Babu Banarasi Das University, Lucknow

School of Engineering
(School Code: 04)
Department of CE/CSE/EE/ECE/ME/IT
(University Branch Code: 31/32/33/34/35/36)
Bachelor of Technology
Evaluation Scheme

Semester I									
Course Category	Course Code	Code Title	Contact Hours			Evaluation Scheme			Credits
			L	T	P	CIA	ESE	Course Total	
C	BAS3101	Matrices and Calculus	3	1	0	40	60	100	4
C	BAS3102	Physics-I	2	1	0	40	60	100	3
Students need to select either GROUP 'A' or GROUP 'B'									
	GP3101	General Proficiency	0	0	0	100	0	100	1
Total			5	2	0	180	120	300	8

GROUP 'A'									
Course Category	Course Code	Code Title	Contact Hours			Evaluation Scheme			Credits
			L	T	P	CIA	ESE	Course Total	
F	BME3101	Engineering Mechanics	3	1	0	40	60	100	4
F	BCS3101	Foundation of Information Technology	3	1	0	40	60	100	4
F	BEC3101	Basic Electronics Engineering	3	1	0	40	60	100	4
C	BAS3104	Environmental Studies	2	0	0	40	60	100	2
F	BME3151	Engineering Mechanics Lab	0	0	2	40	60	100	1
F	BCS3151	Foundation of Information Technology Lab	0	0	2	40	60	100	1
F	BME3152	Workshop Practice	0	1	2	40	60	100	2
C	BAS3152	Physics-I Lab	0	0	2	40	60	100	1
Total			11	4	8	320	480	800	19

GROUP 'B'									
Course Category	**Course Code**	**Code Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
F	**BEE3101**	Basic Electrical Engineering	**3**	**1**	**0**	**40**	**60**	**100**	**4**
F	**BME3102**	Basic Mechanical Engineering	**3**	**1**	**0**	**40**	**60**	**100**	**4**
C	**BAS3103**	Chemistry	**3**	**1**	**0**	**40**	**60**	**100**	**4**
C	**BHS3101**	Technical Communication	**3**	**1**	**0**	**40**	**60**	**100**	**4**
F	**BEE3151**	Basic Electrical Engineering Lab	**0**	**0**	**2**	**40**	**60**	**100**	**1**
F	**BME3153**	Engineering Graphics Lab	**0**	**1**	**2**	**40**	**60**	**100**	**2**
C	**BAS3153**	Chemistry Lab	**0**	**0**	**2**	**40**	**60**	**100**	**1**
Total			**12**	**5**	**6**	**280**	**420**	**700**	**20**

Semester II

Course Category	Course Code	Code Title	Contact Hours			Evaluation Scheme			Credits
			L	T	P	CIA	ESE	Course Total	
C	BAS3201	Differential Equations and Fourier Analysis	3	1	0	40	60	100	4
C	BAS3202	Physics-II	2	1	0	40	60	100	3
Students need to select either GROUP 'A' or GROUP 'B'									
	GP3201	General Proficiency	0	0	0	100	0	100	1
Total			5	2	0	180	120	300	8

Note: Students who have selected GROUP 'A' in the first semester will select GROUP 'B' in the second semester and Vice-Versa.

GROUP 'A'

Course Category	Course Code	Code Title	Contact Hours			Evaluation Scheme			Credits
			L	T	P	CIA	ESE	Course Total	
F	BME3201	Engineering Mechanics	3	1	0	40	60	100	4
F	BCS3201	Foundation of Information Technology	3	1	0	40	60	100	4
F	BEC3201	Basic Electronics Engineering	3	1	0	40	60	100	4
C	BAS3204	Environmental Studies	2	0	0	40	60	100	2
F	BME3251	Engineering Mechanics Lab	0	0	2	40	60	100	1
F	BCS3251	Foundation of Information Technology Lab	0	0	2	40	60	100	1
F	BME3252	Workshop Practice	0	1	2	40	60	100	2
C	BAS3252	Physics-I Lab	0	0	2	40	60	100	1
Total			11	4	8	320	480	800	19

GROUP 'B'									
Course Category	Course Code	Code Title	Contact Hours			Evaluation Scheme			Credits
			L	T	P	CIA	ESE	Course Total	
F	BEE3201	Basic Electrical Engineering	3	1	0	40	60	100	4
F	BME3202	Basic Mechanical Engineering	3	1	0	40	60	100	4
C	BAS3203	Chemistry	3	1	0	40	60	100	4
C	BHS3201	Technical Communication	3	1	0	40	60	100	4
F	BEE3251	Basic Electrical Engineering Lab	0	0	2	40	60	100	1
F	BME3253	Engineering Graphics Lab	0	1	2	40	60	100	2
C	BAS3253	Chemistry Lab	0	0	2	40	60	100	1
Total			12	5	6	280	420	700	20

Legends:

L	Number of Lecture Hours per week
T	Number of Tutorial Hours per week
P	Number of Practical Hours per week
CIA	Continuous Internal Assessment
ESE	End Semester Examination

Category of Courses:

F	Foundation Course
C	Core Course
GE	Generic Elective
OE	Open Elective

BAS 3101 Matrices and Calculus **Credits: 4**

Course Objective:

The general objective of the course is to introduce

1. the concepts of matrix algebra, methods of solving system of linear equations and determine eigen values and eigen vectors of a matrix;
2. the concepts of the eigen values and eigen vectors of Hermitian, Unitary and Normal matrices differ from those of general matrices;
3. the concepts of derivatives of functions (one and several variables) and their applications;
4. the concepts of multiple integration, Beta, Gamma functions and their applications;
5. the concepts of vector calculus to expose students to mathematical applications.

Learning Outcomes:

Upon successful completion of the course, students will be able to

1. demonstrate ability to manipulate matrices, to find rank and to solve the system of linear equations;
2. find eigen values and eigenvectors and use them in diagonalization problems and other applications;
3. find nth derivative by using Leibnitz theorem;
4. apply partial derivatives to study extrema & expansion of functions of two variables;
5. evaluate double integrals by changing variables , changing order and triple integration to find the area and volume of given region;
6. calculate line integrals along piecewise smooth paths, interpret such quantities as work done by a force;
7. solve double and triple integrations and apply it to calculate line, surface and volume integrals;
8. apply Green's theorem to evaluate line integrals along simple closed contours on the plane, Stoke's theorem to give physical interpretation of the curl of a vector field and Divergence theorem to give physical interpretation of the divergence of a vector field.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Matrices** Type of Matrices, Elementary row and column transformation, Rank of matrix, Linear dependence, Consistency of linear system of equations and their solution, Characteristic equation, Caley-Hamiltion theorem, Eigen values and eigen vectors, Application of matrices to engineering problems.	30	1
II	**Differential Calculus** Leibnitz theorem, Partial differentiation, Euler's theorem, Expansion of function of several variables. Jacobian, Extrema of functions of several variables, Lagranges method of multipliers (Simple applications).	30	1

III	**Multiple Integrals** Double and triple integrals, Change of order, Change of variables, Beta and Gamma functions, Applications to area and volume, Dirichlet integral and applications.	30	1
IV	**Vector Calculus** Point function, Gradient, Divergence and Curl of a vector and their physical interpretations, Line, Surface and Volume integrals, Green's, Stoke's and Gauss divergence theorems (without proof) and applications.	30	1

Recommended Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Advanced Engineering Mathematics, Thomson (Cengage) Learning, 2007.
3. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
4. R. K. Jain & S. R. K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House, 2002.
5. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.

SYLLABUS

BAS-3102 ENGINEERING PHYSICS I

Course Objective:

The main objectives of the course are

1. To provide knowledge and develop an understanding of principles and processes of wave optics, optical communication and fundamentals of special theory of relativity.
2. To develop the basic skills to apply knowledge by the topics covered in the course to engineering problems.

Learning Outcome:

At the end of the course students shall be able

1. To apply knowledge of wave optics.
2. To design and conduct experiments.
3. To identify and solve the problems in different field of engineering & technology.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Wave Optics:** Interference: Interference of light, Biprism experiment, Displacement of fringes, Interference in thin film, Wedge shaped film, Newton's rings. Diffraction: Single slit and N-slit, Diffraction grating, Grating spectra, Dispersive power of grating, Rayleigh criterion and resolving power of grating. Polarisation: Double refraction, Nicolprism, Production and detection of plane, circularly and elliptically polarised light, Optical activity and Fresnel's theory of optical activity, Specific rotation and Polarimeter.	30	1
II	**Laser and Fibre Optics:** Laser: Spontaneous and stimulated emission of radiation, Einstein coefficient, Population inversion & pumping, Construction and working of ruby & He-Ne Laser, Applications of Laser, Holography. Fundamental idea about optical fibre, Propagation mechanism & communication in optical fibre, Types of optical fibre, Acceptance angle and acceptance cone, Numerical aperture	30	1

	and V-number, Attenuation ,Signal loss in optical fibre, Dispersion in optical fibre.		
III	**Special theory of Relativity:** Inertial & non inertial frames, Concept of ether, Michelson and Morley Experiment, Einstein's basic postulate of special theory of relativity, Lorentz transformation equations, length contraction, Time dilation, Mass variation, relativistic velocity addition theorem, Mass-energy Equivalence relation.	30	1

References:

1. Concepts of Modern Physics, Aurther Beiser , Mc-Graw Hill
2. Introduction of Special theory of relativity, Robert Resnick, Wiely
3. Optics, Ajay Ghatak, TataMc-Graw Hill
4. Optical fibre and Laser, Anuradha De, New Age
5. Fundamental of Physics, Resnick, Halliday & Walker, Wiely
6. Optics, Jenkin and White, Tata Mc-Graw Hill

(Dr. Karunesh Tiwari)
Convener

(Prof. Rajeev Manohar)
External Expert

(Dr. Nitin Jain)
Nominee

(Dr. Neelam Yadav)
Member

ENGINEERING MECHANICS (BME3101/BME3201)

Course Objective:

1. A working knowledge of statics with emphasis on force equilibrium and free body diagrams.
2. To calculate the reactive forces and analyse the structures.
3. To know the geometric properties of the different shapes & to learn energy and momentum methods.
4. Provides an understanding of the kinds of stress and deformation and how to determine them in a wide range of simple, practical structural problems, and an understanding of the mechanical behavior of materials under various load conditions.

Learning Outcome:

At the end of the course student should be able to:

1. Solve the engineering problems in case of equilibrium and non- equilibrium conditions & solve the problems involving dry friction.
2. Calculate the reaction forces and forces in members of statically determinate structures.
3. Determine the centroid, centre of gravity and moment of inertia of various surfaces and solids &calculate the forces acting on the rigid body, structures using varying principles.
4. To find out the stress, strain and elastic properties of different bodies.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Two-Dimensional Force Systems:** Basic concepts, Laws of motion, Principle of Transmissibility of forces, Transfer of a force to parallel position, Resultant of a force system, Simple Resultant of Two dimensional concurrent Force systems and Non-concurrent Force systems, Distributed force system, free body diagrams, Equilibrium and Equations of Equilibrium, Applications of two dimensional force system. **Friction:** Types of friction, Limiting friction, Laws of Friction, Static and Dynamic Friction, Equilibrium of bodies involving dry friction, Belt friction, Application of friction.	30	1

II	**Beam**: Introduction, Shear force and Bending Moment, Differential equations for shear force & bending moment, Shear force and Bending Moment Diagrams for Statically Determinate Beams. **Trusses:** Introduction, Simple Truss and Solution of Simple Truss, Method of Sections; Method of Joints; How to determine if a member is in tension or compression; Simple Trusses; Zero force members	30	1
III	**Centroid and Moment of Inertia:** Introduction, Centroid of plane, curve, area, volume and composite bodies, Moment of inertia of plane area,Parallel Axes Theorem & Perpendicular axes theorem, Moment of inertia of composite bodies. **Kinematics and Kinetics:** Linear motion, Instantaneous center, D'Alembert principle, Rotation of rigid bodies, Impulse and momentum principle, Work and energy principle.	30	1
IV	**Simple Stress and Strain:** Definition of stress, stress tensor, normal and shear stresses in axially loaded members, Stress-strain relationship, Stress-strain diagram for uniaxial loading of ductile and brittle materials, Hooke's law, Poisson's ratio, shear stress, shear strain, modulus of rigidity, Relationship between elastic constants. One Dimensional Loading of members of varying cross-sections, Temperature Stresses,Strain energy.	30	1

Reference Books:

1. Engineering Mechanics by Irving H. Shames. Prentice-Hall.
2. Engineering Mechanics: Principles of Statics and Dynamics by R. C. Hibbler. Pearson Press.
3. Engineering Mechanics: by Shanes and Rao. Pearson Education.
4. Engineering Mechanics by S.S. Bhavikatti, K.G. Rajashekarappa, New Age Publications.
5. A textbook of Engineering Mechanics by Dr. R.K. Bansal, Laxmi Publications.
6. Mechanics of Solids by Abdul Mubeen, Pearson Education Asia.
7. Mechanics of Materials by E.P. Popov, Prentice Hall of India Private Limited.

SYLLABUS

BCS3101/ BCS3201 Foundation of Information Technology

Course Objective:

1. Introduce the fundamentals of computing devices and reinforce computer vocabulary, particularly with respect to personal use of hardware and software, the internet, network and mobile computing.
2. Study the basic concepts and functions of hardware and software.
3. Study the basic concepts and functions of operating system.
4. Study the basic concepts and functions of computer network.
5. Study the basic concepts and functions of Information Technology.
6. Study the basic concepts of C programming language.
7. Provide foundational or "Computer literacy" curriculum that prepares students for life-long learning of computer concept and skills.

Learning Outcome:

At the end of the course, the student should be able to:

1. Understanding organization of computer system and networking.
2. An ability to understand the basics of computer hardware and software.
3. Awareness of basic information security issues.
4. To understand the use of Information Technology in business.
5. To analyse and understand various types of software system.
6. An ability to understand operating system and its functions.
7. Ability to apply knowledge and practice on office tools to develop I.T application.
8. To analyse various computer networks.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Hardware and Software** Hardware, Software, Information technology, Types of computer: Mainframe computer, network computer, personal computer, laptop, personal digital assistant (PDA); Personal computer: Central processing unit (CPU), hard disk, common input or output devices, types of memory viz. RAM, ROM, peripheral device, computer performance. **Input Devices**: Mouse, keyboard, trackball, scanner, touchpad, light pen, joystick, digital camera and microphone. **Output Devices**: Monitors, screens, printers, plotters, speakers. **Input/output Devices**: Modems, Touch Screens. **Storage Devices**: Diskette, Zip disk, data cartridges, CD-ROM, internal, external hard disk: Disk formatting **Software:** Types Of Software: Operating systems software and application software, Software versions. Operating System: Functions and Types. Graphical User Interface (GUI), SDLC and its phases.	30 Hours	1

II	**Computer Network** Networks: LAN, WAN, client/server, sharing printers, applications, and files across a network. Intranet, Extranet, Internet and its uses, World Wide Web (WWW) The Telephone Network In Computing: Public Switched Telephone Network (PSTN), Integrated Services Digital Network (ISDN), Asymmetric Digital Subscriber Line (ADSL), Analog and digital modem and transfer rate.	30 Hours	1
III	**Information Technology (IT)** Applications of IT: Applications in business such as: business administration systems, airline booking systems, insurance claims processing, online banking. Uses of large-scale computer applications in government such as: public records systems (census, vehicle registration), revenue collection, electronic voting. Applications in education such as: student registration and timetabling systems, computer-based training (CBT), distance learning, homework using the Internet. Electronic World: electronic mail, E-Commerce, concept of purchasing goods and services online, payment methods, advantages and disadvantages of purchasing goods and services online Health, safety and environment: Ergonomics, health issues, precautions, recycling printed outputs, recycling printer toner cartridges, using efficient monitor	30 Hours	1
IV	**Introduction to the C Language** Introduction to the C Language and its Advantages. C Program: Structure, Writing, Building an Executable Version, Debugging, and Running. Data Types and Variables, Operands, Operators, and Arithmetic Expressions, Control statements, use of while, for and do while loops, nesting loops and break, continue statement.	30 Hours	1

Text/Reference Books:

1. D. S. Yadav, "Foundations of Information Technology", New Age International Pvt. Ltd.
2. Silberschatz, Galvin and Gagne, "Operating Systems Concepts", Wiley Publication
3. D M Dhamdhere, "Operating Systems: A Concept based Approach", TMH
4. Yashavant P. Kanetkar, "Let us C", BPB

BEC3101/BEC3201 BASIC ELECTRONICS ENGINEERING

Course Objective:

This course provides

1. Comprehensive idea about basic electronics devices like Diodes, BJT, JFET, MOSFET, Operational Amplifier.
2. Fundamental principles of Electronic instruments like CRO and digital multi-meter.
3. Fundamental principle of communication.

Learning Outcome:

At the end of the course students will be able to gain knowledge about the

1. Fundamentals of electronic devices like Diodes, BJT, JFET, MOSFET, Operational Amplifier and Electronic instruments like CRO and digital multi-meter.
2. Number system, Boolean algebra, logic gates, Kaurnaugh map
3. Basics of communication systems.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**DIODES :** Energy band theory, Semiconductor material, Mass action law, PN junction: Forward and Reverse Bias characteristics, Diode as Rectifier: Half wave and Full wave Rectifiers, Breakdown Mechanism: Zener & Avalanche breakdown, Zener Diode and its application, LED, LCD, and Solar Cell.	30 Hours	1
II	**TRANSISTORS** Construction of Bipolar Junction Transistor: PNP and NPN, Working of Transistor, BJT configurations: CE, CB and CC, Input & Output characteristics of CB & CE configuration, Biasing: Fixed bias, Emitter bias, Potential divider bias, Comparison of biasing circuits. JFET: Basic construction and characteristics, Concept of pinch off, maximum drain saturation current. Input and transfer characteristics, Biasing: Self bias and fixed bias. MOSFET- Depletion and Enhancement type MOSFET- construction, operation and characteristics.	30 Hours	1
III	**DIGITAL ELECTRONICS AND COMMUNICATION SYSTEM** Number System, Complements, Boolean Algebra: Basic	30 Hours	1

	Theorems and De Morgan Theorems. Standard logic gates. Universal Logic Gates, Implementation of Boolean function using Basic gates and Universal gates. Reduction of Boolean function using K-Map upto4variables. Block Diagram of Communication System, Electromagnetic spectrum, Need for Modulation, Basic Definitions AM,FM,PM		
IV	**OPERATIONAL AMPLIFIER AND APPLICATIONS:** Introduction to OP-AMP, Characteristics of ideal OP-AMP. Basics of ideal and practical OP-AMP. Configurations: Open loop and closed loop, Applications of OP-AMP, Inverting amplifier, Non-inverting amplifier, Voltage follower, summing amplifier, Difference Amplifier, Integrator and Differentiator. Principle of oscillation and Barkhausen criterion.	30 Hours	1

Text Books:

1. Robert L. Boylestad and Louis Nashelsky Electronic Devices and Circuit Theory, Pearson India.
2. Kennedy. Electronic Communication System. TMH
3. Kalsi H.S, Electronic Instrumentation. TMH
4. M. Morris Mano, Digital Logic and Computer Design, PHI

Reference Books:

1. Jacob Millman, Christos C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems (McGraw-Hill electrical and electronic engineering series).
2. William D. Cooper, Albert D.Hefrick, Modern Electronic instrumentation and measurement technique 5th edition Prentice Hall Of India, New Delhi 1997.
3. Ramakant Gaikwad .Op –Amp's & linear Integrated Circuits, 4th edition. Prentice Hall of India, New Delhi 2002.
4. Albert Paul Malvino, Donald P Leach . Digital Principle & Application 4th edition, Tata McGraw –Hill Edition . New Delhi -1991.

BAS 3104/BAS3204: ENVIRONMENTAL STUDIES

Course Objectives: The main objectives of the course are:

1. To create awareness and improve knowledge about environment.
2. To conserve natural resources through sustainable use.
3. To prevent, control of pollution and protect environment.
4. To developed skill and participation in environment protection activities.

Learning outcome: After the completion of the course, students are expected to better understanding of:

- Environments and related issues.
- Develop skill to solve many inter related problems of socio-economic nature and ecology.
- Able to conserve natural resources and sustainable use.
- Able to protect environment.

Course Contents:

Modules	Course Topics	Total Hours	Credit	Lecture/ week		
				L	T	P
1.	**Environment** Environment: Definition, Principles and Scope of Environmental Studies, Structure and composition of atmosphere, hydrosphere, lithosphere and biosphere, Ecosystems, structure and function of ecosystem, Types of ecosystem, energy flow in an ecosystem, Food chain and food web, ecological pyramids, Prey-Predator interaction, Population dynamics of Prey and Predator. Material cycle: Definition and importance, Nitrogen and carbon cycle Environmental Impact Assessment (EIA): Definition and Concept, Elements of EIA, Prediction of impacts and its methodology, Sustainable Development. **Natural resource and its conservation** Natural resources: Renewable & non-renewable natural resources, drinking water quality, water borne and water induced diseases, arsenic and fluoride problem in drinking water, deforestation, impact of overexploitation mineral resources. Energy resources: Conventional and non-conventional energy sources, solar energy, hydro-power energy, Hydrogen-energy, wind energy, geothermal energy, biomass energy, nuclear energy, fossil fuels.	30	1	2	0	0

2.	**Environmental Pollution** Environmental pollution: Definition, pollutants, sources, causes, effects and control measures of air, water, and soil pollutions. Noise: Sources of noise pollution, measurement of noise, Noise exposure levels and standards. Impact of noise on human health. Noise control and abatement measures. Waste water and its treatment. Eutrophication and Biomagnifications. Solid waste management: solid waste source, characterization, effects and control measures of urban and industrial waste. **Current Environmental Issues** Current environmental Issues: Population growth, logistic curve equation. Climate change, global warming, acid rain, ozone layer depletion, Water Crises-Conservation of water, Rain water harvesting, Biodiversity and its conservation: Natural disaster and its management. Nuclear hazards Environment protection: Legal aspects of environment protection, Environment Protection Act, Air(Prevention and Control of Pollution)Act, Water(Prevention and control of Pollution)Act, Role of NGOs in environment protection. Environmental Education and Awareness.	30	1	2	0	0

Text Books:

1. Environmental Biology- Agarwal, K.C.2001, Nidi Publ. Ltd. Bikaner.

2. Basics of Environment and Ecology- A. Kaushik and C.P. Kaushik, Second Edition, 2014, New Age International(p) Ltd.

Suggested Readings:

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd.,Ahmedabad-380013,India
2. Brunner R.C., Marine Pollution, Clanderson Pross Oxford (TB)
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Publ, House , Mumbai,1196p.
4. De A.K., Environmental Chemistry, Wiley Eastern Ltd. Down to Earth, Centre for Science and Environment (R).

ENGINEERING MECHANICS LAB (BME3151/BME3251)

1. To conduct the tensile test and determine the ultimate tensile strength, percentage elongation for a steel specimen.
2. To determine the compression test and determine the ultimate compressive strength for a Specimen.
3. To conduct the Impact-tests (Izod/Charpy) on Impact-testing machine to find the toughness.
4. To determine the hardness of the given specimen using Vickers/Brinell/Rockwell hardness testing machine.
5. Friction experiment(s) on inclined plane and/or on screw-jack.
6. Worm & worm-wheel experiment for load lifting.
7. Belt-Pulley experiment.
8. Bending of simply-supported and cantilever beams for theoretical & experimental deflection.
9. Torsion of rod/wire experiment.
10. Experiment on Trusses.
11. Statics experiment on equilibrium.
12. Experiment on Moment of Inertia.

Note:

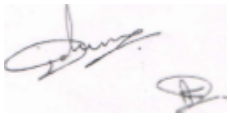
1. At least ten experiments are to be performed in the semester.

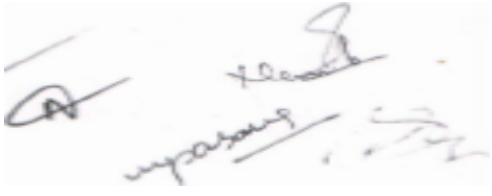
2. At least eight experiments should be performed from the above list.

Remaining two experiments may either be performed from the above list or designed & set by the concern faculty as per the scope of the syllabus.

BCS3151/BCS 3251 Foundation of Information Technology Lab

1) Run basic DOS commands.
2) Learn the use of Word Processor.
3) Learn the use of Excel.
4) Prepare presentation on any topic of your choice.
5) Write a C program to find sum of two numbers.
6) Write a C program to learn the function of FOR loop.
7) Write a C program to learn the function of WHILE/ DO WHILE loop.
8) Write a C program for pattern printing
9) Write a C program to print Fibonacci series.
10) Write a C program to find factorial and reverse of a number.





WORKSHOP PRACTICE (BME3152/BME3252)

1. **Carpentry Shop:** Study of tools & operations and carpentry joints, Simple exercise using jack plane, to prepare half-lap corner joint, mortise & tennon joints. Simple exercise on wood working lathe.
2. **Fitting Bench Working Shop:** Study of tools & operations, Simple exercises involving fitting work, make perfect male-female joint, Use of drills/taps idea.
3. **Black Smithy Shop:** Study of tools & operations, Simple exercises base on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.
4. **Welding Shop:** Study of tools & operations of Gas welding & Arc welding, Simple butt and Lap welded joints, Oxy-acetylene flame cutting.
5. **Sheet-metal Shop:** Study of equipment & operations, Making Funnel complete with 'soldering', Fabrication of tool-box, tray, electric panel box etc.
6. **Machine Shop:** Study of machine tools and operations, Plane turning, Step turning, Taper turning, Threading, grinding of turning equipment.
7. **Foundry Shop:** Study of tools & operations, Pattern making, Mould making with the use of a core, Method of material pouring and Casting.

Note:

1. At least ten experiments are to be performed in the semester.
2. At least eight experiments should be performed from the above list.

Remaining two experiments may either be performed from the above list or designed & set by the concern faculty as per the scope of the syllabus

BAS-3151*BAS-3252 PHYSICS PRACTICALS**

Course Objective:

The main objectives of the course are

1. To learn some basic principles of physics that help students to understand how the world around them works.
2. To realize fundamental concepts of physics and how it can be applied to other field i.e. engineering.
3. To apply scientific knowledge systematically.

Learning Outcome:

At the end of the end of the course students be able to

1. Tackle experimental problems in physics.
2. Use mathematics to describe the physical world.
3 Plan, execute, analyse and report experiments.
4. Compare results critically with prediction from theory.

The student shall perform ten experiments in the laboratory by choosing at least four experiments from each group

GROUP-A

Practical	Topics	Total Hours	Credits
1.	To determine the wavelength of monochromatic light by Newton's rings.	30	1
2.	To determine the wavelength of monochromatic light with the help of Fresnel's biprism		
3.	To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.		
4.	To determine the specific rotation of cane sugar solution using Bi-quartz polarimeter.		
5.	To determine the wavelength of various spectral lines using plane transmission grating		
6.	To study the polarization of light by simple reflection using laser.		
7.	Measurement of wavelength of a laser (He-Ne) light using single slit diffraction.		

*BAS3152

**PHYSICS-I LAB

As per Evaluation Scheme, SOE

GROUP-B

Practical	Topics	Total Hours	Credits
8	To determine the specific resistance of the material of given wire using Carey Foster's bridge	30	1
9	To determine the variation of magnetic field along the axis of a current carrying coil and then to estimate the radius of the coil.		
10	To verify Stefan's Law by electrical method		
11	To calibrate the given ammeter and voltmeter		
12	To study the Hall Effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall-effect set up.		
13	To determine energy band gap of a given semiconductor material.		
14	To study the characteristics of zener diode		
15	To determine electrochemical equivalent of copper using Tangent or Helmholtz galvanometer		
16	To draw hysteresis curve of a given sample of ferromagnetic material and from this to determine magnetic susceptibility and permeability of the given specimen.		
17	To determine the ballistic constant of a ballistic galvanometer		
18	To determine the value of a planck's constant by a photocell.		
19	To determine the coefficient of viscosity of a liquid.		
20.	Measurement of fiber attenuation and aperture of fiber		

(Dr. Karunesh Tiwari
Convener

(Prof. Rajeev Manohar)
External Expert

(Dr. Nitin Jain)
Nominee

(Dr. Neelam Yadav)
Member

BABU BANARASI DAS UNIVERSITY, LUCKNOW

School of Engineering

Department of Electrical Engineering

Bachelor of Technology

SEMESTER – I / II

BEE3101/BEE3201 BASIC ELECTRICAL ENGINEERING

Course Objective:

1. This course provides comprehensive idea about circuit analysis.
2. The subject gives the knowledge about combinational circuits.
3. Subject gives the knowledge about the analysis and design of new electrical circuits.
4. Other logical working principles of machines and common Measuring instruments.

Learning Outcome:

At the end of the course students will be able.

1. To understand basic theorem of electrical engineering.
2. To understand basic electrical engineering.
3. To understand the basic concepts of magnetic, AC & DC circuits.
4. To explain the working principle, construction, applications of DC & AC machines & measuring instruments.
5. To gain knowledge about the fundamentals of electric components, devices.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Electric Circuit:** Introduction to linear and nonlinear circuits, circuit elements, various sources and source transformation, Star delta transformation, solution of D.C. circuits using Kirchhoff's laws- Mesh Analysis and Nodal Analysis, Signal wave forms, Passive elements specifications. **Basic theorems:** Thevenin, Norton, Maximum Power, Superposition, Millman's Theorem, Tellegen's Theorem applied to DC networks.	30 Hours	1
II	**A. C. Circuits:** A.C. voltage and currents, average and r.m.s. values, Form factor and peak factor, Phasor	30 Hours	1

	representation of sinusoidal quantities, phasor in polar, rectangular and exponential forms. Analysis of single phase series, parallel and series-parallel circuits, Active & reactive and apparent power, p.f., Volt-amperes, frequency response and Q-factor. Analysis of balanced three phase a.c. circuits, Introductory concept, voltage, current and power in three phase balanced circuits. Star-delta connections. Measurement of three phase power by Wattmeter Method.		
III	**Measuring Instruments & Electromagnetic and Transformer:** Types of instruments, construction, working principles & applications, PMMC, MI, Single phase dynamometer, Ammeter, Voltmeter, Wattmeter, Induction type Energy meter, Use of shunt and multiplier. Magnetic circuit concept, B-H curves characteristics of magnetic materials, Practical magnetic circuits. Magnetic circuits with D.C. and A.C. excitation, Hysteresis and eddy current losses, Magnetic force. Self and mutual inductances, Faraday`s laws, Lenz`s Law, Statically and dynamically induced emfs, Energy stored in magnetic fields. Principle of Transformer operation, emf equation, Equivalent circuit of transformer, Losses and efficiency, Introduction of Auto Transformer and its applications.	30 Hours	1
IV	**Electrical Machines:** Basic concepts of rotating electric machines, DC machines (motor and generator), working principle, types, EMF and torque equations characteristics and application of DC motor. Three phase induction motors, types, principle of operation, applications. Single phase induction motors, principle of operation, starting methods, applications. Synchronous machines (motor and generator), principle of operation and applications.	30 Hours	1

Text &Reference books:

1. 'Fundamental of Electric Circuits' by Charles K Alexander and Matthew N.O. Sadiku, Tata McGraw Hill Publication.

2. 'Electrical Engineering Fundamentals' by Vincent Del Toro, PHI Publication.
3. 'Electric Technology, by H.Cotton, CBS Publishers and Distributors.
4. 'Basic Electrical Technology' by A.E.Fitzgerald, McGraw Hill Publication.
5. 'Basic Electrical Technology' by Kothari and I.J. Nagrath, Tata McGraw Hill.
6. 'Basic Electrical Technology' by S.N.Singh, PHI Publication.

BASIC MECHANICAL ENGINEERING (BME3102/BME3202)

Course Objective:

1. To learn the basic principles of classical thermodynamics.
2. To apply the laws of thermodynamics to various systems and analyze the significance of the results.
3. To learn the basic concepts of internal combustion engines.

Learning Outcome:

At the end of the course student should be able to:

1. Differentiate between closed and open systems and analyze related problems.
2. Apply the concept of first and second law to analyze thermodynamic systems.
3. Analyze the performance of IC engines and identify methods to improve the efficiency.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Fundamental Concepts and Definitions:** Definition of thermodynamics, Microscopic and Macroscopic approaches, Systems, surroundings and universe, Concept of continuum, Properties and state, Thermodynamic properties, Thermodynamic path, process and cycle, Thermodynamic equilibrium, Reversibility and irreversibility, Quasi static process, Work and heat, Zeroth law of thermodynamics, concept of temperature.	30	1
II	**First law of thermodynamics**: Thermodynamic processes, flow work, Joules' experiment, Internal energy and enthalpy, First law of thermodynamics applied to open systems, Steady flow systems and their analysis, Application of steady flow energy equation, Limitations of first law of thermodynamics, PMM-I. **Second law of thermodynamics:** Statement of second law, heat engine, heat pump and refrigerator, PMM- II, Efficiency of Carnot engine, Entropy, Clausius Inequality, definition of third law of thermodynamics.	30	1

III	**IC engines:** Classification of IC engines, engine terminology, Compression Ignition engines and Spark Ignition engines, Construction and working of two stroke and four stroke engines, Difference between SI and CI engines, difference between 2-stroke and 4-stroke engine, Efficiency of Otto cycle and diesel cycle. Boilers & Condensers **Boilers:** Steam generators-classifications, Working of fire-tube and water-tube boilers, Boiler mountings & accessories. **Condensers:** Classification of condenser, Air leakage, condenser performance parameters.	**30**	**1**

Reference Books:

1. P.K. Nag, Basic and Applied Thermodynamics, Tata McGraw-Hill Publishing Company Ltd.
2. Yunus A. Cengel and M.A. Boles, Thermodynamics: An Engineering Approach. Tata McGraw- Hill Publishing Company Ltd.
3. C.P. Arora,Thermodynamics, Tata McGraw- Hill Publishing Company Ltd.

SYLLABUS

(BAS 3103/BAS 3203) CHEMISTRY

Course Objective: The main objectives of course are:

1. To provide basic building blocks of engineering chemistry.
2. To provide spatial learning style using images, pictures, colors and models.
3. To provide the basic mathematical problems of polymer chemistry.

Learning Outcome: At the end of the course, the student will be able to:

1. understand the role of chemistry in field of engineering.
2. understand the structure of atoms and apply the periodic laws to predict chemical and physical properties of the elements.
3. develop analytical capabilities and techniques of interpretation.
4. apply the knowledge in solving problems in their respective field of study.
5. employ critical thinking and efficient problem-solving skills in the four basic areas of chemistry (analytical, inorganic, organic, and physical).

Course Contents:

Module	Course contents	Total Hours	Credits
I	**Introduction to General Chemistry** Atomic structure, Chemical bonding: Significance of Quantum numbers, Shapes of s, p, d, and f atomic orbitals. Rules for filling electrons in various orbitals. Electronic configuration of atoms, Molecular Orbital Theory and its Applications in Homonuclear and Heteronuclear diatomic molecules. Reactions kinetics: Rate equation, Order and molecularity of reaction. Theories of reaction rates, Integrated rate equations. Electrochemistry: Nernst equation and its importance. Nanomaterials: Types of nanomaterial, Creation and use of Fullerenes. Carbon nanotube and its application. States of matter: Space lattice, Types of unit cell (cube), Density of unit cell, Defects in crystal. Liquid crystal and its application.	30	1

Shalini

Manisha

(Prof. V.P. Sharma)

II	**Mechanistic Concepts of Stereochemistry**: Concept of Isomerism, Types of Isomerism. Optical isomerism: Elements of symmetry, molecular chirality, optical activity, chiral and achiral molecules with two stereogenic centers. Properties of Enantiomers and Disasteromers. Relative and absolute configuration: Sequence rules, D & L and R & S systems of nomenclature. Geometric isomerism: Determination of configuration of geometric isomers, E & Z system of nomenclature. Conformational isomerism: Conformational analysis of ethane and n-butane. Introduction to Green Chemistry, 12 principles of Green Chemistry.	30	1
III	**Titrimetric Analysis:** Introduction, Standard solutions, Equivalents and Normalities and Oxidation numbers, Indicators. **State of Art Analytical techniques** Nuclear Magnetic Resonance: Magnetic nuclei with special reference to ^{1}H. Chemical shift, Shielding and Deshielding. Ultraviolet Spectroscopy: Types of Transition, Chromophores and Auxochromes. Water treatment methods for boiler feed water by Zeolite method. Water treatment: Water Quality Monitoring and Management, Surveillance, Water effluent treatment and Relevant Standards and Regulatory Norms(IS:10500, IS 14543, IS 13428)	30	1
IV	**Principles of Polymer Chemistry** Introduction of Polymer: Classification of Polymers, Mechanism of addition polymerization, Thermoplastic and thermosetting resins, Molecular weight of polymers. Elastomers: Natural rubber, Buna-S, Buna-N, Butyl rubber. Synthetic Fibers: Nylon-6, Nylon 6, 6, Kevlor, Dacron. Organic conducting polymers: Polyacetylene, Polythiophene, Polypyrrole, Polyaniline. Biodegradable polymers.	30	1

Shalini

Manisha

(Prof. V. P. Sharma)

Text Book:

1. Shashi Chawla, A Text book of Engineering Chemistry,8th edition Dhanpatrai & Co(p) ltd,2013.
2. R.K. Agarawal: Engineering chemistry, 15th edition,Krishna publication media (P) Ltd,2014
3. I.L.Finar,Organic Chemistry,6th edition ,Pearson,2011
4. Clark, J. H. "Green chemistry: Challenges and opportunities". *Green Chemistry*.1999

Suggested Readings:

1. Arun Bahl and B.S. Bahl , Advanced organic chemistry,S.Chand,2010
2. R.T. Morrison, R.N. Boyd, S.K. Bhatacharjee, Organic Chemistry, 7thEdn, Pearson, 2011.
3. Charles P Poole, Frank J Owens, Introduction to Nanotechnology,John Wiley Sons,2007
4. Atkins P and de Paula J. Physical Chemistry (8th ed., W.H. Freeman 2006)

SYLLABUS

Course Title: Technical Communication **Course Code: BHS3101/3201**

Course Objectives:

- To make the students aware of the fundamentals of communication and its types and various levels;
- To train them techniques and methods of vocabulary building and paragraphs writing and make communication effective and impressive;
- To groom them expert in oral as well as written communication with the knowledge of various forms and formats;
- To make them understand the role of Nonverbal (Kinesics) in Communication
- To enhance their capacity for comprehension, creative and critical thinking;

Learning Outcome: The successful completion of the course students will be able to:

- Understand the meaning of communication and its various applications;
- Form and apply suitable vocabulary, phrases and sentences in communicating variety of situations;
- Able to use variety of forms/formats and techniques required in different levels of communication;
- Maintain congruity between verbal and nonverbal communication;
- Able to comprehend and clarify the intricacies of art of communication.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Fundamentals of Communication:** Communication: Definition, Nature, Origin, Scope, Features and Process of communication; Types of Communication: Verbal and Non-Verbal, Formal and Informal, Oral & Written Communication and technical and general Communication; Levels of Communication: Extra-personal, Intra-personal, Interpersonal, organisational, Grapevine, Group and Mass Communication; Language as a Tool of Communication; The Flow of Communication: Vertical (Upward and Downward), Lateral or Horizontal; Technical Communication: Definition, Distinction between Technical & General Communication, Importance of Technical Communication for Technocrats & Professionals; Barriers to Communication: definition; types: Physical, Semantic, Psychological barriers or Extra-personal, Intra-personal, Interpersonal, and Organizational barriers, How to Overcome these Barriers;	30	1
II	**Creativities in Communication** **Word Formation:** Affixation, Compounding, Blending,	30	1

10/6/19 10/6/19

	Conversion. Enriching **Vocabulary:** Synonyms, Antonyms, Homophones. Homonyms, One word Substitution, Foreign Words & Phrases; **Forms of Writing and Techniques:** Note taking, Reviewing. Interpreting, Paraphrasing and Précis Writing, Pre-Requisites of Good Sentences; Essentials of Good Sentences, Common Errors to be avoided **Requisites of Good Paragraph Writing:** Unity, Coherence, Clarity. Proper Length, Emphasis, Logical Sequencing, Development of Paragraphs; **Methods of Writing:** Inductive, Deductive, Chronological, Spatial. Comparison & Contrast, Question to Answer, Interruptive. Illustrative;		
III	**Business Communication** Principles. 7 C's of technical Communication; Formats of Business Letters; **Types of Letter:** Sales & Credit Letters, Inquiry. Quotation & Reply Letters, Letters for Placing & Fulfilling Orders, Complaint, Claim & Adjustment Letters; **Job Letters:** Cover letters, Resume **Reports:** Definition, Significance, Features & Purpose, **Types:** Formal . Informal, Periodic, Informational, Analytical; **Formats & Structures of Reports:** Letter Format, Memo Format. Printed Format, Manuscript Format; Writing of a Report Structure of Manuscript Format; **Proposals:** Definition, Significance, Features & Purpose; Types & Structures: Solicited & Unsolicited, Business, Research. Technical; Structure of Technical Proposals.	30	1
IV	**Presentation Strategies:** Purpose, Scope, Understanding Audience & Locale. Organizing contents, Audio-Visual Aids; **Modes of Presentation:** Manuscript, Impromptu, Memorization. Extempore; **Non-Verbal Dimensions of Communication:** **Kinesics:** Gesture. Posture, Facial Expression, Eye Contact; Paralinguistics. Proxemics, Haptics, Chronemics, Oculecsis. Group Discussion.Telephone Etiquettes,Dining Etiquettes, Interviews.Ice-Breaking.	30	1

Text books:

Minakshi Raman et al. Technical Communication, New Delhi: Oxford University Press, 2014.

Singh. R.P. Functional Skills in Language & Literature, New Delhi: Rupa, 2007.

Reference Books:

Sharma, Sangeeta et al. Communication Skills for Engineers and Scientists, New Delhi: PHI, New Delhi. 2009.

Shukla, Aditya. Professional Communication, Pune: Technical Publications, 2013.

10/6/19

10/6/19

BEE3151/BEE3251 BASIC ELECTRICAL ENGINEERING LAB

(Any 10 experiments)

1. Verification of KCL & KVL.
2. Verification of Thevenin's theorem.
3. Verification of Norton's theorem.
4. Verification of Superposition theorem.
5. Measurement of active and reactive power in 1-phase and Power Factor Improvement.
6. Measurement of active power in 3 -phase circuit using TWO wattmeter methods.
7. Study of transformer through assembling and polarity check.
8. Determination of equivalent circuit parameters of a single phase transformer by O.C. and S.C. tests and estimation of voltage regulation and efficiency at various loading conditions and verification by load test.
9. Study of dc shunt motor speed control using (1) Armature control (2) Field Control.
10. Determination of efficiency of DC shunts motor by load test.
11. Study of Electrical Equipment used in daily life.
12. Study of DC Machine.
13. Full wave rectifier circuit using diodes.
14. Transistor input-output characteristics.

ENGINEERING GRAPHICS LAB (BME3153/BME3253)

1. **Scales:** Representative factor, plain scales, diagonal scales, scales of chords.
2. **Projection:** Types of projection, orthographic projection, first and third angle projection.
3. **Projection of points:** The principle of orthographic projections of a point on HP and VP, Conventional representation, Projection of a point in all the quadrants.
4. **Projection of Lines**: Line inclined to one plane, inclined with both the plane, True Length and True Inclination, Traces of straight lines.
5. **Projection of planes and solids:** Projection of Planes like circle and polygons in different positions; Projection of polyhedrons like prisms, pyramids and solids of revolutions like cylinder, cones in different positions.
6. **Section of Solids:** Section of right solids by normal and inclined planes; Intersection of cylinders.
7. **Isometric Projections:** Isometric scale, Isometric axes, Isometric Projection from orthographic drawing.
8. **Perspective Projection:** Nomenclature of Perspective Projection, Method of drawing perspective views, Visual Ray Method, using Top and Front, Top and Side views.
9. **Computer Aided Drafting (CAD)-I:** Introduction, benefit, software's basic commands of drafting entities like line, circle, polygon, polyhedron, cylinders.
10. **Computer Aided Drafting (CAD)-II:** Transformations and editing commands like move, rotate, mirror, array; solution of projection problems on CAD.

Note:

1. At least ten experiments are to be performed in the semester.

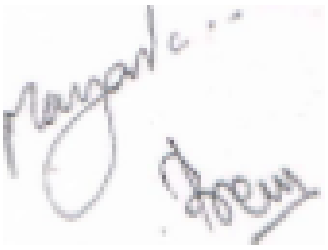
2. At least eight experiments should be performed from the above list.

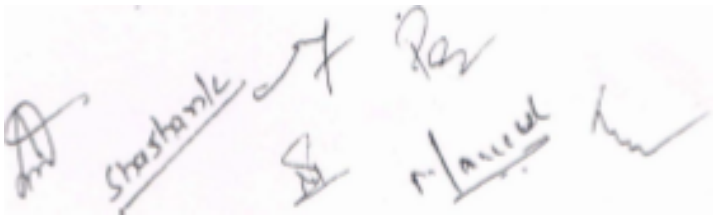
Remaining two experiments may either be performed from the above list or designed & set by the concern faculty as per the scope of the syllabus

Reference Books:

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

2. Engineering Graphics by K.R.Gopalakrishna, 32nd edition, 2005, Subash Publishers Bangalore.





BAS 3153/BAS3253 CHEMISTRY LAB

Course Objective: The main objectives of course are:

1. To Purify and identify organic compounds.
2. To calculate reaction yield for relevant lab experiments.

. **Learning objective:** Upon successful completion of this course, students will be able to:

1. identify the difference between scholarly/peer-reviewed research and practical information related to agriculture as well as information that is authoritative, unbiased, and timely.
2. apply the principles of teaching and learning in relation to practical chemistry laboratories and associated chemistry concepts.

Course Contents:

Module	List of Experiments	Total hours	Credit
1.	Determination of constituents and amount of alkalinity of supplied water sample.		
2.	Determination of total hardness of water by complexometric titration method.		
3.	Determination of chloride content in a given sample of bleaching powder		
4.	Determination of chloride content in supplied water sample using mohes method.	60	2
5.	Determination of iron content in the given water sample by using external indicator		
6.	Determination of pH of a solution using a pH meter and titration of such a solution phmetrically.		

Suggested Readings:

1. Textbook of practical chemistry, A.I. Vogel, Prentice Hall, 5th edition.
2. Vogels quantitative chemical analysis, A.I. Vogel, Prentice hall, 6th edition.
3. Practical organic chemistry, F.G. Mann & B.C. Saunders, orient longman,1960.

Shalini Sharma (Prof V.K. Sharma)

BAS 3201 Differential Equations and Fourier Analysis **Credits: 4**

Course Objective:

The general objective of the course is to introduce

1. the formulation and solution of ordinary differential equations;
2. the concepts of series solution of differential equation and solution of Bessel's. Legendre's equations and their properties;
3. the concept of Fourier series expansion of functions and harmonic analysis;
4. the formulation and solution of partial differential equations arising in a number of practical problems;
5. the applications of partial differential equation in wave equations, heat flow and line transmission.

Learning Outcomes:

Upon successful completion of the course, students will be able to

1. identify an ordinary differential equation and its order and degree;
2. compute the general solution of 2nd order ordinary differential equations and apply them to solve the L-C-R circuits;
3. determine the general solution of higher order linear equations with constant coefficients;
4. determine whether a system of functions is linearly independent using the Wronksian;
5. use the method of reduction of order and undetermined coefficients to find a second linearly independent solution of a second order linear homogeneous equation when one solution is given;
6. use the method of variation of parameters to find particular solutions of second order, linear homogeneous equations;
7. use power series and Frobenius series method to solve differential equations;
8. expand periodic functions into Fourier series the knowledge of which is useful in signal processing;
9. determine the Fourier sine and cosine series for functions defined on an interval;
10. use the method of separation of variables to reduce some partial differential equations to ordinary differential equations;
11. solve quasilinear first-order partial differential equations using the method of characteristics and first integrals;
12. solve second-order hyperbolic partial differential equations by the travelling wave approach (D'Alembert's method of solution);
13. provide an application oriented computation for solving wave equation, heat equation and steady state two dimensional heat flow.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Differential Equations** Linear differential equations of nth order with constant coefficients, Complementary functions and particular integrals, Simultaneous linear differential equations, Solution of second order differential	30	1

	equation by changing dependent and independent variables, Method of variation of parameters, Applications to engineering problems (without derivation).		
II	**Series Solution and Special Functions** Series solution of ordinary differential equations of 2^{nd} order with variable coefficients (Frobenius Method), Bessel and Legendre equations and their series solutions, Properties of Bessel functions and Legendre polynomials.	30	1
III	**Fourier series** Periodic functions, Trigonometric series, Fourier series of period 2π, Euler's formulae, Functions having arbitrary period, Change of interval, Even and odd functions, Half range sine and cosine series. Harmonic Analysis.	30	1
IV	**Partial Differential Equations and its applications** Homogeneous Linear partial differential with constant coefficients, Non- Homogeneous Linear partial differential equation with constant coefficients. Method of separation of variables for solving partial differential equations, Wave equation up to two-dimensions, Laplace equation in two-dimensions, Heat conduction equations up to two-dimensions, Equations of transmission lines.	30	1

Recommended Books:

1. E. Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, 2005.
2. Peter V. O'Neil, Engineering Mathematics-II, Thomson (Cengage) Learning, 2007.
3. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd., 2008.
4. R. K. Jain & S. R. K. Iyenger, Advance Engineering Mathematics, Narosa Publishing House, 2002.
5. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2005.
6. C. Ray Wylie & Louis C. Barrett, Advanced Engineering Mathematics, Tata McGraw-Hill Publishing Company Ltd. 2003
7. G. F. Simmons, Differential Equations, Tata McGraw-Hill Publishing Company Ltd. 1981.
8. C. Prasad, Advanced Mathematic for Engineers, Prasad Mudranalaya, 1996.
9. A. C. srivastava and P. K. Srivastava, Engineering Mathematics, Vol. II, PHI Learning Pvt. Ltd., New Delhi, 2011.

SYLLABUS

BAS-3202 ENGINEERING PHYSICS II

Course Objective:

The main objectives of the course are

1. To provide knowledge and to develop an understanding of Modern Physics.
2. To develop a scientific attitude at micro and nano scales of materials.

Learning Outcome:

At the end of the course students shall be able

1. To apply knowledge in developing advanced materials and devices.
2. To apply fundamental laws of electricity and magnetism in engineering.
3. To identify and solve applied physics problems.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Fundamental of quantum Mechanics:** Wave particle duality, de-Broglie matter wave, Davission Germer experiment, Phase velocity and group velocity, Uncertainty principle and its applications, Wave function and its significance, Expectationvalue, Schrödinger wave equation and its significance, Particle in one dimensional box, Linear harmonic oscillator.	30	1
II	**Crystal Structure, X ray Diffraction & Electromagnetism:** Space lattice, basis, Unit cell, Lattice parameter, Seven crystal systems and Fourteen Bravais lattices, Crystal-System Structure, Packing factor (cubic, body and face), Crystal structure of NaCl and diamond, Lattice planes and Miller Indices, Reciprocal Lattice, Diffraction of X-rays by crystal, Laue's experiment, Bragg's Law, Bragg's spectrometer. Displacement current, Equation of continuity, Maxwell's equations (Integral and Differential forms), Poynting theorem and poynting vectors, EM-wave equation and its propagation characteristics in free space, non-conducting and in conducting media, Skin depth.	30	1

III	**Superconductivity and Nanotechnology:** Superconductors: Temperature dependence of resistivity in superconducting materials, Effect of magnetic field (Meissner effect), Temperature dependence of critical field, Type I and Type II superconductors, BCS theory (Qualitative), High temperature superconductors and applications of super-conductors. Nano-Materials: Basic principle of nanoscience and technology, Structure; properties and uses of fullerene and carbon nanotubes, Synthesis of nanomaterials-chemical vapour deposition technique, pulse laser deposition technique, characterization techniques (XRD, SEM,AFM),. Applications of nanotechnology.	30	1

References:

1. Concept of modern physics, Auther Bieser, Tata Mc-Graw Hill
2. Solid state Physics, S.O. Pillai, New Age International
3. Solid State Physics, CharleKittal Seventh Ed. Wiley Eastren
4. Nanotechnolgy, Reached Booker& Earl Boisen, Welly PL
5. Introduction to Electrodynamics, David J. Griffith, PHI

(Dr. Karunesh Tiwari)
Convener

(Prof. Rajeev Manohar)
External Expert

(Dr. Nitin Jain)
Nominee

(Dr. Neelam Yadav)
Member

Babu Banarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Bachelor of Technology

Evaluation Scheme (w.e.f 2019-20)

SEMESTER III									
Course Category	**Course Code**	**Code Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
C	**BHS3301 /BHS3302**	Industrial Psychology / Industrial Sociology	2	0	0	40	60	**100**	**2**
C	**BAS3301**	Complex Analysis and Integral Transforms	3	1	0	40	60	**100**	**4**
C	**BCE3301**	Civil Engineering Materials & Construction	4	1	0	40	60	**100**	**4**
C	**BCE3302**	Structural Mechanics	4	1	0	40	60	**100**	**4**
C	**BCE3303**	Fluid Mechanics	4	1	0	40	60	**100**	**4**
C	**BCE3304**	Surveying	3	1	0	40	60	**100**	**3**
C	**BCE3351**	Civil Engineering Materials Lab	0	0	2	40	60	**100**	**1**
C	**BCE3352**	Engineering Geology Lab	0	0	2	40	60	**100**	**1**
C	**BCE3353**	Fluid Mechanics Lab	0	0	2	40	60	**100**	**1**
C	**BCE3354**	Surveying Lab	0	0	2	40	60	**100**	**1**
	GP3301	General Proficiency	-	-	-	100	-	**100**	**1**
Total			**20**	**5**	**8**	**500**	**600**	**1100**	**26**

Legends:

L Number of Lecture Hours per week
T Number of Tutorial Hours per week
P Number of Practical Hours per week
CIA Continuous Internal Assessment
ESE End Semester Examination

Category of Courses:

F Foundation Course
C Core Course
GE Generic Elective
OE Open Elective

Babu Banarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Bachelor of Technology

Evaluation Scheme (w.e.f 2019-20)

SEMESTER IV									
Course Category	**Course Code**	**Code Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
C	**BHS3402/ BHS3401**	Industrial Sociology /Industrial Psychology	2	1	0	40	60	**100**	**2**
C	**BAS3401**	Statistical and Numerical Techniques	2	1	0	40	60	**100**	**3**
C	**BCE3401**	Structural Analysis-1	4	1	0	40	60	**100**	**4**
C	**BCE3402**	Hydraulics & Hydraulic Machines	4	1	0	40	60	**100**	**4**
C	**BCE3403**	Geoinformatics	3	1	0	40	60	**100**	**4**
C	**BCS3405**	Programming in 'C'	3	1	0	40	60	**100**	**4**
C	**BCE3451**	Civil Engineering Drawing Lab	0	0	2	40	60	**100**	**1**
C	**BCE3452**	Hydraulic Machine Lab	0	0	2	40	60	**100**	**1**
C	**BCE3453**	Geoinformatics Lab	0	0	2	40	60	**100**	**1**
C	**BCS3455**	C Programming Lab	0	0	2	40	60	**100**	**1**
	GP3401	General Proficiency	-	-	-	100	-	**100**	**1**
Total			**18**	**6**	**8**	**500**	**600**	**1100**	**26**

Legends:

L Number of Lecture Hours per week
T Number of Tutorial Hours per week
P Number of Practical Hours per week
CIA Continuous Internal Assessment
ESE End Semester Examination

Category of Courses:

F Foundation Course
C Core Course
GE Generic Elective
OE Open Elective

Babu Banarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Bachelor of Technology

Evaluation Scheme (w.e.f 2019-20)

SEMESTER V									
Course Category	**Course Code**	**Code Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
C	**BHS3501**	Engineering & Managerial Economics	3	0	0	40	60	**100**	**3**
C	**BCE3501**	Geotechnical Engineering	4	1	0	40	60	**100**	**4**
C	**BCE3502**	Environmental Engineering-I	3	1	0	40	60	**100**	**4**
C	**BCE3503**	TransportationEngineeringI	3	1	0	40	60	**100**	**3**
C	**BCE3504**	Structural Analysis II	4	1	0	40	60	**100**	**4**
C	**BCE3505**	Design of Concrete Structures-I	4	0	0	40	60	**100**	**4**
C	**BCE3551**	Geotechnical EngineeringLab	0	0	2	40	60	**100**	**1**
C	**BCE3552**	Environmental Engineering Lab	0	0	2	40	60	**100**	**1**
C	**BCE3553**	Transportation EngineeringLab	0	0	2	40	60	**100**	**1**
	GP3501	General Proficiency	-	-	-	100	-	**100**	**1**
Total			**21**	**4**	**6**	**460**	**540**	**1000**	**26**

Legends:

L Number of Lecture Hours per week
T Number of Tutorial Hours per week
P Number of Practical Hours per week
CIA Continuous Internal Assessment
ESE End Semester Examination

Category of Courses:

F Foundation Course
C Core Course
GE Generic Elective
OE Open Elective

Babu Banarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Bachelor of Technology

Evaluation Scheme (w.e.f 2019-20)

SEMESTER VI									
Course Category	**Course Code**	**Code Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
C	**BHS3601**	Industrial Management	3	0	0	40	60	**100**	**3**
GE	**GE33111/ GE33115**	Generic Elective - I	3	0	0	40	60	**100**	**4**
C	**BCE3601**	Transportation Engineering - II	3	1	0	40	60	**100**	**4**
C	**BCE3602**	Environmental Engineering - II	3	1	0	40	60	**100**	**4**
C	**BCE3603**	Design of Concrete Structures-II	4	1	0	40	60	**100**	**4**
C	**BCE3604**	Construction Technology & Management	3	1	0	40	60	**100**	**3**
C	**BCE3651**	Structural Detailing Lab	0	0	2	40	60	**100**	**1**
C	**BCE3652**	CAD Lab-I	0	0	2	40	60	**100**	**1**
C	**BCE3653**	Survey Camp	0	0	2	100	0	**100**	**1**
	GP3601	General Proficiency	-	-	-	100	0	**100**	**1**
Total			**19**	**4**	**6**	**520**	**480**	**1000**	**26**

Note :A student needs to undergo 4 – 6 weeks of Industrial training that will be evaluated in the Seventh Semester.A Survey Camp will be held after the Fifth Semester and in the beginning of Sixth Semester.

Legends:

L Number of Lecture Hours per week

T Number of Tutorial Hours per week

P Number of Practical Hours per week

CIA Continuous Internal Assessment

ESE End Semester Examination

Category of Courses:

F Foundation Course

C Core Course
GE Generic Elective
OE Open Elective

Babu Banarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Bachelor of Technology

Evaluation Scheme (w.e.f 2019-20)

SEMESTER VII									
Course Category	**Course Code**	**Code Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
OE		Open Elective-I*	3	1	0	40	60	**100**	**4**
GE	**GE33121/ GE33125**	Generic Elective - II	3	1	0	40	60	**100**	**4**
GE	**GE33131/ GE33134**	Generic Elective - III	3	1	0	40	60	**100**	**4**
C	**BCE3701**	Design of Steel Structures	3	1	0	40	60	**100**	**4**
C	**BCE3702**	Quantity Survey & Estimation	3	1	0	40	60	**100**	**4**
C	**BCE3751**	CAD Lab-II	0	0	2	40	60	**100**	**1**
C	**BCE3752**	Industrial Training	0	0	2	100	0	**100**	**1**
C	**BCE3753**	Project - I#	0	0	2	100	0	**100**	**1**
C	**BCE3754**	Seminar	0	0	2	100	0	**100**	**1**
	GP3701	General Proficiency	-	-	-	100	-	**100**	**1**
Total			**15**	**5**	**8**	**640**	**360**	**1000**	**25**

*Student will select any one of the open elective from the list of open electives provided by the University.

#Student need to submit an abstract for the project, select the guide and will complete at least 20% of the project work.

Legends:

L Number of Lecture Hours per week
T Number of Tutorial Hours per week
P Number of Practical Hours per week
CIA Continuous Internal Assessment
ESE End Semester Examination

Category of Courses:

F Foundation Course
C Core Course

GE Generic Elective
OE Open Elective

Babu Banarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Bachelor of Technology

Evaluation Scheme

List of Open Elective offered by the Department

Course Category	Course Code	Code Title	Contact Hours			Evaluation Scheme			Credits
			L	T	P	CIA	ESE	Course Total	
OE	**OE33101**	Disaster Management	4	0	0	40	60	100	4
Total			**4**	**0**	**0**	**40**	**60**	**100**	**4**

Babu Banarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Bachelor of Technology

Evaluation Scheme (w.e.f 2019-20)

SEMESTER VIII									
Course Category	**Course Code**	**Code Title**	**Contact Hours**			**Evaluation Scheme**			**Credits**
			L	**T**	**P**	**CIA**	**ESE**	**Course Total**	
OE		Open Elective – II**	**3**	**1**	**0**	40	60	**100**	**4**
GE	**GE33141/ GE33143**	Generic Elective - IV	**3**	**0**	**0**	40	60	**100**	**4**
GE	**GE33151/ GE33153**	Generic Elective - V	**3**	**1**	**0**	40	60	**100**	**4**
C	**BCE3801**	Water Resource Engineering	**3**	**1**	**0**	40	60	**100**	**4**
C	**BCE3859**	Project – II##	**0**	**0**	**16**	200	300	**500**	**8**
	GP3801	General Proficiency	**0**	**0**	**0**	100	0	**100**	**1**
Total			**12**	**3**	**16**	**460**	**540**	**1000**	**25**

****** Student will select any one of the open elective from the list of open electives provide by the University. The opted subject should be different from the one selected in semester VII.

This is in continuation with the project work started in Semester VII. In this Semester a student will complete the project.

Legends:

L Number of Lecture Hours per week
T Number of Tutorial Hours per week
P Number of Practical Hours per week
CIA Continuous Internal Assessment
ESE End Semester Examination

Category of Courses:

F Foundation Course
C Core Course
GE Generic Elective
OE Open Elective

Babu Banarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Bachelor of Technology

Evaluation Scheme (w.e.f 2019-20)

Credit Summary Chart

Course Category	Semester								Total Credits	%age
	I	II	III	IV	V	VI	VII	VIII		
F	16	11	0	0	0	0	0	0	27	**12.92**
C	10	16	25	25	25	21	12	12	146	**69.86**
GE	0	0	0	0	0	4	8	8	20	**9.57**
OE	0	0	0	0	0	0	4	4	8	**3.83**
GP	1	1	1	1	1	1	1	1	8	**3.83**
Total	**27**	**28**	**26**	**26**	**26**	**26**	**25**	**25**	**209**	**100 %**

Discipline wise Credit Summary Chart

Course Category	Semester								Total Credits	%age
	I	II	III	IV	V	VI	VII	VIII		
Basic Sciences	10	12	4	3					**29**	**13.88**
Humanities & Socials Sciences	0	4	2	2	3	3			**14**	**6.70**
Engineering Sciences	16	11							**27**	**12.92**
Professional Subject Core			19	20	22	17	9	4	**91**	**43.54**
Professional Subject - General Elective						4	8	8	**20**	**9.57**
Professional Subject -Open Elective							4	4	**8**	**3.83**
GP + Project Work, Seminar and / or Internship in Industry or elsewhere.	1	1	1	1	1	2	4	9	**20**	**9.57**
Total	**27**	**28**	**26**	**26**	**26**	**26**	**25**	**25**	**209**	**100 %**

Babu Banarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Bachelor of Technology

Evaluation Scheme (w.e.f 2019-20)

Course Code	Generic Elective-I
GE33111	Techniques for Ground Improvement
GE33112	Prestressed Concrete Design
GE33113	Matrix Analysis of Structures
GE33114	Traffic Engineering
GE33115	Remote Sensing and GIS

Course Code	Generic Elective-II
GE33121	Advanced Foundation Design
GE33122	Analysis & Design of Bridges
GE33123	Rural Water Supply and Sanitation
GE33124	Environmental Management in Industries
GE33125	Precast And Modular Construction Practices

Course Code	Generic Elective-III
GE33131	Industrial Pollution Control
GE33132	Environmental Geotechnology
GE33133	Tunnel Engineering
GE33134	River Engineering

Babu Banarasi Das University, Lucknow

Department of Civil Engineering

School of Engineering

Bachelor of Technology

Evaluation Scheme (w.e.f 2019-20)

Course Code	Generic Elective-IV
GE33141	Advanced Concrete Design
GE33142	Concrete Science & Mix Design
GE33143	Industrial Pollution Control and Environmental Audit

Course Code	Generic Elective-V
GE33151	Earthquake Resistant Design
GE33152	Hydraulic Structures
GE33153	Groundwater Management

BCE3301 CIVIL ENGINEERING MATERIALS & CONSTRUCTION

Course Objective:

1. To give knowledge on the basic materials used for construction.
2. Use of proper material as per the Indian standards.
3. To give basic knowledge of building as per national building code.
4. To know about the components of building.

Learning Outcome:

1. To know the basics of Cement, Aggregate, Concrete, Bricks, Timber and Glass.
2. It illustrates mortar, paints insulating materials and its properties.
3. It gives exposure on components of the building and its construction principle and termite treatment.
4. Gives the basics of doors, windows, roofs and different non-structural components of the building.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Cement and Aggregates** Methods of manufacturing of cement and its chemistry, Types of cement and their properties, hydration mechanism, Testing of cement, Grading, shape and texture of aggregates, Properties of aggregates. **Concrete** Properties of fresh concrete, Tests on fresh and hardened concrete, Factors affecting Strength of concrete, durability of concrete, Introduction to mix design- IS code Method. **Bricks** Manufacture of clay bricks, and their classification, Properties of clay bricks and their testing, Problems of efflorescence & lime bursting in bricks. **Timber** Classification and identification of timber. Defects in	30 Hours	1

	timber, Factors affecting strength of timber, Seasoning and preservation of timber.		
II	**Mortars** Classification, Uses, Characteristics of good mortar, Ingredients, Cement mortar, Lime mortar, Lime cement mortar, special mortars. **Paints & Distempers** Paints, varnishes and distempers, Common constituents, types and desirable properties, Cement paints. **Insulating Materials** Insulating Materials, Thermal and sound insulating material, Desirable properties and type.	30 Hours	1
III	**Building Components** Building and its types, Components of building, Construction Principle and Methods for layout, Damp proofing ant termite treatment, vertical circulation means staircases ramp design and construction. Different types of floors, and flooring materials (Ground floor and upper floors). Bricks masonry, Cavity wall hollow block and Waffle slab construction.	30 Hours	1
IV	**Building Construction** Doors, Windows and Ventilators, Roofs types, Lintels and Chajja. Ventilation and Lighting. Firefighting. Plastering different types, pointing, Distempering, Color washing, Painting etc.	30 Hours	1

References:

1. Duggal S. K., "Building Materials", New Age International.

2. Varghese P. C., "Building Materials", PHI Publications.

3. Punmia B. C., "A Text Book of Building Construction", Laxmi Publications, Delhi.

4. Koenisberger O.H., “Manual of tropical housing and building”, Orient Longman.
5. Arora S.P., “AText Book of Building Construction”, DhanpatRai& Sons.

BCE3302 STRUCTURAL MECHANICS

Course Objective:

1. To study basics concepts in strength of materials as deflection, energy principles, stability criteria, theories of failure, locating shear center.
2. To study the basic behavior of columns and their buckling.

Learning Outcome:

1. To analyze the structural elements by energy concepts and find stresses and Deflections.
2. To determine the deflections in beams by various methods like Macaulay's, Area Moment Method.
3. To study Euler's, Rankine's and other theories of columns and locating shear center.
4. To study the stresses in thin cylinders, thick cylinders and compound cylinders

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Compound stress and strains** Introduction, state of plane stress, Principal stress and strain, Mohr's circle. 3-D Stress, Theory of failure, Castigliano's Theorem, Impact load- Three-dimensional state of stress & strain, equilibrium equations, Generalized Hook's Law, Theories of Failure, Castigliano's Theorem	30 Hours	1
II	**Stresses in Beams** Review of pure Bending, Direct and shear stresses in beams due to transverse and axial loads, composite beams. **Deflection of Beams** Equation of elastic curve, cantilever and simply supported beams, Overhanging beams, Macaulay's	30 Hours	1

	method, area moment method. **Torsion** Review of Torsion, combined bending & torsion of solid & hollow shafts.		
III	**Columns and Struts** Combined bending and direct stress, middle third and middle quarter rules, Struts with different end conditions, Euler's theory and experimental results, RankineGardon Formulae **Shear center** Determination of shear center and flexural axis (for symmetry about both axis and about one axis) for I-section and channel-section.	30 Hours	1
IV	**Thin cylinders & spheres** Hoop and axial stresses and strain, Volumetric strain. **Thick cylinders** Radial, axial and circumferential stresses in thick cylinders subjected to internal or external pressures, Compound cylinders, Stresses in rotating shaft and cylinders, Stresses due to interference fits.	30 Hours	1

References:

1. Hibbeler, "Mechanics of Materials", Pearson Publications
2. Beer, Jhonston, DEwolf and Mazurek, "Mechanics of Materials", TMH
3. Pytel and Singer, "Strength of Materials", Harper Collins
4. Ryder, "Strength of Materials", Macmillan.
5. Timoshenko and Youngs, "Strength of Materials", East West Press.
6. Shames, "Introduction to Solid Mechanics", PHI Publications
7. Rajput R K., "Strength of Materials", S. Chand Publishing
8. Ramamrutham S., "Strength of Materials", DhanpatRai Publications

BCE3303 FLUID MECHANICS

Course Objective:

1. Study of fluids (liquids, gases, and plasmas) rest or motion and itsproperties
2. Nature of fluid and types offlow.
3. Know about continuummechanics,
4. Measurement of boundary layerconditions.

Learning Outcome:

1. It gives the knowledge of fluid properties.
2. It gives the knowledge of different type of flow.
3. It gives the knowledge of discharge measuring with different instruments and conditions.
4. It gives the knowledge of Laminar and turbulent flow.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction about fluid properties** Fluid propertiesand classification, objective**,** Principal of conservation of mass, energy. Capillarity, Cavitation**,** Measurement of pressure by Manometers, Surface Tension**,** The Hydrostatic law, Stability of immersed and floatingbodies, buoyancy, centre of buoyancy, metacentre.	30 Hours	1
II	**Fluid Kinematics** Types of flows; Steady flow, Unsteady flow, Uniform and Non-Uniform flow, Rotational flow, Irrotational flow, 1-D, 2-D, 3-D flows, Streamlines, Path lines and Streak lines, Rotational, Vorticity, Circulation, Velocity potential lines.	30 Hours	1

III	**Flow measuring instruments** EulerEquation, Bernoulli's equation and its applications, Pitot tube, Flow through Orifices meter**,** Venturimeter. Mouthpieces, Nozzles, Sluice gates under free Submerge flow condition, Dimension analysis**,** Angular momentum and forcevortex.	30 Hours	1
IV	**Boundary layers** Laminar flow and Turbulent flow, Boundary layer thickness, Drag and lift, Separation of boundary layer, Methods of separation of boundary layer.	30 Hours	1

References:

1. Fox & Donald, —Introduction to Fluid Mechanics‖ John Wiley &Sons Pvt Ltd
2. Cengel&Cimbala, —Fluid Mechanics‖ TMH, New Delhi
3. White F.M., —Fluid Mechanics‖ TMH, New Delhi
4. Munsen, —Fundamental of Fluid Mechanics‖ Wiley Newyork Ltd
5. Garde R.J., — Fluid Mechanics, SciTech Publications Pvt. Ltd

Shames I.H., —Mechanics of Fluids, McGraw Hill, Int. Student, Education

BCE3304 SURVEYING

Course Objective:

1. To know about the basics of surveying.
2. To know R.L's different stations.
3. To know the basics of curve and plane table survey.
4. To study local attraction and compute area and volume.

Learning Outcome:

1. It gives the knowledge of surveying with different instruments and its importance.
2. It gives the exposure on leveling and contouring.
3. It gives the exposure on curve and plane table survey.
4. To study local attraction and compute area and volume by different methods

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Principal and errors** Importance of surveying to engineers, plane and geodetic surveying, principles of surveying. Classification of surveys, objective of offset, Principles of different methods and their accuracies, Measurement by tape, Error due to incorrect chain, Reference meridians, bearing and azimuths, magnetic declination, Latitude and Departure,local attraction, compass, Theodolite, temporary adjustments, Measurements of horizontal angle, EDM,TS	30 Hours	1
II	**Levelling** Height of Instrument and Rise and Fall method, Principles of stadia systems, Methods of determining elevations. Curvature and refraction, Reciprocal levelling, permanent adjustment of level. Contouring methods and uses, differential leveling.	30 Hours	1
III	**Transition curve and plane table survey** Transition curves, types and their characteristics, Ideal transition curve, Equations of various transition curves.		

	Introduction to vertical curves, stadia system Theory and methods of setting out simple circular curves, Principles of plane table and it'sequipment, Methods, resection by three point problem, two point problem. **Closed Traversing and Area Calculation** Closed survey, Computation of area by trapezoidal and Simpson's rule. Area of closed traverse	30 Hours	1

References:

1. Punamia B. C., "Surveying Vol. I, II", Laxmi Publishers.
2. Chandra A M., "Plane Surveying, Higher Surveying", New Age International Publishers.
3. Duggal S K., "Surveying Vol. I, II", Tata Mcgraw Hill, New Delhi.
4. Subramanian R., "Surveying & Leveling", Oxford University Press.
5. Venkatramaih C., "Text Book of Surveying", University Press.
6. Schofield W.,Mark Breach, "Engineering Surveying", CRC Press.

BCE3351 CIVIL ENGINEERING MATERIALS LAB

Note: Minimum of 8 experiments to be performed by students:

List of experiments:

1. To determine the Normal Consistency of Cement.
2. To determine the Initial and Final Setting time of Cement.
3. To determine the Compressive Strength.
4. To determine the Soundness of Cement.
5. To determine the Fineness modulus of Fine Aggregate.
6. To determine the Bulking and Silt content of Sand.
7. To determine the effect of Water - Cement ratio.
8. To determine the Slump and Compaction Factor.
9. To determine the Compressive Strength of Bricks.
10. To determine the Water absorption in Bricks.
11. To determine the Dimension Tolerance of the Bricks.

BCE3352 ENGINEERING GEOLOGY LAB

Note: Minimum of 6 experiments to be performed by students:

List of experiments:

1. Study of Crystal Models.
2. Study of Mineral Hands Specimens.
3. Study of Rock Hand Specimens, (Igneous, Sedimentary and metamorphic rocks).
4. Study of Optical Properties of rocks and minerals.
5. Classification of rocks based on Hardness.(Hardness Scale).
6. Study of Faults and Folds.
7. Study of Geological maps.

BCE3353 FLUID MECHANICS LAB

Note:At least eight experiments should be performed from the above list.

List of Experiments:

1. To determine the coefficient of discharge of an orifice of a given shape. Also, to determine the coefficient of velocity and the coefficient of contraction of the orifice mouthpiece.
2. To calibrate an orifice meter and study the variation of the co-efficient of discharge with the Reynoldsnumber.
3. To calibrate a Venturimeter and study the variation of the co-efficient of discharge with the Reynoldsnumber.
4. To study the calibrate a bend meter and study the variation of the co-efficient of discharge with the Reynoldsnumber.
5. To study the transition from laminar to turbulent flow and to determine the lower critical Reynoldsnumber.
6. To study the velocity distribution in a pipe and also to compute the discharge by integrating the velocityprofile.
7. To determine Meta-centric height of a given shipmodel.
8. To study the head loss for a suddenenlargement.
9. To study the head loss for a suddenContraction

BCE3354 SURVEYING LAB

Note: Minimum of 8 experiments to be performed by students:

List of experiments:

1. To prepare conventional symbol chart based on the study of different types of topographical maps.
2. To measure bearings of a closed traverse by prismatic compass and to adjust the traverse by graphical method.
3. To find out reduced levels of given points using Auto/dumpy level.
4. To study parts of a Vernier theodolite and measurement of horizontal and vertical angle.
5. Plane tabling by radiation method.
6. Plane tabling by intersection method.
7. Solution of two point problem by resection method.
8. Solution of three point problem by resection method.
9. To determine the height of a vertical structure (e.g. chimney / water tank etc.) using trigonometrically levelling by taking observations in single vertical plane.
10. To study various parts of Electronic Theodolite, Total Station and practice for measurement of distance, horizontal and vertical angles.

BCE3401 STRUCTURAL ANALYSIS I

Course Objective:

1. To know about types of structures and to calculate the degree of static and kinematic indeterminacy of a given structure and exposure on ILD.
2. To know about determinate structure and find slope and deflection using different methods.
3. To know the basics of strain energy concept.
4. To analysis of truss, arches, cables and stiffening girder.

Learning Outcome:

1. Familiar with concept development and key components of Structures.
2. Understand the analysis of different type of structures by using different methods.
3. Illustrate the concept of strain energy.
4. Understanding concept of arches, cables and truss.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction** Forms of structures, Beams, Frames, Trusses, Cables, Arches, Loads and Forces, Free body diagram, Support and connections – reactions, Conditions of equilibrium of forces, Difference b/w determinate and indeterminate structure, Introduction to Static and kinematic indeterminacy, ILD for different type of determinate structures, ILD for Reactions, ILD for Bending moments, ILD for Shear force	30 Hours	1
II	**Statically Determinate Beams** Computation of Shear Force, Axial Thrust, Bending moment, Points of contraflexures, Deflection in Beams, Computation of slope, Computation of deflection, Applications to Simply supported Beams, Overhang Beams, Cantilever beams due to point load and UDL. Double integration method, Moment area method, Conjugate beam method.	30 Hours	1
III	**Strain Energy and Virtual work** Strain energy, Axial force, Bending, Shear, Maxwell's reciprocal theorem, Betti's theorem,	30 Hours	1

	Castigliano'stheorems**,** Applications to find deflection for determinate structures**,** Beams**,** Frames**,** Trusses.		
IV	**Analysis of Pin-Jointed Structure** Introduction to trusses, Analysis of Trusses, Method of joints, Method sections, Method of tension coefficient, Analysis of Deflection of joints of Trusses **Arches** Introduction**,** Types of Arches**,** Analysis of three hinged parabolic and circular Arches**,** Linear arch, Eddy's theorem**.** **Cables** Introduction**,** Analysis**,** Suspension bridges with three and two hinged stiffening girders.	30 Hours	1

References:

1. Ramamrutham S, "Theory of Structures", DhanpatRai Publishing Company (P) Ltd.
2. Reddy C S, "Basic Structural analysis", Tata McGraw-Hill Education Pvt. Ltd.
3. *Wilbur and Norris, "Elementary Structural Analysis", Tata McGraw Hill.*

BCE3402 HYDRAULICS & HYDRAULIC MACHINES

Course Objective:

1. How to identify Open channel and its types.
2. Study the various parameters of uniform flow.
3. Introduction to varied flow and hydraulic jump.
4. How to harness the power of water through different Pumps and Turbine.

Learning Outcome:

1. Introduction to the basic principles and energy-depth relationships in Open channel flow. Various aspects of critical flow, its computations and use in analysis of transitions.
2. Uniform flow resistance and computations .Some aspects relating to compound channels.
3. Varied Flow theory and computations of varied flow profile with sufficient coverage of control points and backwater curve computations in natural channels. Hydraulic jump phenomena in channels of different shapes.
4. Hydraulic machine their calculation of work done, power and efficiency of different machines

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction to Open Channel Flow** Kinds of Open Channel Flow, Channel Geometry, Types and Regimes of Flow, Velocity Distribution in Open Channel, Wide Open Channel, Specific Energy, Critical Flow and Its Computation, Energy in Non-Prismatic Channel. Momentum in Open Channel Flow. Specific Force.	30 Hours	1
II	**Study of Uniform Flow** Qualification Of Uniform Flow, Velocity Measurement, Manning's And Chezy's Formula. Determination Of Roughness Coefficients. Determination Of Normal Depth And Velocity. Most Economical Sections. Non-Erodible Channels. Flows In A Channel Section With Composite Roughness.	30 Hours	1
III	**Varied Flow and Hydraulic Jumps** Dynamic Equations Of Gradually Varied Flow,	30 Hours	1

	Assumptions And Characteristics Of Flow Profiles. Classification Of Flow Profile, Draw Down And Back Water Curves, Profile Determination, Graphical Integration, Direct Step And Standard Step Method. Numerical Methods, Flow Through Transitions, Hydraulic Jump. Types Of Jump. Basic Characteristics Of Jump. Length And Location Of Jump. Jump As Energy Dissipation. Control Of Jump, Basic concepts of Spatially Varied Flow		
IV	**Pumps and Turbines** Application Of Momentum Principle. Impact Of Jets On Plane And Curved Plates, Turbines, Classification, Radial Flow Turbines, Axial Flow Turbines, Impulse And Reaction Turbines. Draft Tube And Cavitation. Performance Of Turbines, Similarity Laws. Centrifugal Pump, Minimum Speed To Start The Pump, Multistage Pumps, Jet And Submersible Pumps. Positive Displacement Pumps, Reciprocating Pump, Negative Slip, Flow Separation Conditions, Air Vessels, Indicator Diagram And Its Variation, Savings In Work Done, Rotary Pumps.	30 Hours	1

References:

1. OJha C.S.P., Berndtsson R., and Chadramouli P.N., "Engineering Fluid Mechanics", Oxford University Press, Dec. 2009.
2. Chanrdamouli P.N., Ojha C.S.P. and Singh K.M., "Hydraulic Machines", Oxford University Press, June 2010.
3. SubramanyaK. ,"Flow through open channels", Tata McGraw Hill.
4. **Bansal**R. K., “A Textbook Of Fluid Mechanics And Hydraulic Machines”, Laxmi Publications (P) Ltd.

BCE3403 GEOINFORMATICS

Course Objective:

1. Capacity building in the field of Remote Sensing &Geoinformatics and their applications in natural resource management, earth and atmospheric sciences, oceanography, urban & infrastructure development, environment and disaster management.

Learning Outcome:

1. To convert the statical data into the graphical form.
2. To study the interaction between the satellite and the earth.
3. To study the ground data from the aerial photographs.
4. To locate features on the ground with the help of GPS.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Geographical information system** Components of GIS, Data acquisition, Raster and Vector formats of data, Topology and its applications, GIS Applications.	30 Hours	1
II	**Remote Sensing** Physics of remote sensing, Ideal remote sensing system, Remote sensing satellites and their data product, Sensors and orbital characteristics, Spectral reflectance curves, resolution and multi-concept, FCC, Satellite Image-Characteristics and formats, Applications of remote sensing. .	30 Hours	1
III	**Aerial photography** Basic terms & Definitions of Aerial Photographs, Scales. Relief displacement and Flight Planning. Stereoscopy, Characteristics of photographic images. Fundamentals of aerial photo-interpretation.	30 Hours	1
IV	**Global positioning system** Satellite navigation System, GPS- Space segment, Control segment, User segment, GPS satellite signals, Receivers, Static, Kinematic and Differential GPS,	30 Hours	1

	Applications of GPS		

References:

1. Chandra A M.,"Higher Surveying", New Age International Publishers.
2. Punamia B.C., "Higher SurveyingVol. I & 11", Luxmi Publication.
3. Anjireddy M, "Remote Sensing & GIS", BS Publications.
4. Agarwal N. K., "Essentials of GPS", Spatial Networks: Hyderabad

BCE3451 CIVIL ENGINEERING DRAWING LAB

Note: Minimum of 6 experiments to be performed by students:

List of experiments:

1. Types of bonds in bricks.
2. Index plan with estimation of boundary wall.
3. Plan, sectional elevation and foundation plan of two rooms set.
4. Different types of staircase, stair well, plan and section of staircase.
5. Plan and sectional elevation of Slab Culvert.
6. Plan, sectional elevation and elevation of duplex unit.
7. Single line drawing of laying of sewer and water supply line.

BCE3452 HYDRAULIC MACHINE LAB

Note: Minimum of 6 experiments to be performed by students:

List of experiments:

1. To determine the Manning's coefficient of roughness 'n' for the bed of a given flume.
2. To study the velocity distribution in an open channel and to determine the energy and momentum correction factors
3. To study the flow characteristics over a hump placed in an open channel.
4. To study the flow through a horizontal contraction in a rectangular channel.
5. To calibrate a broad-crested weir.
6. To study the characteristics of free hydraulic jump.
7. To study rotodynamic pumps and their characteristics
8. To study characteristics of any two turbines (Francis / Kaplan / Pelton)

BCE3453 GEOINFORMATICS LAB

Note: Minimum of 5 experiments to be performed by students:

List of experiments:

1. Demonstration and working on Electronic Total Survey Station.
2. To layout a precise traverse in a given area and to compute the adjusted coordinates of survey stations.
3. Demonstration and working with Pocket/ Mirror stereoscopes, Parallax bar and Aerial photographs.
4. Visual Interpretation using IRS false colour composite.
5. Demonstration and practice work with hand held GPS.
6. Lay out of circular curve by Rankine's method.

BCE3501 GEOTECHNICAL ENGINEERING

Course Objective:

1. To know the classification of soil and it's properties.
2. To know seepage phenomenon
3. To know about the Compaction, Consolidation and Lateral Earth Pressure.
4. To know shear strength of soil and stability of slopes.

Learning Outcome:

1. Understanding of behavior of soil.
2. Understanding the flow of water in soil.
3. Concept of stress developed in soil.
4. Calculation of soil strength and basics of slopes.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Soil** Origin and types of soil, Identification and classification of soils, Index properties, Phase relationship, Consistency, Sensitivity, Clay mineralogy	30 Hours	1
II	**Seepage** Permeability, Factors affecting permeability, Determination of Coefficient of permeability, Equivalent permeability for stratified soil, Seepage, Flow nets, its principles, construction and application, Quick sand condition and piping, Filtration criteria.	30 Hours	1
III	**Compaction, Consolidation and Lateral Earth Pressure** Compaction, Principle of compaction, Light and heavy compaction, factors affecting compaction, Consolidation, Types of consolidation, Terzaghi's theory of one-dimensional consolidation, Estimation of consolidation settlement, Lateral earth pressure, Earth pressure at rest, Active earth pressure, Passive earth pressure, Rankine earth pressure theory.	30 Hours	1
IV	**Shear Strength of Soil and Stability of Slope** Shear strength, Shear Stress envelope, Evaluation of	30 Hours	1

	shear strength parameters, Tests for shear strength, Direct shear test, Vane shear test, Unconfined compression test. Slopes, types of slopes, Stability of infinite slope, Stability of finite slope, Slope protection.		

References:

1. Venkataramaiah C., “Geotechnical Engineering”, New Age International Publishers.
2. RanjanGopal and Rao A.S.R., “Basic and Applied Soil Mechanics”, New Age International Publishers.
3. Punmia B.C., Ashok Kumar Jain, “Soil Mechanics and Foundations”, Laxmi Publications.
4. Arora K R., “Soil Mechanics & Foundation Engineering”, Standard Publishers and Distributors.

BCE3502 ENVIRONMENTAL ENGINEERING I

Course Objective:

1. Water demand assessment for planning of supply in community.
2. Learning about different water sources available for supply and the man-made sources of water.
3. Required standard quality of water, to be used for different purposes; diseases that can result from impure water; and the treatment of impure water to make it usable.
4. To study about the air pollution and noise pollution.

Learning Outcome:

1. Population forecasting and assessment of probable water demand. Useful for planning water works in colonies or communities etc.
2. The knowledge on Water sources and their types is very important to decide on the most suitable and economically viable water source as per the need. Also, working of well to have underground water is useful.
3. Water to be delivered must be examined before delivering. Hence, correct way of sampling and tests performed must be learnt.
4. To develop Awareness of air pollution.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Water Demand** Population forecasting, design period, estimation of water demand for various uses, factors affecting consumption and fluctuation of demand. Water Quality- Impurities – types and their effects, sampling & analysis, water borne diseases and their control, water quality standards (potable and industrial)	30 Hours	1
II	**Water Purification** Sedimentation, Coagulation and Flocculation, Types of coagulants, Filtration, Disinfection, Water softening techniques, Miscellaneous methods of Treatment. Distribution System- Requirements, Classification, Layout, storage reservoir yield and capacity estimation by mass-curve method, concept of service and balancing reservoirs, Design Analysis (Hardy - Cross method	30 Hours	1

III	**Structure and composition of Atmosphere** Definition, Scope and Scales of Air Pollution Sources and classification of air pollutants and their effect on human, vegetation and materials, Factors affecting Selection of Control Equipment , Working principle, Design and control of particulate contaminants, Gas Particle Interaction, – Working principle, Design and performance equations of Gravity Separators (cyclone) ,Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators	30 Hours	1
IV	**Noise pollution and control** Definition of decibel, sound power level, sound intensity level and sound pressure level; measurement of noise level; basic concept of community noise, transportation noise and industrial noise; acceptable outdoor and indoor noise levels; effects of noise and control measures.	30 Hours	1

References:

1. Peavy, Rowe and Tchobanoglous, "Environmental Engineering", TMH
2. C.Stern Arthur, ' Air Pollution (Vol.I – Vol.VIII)', Academic Press, 2006.
3. Garg S.K., "Water Supply Engineering (Environmental Engineering Vol.– I)", Khanna Publications.
4. Garg S.K., "Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II)", Khanna Publications.

BCE3503 TRANSPORTATION ENGINEERING I

Course Objective:

1. Role of the various modes of Transportation in our life.
2. Various types of roads, pavements and the geometric designing principles of highway.
3. The materials used in the designing of road and related terminology.
4. The methods by which the designing of roads is undertaken

Learning Outcome:

1. Helpful in identifying and classifying the various modes of transport, need for means of transport.
2. Students will develop an understanding for the different types of roads, plans related to making roads in our country.
3. Students will develop a sense awareness for the different types of materials by which road can be constructed with their advantages and disadvantages.
4. Methods employed in the construction of roads will be learned with the advantages of each.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction to Roads and Highways** Role of Transportation, Modes of Transportation History of road development, Nagpur road plan, Bombay road plan & 3rd 20 Year Road Plan, Road types and pattern. Geometric Design: Cross sectional elements, camber, shoulder, sight distance, PIEV theory, horizontal curves, super elevation, extra widening, transition curves and gradient, vertical curves, summit and valley curves. Modes and Role of Transportation Engineering, Terminals, Modes of travel and their co-ordination.	30 Hours	1
II	**Highway Planning and Surveying** Necessity, Road Development Plans, Classification of Roads, Road Patterns & Networking, Highway Alignment & Re-Alignment. **Geometric Design** Elements, Specifications and Design principles.	30 Hours	1

III	**Road Construction materials and Methods** Properties of Subgrade, Aggregates & Binding materials, Various tests and specifications. Marshall Mix Design, WBM and Asphaltic Concrete, Cement Concrete road construction. **Design of Highway Pavement** Types of Pavements, Design factors, Design of Flexible Pavement by CBR method (IRC : 37-2001), Design of rigid pavement, Westergaard's theory, load and temperature stresses, joints, IRC method of rigid pavement design.	30 Hours	1

References:

1. Khanna S. K. &.Justo C.E.G, "Highway Engineering", Nem Chand and Bros.
2. Kadiyali L. R., "Transportation Engineering", Khanna Publications.
3. Sharma S. K., "Highway Engineering", S Chand and Company
4. Chakraborty P. & Das A., "Principles of Transportation Engineering", Prentice Hall (India), New Delhi,

BCE3504 STRUCTURAL ANALYSIS II

Course Objective:

1. To know about the indeterminate structure.
2. To know about two hinged arch and plastic analysis.
3. To know about different method of analysis.
4. To analyze the different structures by Matrix Approach.

Learning Outcome:

1. Exposure on indeterminate structures.
2. Illustrates about two hinged arch and plastic analysis.
3. Exposure on the analysis of indeterminate structure by different methods.
4. Exposure on the analysis of indeterminate structure by Matrix Approach.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Indeterminate Beams** Indeterminate Beams Analysis, Propped cantilever, Fixed Beam, Continuous beams, Sinking of support, Three moment equation, Muller-Breslau's Principle, Applications for drawing influence lines for indeterminate beams and trusses.	30Hours	1
II	**Two Hinged Arches** Introduction, Analysis of Parabolic Arches, Circular Arches. Basics of Plastic Analysis, Introduction, Application of Static theorem, Kinematic theorem, Beams, Building frames.	30 Hours	1
III	**Methods of Analysis** Classical Displacement Method, Slope deflection method, Moment distribution method, Classical Force Method, Consistent deformation method, Column analogy method.	30 Hours	1

IV	**Matrix Methods of Structural Analysis** Introduction, Stiffness Coefficients, Flexibility Coefficients, Analysis by Flexibility Matrices, Stiffness Matrices.	30 Hours	1

References:

1. Ramamrutham S, "Theory of Structures", DhanpatRai Publishing Company.
2. *Wilbur and Norris*, "*Elementary Structural Analysis*", *Tata McGraw Hill.*
3. Reddy C S, "Basic Structural Analysis", Tata McGraw-Hill Education Pvt. Ltd.

BCE3505 DESIGN OF CONCRETE STRUCTURES I

Course Objective:

1. To know the basics of WSM
2. To know the basics of LSM
3. To know the behaviour of Section in Shear & bond as well as slab.
4. To know about the columns.

Learning Outcome:

1. Illustration on WSM for different sections.
2. Illustration on LSM for different sections.
3. Exposure on the behaviour of RC beams in shear and design of slab.
4. Exercise on design of columns for uniaxial and biaxial load.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Working Stress Design** Introduction to Reinforced Cement Concrete, Assumption in Working Stress, Design Method, Distribution of Stresses on the cross section in bending, Analysis and Design of a rectangular singly and doubly reinforced section, T and L sections for flexure.	30 Hours	1
II	**Limit State Design** Assumptions in Limit State Design Method, Design of Rectangular Singly and Doubly Reinforced beams, T-beams, L-beams.	30 Hours	1
III	**Behaviour of Section in Shear & bond** Behavior of RC beam in Shear, Shear Strength of beams with and without shear reinforcement, Minimum and Maximum shear reinforcement, design of beam in shear, Introduction to development length, Anchorage bond, flexural bond, Failure of beam under shear, Concept of Equivalent Shear and Moments. Design of one way and two way solid slabs	30 Hours	1
IV	**Design of Columns** Classification of Compression members, Effective	30 Hours	1

	height of columns, Assumptions, Minimum eccentricity, Short column under axial compression, requirements for reinforcement, Column with helical reinforcement, Short column under axial load and uni-axial bending, Design of Columns using IS-456 Design Aids with Uniaxial and biaxial bending.		

References:

1. Jain O. P. & Jai Krishna, "Plain and Reinforced Concrete Vol. I & II", Nem Chand & Bros.
2. JainA. K., "Reinforced Concrete: Limit State Design", Nem Chand & Brothers.
3. Ramamrutham S., "Design of Reinforced Concrete Structures", DhanpatRai Publications.
4. Punmia B C, "R. C. C Design(Reinforced Concrete Structures)",Laxmi Publications-New Delhi.

BCE3551GEOTECHNICAL ENGINEERING LAB

Note: Minimum of 8 experiments to be performed by students:

List of experiments:

1. To determine the size of aggregates by Sieve Analysis.

2. To determine specific size distribution of soil particles using Hydrometer Analysis.

3. To determine Liquid & Plastic Limit.

4. To determine Shrinkage Limit.

5. To perform Proctor Compaction test for optimum moisture content.

6. To determine Relative Density.

7. To determine In Situ Density – Core cutter & Sand Replacement.

8. To determine permeability.

9. To perform Direct Shear Test.

10. To perform Auger Boring.

11. To perform Static Cone Penetration Test.

12. To perform Standard / Dynamic Cone Penetration Test.

BCE3552ENVIRONMENTAL ENGINEERING LAB

Note: Minimum of 8 experiments to be performed by students:

List of experiments:

1. Determination of turbidity, colour and conductivity.
2. Determination of pH, alkalinity and acidity.
3. Determination of hardness and chlorides.
4. Determination of residual chlorine.
5. Determination of most probable number of coliforms.
6. Measurement of air pollutants with high volume sampler.
7. Determination of total, suspended and dissolved solids.
8. Determination of BOD.
9. Determination of COD.
10. Determination of kjeldahl nitrogen.
11. Determination of fluoride.

BCE3553TRANSPORTATION ENGINEERING LAB

Note: Minimum of 8 experiments to be performed by students:

List of experiments:

1. Crushing Value Test of Aggregate
2. Impact Value Test of Aggregate
3. Los Angeles Abrasion Value of Aggregate
4. Shape Test (Flakiness Index, Elongation Index) of Aggregate
5. Penetration Test of Bituminous Sample
6. Softening Point Test of Bituminous Sample
7. Stripping Test of Bituminous Sample
8. Ductility Test of Bituminous Sample
9. Flash & Fire Point Test of Bituminous Sample
10. Classified both directional Traffic Volume Study
11. Traffic Speed Study (Using Radar Speedometer or Enoscope)

BCE3601 TRANSPORTATION ENGINEERING II

Course Objective:

1. Beginning of railways in India, types of rails and related terminology. Various materials needed in the construction of railways and their importance.
2. Railway track Geometry being explained in detail. Importance of the topography in designing rails.
3. Determination of the type of site suitable for railway station construction.
4. Air Transport along with its advantages over other means of transport .Water transports its types and demand.

Learning Outcome:

1. Requirements of railways, various rail types and features will be made to understand. Materials that are used in railways will be taught.
2. Laying down of the rails, site selection, and geometry of the rail tracks will be explained .The arrangements that are required to be made for railways will be expressed.
3. What are the areas suitable for making a railway station, their requirements, systematically signals need be explained.
4. How have airways proved to be a boon, their terminology and airports functioning will help students know the system closely.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction to Indian Railways** Development and organization of Indian Railways. Permanent way- Sub-grade, formation, embankment and cutting, track drainage. **Rails, its fastenings, Sleepers and Ballasts** Rail gauges, types of rails, defects in rails, rail failure, creep of rail. Rail Fastenings: Fish plates, spikes, chairs, keys, bearing plates. Sleepers: Timber, steel, cast iron, concrete and prestressed concrete sleepers, manufacturing of concrete sleepers, sleeper density. Ballast: Ballast materials, size of ballast, screening of ballast, specification of ballast, tests on ballast.	30 Hours	1
II	**Railway Track Geometry** Gradients, horizontal curves, super-elevation, safe speed	30 Hours	1

	on curves, cant deficiency, negative super elevation, compensation for curvature on gradients, track resistance and tractive power. **Points & Crossings** Elements of a simple turn-out, details of switch, details of crossings, number & angle of crossings, design of turn-out.		
III	**Stations & Yards** Site selection for a railway station, layout of different types of stations, classification of stations, brief introduction to platforms, types of railway yard, functions of Marshalling yards. **Signalling& Interlocking** Classification of signals, method of train working, absolute block system, mechanical interlocking of a two line railway station	30 Hours	1
IV	**Airport Engineering** Air craft characteristics affecting airport design;Runway operation; Runway pavement design, Runway lighting and marking heliport. Water Transport Harbors; Layout and port facilities; Inland waterways; Inland water operation.	30 Hours	1

References:

1. Arora S. P. &Saxena S. C., "A Text Book of Railway Engineering", DhanpatRai Publications.
2. Rangwala, "Railway Engineering", Charotar Publishing House.
3. Rangwala S C, "Airport Engineering", Charotar Publishing House.
4. Saxena S C, "Airport Engineering: Planning and Design", CBS Publisher.

BCE3602 ENVIRONMENTAL ENGINEERING II

Course Objective:

1. Study of properties essential for the usability of water; disposal of waste water
2. Detailed study of sanitary system and engineering including designing of sewers.
3. Waste water treatment: primary, secondary, tertiary.
4. To study the disposal of solid waste.

Learning Outcome:

1. Water parameters on which its purity can be deduced, are important to be well understood, for choosing it to be used for different purposes. Also, the disposal of industrial and domestic waste correctly is important.
2. Whole science of delivering the disposed waste water to the treatment plant is sanitary science. The construction of sewer lines and planning on delivery of the waste has to be properly understood.
3. The next step is the treatment of waste water to make is environmentally friendly to be dumped, or to make it usable for domestic purposes.
4. To develop awareness about solid waste management.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Waste Water Characteristics** Constituent of sewage, physical & chemical, oxygen demand, BOD, COD, Relative Stability, population equivalent, Biological characteristics, sewage treatment system, Sewer Design, hydraulic design, minimum & maximum flow. Waste Water Flow: Estimation of Dry Weather Flow and Storm Water, Variation of flow, Estimation of design discharges	30 Hours	1
II	**Waste Water Treatment** Flow diagram of conventional sewage, treatment plant, and Primary treatment – screens, Grit Chambers, detritus tank, skimming tank, sedimentation – Plain & Chemical. Secondary treatment – Trickling fitters, Biological contactor, Activated sludge process, oxidation pond and ditches, aerated lagoon.	30 Hours	1
III	**Anaerobic digestion of sludge** Design of low and high rate anaerobic digesters and	30 Hours	1

	septic tank, soak pit, soak trench. Basic concept of anaerobic contact process, anaerobic filter, anaerobic fixed film reactor, fluidized bed and expanded bed reactors and up flow anaerobic sludge blanket (UASB) reactor. Sludge disposal		
IV	**Types and Sources of solid and hazardous wastes** Need for solid and hazardous waste, Waste disposal options – Disposal in landfills - Landfill Classification, types and methods, site selection - design and operation of sanitary landfills, secure landfills and landfill bioreactors – leachate and landfill gas management – landfill closure and energy recovery options	30 Hours	1

References:

1. Peavy, Rowe and Tchobanoglous, “Environmental Engineering”, TMH
2. Metcalf and Eddy Inc., “Wastewater Engineering”, TMH
3. Garg, “Water Supply Engineering (Environmental Engineering Vol.– I)”, Khanna Publications.
4. Garg, “Sewage Disposal and Air Pollution Engineering (Environmental Engineering Vol. – II)”, Khanna Publications.

BCE3603 DESIGN OF CONCRETE STRUCTURES II

Course Objective:

1. To bring about an exposure to advanced topics in structural design comprising of RCC retaining walls, water tanks, Flat Slab, curved beam, footing and a brief knowledge about pre-stress concrete.

Learning Outcome:

1. To design the Flat Slab and curved beam.
2. To design RCC cantilever and counterfort retaining walls and footings
3. To design different type of water tanks including underground and overhead tanks.
4. To analyze prestressed concrete sections and design of beams.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Design of Flat Slab** Design of flat slabs with and without drops Design of Curved Beam: Analysis and design of beam curved in plan	30 Hours	1
II	**Design of Footings** Structural behavior of footings, design of footing for a wall and a single column, combined rectangular and trapezoidal footings, Design of strap footing **Design of Retaining Walls** Types of retaining walls. Structural behavior of retaining wall, stability of retaining wall against over-turning sliding and pressure developed under the base, Design of T-shaped retaining wall, Concept of counterfort retaining wall	30 Hours	1
III	**Water tanks** Design of Circular Water Tanks, Design criteria, material specifications and Permissible stresses for water retaining structures, Design of circular water tanks with fixed & flexible base situated on the	30 Hours	1

	ground/underground. Design of Rectangular Water Tanks situated on the ground and underground using approximate method and IS- code method.		
IV	**Prestressed Concrete Design** Advantages of prestressing, methods of prestressing, Losses in prestress, analysis of simple prestressed rectangular and T-section. Introduction to design of element, load balancing concept, profile of cable.	30 Hours	1

References:

1. Jain O. P. & Jai Krishna, "Plain and Reinforced Concrete Vol. I & II", Nem Chand & Bros.
2. JainA. K., "Reinforced Concrete: Limit State Design", Nem Chand & Brothers**.**
3. Ramamrutham S., "Design of Reinforced Concrete Structures", DhanpatRai Publications.
4. Punmia B C, "R. C. C Design (Reinforced Concrete Structures)", Laxmi Publications-New Delhi.
5. RajuKrishna, "Prestressed Concrete", Tata Mcgraw Hill Education Private Limited.

BCE3604 CONSTRUCTION TECHNOLOGY & MANAGEMENT

Course Objective:

1. To know about the basics of management and Network Techniques.
2. To know about the concept of Engineering Economics and Equipment.
3. To know about the Contract Management and tender preparation.

Learning Outcome:

1. Exposure onbasics of management andNetwork Techniques.
2. Exposure onconcept of Engineering Economics and Equipment.
3. Exposure on Contract Management and tender preparation.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Elements of Management** Project cycle, Organization, Planning, Scheduling, monitoring, updating and management system in construction **Network Techniques** Bar charts, milestone charts, Work break down structure and preparation of networks. Application of network Techniques in construction management like PERT, GERT, CPM AON and AOA. Project monitoring, cost planning, resource allocation through network techniques, Line of balance technique.	30 Hours	1
II	**Engineering Economics** Time value of money, Present economy studies, Equivalence concept, financing of projects, Economic comparison present worth method Equivalent annual cost method, discounted cash flow method, analytical criteria for postponing of investment retirement and replacement of asset, Depreciation and break even cost analysis. **Equipment Management** The work motion study, Simulation techniques for resource scheduling. Construction equipment's for earth	30 Hours	1

	moving, Hauling equipment's, Hoisting equipment's, Conveying equipment's, Concrete Production Equipment.		
III	**Contract Management** Legal aspects of contraction, laws related to contracts land acquisition, labour safety and welfare, Different types of contracts, their relative advantages and disadvantages. Elements of tender preparation, Process of tendering pre-qualification of contracts, Evaluation of tenders, Contract negotiation and award of work, Monitoring of contract extra items, Settlements of disputes, arbitration, pre-requisites of arbitrator and commissioning of project.	30 Hours	1

References:

1. Peurify R.L., "Construction Planning Equipment and Methods", T.M.H., International Book Company.
2. Srinath L.S., "PERT & CPM Principles and Applications", E.W.P. Ltd., New Delhi.
3. Bhatnagar S.K., "Network Analysis Techniques", Willey Eastern Ltd.
4. Sarkar, "Construction Technology", Oxford University Press, USA.

GE33111 TECHNIQUES FOR GROUND IMPROVEMENT

Course Objective:

1. To know about compaction and mixes.
2. To understand various methods and techniques used.
3. To understand densification methods in clay.
4. To understand grouting.
5. To know about underpinning foundation.
6. To know use of granular piles.

Learning Outcome:

1. Able to design mixes.
2. Knowledge of densification methods in granular soil.
3. Knowledge of densification methods in cohesive soil.
4. Application of grouting.
5. Knowledge of geotextiles.
6. Knowledge about underpinning foundation and granular piles.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Compaction and Mixes** Review of compaction theory, effect of compaction on surface behavior, Field methods of compaction, Quality Control, Design of Mixes, Design of soil-lime Mix, Design of soil-cement Mix, Design of soil-bitumen Mix, Design of soil-lime-fly ash Mix	30 Hours	1
II	**Methods and Techniques** In-situ densification methods in granular soils, Deep compaction, Introduction, Terra-Probe, Vibroflotation techniques, Ground Suitability for Vibroflotation and Advantages, Mueller Resonance Compaction, Dynamic Compaction, Depth of Improvement	30 Hours	1
III	**Densification Methods in Cohesive Soil and Grouting** In-situ densification methods in cohesive soil, Introduction, Pre-loading and de-watering, Vertical drains, Electrical method, Thermal method, Grouting- Introduction, suspension grout, solution	30 Hours	1

	grout, grouting equipment, Grouting methods, design and layout		
IV	**Geotextiles and Ground Improvement** Granular Piles, Underpinning of foundations and Geotextiles- granular piles, Ultimate bearing capacity and settlement, method of construction, load test, Underpinning of foundations, importance and situations for underpinning, methodology and typical examples, Geotextiles, types and functions, specification, precautions in transportation and storage.	30 Hours	1

References:

1. Garg S. K., "Soil Mechanics & Foundation Engineering", KhannaPublishsers.
2. GopalRanjan and A.S.R. Rao, "Basic and Applied Soil Mechanics", New Age International Publishers.
3. Mandal J. N. – Geosynthetics World.
4. Bergado D., "Soft Ground Improvement", CRC Press.
5. Koerner, R. M., "Designing with geosynthetics", Xlibris Corp.

GE33112PRESTRESSED CONCRETE DESIGN

Course Objective:

1. To provide an exposure to the design of Prestressed Concrete Structures and Structural Elements.

Learning Outcome:

1. To introduce prestressing methods, principles and concepts and to determine losses in prestress& anchorage zone stresses
2. To design of prestressed concrete beams, stresses at transfer, service load, Design of End Blocks.
3. To compute the strength of the beam and behaviour in Tension and Compression members.
4. To design prestressed concrete slabs, and Application of Prestressed Concrete in Bridges.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Basic concepts of prestressing, Type of concrete and steel used in Prestress work, prestressing systems, allowable stresses, Losses in prestressing, Effect of shrinkage, Creep and Stretching of wires, etc	30 Hours	1
II	Analysis and Design of Prestressed concrete Beams in bending and shear, Cable profiles, Design of End Blocks	30 Hours	1
III	Calculation of Deflection and Ultimate Strength of a Prestressed Beam, Importance of control deflection, Short term deflections of uncracked members, Prediction of long time deflections, deflections of cracked members, Use of Prestressed Concrete in Tension and Compression Members	30 Hours	1
IV	Types of prestressed concrete slab, design of one-way slab, design of two-way slab, design of simple flat slab, Application of Prestressed Concrete in Bridges	30 Hours	1

References:

1. Krishnaraju .R, “PrestressedConcrete”,Tata McGraw-Hill Education, New Delhi, 2006
2. Pandit .G.S, Gupta .S.P, “Prestressed Concrete”, CBS Publishers & Distributors, 2008
3. Rajagopalan .N, “Prestressed Concrete”, Alpha Science International, Limited, 2005

GE33113MATRIX ANALYSIS OF STRUCTURES

Course Objective:

1. Basics of matrices and introduction of matrices to the structures.
2. Matrix analysis for truss elements.
3. Matrix analysis for beams.
4. Matrix analysis for Plane frame structures.

Learning Outcome:

1. To enable the student to have a good grasp of all the fundamental issues in these advanced topics in structural analysis, besides enjoying the learning process, and developing analytical and intuitive skills.
2. Exposure on axial elements, truss element by matrix approach.
3. Illustration on beam by matrix approach.
4. Illustration on plane frame by matrix approach.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Matrix Concepts and Matrix Aanalysis of Structures** Matrix vector; basic matrix operations; rank; solution of linear simultaneous equations; eigen values and eigenvectors. Introduction; coordinate systems; displacement and force transformation matrices. Contra-gradient principle; element and structure stiffness matrices. Element and structure flexibility matrices; equivalent joint loads; stiffness and flexibility approaches	30 Hours	1
II	**Matrix Analysis of Structures with Axial Elements** Introduction, Axial stiffness and flexibility; stiffness matrices for an axial element (two dof), plane truss element (four dof) **One-dimensional axial structures** Analysis by conventional stiffness method (two dof per element) and reduced element stiffness method (single dof); Analysis by flexibility method **Plane trusses** Analysis by conventional stiffness method (four dof per	30 Hours	1

	element) and reduced element stiffness method (single dof); Analysis by flexibility method.		
III	**Matrix Analysis of Beams** Conventional stiffness method for beams: Beam element stiffness (four dof); generation of stiffness matrix for continuous beam; dealing with internal hinges, hinged and guided-fixed end supports; accounting for shear deformations **Reduced stiffness method for beams** Beam element stiffness (two dof); dealing with moment releases, hinged and guided-fixed end supports **Flexibility method for fixed and continuous beams**Force transformation matrix; element flexibility matrix; solution procedure(including support movements)	30 Hours	1
IV	**Matrix Analysis of Plane Frames** Conventional stiffness method for plane frames: Element stiffness (six dof); generation of structure stiffness matrix and solution procedure; dealing with internal hinges and various end conditions. **Reduced stiffness method for plane frames** Element stiffness (three dof); ignoring axial deformations; dealing with moment releases, hinged and guided-fixed end supports **Flexibility method for plane frames** Force transformation matrix; element flexibility matrix; solution procedure (including support movements); Ignoring axial deformations	30 Hours	1

References:

1. DevdasMenon, "Advanced Structural Analysis", Narosa Publishing House, 2009
2. AsslamKassimali, "Matrix Analysis of Structures", Brooks/Cole Publishing Co., USA, 1999
3. Amin Ghali, Adam M Neville and Tom G Brown, "Structural Analysis: A Unified Classical and Matrix Approach", Sixth Edition, 2007, Chapman & Hall
4. DevdasMenon, "Structural Analysis", Narosa Publishing House, 2008

GE33114 TRAFFIC ENGINEERING

Course Objective:

1. Role of transportation, Nature of traffic and issued arising out of it.
2. Various methods used to determine the flow of traffic and the vehicular characteristics.
3. Study about the traffic signals, lighting on roads and traffic management.
4. Study of the various theories related to traffic flow.

Learning Outcome:

1. Students will easily learn to figure out the need of transportation as well at the same time the problems faced due to traffic.
2. Clear picture will be set up regarding the traffic studies, road user and traffic characteristics.
3. Need to follow the traffic signals, parking rules and the importance to drive safely.
4. Students will learn the theories related to traffic and the role of other fields in it.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction** Overview of transportation system, nature of traffic problems in cities, Present Scenario of road transport and transport assets, Role of transportation: Social, Political, Environmental, etc. Elements of Traffic Engineering: Vehicular, Driver and Road Characteristics.	30 Hours	1
II	**Traffic Studies** Speed, journey time, delay, traffic flow, volume, capacity, forecasting and statistical methods in traffic engineering, Road user & vehicular characteristics, level of service, sampling technique, parking studies.	30Hours	1
III	**Traffic controls and Regulations** Traffic signs, signals, road markings and traffic control aids, parking and street lighting, accidents studies, Traffic management and regulations, pollution,	30 Hours	1

	Intersection control and design of traffic signals, safety		
IV	**Traffic Flow Theory and Transport system management** Diagram of traffic flow, relationship, Lighthill& Witham's theory, Car following theory, Queneing theory and headways & gaps. Long term and short term planning, use of IT in transportation	30 Hours	1

References:

1. Khanna S. K. &.Justo C.E.G, "Highway Engineering",Nem Chand and Bros.
2. KadiyaliL. R., "Transportation Engineering",Khanna Publications.
3. SharmaS. K., "Highway Engineering",S Chand and Company
4. Chakraborty P. & Das A., "Principles of Transportation Engineering", Prentice Hall (India), New Delhi,
5. Garber, Nicholas J.|Hoel, Lester A., "Principles of Traffic and Highway Engineering", Cengage Learning India.

GE33115 REMOTE SENSING AND GIS

Course Objective:

1. To know about the principles of remote sensing and spectral signatures
2. To know about satellites, types of remote sensing and digital image processing
3. To study about the history and components of GIS
4. To know the applications of remote sensing and GIS

Learning Outcome:

1. Demonstrate the concepts of Electro Magnetic energy, spectrum and spectral signature curves
2. Apply the concepts of satellite and sensor parameters and characteristics of different platforms
3. Apply the concepts of DBMS in GIS
4. Apply GIS in land use, disaster management, ITS and resource information system

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Remote Sensing** Principle -Electro-magnetic energy, spectrum -EMR interaction with atmosphere –Atmospheric Windows and its Significance –EMR interaction with Earth Surface Materials –Spectral Signature and Spectral Signature curves for water, soil and Earth Surface.	30 Hours	1
II	**Satellites** Classification –Satellite Sensors –satellite and sensor parameters -Resolution –Types of Remote Sensing - Visual Interpretation of Satellite Images –Digital Image processing –Characteristics of different platforms: Landsat, SPOT, IRS series, IKONOS, QUICKBIRD –Radar, LIDAR, SAR, MODIS, AMSRE, Sonar remote sensing systems.	30 Hours	1

III	**GIS** History of Development -Components of GIS – Hardware, Software and Organizational Context –Data –Spatial and Non-Spatial –Data Input Sources—DBMS –Data Output -Data models - Raster and Vector data structures –Data compression –Raster vs. vector comparison.	30 Hours	1
IV	**Applications of Remote Sensing and GIS** Advanced applications of GIS –Disaster management, Water resource, Land use –Land cover –Urban planning -Intelligent Transport Systems - Development of Resources Information Systems.	30 Hours	1

References:

1. Burrough P.A. and Rachel A. McDonell, Principles of Geographical Information Systems, Oxford Publication, 2004.
2. C.P. Lo and Albert K. W. Yeung, Concepts and Techniques of Geographical Information Systems, Prentice-Hall India, 2006.
   Thomas. M. Lillesand and Ralph. W. Kiefer, Remote Sensing and Image Interpretation, John Wiley and Sons, 2003.

BCE3701 DESIGN OF STEEL STRUCTURES

Course Objective:

1. To develop knowledge in designing structural elements made of steel
2. To introduce the limit state design of steel structural components subjected to bending, compression and tensile loads including the connections.
3. To design heavy structures made up of steel.

Learning Outcome:

1. To learn the properties of steel sections and design basics and codal provisions Design of connections
2. To learn the behavior of the connections and the strength in each condition (Riveted, bolted and welded).
3. To design steel members subjected to tension and compression members
4. Design steps involved in beams, built up beams and connections in beam column, Lintels, Purlins, Bearing Plates and Introduction to plate girders, gantry girders.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**General Considerations** Structural Steel.Stress-Strain Curve for Mild Steel.Rolled Steel Sections.Design Philosophies.Local Buckling of Plate Elements.Introduction to Plastic Analysis and Design.Introduction to Limit State Steel Design.Probabilistic Basis for Designand Design Criteria.	30 Hours	1
II	**Simple Connections** Introduction to Riveted and Bolted Connections, Types of Bolted Joints, Load Transfer Mechanism,Failure of Bolted Joints,Specification for Bolted Joints,Bearing-Type Connections, Prying Action,Efficiency of the Joint, Slip-Critical Connections,Pin Connections **Simple Welded Connections** Types of welds, Weld Defects, Inspection of Welds, Assumptions in the Analysis of Welded Joints, Analysis and design of Welded Joints such as Groove Welds, Fillet Welds, Intermittent Fillet Welds, Plug and Slot	30 Hours	1

	Welds Design Of Fillet Weld For Truss Members, Distortion of Welded Parts, Failure of Welds, Fillet Weld vs Butt Weld, Welded Jointed vs Bolted and Riveted Joints		
III	**Tension Members** Types of Tension Members, Net and effective Sectional Areas, Modes of Failure, Factors affecting the strength of tension members, Design Strength and design of Tension Member, Lug Angles, Splices, Gusset Plate **Compression Members** Effective Length, Slenderness Ratio (λ) and types of buckling, Classification of Cross Sections, Column Formula, Design of Axially Loaded Compression Members, Built-Up Columns (Latticed Columns), Lacing, Batten,Encased Column, Splices,Design of Column Bases and Caps	30 Hours	1
IV	**Beams** Types of Sections, Behavior of Beam in Flexure,Section Classification, Lateral Stability of Beams,Lateral and Torsional Buckling,Design of Laterally Supported and Unsupported Beams Rolled Beams,Built-Up Beams (Plated Beams), Design of Lintels, Purlins, Bearing Plates.Introduction to Plate Girder and Gantry Girder	30 Hours	1

References:

1. Duggal S. K., “Limit State Design of Steel Structures”, Tata Mcgraw Hill.
2. Subramanian N., “Design of Steel Structures”, Oxford University Press
3. Sairam K S, “Design of Steel Structures”, Pearson Education.

BCE3702 QUANTITY SURVEY & ESTIMATION

Course Objective:

1. To provide hands-on experience on estimation of RCC, steel, masonry buildings and roads and culverts and inculcate the fundamentals of valuation, contracts and tendering.
2. Ton have an awareness regarding specification, analysis of rates, valuation etc. in connection with construction.
3. To prepare detailed estimates by long wall and short wall method.

Learning Outcome:

1. Exposure on the fundamentals of estimation and specification
2. Exposure to rate analysis and basics of estimation
3. Illustrate the fundamentals of valuation
4. Gives the study of valuation by different methods.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction to estimates and specifications** Introduction to Quantity surveying – purpose of estimates. Types of estimates, various items to be included in estimates. Principles in selecting units of measurement for items, various units and modes of measurement for different trades, I.S. 1200, Specifications – purpose and basic principles of general and detailed specifications; detailed specifications for various items of work.	30 Hours	1
II	**Rate Analysis and Quantity Measurement** Taking out quantity, Measurement and abstract sheets and recording. Centre line method. Analysis of rates, factors affecting the cost of materials, labour. Task work, schedule as basis of labour costs. Plants and equipment -hour costs based on total costs and outputs. Transports, octroi. Overhead charges, rates for various items of construction of civil engineering works. Standard schedule of rate, price escalation.	30Hours	1
III	**Fundamentals of valuation** Principles of valuation, definition of value, price and	30 Hours	1

	cost. Attributes of value, Different types of values- Book value, salvage value, scrap value, replacement value, reproduction value, earning value, Market value, Potential value, Distress value, Speculation value, Sentimental value. Accommodation value. Essential characteristics of market value. Valuer and his duties, purpose of valuation and its function.		
IV	**Methods of valuation** Rental method of valuation. Form of rent, different types of rent, standard rent. Value of land, belting method of valuation, Valuation based on land and building- item wise, carpet area basis, unit basis, cubic content basis. Valuation from yield and from life, gross yield and net yield, outgoing, capitalized value, Year's purchases-Single rate and dual rate, reversion value of land, annuity- perpetual, whole life, deferred. Sinking fund.	30 Hours	1

References:

1. Chakraborti M.," Estimating Costing", Specification and Valuation in Civil Engineering",M Chakraborty.
2. Dutta B.N., "Estimating and Costing in Civil Engineering Theory and Practice," UBS Publishers' Distributors (P) Ltd.-New Delhi.
3. Birdie .G.S, "A Text Book on Estimating and Costing", DhanpatRai and Sons, New Delhi.

GE33121 ADVANCED FOUNDATION DESIGN

Course Objective:

1. To know about stresses under loads.
2. To know about bearing capacity and settlement shallow foundations.
3. To know about Pile foundation its criteria and settlement
4. To know about Machine and well foundation

Learning Outcome:

1. Understanding stress development in soil
2. Able to design of shallow foundation
3. Able to design of deep foundation
4. Understanding well and machine foundation

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Stresses under loads** Pressure under loads, Vertical pressures under surface loads, Boussinesq equation, Westergaard's equation, New Mark Charts, Approximate solution	30 Hours	1
II	**Bearing capacity and settlement analysis of shallow foundations** Terzaghi's,bearing capacity equation, Skempton's bearing capacity equation, Meyerhof's bearing capacity equation, BIS bearing capacity equation, Types of settlements, Immediate and consolidation settlements in cohesive soil, De-Beer and Schmmertman's methods of settlement prediction in non-cohesive soil	30 Hours	1
III	**Bearing capacity and settlement analysis of deep foundation** Pile foundation, Classification of piles, load carrying capacity of single piles in clay, silt and sand by dynamic methods, Load carrying capacity of single piles in clay, silt and sand by static methods, Pile load test, Pile group, Negative skin friction, Settlement of pile group	30 Hours	1
	Foundation on expansive soil and Machine foundation Foundation on expansive soil, Construction on expansive soil, Alteration of soil condition, under-reamed piles, Well foundation, Elements of well foundation, Shape of well foundation, Depth of scour,	30 Hours	1

IV	Well sinking, Tilt, shift and their prevention Machine foundation, Classification, Definitions, Design principle in brief. Barken's method		

References:

1. Venkataramaiah C., "Geotechnical Engineering", New Age International Publishers.
2. GopalRanjan and Rao A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers.
3. Punmia B.C., Jain Ashok Kumar, "Soil Mechanics and Foundations", Laxmi Publications.
4. Arora K R., "Soil Mechanics & Foundation Engineering", Standard Publishers Distributors.
5. Murthy VNS, "Advanced Foundation Engineering", CBS Publishers & Distributors-New Delhi.

GE33122ANALYSIS & DESIGN OF BRIDGES

Course Objective:

1. To bring about an exposure to special topics in structural design comprising of RC bridges.
2. To know about prestressed concrete girder bridges,
3. To know about steel bridges,
4. To know about design of T-beam bridge, box culverts, piers and pier caps and Abutments and bearings.

Learning Outcome:

1. To design RCC slab.
2. To design prestressed concrete girder bridges.
3. To design steel bridges.
4. To Design of T-beam bridge, box culverts, piers and pier caps and Abutments and bearings.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction to Bridges** Site selection, various types of bridges and their suitability, loads, forces and IRC bridge loading and permissible stresses, Design of RC slab culvert, Design of RC bridges under concentrated loads using effective width and Pigeauds Method. Courbon's Method of load distribution	30Hours	1
II	**Prestressed Concrete Girder Bridges** Advantages of presstressed concrete slab and girder bridges, suitable spans, design of slab and beam cross sections for given bending moment, shear, prestressing force, eccentricity (analysis of bridges need not be repeated)	30 Hours	1
III	**Steel Bridges** Design and detailing of plate girder, Design and detailing of box girder, Design and detailing of Truss bridges	30 Hours	1
IV	**Design of T-beam bridge** Design of box culverts, Design of piers and pier caps and foundation, Design of Abutments and bearings	30 Hours	1

References:

1. Victor D. J., “Essentials of Bridge Engineering”,Oxford & IBH Publishing Co. Pvt. Ltd.
2. Rajagopalan N., “Bridge Superstructure”, Narosa Book Distributors Pvt. Ltd.
3. Raju, Krishna, “Prestressed Concrete Bridges”, CBS Publisher.
4. RajuN.K., “Design of Bridges”,Oxford &IBH-Pubs Company-New Delhi.
5. Duggal, S K., “Design of Steel Structure”,McGraw Hill Education (India) Private Limited.

GE33123 RURAL WATER SUPPLY AND SANITATION

Course Objective:

1. To learn basic concept of sanitation
2. To design the well, galleries etc.
3. To know the water treatment method
4. Detailed knowledge of water distribution system
5. To study solid waste management and health aspect

Learning Outcome:

1. To develop awareness about rural sanitation
2. Find out appropriate source of water in rural area
3. To develop low cost treatment plant in rural areas
4. Analysis of pipe network system

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Introduction to rural water supply- Concept of environment and scope of sanitation in rural areas. Magnitude of problems of rural water supply and sanitation. Water supply: Design population and demand loads. Various approaches of planning of water Supply schemes in rural areas. Wells, infiltration wells, radial wells and infiltration galleries	30 Hours	1
II	Collection and treatment of water- Collection of raw water from surface source. Specific practices and problems encountered in rural water supply. Methods of treatment of surface and ground waters for rural water supply, Brief Detail of rapid sand filter and slow sand filter, Chlorination ,disinfection	30 Hours	1
III	Planning of distribution system- Pumps, pipe materials, appurtenances used in rural water supply, Planning of distribution system in rural areas. Planning of waste water collection system in rural areas, stabilization ponds, septic tanks, Emerging technologies for water treatment	30 Hours	1
IV	Solid waste management and rural health- solid waste management concept, Disposal of Solid Wastes. Composting, land filling, incineration, Biogas plants, Rural health. Other specific issues and problems encountered in rural sanitation	30 Hours	1

References:

1. Mann H.T. & Williamson D., “Water Treatment and Sanitation – Simple Method for Rural Area”, Practical Action; Revised edition.
2. Steel E.W. &Mcghee T.J., “Water Supply and Sewerage”, McGraw Hill.
3. ‘Manual on Water Supply and Treatment’, CPHEEO, Ministry of Urban Development, Govt. of India.
4. ‘Manual on Sewerage and Sewage Treatment’, CPHEEO, Ministry of Urban Development, Govt. of India.
5. Srinivasan D., “Environmental Engineering”, PHI Learning Pvt. Ltd. 2009.

GE33124ENVIRONMENTAL MANAGEMENT IN INDUSTRIES

Course Objective:

1. To provide knowledge regarding environmental legislations
2. To know the different source of solid waste
3. To categories the different type of solid waste
4. To study physical ,biological ,social aspect of environment
5. To study about EIA and ISO14000

Learning Outcome:

1. To know legal aspect of environmental
2. To develop waste minimization technique
3. To know social aspect of environment along with physical and biological component
4. Case study of environmental pollution for different industries
5. To know the drafting of EIA

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Environmental Legislation** Environmental legislations for setting up and for operation of an industrial activity, Need of Environmental Impact Assessment (EIA) study, Defining the industrial activity- Location, approach, manufacturing processes, raw materials and other inputs of natural resources; Other Pollution control legislations.	30Hours	1
II	**Sources and types of solid waste** Sources and types of wastes. Solid, liquid and gaseous wastes from various industries, Control and removal of specific pollutants in industrial wastewater, e.g., oil and grease, cyanide, fluoride, toxic organics, heavy metals, Solid and hazardous wastes—definitions, concept and management aspects. Recent trends in industrial waste management, Life cycle analysis, clean technologies.	30 Hours	1
III	**Component of Environment** Detailing of the local environment: Physical environment- water, air, land resources &solid wastes, noise emissions, Biological environment- all flora & fauna, Socio-economic environment- history of the area, customs & rituals, Education, health, and developmental profile of the area, specific local environmental issues. Environmental Pollution in Industries.	30Hours	1
IV	**Case study of various industry and Environmental**	30Hours	1

	Clearance Case studies of various industries, e.g., dairy, fertilizer, distillery, sugar, pulp, Environmental Impact Assessment (EIA): definitions, methodologies, ISO and ISO14000 etc. .		

References:

1. Shen, T.T., "Industrial Pollution Prevention Handbook", Springer- Verlag, Berlin.
2. Pandey, G.N. and Corney, G.C., "Environmental Engineering", Tata McGraw Hill, New Delhi.
3. Nancy, J. Sell, "Industrial Pollution Control –Issues and Techniques", Van Nostrand Reinhold Co, NY.
4. Environment (protection) Act- 1986. Any authorized & recent publication on Government Acts.Also available on CPCB/MoEF Website
5. Rao M.N., "Air Pollution" Tata McGraw Hill, 1989.

GE33125 PRECAST AND MODULAR CONSTRUCTION PRACTICES

Course Objective:

1. To overview Precast concrete construction and design of recast prefabrication.
2. Structural Design of joints in prefabricated structures and RMC.
3. To give the concept of productivity analysis, Form work and its design.
4. To study about Modular Construction Practices, its limitations and advantages.

Learning Outcome:

1. It will enable students to understand the concept of prestressed, recast/ prefabricated building components.
2. It will give the knowledge of design of joints, and production of RMC.
3. It will give knowledge of Productivity analysis and Formwork design.
4. It will impart the deep understanding of Modern Construction Practices, their advantages and Limitations.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Overview of reinforced and prestressed concrete construction Design and detailing of recast / prefabricated building components.	30 Hours	1
II	Structural design and detailing of joints in prefabricated structures, Production of (RMC) Ready Mixed Concrete, quality assurance.	30 Hours	1
III	Use of equipments in precast prefabricated structure, Productivity analysis, Economics of form work, Design of Formwork and their reusability.	30 Hours	1
IV	Modular construction Practices, Fibonacci series, its handling and other reliable proportioning concepts. Lamination and Advantages of modular construction.	30 Hours	1

References:

1. Handbook of low cost housing by A K Lal
2. Precast Concrete Structures by Kim Elliot

GE33131INDUSTRIAL POLLUTION CONTROL

Course Objective:

1. Study of air pollutants and their dispersion in atmosphere.
2. Learn sampling and analysis of the pollutants in a particular area.
3. Detailed knowledge of equipment used for gaseous pollution control.
4. To draft the EIA report.

Learning Outcome:

1. To know about the ambient air quality.
2. To learn about the sampling and analysis method of air pollutant.
3. Detailed knowledge of pollution control devices.
4. To discuss case study of various industries regarding EIA.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Air Pollution** Sources, effects and regulations of air Pollutants, Meteorology and dispersion of air pollutants. Major Air pollutants-their sources and effects in quality criteria and Ambient air quality standard.	30 Hours	1
II	**Sampling and analysis** Sampling and analysis of gaseous and particulate air pollutants. Photochemical air pollution and mobile sources; High volume sampler.	30 Hours	1
III	**Pollution control** Gaseous Pollutants Control, Mechanisms to remove particulate contaminants from gas streams, Combustion stoichiometry, Adsorption, Absorption Particulate Emission Control Devices, Mechanisms to remove particulate contaminants from gas streams, Gravitational setting chambers, Centrifugal separators, Wet scrubbers, Fabric Filters, Electrostatic precipitators	30 Hours	1
IV	**Plant Compliance for Managers** EIA, Environmental Audit, Clean Technologies, Case studies of various industries	30 Hours	1

References:

1. Azad A., Singh H., “Industrial Wastewater Management Handbook”,Editor-in-Chief, McGraw Hill, New York
2. Boubel R.W., D.L. Fox, D.B. Turner & A.C. Stern, “Fundamentals of Air Pollution”, Academic Press, New York, 1994.
3. Rao M.N., “Air Pollution” Tata McGraw Hill, 1989.
4. Pandey, G.N. and Corney, G.C., “Environmental Engineering.”, Tata McGraw Hill, New Delhi
5. Environment (protection) Act- 1986

GE33132 ENVIRONMENTAL GEOTECHNOLOGY

Course Objective:

1. To know basics of Environmental Geotechnology.
2. To know bearing capacity of soil.
3. Brief knowledge of ground improvement technique.
4. To study control measure of hazardous waste.
5. To know the engineered land filling.

Learning Outcome:

1. To understand the environmental Geotechnology issues.
2. To find out the bearing capacity of soil.
3. To gain basic knowledge of pile foundation.
4. To study grouting technique.
5. To develop cost effective method of solid disposal.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction to environmental Geotechnology** Introduction, Development of Environmental Geotechnology Aims, Environmental Cycle and their interaction with Geotechnology. Natural environment, cycles of nature. Environmental geotechnical problems	30 Hours	1
II	**Bearing capacity of soil** Load environment factor design criteria, Soil-structure vs structure soil interaction, load and environmental loads. Bearing capacity based on load footing interaction, lateral earth pressure. Pile foundations, environmental factors affecting pile capacity, under-water foundation problems	30 Hours	1
III	**Ground improvement technique** Ash Pond and Mine Tailing Impoundments. Geotechnical re-use of waste materials and fills. Grouting and injection process. Grout used for controlling hazardous wastes, Sinkhole: interaction with environment and remedial action	30 Hours	1
IV	**Solid waste disposal** Sanitary landfills, Selection of waste disposal sites, Landfills for Municipal and Hazardous wastes. Design of liners: clay and synthetic clay liners, incineration	30 Hours	1

Reference:

1. Wentz, C.A., “Hazardous Waste Management”, McGraw Hill, Singapore, 1989
2. Daniel, B.E., “Geotechnical practice for waste disposal”, Chapman and Hall, London, 1993.
3. Fang, H.Y.,“Introduction to environmental Geotechnology”, CRC press New York, 1997.
4. Lagrega, M.d., Bukingham, P.L., and Evans, J.C., “Hazardous Waste Management”, McGraw Hill, Inc. Singapore, 1994

GE33133 TUNNEL ENGINEERING

Course Objective:

1. To know about the tunnel.
2. To know about the analysis and design of tunnel.
3. To know about the Construction & Excavation Techniques.
4. To know about the Ventilation of tunnels and Safety measures.

Learning Outcome:

1. Exposure on tunnel, its suitability with different type of rock.
2. Exposure on analysis and design of tunnel.
3. Exposure on Construction & Excavation Techniques.
4. Exposure on Ventilation of tunnels and Safety measures.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Introduction to Geotechnical Considerations, rock Quality Designation, Rock Mass Rating, Types of Tunnel Sections, with advantages and disadvantages of each.	30 Hours	1
II	Design of Tunnels, Empirical Method, Analytical Method.	30 Hours	1
III	Construction & Excavation Methods, Soft Ground Tunnels, Rock Tunnels,Micro Tunneling Techniques.	30 Hours	1
IV	Ventilation of tunnels, Drainage in Tunnels, Safety Aspects.	30 Hours	1

References:

1. Bickel J O &Kuesel T R, “Tunnel Engineering Handbook”, CBS Publishers & Distributors-New Delhi.
2. Maidl, “Handbook of Tunnel Engineering”, John Wiley.
3. Alan Beard, “Handbook Of Tunnel Fire Safety”, ICE Publishing.

GE33134 RIVER ENGINEERING

Course Objective:

1. Introduction, classification and River Morphology.
2. Behavior of Rivers
3. Mechanics of Alluvial Rivers
4. River Training and Protection Works

Learning Outcome:

1. It will give the knowledge of classification of river, sediment transport and River morphology
2. It will help the students to understand river behavior, characteristics and shapes of meanders, hydraulic geometry.
3. It will enable the students to understand the concept of River Mechanics, time series and Bio- engineering techniques.
4. It will give the knowledge of River Training and Protection Works.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	Introduction, classification of Rivers, alluvial rivers including channel and flood plain features, Sediment transport and budgets, River morphology and various classification schemes.	30 Hours	1
II	Behavior of Rivers: Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control.	30 Hours	1
III	Mechanics of Alluvial Rivers, Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration. Bio-engineering Techniques, Classification review, Natural Channel Design Analysis, Time Series, Analysis of flow, Sediment and channel geometry data.	30 Hours	1
IV	River Training and Protection Works: Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/ dampers and other river/ flood protection works.	30 Hours	1

References:

1. River Behavior Management and Training (Vol. I & II), CBI & P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punamia and Pande B. B. Lal.
3. River Engineering by Margaret Peterson.
4. Principles of River Engineering by (The Non-Tidal Alluvial) PH Jameen.

OE33101 DISASTER MANAGEMENT

Course Objective:

1. Study about Basic concept of environmental chemistry.
2. Learn about the various parameters of water and wastewater.
3. How to examine microbial contamination of water.
4. Study about the different – phases of microbial growth.

Learning Outcome:

1. Introduction to the basic principles of environmental chemistry.
2. Detailed knowledge of different parameter of water and wastewater.
3. To know the thermodynamics microbial system.
4. Know the aerobic and anaerobic process involved in the water and wastewater.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction** Concept of Environmental Hazards, Environmental stress & Environmental Disasters. Types of Environmental hazards & Disasters: Natural hazards and Disasters, Volcanic Hazards/ Disasters, - Causes and distribution of Volcanoes, - Hazardous effects of volcanic eruptions, - Environmental impacts of volcanic eruptions, Earthquake Hazards/ disasters, - Causes of Earthquakes, - Distribution of earthquakes, - Flood control measures (Human adjustment, perception & mitigation), Droughts: - Impacts of droughts, - Drought hazards in India, - Drought control measures	30 Hours	1
II	**Mechanics & forms of Soil Erosion** Factors & causes of Soil Erosion, Conservation measures of Soil Erosion, Chemical hazards/ disasters-- Release of toxic chemicals, nuclear explosion, Sedimentation processes, - Global Sedimentation problems, Regional Sedimentation problems, Sedimentation & Environmental problems, Corrective measures of 23 Erosion & Sedimentation, Biological	30 Hours	1

	hazards / disasters, Population Explosion		
III	**Stages** Pre- disaster stage (preparedness)- Preparing hazard zonation maps, Predictability/ forecasting & warning, Preparing disaster preparedness plan, Land use zoning, Pre-disaster stage (mitigation) Disaster resistant house construction, Population reduction in vulnerable areas, Awareness . Emergency Stage:-Rescue training for search & operation at national & regional level, Immediate relief, and Assessment surveys. Post Disaster stage, Rehabilitation- Political Administrative Aspect	30 Hours	1
IV	**Relief Measures** Provision of Immediate relief measures to disaster affected people, Prediction of Hazards & Disasters, Measures of adjustment to natural hazards Mitigation-discuss the work of following Institution, Meteorological observatory, Seismological observatory, Hydrology Laboratory, Industrial Safety inspectorate, Institution of urban & regional planners, Chambers of Architects, Engineering Council, National Standards Committee, Integrated Planning Contingency management Preparedness Education on disasters, Community involvement, The adjustment of Human Population to Natural hazards & disasters	30 Hours	1

References:

1. Singh. Savinder, "Environmental Geography", PrayagPustakBhawan.

2. Sharma V.K., "(Ed) Disaster Management", IIPA Publication New Delhi.

BCE3801 WATER RESOURCE ENGINEERING

Course Objective

1. To impart knowledge regarding the availability of water on hydrosphere, it's distribution and quantification.
2. To convey the knowledge on the scientific methods for computing irrigation water requirements
3. To communicate fundamental knowledge on reservoir engineering and river engineering.

Learning Outcome:

1. Describe the hydrological cycle and estimate the different components.
2. Determine crop water requirement for design of irrigation systems.
3. Compute the yields of aquifers and well.
4. Know the features of various river training works.
5. Estimate the storage capacity of reservoirs and their useful life.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Introduction to Hydrology** Hydrologic Cycle, Water Budget Equation. Precipitation Types, measurements and analysis, error in estimation, missing data, consistency of rainfall records, Intensity during frequency (IDF) and probable maximum Precipitation (PMP) curves. Evaporation and consumptive use: Process affecting factors, estimation and measurement techniques. **Infiltration** Process affecting factors, measurement and estimation, Infiltration Indices, Infiltration galleries. **Ground Water Hydrology** Zones of underground water, Aquifers and their types, important terms, Determination of discharge through unconfined and confined aquifers with steady flow conditions. **Well** Interference among wells, Well loss and specific capacity, efficiency of a well, types of water wells,	30 Hours	1

	specific yield of a well, , type of tube wells, well surrounding and well development, Suitable site selection for a tube well, Types of open wells.		
II	**Surface Runoff** Components and factors affecting runoff, methods of estimation of Runoff volume and peak runoff, rating curve, Rainfall -runoff relationships.Hydrograph analysis, Components, factors affecting hydrographs, base flow separation, Direct Runoff Hydrograph **Unit Hydrograph** Theory and assumptions. Derivation of Unit Hydrograph, Synthetic Unit Hydrograph Introduction to computer models for rainfall runoff analysis. **Irrigation** Developments in India, Necessity and types Advantages & disadvantages of Irrigation. Functions of water in plant growth, Methods of Irrigation, Water requirement Of crops. Irrigation frequency, Irrigation efficiencies, Principal crops and crop season, crop rotation. **Canal irrigation** Classes and alignment, Parts of a canal system, Commanded area, curves in channels, channel losses.	30 Hours	1
III	**Sediment Transportation** Suspended and Bed load and its estimation. **Irrigation channels** Types , silt theories- Kennedy's and Lacey'sDesign procedure for irrigation channels, longitudinal cross section, Schedule of area Statistics and channel dimensions, use of Garret's Diagrams in channel design, cross Sections of an Irrigation channel, **Lining of Irrigation Canals** Advantages and types, factors for selection of a particular Type, design of lined channels, cross section of lined channels, Economics of canal lining.	30 Hours	1

	Water Logging Definition, effects, causes and anti-water logging measures, Drainage of Water logged land, Types of drains open and closed, spacing of closed drains.		
IV	**Regulation and control of canal system** Purpose, Types of canal regulation works and their functional aspects, Relative merits and demerits canal irrigation. **Irrigation Outlets** Requirements, types, non-modular, semi-module and rigid module, selection criterion. **River Training** Objective and need, classification of rivers, and river training works, meandering, stages, methods of river training, bank protection, Methods for measurement of discharge.	30 Hours	1

References:

1. Garg S.K., "Irrigation Engg. and Hydraulic Structures", Khanna Publishers.
2. Punmia B.C., "Irrigation and water Power engineering", Laxmi Publications.
3. Subramanya K., "Engineering Hydrology", TMH.
4. Arora K.R., "Irrigation Water Power and Water Resource Engg.",Standard Publishers Distributors.

GE33141 ADVANCED CONCRETE DESIGN

Course Objective:

1. To know about the basics of RCC water tanks.
2. To know about the analysis of building frames.
3. To know about the basics of RC bridge.
4. To know about the bunker and silos.

Learning Outcome:

1. To design different type of water tanks including underground and overhead tanks
2. To access the various loads, forces in framed structures.
3. To design the bridges according the codal recommendations.
4. To learn the basics of design of Bunker and silos.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**RCC water tanks** Design of rectangular and circular water tanks- Underground and overhead- Intz type tanks- design of staging.	30 Hours	1
II	**Building Frames** Dead, Live, Wind and Earthquake loads, Analysis of framed building byapproximatemethods for vertical and horizontal loads, conceptof Exact Analysis, joint detailing.	30 Hours	1
III	**Design of Bridges** Loads,Forces andPermissible Stresses, Code Recommendations regarding design and detailing, Design of RCslab culvert, Design of T-beam bridge.	30 Hours	1
IV	**Bunker and silos** Design of Bunker and silos, Difference between Bunker and Silo, Design of composite Sections: Composite beam and slabs insimple conditions.	30 Hours	1

Reference:

1. Gambhir M L., “Reinforced Concrete Design”, TMH.
2. Punamia B C, “Reinforced Concrete Design”, Laxmi Publications
3. Victor D.J., “Essentials of Bridge Engineering”, Oxford and IBH.

GE33142 CONCRETE SCIENCE & MIX DESIGN

Course Objective:

1. The basic course on Civil Engineering Materials deals with some fundamentals related to concrete and concrete materials, besides dealing with masonry, steel etc.
2. The specific course on "Concrete Technology" focuses more on detailed understanding of concrete making materials including supplementary cementitious materials.
3. Concrete production process also forms a part of the discussion. Recent developments in concrete materials are also given adequate consideration.
4. Going through the course one would develop adequate understanding on concrete production process and properties and uses of concrete as a modern material of construction.

Learning Outcome:

1. The courses will enable one to make appropriate decision regarding ingredient selection and use of concrete.
2. Optimize the ingredients of the various concrete mixes.
3. Selection of various other materials in making of concrete mixes.
4. It gives the exposure of special concretes and mix design.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Materials** Cement – Ingredients, Chemical composition, basic properties of cement compounds, Hydration of cement- heat of hydration, physical properties of Portland cements, Indian standard tests and specification, various types and grades of cement, storage of cement Aggregates:- Classification of aggregates. Characteristics of aggregates – Strength of aggregate, particle shape and texture, specific gravity, bulk density, porosity, water absorption and moisture content of aggregate, bulking of fine aggregate, deleterious substance in aggregate, soundness of aggregate , alkali- aggregate reaction , sieve	30 Hours	1

	analysis:- grading curves, fineness modulus, grading requirements, grading of fine and coarse aggregates, zoning, IS tests and specification for aggregates for concrete. Water: - Quality of mixing water, effect of impurities in water on properties of concrete. permissible impurities as per I.S Admixtures:- Functions and classification of admixtures, factors influencing the dosage of different admixtures- IS specification for admixtures for concrete. accelerators - retarders - plastizers - water reducing agents - use of silica fumes		
II	**Properties of fresh concrete** Water/ Cement ratio and its significance in fresh concrete- workability- different methods for assessing workability according to IS Specification, factors affecting workability, requirements of workability for various work, segregation, bleeding, setting, hardening, strength development. Process of manufacture of Concrete, Mix proportion and grade of concrete - Various types of batching, mixing, transporting, placing, compacting, curing and finishing of concrete (in detail). Joints in concreting – construction and expansion.	30 Hours	1
III	**Properties of Hardened concrete** Strength of concrete- strength of concrete in compression, tension and flexure - stress-strain characteristics and elastic properties - shrinkage and creep. durability of concrete - permeability - chemical attack - sulphate attack - resistance to abrasion and cavitation - resistance to freezing and thawing - resistance to fire - marine atmosphere - quality control - frequency of sampling - test specimens - statistical analysis of test results - standard deviation - acceptance criteria.	30 Hours	1

	Non-destructive testing of concrete:-Rebound hammer and ultrasonic pulse velocity testing		
IV	**Special concrete** Lightweight concrete, High strength concrete, Polymer concrete, fiber reinforced concrete, Ferro-cement, Ready mixed concrete. vacuum concrete - shotcrete - steel fiber reinforced concrete- high performance concrete. **Mix Design** Quality Control - Factors causing variations in the quality of concrete - mix design - nominal mixes - design mixes - factors influencing mix design - A.C.I method - I.S method - design for high strength mixes.	30 Hours	1

References:

1. Neville, A.M., "Properties of Concrete", Pitman.
2. Brandt, A.M., "Cement Based Composites: Materials, Mechanical Properties and Performance", E & FN Spon. 1995.
3. Newman, K., "Concrete Systems in Composite Materials", EDT BY L. Holliday. Elsevier Publishing Company. 1966.
4. Powers, T.C., "The Properties of Fresh Concrete", John Wiley & Sons, Inc.
5. Mehta, P.K., "Concrete Structure, Material and Properties", Prantice Hall Inc.
6. Shetty M.S., “Concrete Technology Theory and Practice”, S. Chand and company, New Delhi.
7. John. H.Bungey, “The Testing of Concrete in Structures”, Urrey University of Press Hall.

GE33143 INDUSTRIAL POLLUTION CONTROL AND ENVIRONMENTAL AUDIT

Course Objective:

1. To Study about the origin and sources of Industrial waste and waste water.
2. To Study about Wastewater re-uses and Gaseous emission control.
3. To study about the recent trends and case studies of different Industries.
4. To understand the concept of Environmental Audit.

Learning Outcome:

1. It will enable the students to understand the origin of Industrial waste and waste water. It will also enable the deep understanding of the different pollutants that affect water pollution.
2. It will give the knowledge of Wastewater recycling methods and also enables the students to learn various methods for the control of gaseous emissions from industries.
3. It will provide the knowledge of modern trends in Industrial Waste Management.
4. It will impart the Knowledge of Environmental Audit.

Course Contents:

Module	Course Topics	Total Hours	Credits
I	**Industrial wastes & their sources** Various industrial processes, sources and types of wastes-solid, liquid, gaseous, noise & radiation emissions. Sources for industrial water usages and various Industrial processes requiring water use and water quality.	30 Hours	1
II	**Behaviour of Rivers** Introduction, River Channel patterns, Straight river channels, causes, characteristics and shapes of meanders and control, cutoff, Braided Rivers, Bed forms, Instability of rivers, Hydraulic geometry, Delta formation and control.	30 Hours	1
III	**Mechanics of Alluvial Rivers** Rivers and restoration structures, Socio-cultural influences and ethics of stream restoration. Bio-engineering Techniques, Classification review, Natural Channel Design Analysis, Time Series,	30 Hours	1

	Analysis of flow, Sediment and channel geometry data.		
IV	**River Training and Protection Works** Introduction, Classification of River Training, Types of training works, Protection for Bridges with reduced waterway, Design of Guide Band, embankment and spurs/ dampers and other river/ flood protection works.	30 Hours	1

References:

1. River Behavior Management and Training (Vol. I & II), CBI & P, New Delhi.
2. Irrigation & Water Power Engineering- B. C. Punamia and Pande B. B. Lal.
3. River Engineering by Margeret Peterson.
4. Principles of River Engineering by (the non tidel alluvial) PH Jameen.