course Articulation Matrix - BTCE304 (Strength of Materials I)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
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Paper- BTCE305

FLUID MECHANICS

Introduction: Fluids Mechanics introduces the principles of fluid behavior, covering topics like fluid properties, providing a foundation for understanding the movement and forces exerted by fluids in various engineering applications.

Course outcome:

CO-1. Apply fundamental principles of fluid mechanics to analyze the behavior of fluids in various engineering applications.
CO-2. Solve problems related to fluid statics, fluid flow in pipes and channels.
CO-3. Design and analyze fluid system such as pumps, turbines, and pipelines, considering factors such as pressure, flow rate, and energy losses.
CO-4. Develop an understanding of the impact of fluid properties such as viscosity, density, and surface tension on fluid behavior.

Unit 1	Fluid Properties: Density, specific weight, specific volume, specific gravity, compressibility, viscosity, surface tension, capillarity, vapour pressure. Fluid Statics: Pressure in a fluid, pressure head, Measurement of pressure, Hydrostatic forces on submerged plane and curved surfaces, Buoyancy, Metacentre, stability of floating and submerged bodies.
Unit 2	Fluid Kinematics: Stream line, streak line, Path line and stream tube. Types of flow, steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows. Equation of continuity for one, two, three dimensional flows, Stream function and velocity potential function, flow net analysis,. Dynamics of Flow: Euler‟s equation of motion, Bernoulli‟s equation, simple applications of Bernoulli‟s equation, Momentum equation. Kinetic energy and Momentum correction factors.
Unit 3	Boundary Layer Theory:; Boundary Layer thickness, Displacement thickness, Momentum thickness, Energy thickness, Boundary layer growth and separation. Laminar flow: Laminar flow through pipes, Hagen - poissuille flow, energy loss. Turbulent flow: Turbulent flow through pipes, Darcy‟s equation, Minor losses, Energy and hydraulic gradients, pipes in series and parallel.
Unit 4	Flow measurement: Pitot tube, Venturimeter, orificemeter, Flow nozzle, and mouthpieces, flow over notches and weirs, Venturiflume and Standing wave flume, Velocity measurement in open channel.
Unit 5	Dimensional Analysis and Similitude: Dimensional analysis - Rayleigh‟s method,

	Buckingham"s fi theorem, Dimensionless numbers, Laws of similitude, Model Analysis, Distorted models, Principles of analogy.

Reference Books

1. Douglas, J.F., Gasiorek, J.M and Swaffield, J.A., Fluid Mechanics 4th Edn. PearsonEducation India, 2002.
2. Das M.M Fluid Mechanics and Turbimachines , Prentice Hall of India (P) Ltd New Delhi, 2008.
3. Arore, K.R Fluid Mechanics, Hydraulic and Hydraulic Machines , Standard Publishersand Distributors , New Delhi , 2005

Course Articulation Matrix - BTCE305 (Fluid Mechanics)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
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Paper- BTCE306

SURVEYING - I

Introduction: Surveying introduces the fundamentals of surveying, covering topics like distance measurement, leveling, and basic surveying instruments, providing a foundation for understanding the principles and techniques used to determine the position and elevation of points on the earth's surface.

Course outcome

CO-1. Apply fundamental principles of surveying to accurately determine the horizontal and vertical positions of points on the earth's surface.
CO-2. Master the use of various surveying instruments and techniques including total stations, GPS, and leveling equipment.
CO-3. Analyze and interpret survey data to create accurate maps, plans, and profiles for various engineering projects.
CO-4. Design and implement surveying projects considering factors such as accuracy, precision, and cost-effectiveness.
CO-5. Develop an understanding of legal and ethical considerations related to surveying practices.
CO-6. Apply knowledge of surveying principles to solve problems in various engineering disciplines such as civil engineering, construction, and environmental engineering.

Unit 1	Introduction Definition–classification-principles –Accuracy and errors–Linear measurements– methods–ranging out survey lines -chaining–Error due to incorrect chain–chaining on uneven or sloping ground–Error in chaining–Tape correction Chain surveying arrangements of survey lines –locating ground features –Field book–field work – Basic problems in chaining - Obstacles in chaining
Unit 2	Compass surveying – Basic terms and definitions–Bearing and angles- compass –types - Magnetic declination –Dip-Traversing - Local attraction plane table surveying-Plane table instruments and accessories- merits and demerits- methods- intersection - traversing–resection–Three point problem–Two point problem Errors in plane tabling–Advantages and Disadvantages of Plane Tabling
Unit 3	Leveling and applications Basic terms and definitions – Methods of leveling – levels and staves- temporary and permanent adjustments –Direct levelling – Differential leveling - booking and reducing Levels – Balancing of sights-curvature and refraction- reciprocal

	leveling- longitudinal and cross sections- traversing –Levelling problems – errors in Levelling Contouring – methods – characteristic and use of contours – plotting
Unit 4	Traversing – Basic terms and definitions-Chain and compass traversing –checks in closed traverse – plotting a traverse –coordinate systems – closing errors – balancing a traverse – degree of accuracy in traversing omitted measurements- cases
Unit 5	Areas and Volumes-Areas enclosed by straight lines – Irregular figures – volume – earthwork calculations – capacity of reservoirs – mass – haul diagrams. Setting out works-introduction – Controls for setting Out – Horizontal Control – Vertical Control – Setting Out in Vertical Direction – Positioning of Structure – Setting Out Foundation Trenches of Building

Reference Books

1. Punmia . B.C . , etc . al..” Surveying “, Vols, I,II and III, Laxmi Publications, 2002

2. Kanetkar, T.P. ,Surveying and leveling, Vols. I & II, United book corporation, Pune.

Course Articulation Matrix - BTCE306 (Surveying I)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3
CO5:	3	3	3	2	2	3	3	2	2	3	3	3	2	2	2
CO6:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

SURVEYING LAB- I (BTCE307L)

1. Study of various instruments used in chain surveying.
2. To conduct the chain survey closed traverse around a building and plot the existingbuilding.
3. To run a survey line across an obstacle obstructing both ranging andchaining using chainsurvey technique.
4. To find the horizontal distance between two inaccessible points.
5. To plot the plan of a given area by compass traversing
6. To draw the position in plan of the given points by radiation method.
7. To draw the position in plan of the given points by intersection method.
8. To locate the position on the plan, of the station occupied by the plane table bymeans of observations to two well defined points whose positions have been previously plotted on the plan.
9. To locate the position on the plan, of the station occupied by the plane table bymeans of observations to three well defined points whose positions have been previously plotted on the plan.
10. To survey a small piece of land by closed traverse technique using plane table.
11. To find the reduced levels of the given stations by differential leveling.
12. To plot the longitudinal section and cross section along a proposed alignment of ahighway.

STRENGTH OF MATERIAL LAB (BTCE308L)

1. To determines water absorption of brick.
2. To determine the shape and size of the supplied brick.
3. To determines the compressive strength of bricks.
4. To determines the efflorescence of bricks.
5. This test method covers the determination of the normal consistency of Hydraulic cement. That is by determining the amount of water required toprepare Cement pastes for Initial and final time of setting test.

6. This test covers determination of the time of Setting of cement by means of the Vicat needle.
7. This test method covers determination of the compressive strength of cementmortars, using *2* in (50 mm) cube specimens.
8. This test method covers determination of the finesses of hydraulic cement bymeans of the 150µm (No.100) and 75µm (No.200) sieves.
9. To determine the soundness of the given sample of cement by "Le-Chatelier"method.
10. To determine crushing strength of a given aggregate as per IS:2386 part – IV.
11. To determine the aggregate impact value of given aggregate as perI.S-2386 Part

Fourth Semester

Paper – BTCE401

Engineering Mathematics IV

Introduction: Engineering mathematics builds upon previous mathematical concepts, focusing on advance topics like numerical methods, linear algebra, differential equations, equipping student's with the mathematical tools need for solving complex engineering problems.

Course outcome:

CO-1. Apply advance mathematics concepts to solve engineering problems.

CO-2. Develop analytical and problem solving skills using mathematical tools.

CO-3. Understand the theoretical foundations of advance mathematical concept.

Unit 1	FUNCTIONS OF A COMPLEX VARIABLE Introduction – Limit of a complex function – Derivative of (z) – Analytic functions – Harmonic functions – Applications to flow problems. Complex Integration – Cauchy"s theorem – Cauchy"s integral formula – Series of complex terms (Statements of Taylor"s and Laurent"s Series without proof) – Zeros of an analytic function – Residues – Calculation of residues – Evaluation of real definite integrals (Integration around the unit circle, Integration around the small semi-circle , Indenting the contours having poles on the real axis). Geometric representation of (z), Some standard transformations
Unit 2	FINITE DIFFERENCES & INTERPOLATION Finite differences – Forward differences – Backward differences – Central differences – Differences of a polynomial – Factorial notation – Other difference operators – To find one or more missing terms – Newton"s interpolation formulae – Central difference interpolation formulae – Interpolation with unequal intervals – Lagrange"s interpolation formula – Inverse interpolation.
Unit 3	Numerical differentiation – Formulae for derivatives – Maxima and minima of a tabulated function – Numerical integration – Newton-Cotes quadrature formula – Trapezoidal rule –
Unit 4	Z – TRANSFORMS Introduction – Definition – Some standard Z-transforms – Linearity property –Damping rule – Some standard results – Shifting Un to the right, Shifting Un to the left – Two basic theorems (Initial value theorem and Final value theorem) – Convolution theorem – Convergence of Z-transforms – Two sided Z-transform of Un – Evaluation of inverse Z- transforms (Power series method, Partial fraction method,

	Inverse integral method) – Applications to difference equations.
Unit 5	SAMPLING THEORY Introduction – Sampling distribution – Testing a hypothesis – Level of significance -Confidence limits – Test of significance of large samples (Test of significance of single mean, difference of means) – Confidence limits for unknown – Small samples – Students t distribution -Significance test of a sample mean – Significance test of difference between sample means – Chi-Square ($\chi 2$) Test – Goodness of fit.

Reference Books

1. Bali N.P. & Manish Goel, A Text Book of Engineering Mathematics, Laxmi Publications, New Delhi 2008.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley Eastern Ltd. (2005).
3. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, Delhi (2008).

Course Articulation Matrix - BTCE401 (Engineering Mathematics IV)

COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
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Paper – BTCE402

Concrete Technology

Introduction: Concrete technology explores the properties, production, and application of concrete, covering topics like mix design, testing methods, and the behavior of concrete under various conditions, providing a foundation for understanding the use of this essential construction.

Course outcome:

CO-1. Understand the properties and behavior of concrete as construction materials, including its strength, durability and workability.
CO-2. Design and specify concrete mixes for various applications, considering factor such as strength requirements durability needs and cost-effective.
CO-3. Evaluate the performance of concrete structures and identify potential problems related to concrete deterioration, cracking, and other defects.
CO-4. Develop an understanding of sustainable concrete practices and the use of alternative materials and technologies to reduce the environmental impact of concrete production.

Unit 1	Portland cement – chemical composition – hydration of Portland cement – heat of hydration – hardening of cement paste – types of Portland cement – special hydraulic cements.
Unit 2	Unit – II Aggregates – natural and mineral aggregates – characteristics of aggregate and their significance – testing of aggregates – admixtures for concrete – concrete at early ages – workability of concrete – early volume changes – setting time.
Unit 3	Concrete – introduction – components of concrete – types – properties of hardened concrete and their significance, structure of the hardened concrete - Compressive strength of concrete and factors affecting it – elastic behaviour of concrete – drying shrinkage and creep.
Unit 4	Durability of concrete – significance – causes of concrete deterioration – alkali- aggregate reaction – deterioration by chemical actions – concrete in marine environment.
Unit 5	Concept of proportioning concrete mixes – mix design – IS code method – ACI method. Testing, evaluation and control of concrete quality.

Reference Books

1. Concrete tyechnology by K.S. Rao., New age International publication, 2019
2. Principles of Concrete technology by Robert F. Legget, McGraw-Hill Education, 2012
3. Concrete Engineering By Barja M. Das, Cengage Learning, 2019

Course Articulation Matrix - BTCE402 (Concrete Technology)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
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Blank = No Direct Mapping

Paper – BTCE403

ENGINEERING GEOLOGY

Introduction: Engineering geology explores the geology principles relevant to engineering projects, covering topics like soil mechanics, rock mechanics, and groundwater, providing a foundation for understanding the interaction between geological conditions and engineering structures.

Course outcome:

CO-1. Identify and characterize geology formations relevant to engineering projects, including soil type, rock types, and ground water.
CO-2. Asses the geotechnical properties of soils and rocks and their impact on stability and performance of engineering structures.
CO-3. Apply geological principles to solve problems related to foundation design, slope stability, and groundwater management in engineering projects.

Unit 1	General Geology: Scope of geology in Civil Engineering - the earth, its structure and environment - physiographic, stratigraphic and tectonic divisions of India - geomorphological (surface) processes – weathering – types , weathered products, assessment of degree of weathering , Fluvial processes, glaciation, wind action, and their significance in Civil Engineering – earthquake, its causes, classification, earthquake zones of India, Geological considerations for construction of buildings.
Unit 2	Mineralogy: Physical properties of minerals – classification - study of important rock forming minerals – Quartz family, feldspar family, Augite, Hornblend, Mica family, calcite, Iron oxide minerals, Augite, Hornblend, and Clay minerals and their behaviour and significance in the field of Civil Engineering.
Unit 3	Petrology: Classification of rock - mode of formation - distinction between igneous, sedimentary and metamorphic rocks - Physical and Mechanical properties of rocks-. Study of important rocks - granite, syenite, diorite, gabbro, pegmatite, dolerite , basalt , sand stone, limestone, shale, breccia , conglomerate , gneiss, quartzite, marble, slate, schist, phyllite and conglomerate - role of petrology in the field of construction.
Unit 4	Structural Geology and Geophysical methods: Attitude of beds - out crops, study of structures such as folds, faults, joints, unconformities in lier and out lier their brief classification and their bearing on engineering construction – principles of geophysical methods, electrical resistivity method , seismic method and its applications in civil engineering.

Unit 5	Geology and construction: Role of geology in site investigation, Geotechnical classification of rock, geological considerations in open excavation, tunnels and dam site, reservoir site, buildings, road cuttings, study of air photographs and satellite images and interpretation for civil engineering projects, landslides-its causes, classification and preventive measures, groundwater- types of aquifers , properties of geological formations affecting groundwater and its role as a geological hazard.

Reference Books

1. Engineering geology by K.S. Rao., New age International publication, 2019
2. Principles of engineering geology by Robert F. Legget, McGraw-Hill Education, 2012
3. Geotechnical and Geological Engineering By Barja M. Das, Cengage Learning, 2019

Course Articulation Matrix - BTCE403 (Engineering Geology)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper – BTCE404

STRENGTH OF MATERIAL II

Introduction: Strength of material introduces the fundamental principles of stress, strain, and material behavior under various loads, providing a foundation for understanding how materials respond to forces and designing safe and efficient structure.

Course outcome:

CO-1. Apply fundamental concepts of stress, strain, and deformation to analyze the behavior of materials under various loading conditions.
CO-2. Analyze the strength and stiffness of structural elements such as beams, columns, and shafts using different theories of failure.
CO-3. Design and evaluate the performance of structural components considering factors such as material properties, load distribution, and safety margins.
CO-4. Develop an understanding of impact of material imperfections and environmental factors on the strength and reliability of structural elements.

Unit 1	Deflection of beams – Macaulay‟s method, moment area method -conjugate beam Methods.
Unit 2	Strain energy due to axial, bending, shear and torsional forces – Impact loads. Principle of virtual displacement – principle of minimum potential energy –Castigliano‟s Theorems – Maxwell – Betti‟stheorem.
Unit 3	Deflection of trusses and frames – strain energy and dummy/unit load methods.
Unit 4	Analysis of continuous beams using generalized theorem of three moments – shear force and bending moment diagrams. Unsymmetrical bending – principal moments of inertia – stresses due to unsymmetrical bending.
Unit 5	Complex strains – linear strains for tri-axial state of stress – principle strains in terms of stress – Mohr‟s strain circle – relationship between Mohr‟s strain and stress circles – Rosetteanalysis. Theories of failure – Brittle and Ductile materials

Reference Books

1. Bhavikatti. S. S., Strength of Materials, Vikas Publishing House (P) Ltd., New Delhi, SecondEdition, 2002.

2. Punmia. B. C., Jain, A. K., and Jain, A. K., Strength of Materials and Theory of Structures,Vols. I & II, XI Edition, Laxmi Publications (P) Ltd, New Delhi, 2002.

3. Hearn, E. J., Strength of Materials, Pergamon Press, Oxford, 1997.

Course Articulation Matrix - BTCE404 (Strength of Material II)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
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Paper – BTCE405

HYDRAULICS AND HYDRAULIC MACHINERY

Introduction: It deals with study of liquids in motion and their application in machines; learn about fluid properties, pressure, flow, and how these principles are used in hydraulic machinery like pump, motors, and actuators.

Course outcome:

CO-1. Apply fundamental principles of fluid mechanics to analyze the behavior of water in various hydraulic systems.
CO-2. Design and analyze hydraulic structures such as dams, canals, and pipelines, considering factors such as flow rate, pressure, and energy losses.
CO-3. Understand the characteristics of hydraulics machinery such as pumps, vturbines, and other hydraulic devices.
CO-4. Solve problems related to water resource management and the design of hydraulic systems for irrigation, power generation, and other applications

Unit 1	Open Channel flow: Types of flow, Types of Channel, Velocity distribution, Chezy,Manning and Basin formulae, for uniform flow, Most economical section , critical flow ,Specific energy, specific force. Computation of uniform flow and critical flow
Unit 2	Open channel flow: Non-Uniform flow, Dynamic equation for Gradually varied flow, computation for length of backwater curve, Rapidly Varied flow - hydraulic jump, types,uses. Surgesin open channels.
Unit 3	Basics of Turbo machinery: Impulse momentum equation, Hydrodynamic forces of jets on vanes, velocity Triangles, Angular momentum principle, application to radial flow turbines.
Unit 4	Turbines: Classification, impulse and reaction turbines, characteristic curves, draft tubes, governing of turbines, specific speed, unit quantities concept, similarity, cavitation,
Unit 5	Pumps: Centrifugal pumps - classification, work done, minimum starting speed, lossesand efficiencies, specific speed, multistage pumps, specific speed, characteristic curves, NPSH, Cavitation in pumps. Reciprocating pumps - types, effects of acceleration and frictional resistance, separation, Air vessels, work saved by fitting air vessels.

Reference Books:

1. Douglas, J.F., Gasiorek, J.M and Swaffield, J.A., Fluid Mechanics 4th Edn. PearsonEducation India, 2002.
2. Das M.M Fluid Mechanics and Turbimachines , Prentice Hall of India (P) Ltd New Delhi, 2008.
3. Arore, K.R Fluid Mechanics, Hydraulic and Hydraulic Machines , Standard 44 Publishersand Distributors , New Delhi , 2005

Course Articulation Matrix - BTCE405 (Hydraulic and Hydraulic Machinery)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

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Blank = No Direct Mapping

Paper- BTCE406

SURVEYING - II

Introduction: Surveying introduces the fundamentals of surveying, covering topics like distance measurement, leveling, and basic surveying instruments, providing a foundation for understanding the principles and techniques used to determine the position and elevation of points on the earth's surface.

Course outcome

CO-1. Apply fundamental principles of surveying to accurately determine the horizontal and vertical positions of points on the earth's surface.
CO-2. Master the use of various surveying instruments and techniques including total stations, GPS, and leveling equipment.
CO-3. Analyze and interpret survey data to create accurate maps, plans, and profiles for various engineering projects.
CO-4. Design and implement surveying projects considering factors such as accuracy, precision, and cost-effectiveness.
CO-5. Develop an understanding of legal and ethical considerations related to surveying practices.
CO-6. Apply knowledge of surveying principles to solve problems in various engineering disciplines such as civil engineering, construction, and environmental engineering.

Unit 1	Theodolites description and uses- temporary and permanent adjustments of Theodolite – horizontal angles – vertical angles –Trignometrical Levelling –Base of the Object Accessible – Inaccessible :for instruments at same and different plane of observation
Unit 2	Tacheometric surveying –Principle of stadia measurement –Basic systems of tacheometric measurement - Determination of Tacheometric measurements – subtense bar – Errorsin tacheometry
Unit 3	Setting out curves: Horizontal curves – Elements of a circular curve and notations – Designation of a curve – Setting out a simple circular curve – Compound curve – Reverse curve – Transition – vertical curve .
Unit 4	Horizontal and vertical control, triangulation - Classification of triangulation system, network, signals, satellite stations - base line measurement - corrections, extension of base- Theory of error and adjustments - true and most probable value, residual error, weighted observation, principle of least square, normal equations, correlatives, adjustment

	of simple triangulation figure, station and figure adjustment
Unit 5	Hydrographic surveying – shore line measurement, soundings – tides and tide gauge – Mine surveying- Equipment for Mine survey- station and station markers – measurement of distance and difference in elevation- Introduction to– EDM and total station – Remote sensing – GIS

Reference Books:

1. Kanetkar, T.P., and Kulkarni,S.V., Surveying and Levelling, Part I & Part II , United bookCorporation, Pune. 1998.
2. Shahani, P.B., Text book of Surveying, Vol.I & II, Oxford & IBH Publications, 1998.
3. Lillesand,T.M.,and Kiefer R.W., Remote sensing and Image Interpretation, John Wiley and Sons, Inc, New York,1997. 45
4. Paul.R. Wolf Elements of Photogrammetry with air photo interpretation, McGraw – Hill,International Book Company, Japan, 1993.
5. Rueger,J.M. Electronic Distance Measurement, Springer – Verlag, Berlin,1990.

Course Articulation Matrix - BTCE406 (Surveying II)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3
CO5:	3	3	3	2	2	3	3	2	2	3	3	3	2	2	2
CO6:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

3 = High Relevance
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SURVEYING LAB- II (BTCE407L)

1. (a) Measurement of horizontal angle.
   (b) Measurement of vertical angle.
2. (a) Measurement of horizontal angle by repetition method.
   (b) Measurement of included angle between various points by Reiterationmethod.
3. (a)Measurement of height and distance using trigonometric leveling (baseaccessible)
   (b) Measurement of base inaccessible by single plane method.
   (c) Measurement of base inaccessible by double plane method.
4. (a) Setting out a simple curve by means offsets from long chord.
   (b) Setting out a simple curve by Rankine‟s method.
   (c) Setting out a simple curve by two theodolite method.
5. (a)Measurement of height and distance using principles of tachometricsurveying.
   (b) Measurement of distance between accessible points by stadia method.
   (c) Measurement of distance between two accessible points by tangentialtachometry method.
6. Setting out of structure.
7. Determination of area using total station.
8. Traversing using total station.
9. Contouring using total station.
10. Determination of remote height using total station.11.Setting out using total station.

ENGINEERING GEOLOGY LAB (BTCE408L)

List of experiments

1. Study of physical properties of Minerals (Hornblende, Garnet, Olivine, Biotite,Kyanite).
2. Study of physical properties and Identification of minerals referred Under theory(Talc, Calcite, Asbestos, Chlorite, Muscovite)
3. Study of physical properties and Identification of minerals referred Under theory(Jasper, Flint, Feldspar, Quartz, Magnetite)
4. Study of physical properties and Identification of minerals referred Under

theory(Chromite, Pyrolusite, Graphite, Hematite, Pyroxene)

5. Study of physical properties and Identification of minerals referred Under theory (Magnesite, Pyrite, Galena, Bauxite, Halite, Corundum)
6. Megascopic and microscopic description and identification of rocks referred Undertheory (Granite, Porphyritic granite, Dolerite, Basalt)
7. Megascopic and microscopic description and identification of rocks referred Undertheory (Conglomerate, Ripple sandstone, Shale, Limestone)
8. Megascopic and microscopic description and identification of rocks referred Undertheory(Gneisses, Marble, Slate, Quarzite)
9. To use measurements of present-day rock geometries to uncover information aboutthe history of deformation (strain) in the rocks, and ultimately, to understand the stress field that resulted in the observed strain and geometries.
10. To draw a geological section along X-Y axis and interprete the geological map.

Fifth Semester

Paper – BTCE501

Engineering Hydrology

Introduction: It focuses on the study of water in the environment and its application in engineering projects; learn about rainfall, runoff, infiltration, and how to manage water resources for project like dams, bridges and irrigation system.

Course outcome:

CO-1. To build on the student's background in hydrology and hydraulics and understanding of water resources systems

CO-2. To develop the skills in measurement and estimation of rainfall runoff.

CO-3. To develop skills in the ground water flow, type of aquifer and yield from the well.

CO-4. To provide the knowledge of Statistical analysis, flood frequency steadies

CO-5. To study the effect, causes and remedial measures of water logging

Unit 1	Introduction: Hydrological cycle and processes, Precipitation, infiltration and evapotranspiration, forms of precipitation, Measurement, analysis, depth-area-duration, and intensity-duration, frequency relations
Unit 2	Evaporation: Process, Measurement and estimation, Infiltration process, Evapotranspiration measurement and estimation, Stream flow measurements
Unit 3	Runoff and Hydrographs: Factors affecting flow hydrograph, Rainfall runoff correlations, Flow duration curve, mass curve, Unit hydrograph, its analysis and S-curve hydrograph, Synthetics and instantaneous unit hydrographs
Unit 4	Statistical analysis, flood frequency steadies, Rational methods, time area curves, Design flood, design storm risk, reliability and safety factors
Unit 5	Channel and flood routing, time series analysis of droughts and floods.

	Groundwater hydrology, flow equation confined and unconfined flow, well hydraulics steady and unsteady flow, well losses, specific capacity

REFERENCES

1. Subramanya, Engineering Hydrology, Tata-McGraw Hill, 2004.

2. Ragunath. H.M., Hydrology, Willey Eastern Limited, New Delhi, 2000.

Course Articulation Matrix - BTCE501 (Engineering Hydrology)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3
CO5:	3	3	3	2	2	3	3	2	2	3	3	3	2	2	2

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper – BTCE502

Structural Analysis I

Introduction: Structural analysis is the study of how structure behaves under load; learn to calculate stresses, strains, and deflections in beams, columns, and other structural elements to ensure safety and stability.

Course outcome:

CO-1. Understanding how structures respond to loads.

CO-2. Analyzing structural elements and systems.

CO-3. Designing safe and efficient structures.

CO-4. Evaluating structural performance.

Unit 1	Static indeterminacy – Analysis of statically indeterminate beams and frames by consistent deformation/force method.
Unit 2	Analysis of plane trusses with one or more redundant members by force method - trusses with lack of fit - Thermal stresses - Settlement of supports – analysis of trussed beams.
Unit 3	Slope Deflection Method - Continuous beams and rigid frames (with and without sway) -Symmetry and anti symmetry – Simplification for hinged end - Support displacements.
Unit 4	Moment Distribution Method - Stiffness and carry over factors – Distribution and carry overof moments - Analysis of continuous Beams - Plane rigid frames with and without sway
Unit 5	Kani‟s method of analysis of beams and frames. Column-analogy method of analysis of simple and symmetric beams and frames

Reference Books

1. Wang. C. K., Intermediate Structural Analysis, McGraw Hill Publishing Co., Tokyo, Fourth Edition, 1989.

2. Jindal, R. L., Indeterminate Structural Analysis, S.Chand & Co. New Delhi, Third Edition, 1997.

3. Kinney. S.J., Indeterminate Structural Analysis, Oxford IBH Publishing Co., 1999.

Course Articulation Matrix - BTCE502 (Engineering Hydrology)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper – BTCE503

GEOTECHNICAL ENGINEERING I

Introduction: It involves the study of soil and rock behavior for construction projects; learn about soil properties, foundation design, slope stability, and how to ensure the stability of structures built on the ground.

Course outcome:

CO-1. Understanding soil and rock mechanics, including their physical and mechanical properties.
CO-2. Designing foundations for buildings, bridges, and other structures, considering soil conditions and loads.
CO-3. Analyzing slope stability, assessing landslide risks, and designing mitigation measures.
CO-4. Evaluating the impacts of construction activities on soil and ground water, and implementing mitigation strategies.

Unit 1	Soil formation – soil minerals – soil structure - three phase system – definitions- interrelationships – Index properties - IS soil classification – sol deposits in India.
Unit 2	Soil hydraulics : soil water – capillary phenomenon – permeability – field and laboratorytest - seepage and flow nets – geostatic stress - neutral and effective stress
Unit 3	Stress Analysis- Stress due to concentrated load, due to uniformly loaded area, line load strip load- pressure distribution diagrams - contact stress - Westergarrd‟s analysis
Unit 4	Compressibility: One dimension consolidation - consolidation process - consolidation theory – laboratory test – pre consolidation pressure. Compaction – laboratory tests – field compaction.
Unit 5	Shear strength- Mohr – coulomb theory – shear strength parameter – laboratory and field tests – pore pressure parameters - stress path – in-situ shear strength - factors affecting shear strength - shearing characteristics of sand and clay.

Reference Books:

1. Bowles,J.E., Physical and Geotechnical Properties of Soils, McGraw Hill, 1998

2. Venkataramiah. C., Geo Technical Engineering, NAIP, 2002

Course Articulation Matrix - BTCE503 (Geotechnical Engineering I)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance

2 = Moderate Relevance

1 = Low Relevance

Blank = No Direct Mapping

Paper – BTCE504

ENVIRONMENTAL ENGINEERING I

Introduction: It focuses on protecting the environment and public health; learn about water and air pollution control, waste management, and sustainable design to minimize the environmental impact of human activities.

Course outcome:

CO-1. Understanding environmental problems and their solutions.
CO-2. Designing and implementing sustainable technologies for clean water, air, and land.
CO-3. Evaluating environmental impacts and promoting responsible resource management.
CO-4. Communicating environmental issues and solutions effectively to diverse audiences.

Unit 1	Introduction: Water supply Scheme - objectives and requirements - Domestic, commercial and public requirements - Various methods of estimating population Variations in rate of demand and its effects on design.
Unit 2	Sources of Water and intakes: Surface and groundwater sources - Computation of storage capacity of reservoirs by analytical and graphical methods - Forms of underground sources like wells, Infiltration wells and galleries, Intake structures, tube wells - Sanitary protection of wells.
Unit 3	Quality of Water: Indian and W.H.O. Standards for drinking water- Impurities in water - Physical, chemical and bacteriological tests for water - quality of water for trade purpose and swimming pools
Unit 4	Water Treatment system: Unit process of water treatment - Principles, functions and design of flocculators, sedimentation tanks, sand filters, principles of disinfection, water softening, aeration, Iron and manganese removal.
Unit 5	Conveyance and distribution –Service reservoir location, determination of capacity – Leak detection - lining of pipes, various materials used for pipes, selection and class of pipes -. - Method of Layout of distribution systems, analysis of pipe networks by different methods, pipe appurtenance for

	distribution system – Plumbing works and layout of water supply system for buildings, Effects of corrosion and its prevention.

Reference Books

1. Peavy, H.S., Rowe, D.R. and Tehobanoglous, G., Environmental Engineering,McGraw Hill Book Company, 1998

2. Hussain ,S.K., Water supply and sanitary engineering , Oxford & IBH, New Delhi, 1997

3. Steel, E.W., Water supply and Sewerage , McGraw Hill, 1996

4. Fair, G.M., Gayer, I. and Okun , Water and Waste Water Engineering , John Wiley &Sons,1981

Course Articulation Matrix - BTCE504 (Environmental Engineering I)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper – BTCE505

TRANSPORTATION ENGINEERING I

Introduction: It deals with planning, design, construction, and operation of transportation system; learn about roads, bridges, highways, traffic management, and how to improve the efficiency and safety of transportation network.

Corse outcome:

CO-1. Understanding transportation systems and their impacts.

CO-2. Designing safe and efficient transportation infrastructure.

CO-3. Analyzing traffic flow and planning for future needs.

CO-4. Evaluating the impacts of transportation projects and advocating for sustainable solutions.

Unit 1	Highway Development and Planning : Brief Introduction; necessity of highway planning suveys preparation of master plan highway planning in India. Highway alignment : Factors controlling alignment; Engineering surveys, Drawing & report.
Unit 2	Highway Geometric Design : Highway cross section elements; Sight distance; Design of horizontal alignment; Design of vertical alignment. Highway materials Sub grade soils- CBR tests; Stone aggregates; Bitumen materials; Pav-ing mixes.
Unit 3	Design of Highway Pavements : Design factors; Design of flexible pave-ments - IRC method, IRC recommendations; Design of Rigid pavements - Westergard's stress equation for wheel loads and temperatures stress; IRC recommendations. Highway construction and maintenance: Construction of water bound macadam roads; bituminous pavements and cement concrete pave-ments; Construction of joints in cement concrete pavements; Mainte-nance of highways- Water bound macadam roads, Bituminous pave-ments, Cement concrete pavements.
Unit 4	Pavement construction techniques- Types of pavements- WBM Road construction. Construction of bituminous and rigid pavements. Pavement

	failures and their remedies. Surface and subsurface highway drainage. Pavement evaluation – structural, functional, design of overlays based on Benkelman beam studies, pavement Maintenance
Unit 5	Highway Drainage : Importance of highway drainage; Requirements; Surface drainage; Sub-surface drainage; Road construction in water logged areas and black cotton soils. Traffic engineering : Introduction; Traffic characteristics- Road user, vehicular & travel pattern; Traffic operation-signal design; Types of inter-sections; Design of rotary intersection.

Reference Books

1. Gupta B. L and Amith Gupta, Highway and Bridge Engg., Standard publishers, andDistributor New Delhi 2003
2. Partha Chakroborthy and Animesh Das, Principles of Transportation Engineering,Prentice Hall of India Pvt. Ltd., New Delhi,2003.
3. Kadiyali, L. R, Lal, N. B, "Principles and practice of highway engineering", KhannaPublishers New Delhi ,006
4. Kadiyali, L. R, "Traffic Engineering and Transport Planning", Khanna Publishers NewDelhi , 2006

Course Articulation Matrix - BTCE505 (Transportation Engineering I)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
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Paper – BTCE506

WATER RESOURCE ENGINEERING

Introduction: it focuses on managing water resource for human use; learn about water supply, irrigation, flood control, water quality, and how to ensure sustainable water management.

Course outcome:

CO-1. Understanding water resources, their availability, and management challenges.

CO-2. Designing and implementing sustainable water infrastructure including dams, canal and treatment plants.

CO-3. Analyzing water quality, quantity, and distribution, and developing solutions for water scarcity and pollution.

Unit 1	Hydrologic cycle - rainfall and its measurement - computation of mean rainfall over a catchment area using arithmetic mean, Theissen polygon and Isohyetal methods - Runoff -infiltration indices - Storm Hydrograph and unit hydrograph
Unit 2	River regions and their characteristics - classification of rivers on alluvial plains - meandering of rivers - river training
Unit 3	Reservoir planning - Investigations - zones of storage in a reservoir - single purpose and multipurpose reservoir - determination of storage capacity and yield - reservoir 53 sedimentation - Reservoir life - Sediment prevention - Flood estimation- Flood forecasting - Flood routing
Unit 4	Ground water - types of aquifers - storage coefficient - coefficient of transmissibility - steady radial flow into a well located in an unconfined and confined aquifers - Tube wells and Open wells - yield from an open well
Unit 5	Water logging - causes and effects of water logging - remedial measures - land reclamation - land drainage - benefits - classification of drains - surface drains - subsurface drains - design principles and maintenance of drainage systems.

References Books

1. Punmia, B.C., Irrigation and Water Power Engineering, Standard Publishers, 2001.

2. Ralph A. Wurbs, Wesley P.James, Water Resources Engineering.

Course Articulation Matrix - BTCE506 (Water Resource Engineering I)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

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GEOTECHNICAL ENGG. LAB (BTCE507L)

List of experiment

1. Atterberg's Limits.
2. Field density-core cutter and sand replacement method
3. Grain size analysis.
4. Permeability of soil, constant and variable head test.
5. Compaction test.
6. CBR Test.
7. Consolidation test.
8. Unconfined compression test.
9. Tri-axial Compression test.
10. Direct shear test.
11. Vane shear test.

Fluid Mechanics Lab (BTCE508L)

List of experiment

1. Calibration of Venturimeter.
2. Calibration of Orifice meter.
3. Performance Test on Centrifugal Pump.
4. Performance Test on Reciprocating Pump.
5. To calculate Friction Factor for a given Pipe Line.
6. Impact of jet of water on Vane.
7. Performance Test on Pelton Wheel.
8. Bernoulli‟s experiment.
9. Performance Test on Francis Turbine.
10. Performance Test on Kaplan Turbine.

Sixth Semester

Paper – BTCE601

STRUCTURAL ANALYSIS II

Introduction: Structural analysis is the study of how structure behaves under load; learn to calculate stresses, strains, and deflections in beams, columns, and other structural elements to ensure safety and stability.

Course outcome:

CO-1. Understanding how structures respond to loads.

CO-2. Analyzing structural elements and systems.

CO-3. Designing safe and efficient structures.

CO-4. Evaluating structural performance.

Unit 1	ILD for shear, moment and reactions for statically determinate beams and pin jointed trusses.
Unit 2	Moving loads for statically determinate structures –single and several points loads – maximum bending moment and maximum shear force – equivalent u.d.l. - absolute maximum bending moment - determination of equivalent UDL.
Unit 3	Influence lines- Müller-Breslau Theorem - principle and its application. Influence lines for continuous beams. Muller Breslau Principles qualitative approach for single bay, single story portals. Analysis of frames for lateral loads by portal and cantilever methods.
Unit 4	Theory of arches - Analysis of three hinged, two hinged and fixed arches - influence lines, rib shortening, settlement, and temperature effects. Analysis of forces in cables - Suspension bridges.
Unit 5	Plastic Theory – Yield stress - Load Factor – Plastic Hinge – Moment redistribution – Shape factor – Upper and lower bound theorems – plastic analysis of beams and frames.

Reference Books

1. Wang. C. K., Intermediate Structural Analysis, McGraw Hill Publishing Co., Tokyo, Fourth Edition,1989.
2. Jindal, R. L.Indeterminate Structural Analysis, S.Chand & Co. New Delhi, Third Edition, 1997.

Course Articulation Matrix - BTCE601 (Structural Analysis II)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper – BTCE602

GEOTECHNICAL ENGINEERING II

Introduction: It involves the study of soil and rock behavior for construction projects; learn about soil properties, foundation design, slope stability, and how to ensure the stability of structures built on the ground.

Course outcome:

CO-1. Understanding soil and rock mechanics, including their physical and mechanical properties.
CO-2. Designing foundations for buildings, bridges, and other structures, considering soil conditions and loads.
CO-3. Analyzing slope stability, assessing landslide risks, and designing mitigation measures.
CO-4. Evaluating the impacts of construction activities on soil and ground water, and implementing mitigation strategies.

Unit 1	Soil Exploration: Introduction, need, planning, stages - depth and spacing of soilexploration methods – samplers, sampling method – In situ tests – SPT,CPT, VST, pressure meter- exploration reports.
Unit 2	Stability of slopes: Introduction- slopes failure - stability of infinite slope – land slides. Finite slope analysis - Swedish circle method – stability number. Slope stability – improving slopestability by reinforcement and confinement.
Unit 3	Lateral earth pressure passive and earth pressure at rest, Rankine and Coulomb‟s: Active, theory–Rebhann's Method. Earth pressure due to inclined back fill, line load and earth quake load- Cantilever sheet pile wall in granular and clay soil. Design of braced excavations.
Unit 4	Shallow foundation: Types and selection criteria. Bearing capacity - Terzaghi‟s analysis – IS code - methods to determine bearing capacity – field tests - proportioning of foundation – BC of foundation subjected to moments and earthquake loading. Methods to increase BC – compaction – dewatering - pre loading – stone columns – lime stabilistion.
Unit 5	Pile foundations: Introduction- classification-selection criteria- Individual

	and group carrying capacity- static and dynamic approach-pile load tests under reamed piles- IS -Codal provisions. Methods to increase pile carrying capacity – deep compaction methods – grouting.

Reference Books:

1. Bowles,J.E., Physical and Geotechnical Properties of Soils, McGraw Hill, 1998

2. Venkataramiah. C., Geo Technical Engineering, NAIP, 2002

Course Articulation Matrix - BTCE602 (Geotechnical Engineering II)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance

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1 = Low Relevance

Blank = No Direct Mapping

Paper – BTCE603

ENVIRONMENTAL ENGINEERING II

Introduction: It focuses on protecting the environment and public health; learn about water and air pollution control, waste management, and sustainable design to minimize the environmental impact of human activities.

Course outcome:

CO-1. Understanding environmental problems and their solutions.

CO-2. Designing and implementing sustainable technologies for clean water, air, and land.

CO-3. Evaluating environmental impacts and promoting responsible resource management.

CO-4. Communicating environmental issues and solutions effectively to diverse audiences.

Unit 1	Definitions - General considerations- Interdependence of water supply and waste water disposal - source and nature of waste water - Combined and separate system – surface drainage - storm water flow – Investigation and design of sewerage schemes – Data collection - Design flow for separate, storm and combined systems.
Unit 2	Sewage Characteristics- Physical and chemical characteristics - Biology of sewage - chemical tests - D.O. and B.O.D. and its significance. Characteristics and quantificationof raw and digested sludge.
Unit 3	Collection and Transport of sewage - Materials for sewers - their strength - Corrosion ofsewers - Flow formulae - Self cleansing of sewers - Full and partial flow conditions - Sewersections. Design of separate sewers - Storm drains and combined sewer systems.- Designprinciples and procedures, sewer construction: Sewer joints - Jointing materials, specification and tests - Sewer laying under various conditions, Loads on sewers – Tests forsewers. Flushing equipment for removal of sand, grit - Repair and connections - Clearing catchbasins, Gases in sewers - Sewage pumping, types of pumps, capacity, design of centrifugal pumps - Manholes - Inlets - catch basins - Sand, grease and oil traps. Sanitary fixtures and fittings - General layout and

	street connection - Principles of design of anti syphonage device -Types - Inspection chamber - Fresh air inlet.
Unit 4	Primary treatment : Basic principles of sewage treatment - Screens, Grit chamber - Principles of sedimentation - Design of settling tanks - Types of settling tanks - Chemical precipitation. Biological Treatment and unit Process : Contact beds - Trickling filter - Description and operation of low rate and high rate filters, intermittent sand filter - Designof the above filters. Activated sludge Process: Theory - Diffuser and Mechanical aeration - Conventional, High rate and extended aeration process - Process modification - Oxidation ditch - Principles and design of waste stabilization lagoon - aerated Lagoon. Principle ofSludge digestion - Optimum conditions - Digestion tanks -Supernatant liquid - Sludge gas -Drying beds. Septic and Imhoff tanks.
Unit 5	Wastewater Disposal and Reuse - Disposal of sewage - Reduction of BOD - Land disposal - Discharge in to rivers. lakes, estuaries and ocean – River pollution - Oxygen sag curve - recycle and reuse of waste effluents. – Disinfection –Chlorination and odour prevention.Introduction to Low cost treatment methods -Special nature of problem of industrial water - Population equivalent – Process modifications and by product recovery

Reference Books

1. Peavy, H.S., Rowe, D.R. and Tehobanoglous, G., Environmental Engineering,McGraw Hill Book Company, 1998

2. Hussain ,S.K., Water supply and sanitary engineering , Oxford & IBH, New Delhi, 1997

3. Steel, E.W., Water supply and Sewerage , McGraw Hill, 1996

4. Fair, G.M., Gayer, I. and Okun , Water and Waste Water Engineering , John Wiley &Sons,1981

Course Articulation Matrix - BTCE603 (Environmental Engineering II)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3

CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
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1 = Low Relevance
Blank = No Direct Mapping

Paper – BTCE604

REINFORCED CEMENT CONCRETE I

Introduction: It combines the compressive strength of concrete with the tensile strength of steel reinforcement; learn about design, construction, and behavior of RCC strictures, which are widely used in building, bridges, and other infrastructure.

Course outcome:

CO-1. Understanding the behavior of reinforced concrete under various loads and environmental conditions.

CO-2. Designing and detailing reinforced concrete structures, including beams, columns, slabs, and foundations.

CO-3. Analyzing the strength and durability of reinforced concrete elements and applying appropriate construction techniques.

CO-4. Evaluating the safety and sustainability of reinforced concrete structures and advocating for responsible construction practices

Unit 1	Role of structural engineer in structural design – elements of structures – reinforced concrete – ductility versus brittleness – methods of design – codes of practice - WorkingStress Method - Introduction-Permissible

	stresses-Factor of Safety- Behaviour of R.C.C beams under Flexure, Shear, Bond and Torsion- Design of beams for flexure, shear, bond and torsion.
Unit 2	Limit State Method: Concepts- Assumptions- Characteristic Strength and Load, Partial Safety Factors- Limit States- Limit State of Collapse in Flexure, Shear, Bond and Torsion- Design of beams for flexure, shear, bond and torsion.
Unit 3	Limit State Design of One-Way, Two- Way and Continuous Slabs using BIS coefficients - Design of Lintel Beams.
Unit 4	Limit State Design of Short Columns and Long Columns subjected to combined axial load and bending using interaction diagram.
Unit 5	Design of Footings (Limit State method)- Isolated footing with axial and eccentric loadingCombined Rectangular and Trapezoidal footing, Design of Stair Cases.

Reference Books

1. Shah V.L and Karve SR, Advanced Reinforced Concrete Design, StructuresPublications, Pune, 2002.

2. Unnikrishna Pillai and Devdas Menon, Reinforced Concrete Design, Tata Mc Graw HillPublishing Company Ltd., New Delhi, 2002.

3. Nilson H., A.H., George Winter,G., „Design of Concrete Structures", McGraw Hill BookCo., New York, 1972

4. Park R and Pauloy T, ReinforcedConcrete Structures, John Wiely & Sons Inc.

5. Mallick S.K., Reinforced Concrete, Oxford & IBH Publishing Company

Course Articulation Matrix - BTCE604 (Reinforced Cement Concrete I)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3

CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
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Paper – BTCE605

TRANSPORTATION ENGINEERING II

Introduction: It deals with planning, design, construction, and operation of transportation system; learn about roads, bridges, highways, traffic management, and how to improve the efficiency and safety of transportation network.

Corse outcome:

CO-1. Understanding transportation systems and their impacts.

CO-2. Designing safe and efficient transportation infrastructure.

CO-3. Analyzing traffic flow and planning for future needs.

CO-4. Evaluating the impacts of transportation projects and advocating for sustainable solutions.

Unit 1	RAILWAY ENGINEERING Introduction : Role of railways in transportation; Comparison of railway and highway transportation; Development of railway systems with particular reference to India; Classification of railways. Railway Track : Permanent way: Gauges in Railway track, Railway track cross - sections; Coning of wheels. Rails & Rail Joints : Functions of rails; Requirements of rails; Types of rails sections; Standard rail sections; Length of rails; Rail failures; Wear on rails.Requirements of an ideal joint; Types of rail joints; Welding of rails. Sleepers : Functions of sleepers; Requirements of sleepers; Classification of Sleepers - Timber sleepers, Metal sleepers & Concrete sleepers; Comparison of different types of sleepers. Fish Plates : Fish plates, section of fish plates, failure of fish plates. Ballast : Functions and requirements of ballast; Types of ballast; Renewal of ballast.
Unit 2	Geometric Design Of Track : Necessity; Gradients & Gradient Compensation; Elements of horizontal alignment; Super elevation; Cant deficiency and cant excess; Negative Super elevation; Length of Transition Curve, Length of vertical curve. Points And Crossings

	Functions of components of turnout; Crossings. Stations And Yards Site selection for railway station; Requirements of railway station; Classifications; Station yards; Level crossing. Signalling : Objects of signaling; Classification of signals; Controllingabsolute block system. Standards of inter locking
Unit 3	AIRPORT PLANNING AND DESIGN Introduction : Development of air transportation system with particular reference to India; Aeroplane components; Air-craft characteristics. Airport planning and layout Selection of site; Apron; Hanger; Typical airport layouts; Airport marking; Airport lighting; Drainage systems. Airport Obstruction : Zoning laws; Classification of obstructions; Imaginary surfaces; Approach zone; Turning zone.
Unit 4	Runway Design : Runway orientation; Basic runway length; Corrections for elevation; Temperature and gradient; Runway geometric design. Specifications for Structural Design Of Airport Pavements : Design factors methods for flexible and rigid pavements; LCN system of pavement design.
Unit 5	DOCKS AND HARBOUR ENGINEERING Introduction : Types of water transportation; Economics and advantages of water transportation. Planning and Design Of Port Facilities : General layout and design considerations; Pier and wharf structures; Fender systems; Transit sheds and Apron; Container ports; Docks; Dredging; Light Houses.

Reference Books

1. Gupta B. L and Amith Gupta, Highway and Bridge Engg., Standard publishers, andDistributor New Delhi 2003
2. Partha Chakroborthy and Animesh Das, Principles of Transportation Engineering,Prentice Hall of India Pvt. Ltd., New Delhi,2003.
3. Kadiyali, L. R, Lal, N. B, “Principles and practice of highway engineering”, KhannaPublishers New Delhi ,006
4. Kadiyali, L. R, “Traffic Engineering and Transport Planning”, Khanna Publishers NewDelhi , 2006

Course Articulation Matrix - BTCE605 (Transportation Engineering II)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3

CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper – BTCE606

CONSTRUCTION METHODS AND EQUIPMENT

Introduction: It focuses on the practical aspects of building projects; learn about different construction techniques, the use of heavy machinery, safety procedures, and the management of materials and labor.

Course outcome:

CO-1. Understanding about various construction methods, materials, and equipment used in different types of projects.
CO-2. Develop skills in planning, scheduling, and managing construction project effectively.
CO-3. Gain practical knowledge of operating and maintaining construction equipment safely and efficiently.
CO-4. Understanding the importance of safety protocols and environmental regulations in construction projects.

Unit 1	Modern Construction Methods - Open excavation, shafts and tunnels, pier and caisson foundation . Basement construction - construction Methods – supporting the excavations- control of ground water- shoring and underpinning- basement waterproofing.
Unit 2	Construction Methods for Bridges, roads railways, dams, harbours, river works and pipelines
Unit 3	Construction equipment and techniques for Earth moving, excavating , drilling, blasting, tunneling and hoisting and erection
Unit 4	Equipment for: Dredging, tunneling, dewatering- Equipment for Flooring – dewatering and floors finishing

Unit 5	Equipment for production of aggregate and concrete – Crushers- feeders- screening equipment – batching and mixing equipment – hauling, pouring and pumping equipment – transporters

Reference Books

1. Antil J.M., Civil Engineering Construction, McGraw Hill Book Co., 1982
2. Peurifoy, R.L., Ledbette. W.B Construction Planning , Equipment and Methods McGrawHill Co, 2000
3. Ratay., R.T Hand Book of Temporary Structures in Construction, McGraw Hill,1984
4. Koerner., R.M, Construction & Geotechnical Methods in Foundations Engineering,McGraw Hill, 1984
5. Varma., M., Construction Equipment and its Planning & Application, MetropolitainBook Co., 1979
6. Smith, R.C, Andres, C.K Principles and Prentice of Heavy Construction, Prentice Hall,198

Course Articulation Matrix - BTCE6067 (Construction Methods and Equipment)

COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
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List of experiments

1. Determination of pH of a sample of water.
2. Determination of turbidity in a water sample.
3. Determination of total, suspended, and dissolved solids.
4. To determine the alkalinity in a sample of water.
5. To determine sulfate ion concentration in a water sample using method:4500-so_4^{2-}
6. Determination of chloride concentration in a sample of water.
7. Determination of acidity.
8. Determination of hardness in a sample of water.
9. To determine odour and taste in a water sample.
10. To determine the na, ca, k in a sample of water introduction.
11. Determination of percentage of ammonia nitrogen present in a given sample ofwater.

COMPUTER AIDED DESIGN LAB (BTCE608L)

Unit-I

Introduction and Demonstration –analysis and Design Packages in Structural Engineering like STAAD-III, Pro 2007 GTSTRUDL, ETABS etc. Analysis and Design of continuous beams, Multistory Frames, Trusses– Analysis of results.

Unit-II

GIS Software Introduction and demonstration –Geographical Information systems– Geomedia Professionals- Thematic –overlays- Applications in Water resources Engineering. Mat Lab Software

Unit-III

Introduction to Mat lab 6 software – Roots of an equation –Solution of simultaneous equations – Matrix Inversion –Linear Regression line of given points –Curve fitting using polynomial regression – Eigen value extraction and Eigen vectors.

Reference Books

1.STAAD –III/ STADD RD Manual, 2002

2.ETABS and SAP 2000 Manual , 2007

Seventh Semester

Paper – BTCE701

ENGINEERING ECONOMICS

Introduction: It applies economics principles to engineering projects; learn about cost analysis, financial decision-making, project evaluation, and how to make sound economic choice in engineering projects.

Course outcome:

CO-1. Understand how to analyze and evaluate engineering projects from a financial perspective.

CO-2. Develop skills in estimating projects costs, controlling expenses, and maximizing profitability.

CO-3. Learn to us financial tools like net present value (NPV) and internal rate of return (IRR) to make informed investment decisions.

CO-4. Understand how to assess and manage risks associated with engineering projects and their economic viability.

Unit 1	Introduction to Economics-Flow in an Economy, Law of Supply and Demand, Concept of Engineering Economics - Engineering Efficiency, Economic Efficiency, Scope of Engineering Economics, Elements of Costs, Marginal Cost, Marginal Revenue, Sunk cost, Opportunity cost, Break-Even Analysis, P/V ratio, Elementary Economics Analysis Material selection for product, Design selection for a product, Building material selection, Process Planning.
Unit 2	Make or Buy Decision, Value Engineering-Function, Aims, Value Engineering procedure, Interest Formulas and their Applications - Time Value of Money, Single Payment Compound Amount Factor, Single Payment Present Worth Factor, Equal Payment Series Compound Amount

	Factor, Equal Payment, Series Sinking Fund Factor, Equal Payment Series Present Worth Factor, Equal Payment Series Capital Recovery Factor, Uniform Gradient Series Annual Equivalent Factor, Effective Interest Rate, Examples in all the methods.
Unit 3	Methods of Comparison of Alternatives- Present Worth Method (Revenue Dominated Cash Flow Diagram, Cost Dominated Cash Flow Diagram), Future Worth Method (Revenue Dominated Cash Flow Diagram, Cost Dominated Cash Flow Diagram), Annual Equivalent Method (Revenue Dominated Cash Flow Diagram, Cost Dominated Cash Flow Diagram), Rate of Return Method, Examples in all the methods.
Unit 4	Replacement and Maintenance Analysis- Types of Maintenance, Types of Replacement Problem, Determination of Economic Life of an Asset, Replacement of an Asset with a New Asset - Capital Recovery with Return and Concept of Challenger and Defender, Simple Probabilistic Model for items which fail Completely.
Unit 5	Depreciation - Introduction, Straight Line Method of Depreciation, Declining Balance, Method of Depreciation, Sum-of-the-Years-Digits Method of Depreciation, Sinking Fund Method of Depreciation/Annuity Method of Depreciation, Service Output Method of Depreciation, Evaluation of Public Alternatives-Introduction, Examples, Inflation Adjusted Decisions- Procedure to Adjust Inflation, Examples on comparison of alternatives and Determination of Economics Life of asset.

Reference Books

1. Degarmo, E.P., Sullivan, W.G. and Canada, J.R.. Engineering Economy, Macmillan,New York, 1984.

2. Grant, E.L., Ireson,.W.G. and Leavenworth, R.S., Principles of Engineering Economy, Ronald Press, New York, 1976.

3. Smith G.W. En :'Engineering Economics, Iowa State Press, Iowa, 1973

Course Articulation Matrix - BTCE701 (Engineering Economics)															

COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper – BTCE702

REINFORCED CEMENT CONCRETE II

Introduction: It deals with planning, design, construction, and operation of transportation system; learn about roads, bridges, highways, traffic management, and how to improve the efficiency and safety of transportation network.

Corse outcome:

CO-1. Understanding transportation systems and their impacts.

CO-2. Designing safe and efficient transportation infrastructure.

CO-3. Analyzing traffic flow and planning for future needs.

CO-4. Evaluating the impacts of transportation projects and advocating for sustainable solutions.

Unit 1	Continuous Beam (Limit State Method) : Design of continuous beam One way Slabs (Limit State Method) Design of Simply supported, Cantilever and Continuous slabs
Unit 2	Two Way Slabs (Limit State Method) Design and detailing of two way

	slabs Flat Slabs (Limit State Method) Design and detailing of flat slabs by direct design method.
Unit 3	COLUMNS (LIMIT STATE METHOD) : Assumptions; Design of axially loaded columns ; Design of rectangular columns (short and Long) sub-jected to axial load and bending moment using Interaction diagrams (SP-16 Charts)
Unit 4	Retaining Walls (Limit State Method): Types of retaining walls, Forces on retaining walls; Stability requirements; Design and detailing of cantile-ver type retaining wall. Foundations (Limit State Method) : Design and detailing of rectangu-lar Isolated footing and Combined footing
Unit 5	Design of Staircase: Introduction to stair cases, design and detailing of dog-legged stair, Single flight stairs. Lintel : Design and Detailing of a Lintel Pre-Stressed Concrete : Concept of prestressing, Difference between RCC & PSC, Situations where prestressed concrete is used, and Materials used in prestressed concrete and their specifications as per IS. Pre-tensioning and Post-tensioning, Mention the systems of prestresses, Mention the Losses in Prestresses. (Excluding numerical problems)

Reference Books

1. Punmia B.C, Ahok Kumar Jain and Arun Kumar Jain, Comprehensive Design of Steel Structures, Lakshmi publications (P) Ltd., New Delhi, 1998.
2. Arya, A.S. and Ajmani,J.L., „Design of Steel Structures", Nem Chand and Bros, Roorkee, 2000
3. Solmon and Johnson, „Steel Structures- Design and Behaviour", Intext Educational Publishers, 1971

Course Articulation Matrix - BTCE702 (Reinforced Cement Concrete II)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3

CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
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1 = Low Relevance
Blank = No Direct Mapping

Paper – BTCE703

ESTIMATION AND COSTING

Introduction: It involves determining the cost of materials, labor, and equipment for construction project; learn about various estimation methods, cost control techniques, and how to prepare accurate cost estimates for different types of projects.

Course outcome:

CO-1. Calculate accurate cost estimation for civil engineering projects.

CO-2. Understand cost control techniques and strategies.

CO-3. Prepare detailed cost breakdowns and project budgets.

CO-4. Analyze and evaluate the economic feasibility of engineering projects.

Unit 1	ESTIMATE OF BUILDINGS Introduction to estimation- Necessity of Estimation- Units and Measurements-Types of Estimates- Methods of Estimation-Load bearing and framed structures Calculation of quantities of brick work, RCC, PCC, Plastering, white washing, colour washing and painting / varnishing for shops, rooms, residential building with flat and pitched roof – Various types of arches – Calculation of brick work and RCC works in arches – Estimate of joineries for panelled and glazed doors, windows, ventilators, handrails etc.- Estimation of Steel for RCC works.
Unit 2	ESTIMATE OF OTHER STRUCTURES Estimating of septic tank, soak pit – sanitary and water supply installations – water supply pipe line – sewer line – tube well – open well Estimate of bituminous and cement concrete roads – estimate of retaining walls – culverts – estimating of irrigation works – aqueduct, syphon, fall.

Unit 3	SPECIFICATION AND TENDERS Data – Schedule of rates – Analysis of rates – Specifications – sources – Detailed and general specifications for buildings, Roads Tenders – Contracts – Types of contracts, BOT – Arbitration and legal requirements.
Unit 4	VALUATION Necessity – Basics of value engineering – Capitalised value – Depreciation – Escalation – Calculation of Standard rent – Mortgage – Lease-Valuation of Building- Loss assessment
Unit 5	REPORT PREPARATION Principles for report preparation – report on estimate of Official building – Culvert – Roads – Water supply and sanitary installations – Tube wells – Open wells.

1. Reference Books

2. Dutta, B.N., "Estimating and Costing in Civil Engineering", UBS Publishers & Distributors Pvt. Ltd., 2003
3. Kohli, D.D and Kohli, R.C., "A Text Book of Estimating and Costing (Civil)", S.Chand & Company Ltd., 2004

Course Articulation Matrix - BTCE703 (Estimation and Costing)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

3 = High Relevance
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1 = Low Relevance
Blank = No Direct Mapping

Paper – BTCE704

GROUND WATER HYDROLOGY

Introduction: It explores the movement, storage, and quality of water beneath the earth's surface; learn about aquifer systems, groundwater flow, well design, and impact of human activates on groundwater resources.

CO-1. Understanding the processes of ground water recharge, flow, and discharge.

CO-2. Learn to conduct site investigations, analyze data, and interpret groundwater conditions.

CO-3. Develop skills in using computer models to stimulate groundwater flow and predict its behavior.

Unit 1	Introduction: Utilization of Groundwater - need for ground water, advantages of Groundwater and Groundwater in Hydrological cycle - types of aquifers, Groundwater Movement: Porosity - Specific yield - Storage coefficient - Permeability and transmissibility - Laboratory and field measurement of permeability. Basic Principles and Fundamental Equation of continuity - Darcy"s law - General differential equation governing groundwater flow for steady and unsteady flows - Application to aquifers - Flow nets.
Unit 2	Well Hydraulics: Steady flow to a well in a confined aquifer, unconfined aquifer and a leaky confined aquifer - Unsteady flow to a well in a confined aquifer, an unconfined and a leaky confined aquifer-Effect of storage in a well of finite diameter - Partially penetrating wells - Method of images - Analysis of pump test data for the above aquifers - Problems.
Unit 3	Water wells: Types of wells - well design - construction - well development - Testing of wellsfor well yield - well completion and sanitary protection of wells.
Unit 4	Model studies of Groundwater: Sand models - Electrical analog models - Viscous models - Membrane - Digital computer models, application of F.D. and F.E. methods (ElementaryTreatment only).

Unit 5	Exploration Techniques: Different methods of Groundwater exploration. Artificial Recharge: Necessity - Different methods of artificial recharge - Selection of method - Examples of artificial recharge schemes adopted in India and abroad.

Reference Books

1. Jacob Bear , Hydraulics of Groundwater, McGraw Hill, 1979.

2. Walton W.C., Groundwater Resources Evaluation, McGraw Hill Book Co., New York.

3. Abdel, Aziz Ismail Kashef, Groundwater Engineering, McGraw Hill Book Co., New York

Course Articulation Matrix - BTCE7048 (Ground Water Hydrology)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

3 = High Relevance
2 = Moderate Relevance
1 = Low Relevance
Blank = No Direct Mapping

Paper – BTCE705

DESIGN OF STEEL STRUCTURE I

Introduction: It involves applying principles of mechanics and materials science to create safe and efficient steel frameworks for buildings, bridges, and other structure; learn about steel properties, design codes, and structural analysis techniques.

Course outcome:

CO-1. Learn to analyze steel structures under various loads using methods like bending, shear, and buckling.
CO-2. Understanding the design principles and codes for steel structure, including materials properties, connections and fabrication.,
CO-3. Gain experience in designing different types of steel structures, such as buildings, bridges, and industrials facilities.

Unit 1	Introduction : What are steel structures ? ; What a steel structure consists of ?; Structural steel; Products of structural steel; Standards, Codes and Specifications; Fatigue; Brittle fracture; Corrosion protection of steel structures; Design philosophies; Methods of structural analysis ; Plate(Local) buckling; Classification of sections. Structural steel fasteners : Introduction; Welding - Shield metal arcwelding, Automatic submerged arc-welding, Types of welds, Quality of welds, Weld symbols and notation, Specifications for welding ; Bolting-Types of failure, Design specifications, High- strength bolts Tension members : Introduction ; Net area ; Shear-lag ; Design of tension members
Unit 2	Compression members : Introduction; Euler's buckling theory; Behaviour of real columns; Types of sections; Design of columns; Validity of design strength calculations; Design of compression members ; Design Procedure; Built-up compression members.
Unit 3	Beams : Introduction ; Flexural behaviour of beams which does not undergo lateral buckling; Flexural behaviour of beams which undergo lateral buckling ; Shear behaviour ; Web buckling and Crippling ; Design strength in bending ; Design strength in shear ; Limit state serviceability - Deflection
Unit 4	Beam-columns : Introduction; Analysis of beam-columns; Modes of failure;

	Design specifications Column Splices and Bases : Introduction ; Column splices ; Column bases
Unit 5	Design of Beams- Laterally Supported and Unsupported –Web Crippling- Built Up Beams Design of Gantry Girder, Design of Beam Column Joints

Reference Books

1. Jain, A.K., Reinforced Concrete Limit State Design, Nem Chand Brothers, 1990.

2. Sinha. S.N. Reinforced Concrete Design, Tata McGraw Hill, 1988.

3. Varghese, P.C .Limit State Design of Concrete, Oxford IBH, 1983.

Course Articulation Matrix - BTCE705 (Design of Steel Structure I)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

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Paper – BTCE706

HYDRO POWER ENGINEERING

Introduction: It involves harnessing the power of flowing water to generate electricity; learn about dam design, turbine technology, power plant operation, and the environmental considerations associated with hydroelectric projects.

Course outcome:

CO-1. Learn to design and analyze various components of hydropower plants, including dams, turbines, and generators.
CO -2. Understand the principles of hydropower plant operation, including water management, power generation, and grid integration.

CO-3. Learn to evaluate the environmental impacts of hydropower projects and implement mitigation measures.

Unit 1	History and types of water power development: History of water power development - water power development in India - Comparison of water power with thermal, nuclear and wind mills - Classification - High, Medium and Low Head schemes - Run off river plants - Storage power station - Tidal power plant - Recent experiences in wave power development - Underground power plants - Pumped storage schemes - Small and mini Hydropower systems - Power demand - Role of Hydropower in a grid.
Unit 2	Planning and Layout of Hydropower schemes: Investigation connected with hydropower development - Site selection, layout of hydro power plant- Capacity - Load factor and Load curve.
Unit 3	Design of Hydroelectric works: Necessities for the construction of a dam - Selection of type of Dam - Spillway, types and design – In take works, types - Design of Intake transition - Trash rack - Design of power canals and penstocks, penstock joints support structures, Elements of laying penstock lines – Water hammer - Rigid and elastic column theory - Characteristics Methods of determining pressure surges in penstocks – surge tanks

Unit 4	Selection of suitable type and number of turbines - Layout and spacing of turbines. Types and spacing of turbines, tanks, and design, Power house - Types - Layout and spacing of units. Economics of Hydropower Installation: Basic factors in economic Analysis -, Cost of Hydroelectric power.
Unit 5	Mini Hydropower Systems: Small and min hydropower systems - Site selection, Hydrologic computations, Site development, Environmental Impact - Economic and Financial Feasibility.

Reference Books

1. Brown, G,, Hydroelectric Engineering Practice, CPS, 1984.

2. Fritz, J.J, Small and Mini Hydropower Schemes, McGraw Hill, 1984.

3. Creager and Justin, Hydro electric Hand Book, John Wiley.

4. Das, M.M Saikia, M.S Irrigation and water Power Engineering. PHI Learning. Pvt. Ltd,2009

Course Articulation Matrix - BTCE7062 (Hydro power Engineering)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

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INDUSTRIAL VISITS /TRAINING (BTCE707)

Subject Code	BTCE707	IA Marks	30
Number of Lecture Hours/Week	-	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	02

During the course of study from 3rd to 7th semester each student is expected to undertake a minimum of four industrial visits or undertake a minimum of two weeks ofindustry/field training. The students are expected to submit a report, which shall beevaluated by an internal assessment committee at the end of seventh semester for 100marks.

CONCRETE TECHNOLOGY AND HIGHWAY ENGINEERING LAB (BTCE708L)

List of experiment

1. To determine aggregate crushing value test.
2. To determine aggregate impact value test.
3. To perform Los Angeles Abrasion test on aggregate.
4. To identify the different shapes of aggregate using flakiness test.
5. To perform penetration test of bitumen
6. To determine softening point of bituminous material.
7. To determine the fineness of a given sample of cement by sieving.
8. To determine specific gravity and unit weight of a given sample of cement
9. To determine standard consistency, initial setting time and final setting time of given sample ofcement.
10. To determine compressive strength of given sample of cement.
11. To determine silt content in fine aggregate by sedimentation method.

Eight Semester

Paper – BTCE801

CONSTRUCTION MANAGEMENT

Introduction: It focuses on planning, organizing, and controlling construction projects; learn about project scheduling, resource allocation, quality control, safety regulations, and effective communication to ensure projects are completed on time and within budget.

CO-1. . Learn to plan, schedule, and manage construction projects effectively using tools like CPM and PERT.
CO-2. Understand the principles of cost estimation, budgeting, and cost control in construction projects.
CO-3. Gain knowledge about construction safety regulations, quality control methods, and risk management in construction.

Unit 1	Management process- Roles – management theories – Social responsibilities – planning and strategic management – strategy implementation – Decision making: tools and techniques - Organizational structure – Human resource management motivation performance-leadership.
Unit 2	Classification of Construction projects, Construction stages, Resources-Functions of Construction Management and its Applications –Preliminary Planning- Collection of Data- Contract Planning - Scientific Methods of Management: Network Techniques in construction management - Bar chart, Gant chart, CPM, PERT- Cost & Time optimization.
Unit 3	Resource planning - planning for manpower, materials, costs, equipment. Labour, - Scheduling –Forms of scheduling - Resource allocation – budget and budgetary control methods
Unit 4	Contract - types of contract, contract document, specification, important conditions of contract - tender and tender document - Deposits by the contractor - Arbitration – negotiation - M.Book - Muster roll - stores
Unit 5	Management Information System - Labour Regulations: Social Security - welfare Legislation - Laws relating to Wages, Bonus and Industrial disputes, Labour Administration - Insurance and Safety Regulations -

	Workmen's Compensation Act -other labour Laws - Safety in construction : legal and financial aspects of accidents in construction – occupational and safety hazard assessment. Human factors in safety – legal and financial aspects of accidents in construction – occupational and safety hazard assessment

Reference Books

1. Ghalot, P.S., Dhir,D.M., Construction Planning and Management, Wiley EasternLimited,1992.

2. Chitkara,K.K., Construction Project Management¸ Tata McGraw Hill Publishing Co, Ltd., New Delhi,998. 3. Punmia,B,C., Project Planning andControl with PERT and CPM, Laxmi Publications, New Delhi,1987.

Course Articulation Matrix - BTCE801 (Construction Management)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

3 = High Relevance
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Paper – BTCE802

DISASTER MITIGATION AND MANAGEMENT

Introduction: It involves understanding natural hazards, assessing risks, and developing strategies to minimize damage and loss of life; learn about disaster preparedness, response, and recovery, including the role of technology and community engagement.

CO-1. - Learn to identify, analyze, and quantify disaster risks, including natural hazards and technological disasters.
CO-2. Develop skills in designing and implementing mitigation measures to reduce the impacts of disasters, such as building codes and early warning systems.
CO-3. Gain knowledge about disaster response planning, emergency operations, and coordination of rescue and relief efforts.
CO-4. Understand the principles of post-disaster recovery, including reconstruction, rehabilitation, and community resilience building.

Unit 1	Introduction to Disaster Management- Natural and Man-made Disasters- International Year of Disaster Reduction
Unit 2	National Disasters- Hydro-meteorological based disasters- Tropical Cyclones, Floods, droughts and Desertification Zones- Forest Fires- Geological based disastersEarthquake, Tsunamis, Landslides, and Avalanches.
Unit 3	Man made Disasters- Chemical Industrial hazards, major power break downs, traffic accidents, Fire hazards etc.
Unit 4	Use of remote sensing and GIS in disaster mitigation and management
Unit 5	Risk and Vulnerability to disaster mitigation and management options- Warning and Forecasting.

Reference Books

1. Thomas D. Schneid., Disaster Management and Preparedness, CRC Publication, USA,2001 71

2. Patrick Leon Abbott, Natural Disasters, Amazon Publications, 2002

3. Ben Wisner., At Risk: Natural Hazards, People vulnerability and Disaster, AmazonPublications, 2001

4. Oosterom, Petervan, Zlatanova, Siyka, Fendel, Elfriede M., "Geo-information forDisaster Management", Springer Publications, 2005

Course Articulation Matrix - BTCE802 (Disaster Mitigation and Management)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

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Paper – BTCE803

DESIGN OF STEEL STRUCTURE II

Introduction: It involves applying principles of mechanics and materials science to create safe and efficient steel frameworks for buildings, bridges, and other structure; learn about steel properties, design codes, and structural analysis techniques.

Course outcome:

CO-1. Learn to analyze steel structures under various loads using methods like bending, shear, and buckling.
CO-2. Understanding the design principles and codes for steel structure, including materials properties, connections and fabrication.,
CO-3. Gain experience in designing different types of steel structures, such as buildings, bridges, and industrials facilities.

Unit 1	Introduction; Loads on gantry girder; Web buckling and Crippling; Deflection, Check ; Design of gantry girder Welded Plate girder Introduction ; Behaviour of transversely stiffened plate girder panels in shear ; Design methods for transversely stiffened web panels ; Design of end panels ; Other design specifications ; Design of stiffeners ; Design of welded plate girder
Unit 2	Welded connections Introduction; Bracket connections; Simple beam end connections; Moment resistant beam end connection. Bolted connections Introduction; Bracket connections; Simple beam end connections; Moment resistant beam end connection; Splicing of beams /girders
Unit 3	Light-gauge steel sections Introduction; Types of sections; Design of light gauge sections; Design of axially loaded columns; Design of beams which do not buckle laterally. Composite Construction Introduction; Composite beam ; Method of construction ; Limit states of collapse; Limit states of serviceability – Deflection
Unit 4	Roof Trusses Components of a trussed roof; Types of trusses; Dead, Live and wind loads on trussed roof; Design of purlins ; Design of members of a roof truss ; Design of connections ; Design of end bearings purlins.
Unit 5	Plastic Design: Introduction to plastic method of analysis, Design of continuous beams and portal frame using plastic design approach.

Reference Books

1. Jain, A.K., Reinforced Concrete Limit State Design, Nem Chand Brothers, 1990.

2. Sinha. S.N. Reinforced Concrete Design, Tata McGraw Hill, 1988.

3. Varghese, P.C .Limit State Design of Concrete, Oxford IBH, 1983.

Course Articulation Matrix - BTCE803 (Design of Steel Structure II)															
COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3

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Paper – BTCE8048

DOCK AND HARBOR ENGINEERING

Introduction: It focuses on the design, construction, and maintenance of marine structure like docks, wharves, breakwaters, and navigation channels; learn about coastal processes hydrodynamics, and specialized construction techniques for these complex environments.

Course outcome:

CO-1. Learn to design and analyze various ports and harbor structures, including wharves, jetties, breakwaters, and dredging operations.
CO-2. Understanding the principles of costal processes, wave action, and sediments transport, and apply them to costal protection and harbor design.
CO-3. Gain Knowledge about the design, construction, and maintenance of marine structures like piers, bridge, and offshore platforms.
CO-4. Develop skills in planning, managing, and optimizing port operations, including cargo handling, vessel traffic management, and logistics.

Unit 1	Growth and regulation of Ports: History of Port – Classification of Harbours - Factors affecting the growth of Port. - Requirement of a Harbour - General Planning – Port capacity –traffic analysis - Berth occupancy – financial evaluation - EIA - Description of selected Indian ports.
Unit 2	Harbour Planning (Technical) Site investigation – harbour entrance - Navigational Channel – Depth of harbour – Turning basin – Anchor basin – berthing area – Storage area - Shipping terminal facilities – Essentials of passenger terminal, dry bulk cargo terminal, Liquid bulk cargo terminals and container terminals.
Unit 3	Introduction to ocean waves – Wave transformation – Wave and wind climate inside Harbour - Break waters: Types – Factors determining their selection – Forces on breakwaters – Design of rubble mound and vertical break waters – Physical Model Studies
Unit 4	Berthing structures – Types – Loads – Selection of berthing structures – Design principles ofdiaphragm walls, dolphins and piles. Selection and

	Design principles of Dock fenders and Mooring accessories.
Unit 5	Design principles of dock structures - Graving dry dock – Slip way – floating dry dock -Monitoring and repair of harbour structures - Dredging - Navigational aids – Light house.

Reference Books

1. Harbour and Coastal Engineering (Indian Scenario) Vol - I & Vol – II; S. Narasimhan & S. kathiroli, NIOT- Chennai
2. Design and construction of Port and marine Structures – Alonzo Def. Quinn – McGraw –Hill book Company
3. IS: 7314 1974 - Glossary of terms relating to Port and harbour Engineering.
4. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part – I) SiteInvestigation.
5. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part – II) EarthPressure.
6. IS: 4651 - Code of practice for Planning and Design of Port and harbour (Part – III)Loading.

Course Articulation Matrix - BTCE8048 (Dock and Harbor Engineering)

COs / Mapping	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO 11	PO 12	PSOs 1	PSOs 2	PSOs 3
CO1:	3	3	3	2	3	3	1	2	2	3	3	3	3	2	2
CO2:	3	2	2	2	3	3	3	2	2	1	2	3	2	3	3
CO3:	2	3	1	3	2	3	2	2	2	3	3	2	3	3	3
CO4:	3	1	3	3	3	3	3	2	2	3	2	3	3	3	3

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1 = Low Relevance
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SEMINAR (BTCE805)

Subject Code	BTCE805	IA Marks	30
Number of Lecture Hours/Week	04	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	02

Each one of the students will be assigned a Seminar Topic in the current and frontier areas. The student has to conduct a detailed study/survey on the assigned topicand prepare a report. The student will make an oral presentation followed by a brief question and answer session. The Seminar (presentation and report) will be evaluated by an internal assessment committee for a total of 100 marks

COMPREHENSIVE VIVA-VOCE (BTCE806)

Subject Code	BTCE806	IA Marks	30
Number of Lecture Hours/Week	01	Term End Exam Marks	70
Total Number of Lecture Hours	60	CREDITS	02

The student will be tested for his understanding of basic principles of the core Civil Engineering subjects. The internal assessment for a total of 50 marks will be made by an internal assessment committee. The committee will conduct two written examinations of objective or short questions type from the all the core subjects. The external university

PROJECT WORK (BTCE807)

Project work phase II will be an extension of the project work started in the seventh semester. On completion of the work, a project report should be prepared and submitted to the department. The project work and the report will be evaluated by an internal assessment committee for 50 marks. The external university examination, which carries a total of 50 marks, will have report evaluation and viva voce examination conducted by a committee of one external examiner and one internal examiner appointed by the University.