

GURU KASHI UNIVERSITY



**Bachelor of Technology in Civil Engineering
Single Major**

Session: 2025-26

Faculty of Engineering & Technology

Graduate Attributes of the Programme (B. Tech Civil Engineering): -

Type of learning outcomes	The Learning Outcomes Descriptors
Graduates should be able to demonstrate the acquisition of: Learning outcomes that are specific to disciplinary/interdisciplinary areas of learning	technical & analytical skills and research promotion in the field of Civil Engineering to identify, formulate, analyze, and solve complex engineering problems in order to develop sustainable construction and planning solutions in broader economic, societal, and environmental contexts.
	practical, professional, and procedural knowledge required for carrying out planning and construction related tasks, which will lead the students to obtain the entrepreneurship skills
	skills of innovation, creative and critical thinking that enable student to follow systematic ways for analyzing and finding innovative solutions in the field of transportation, geotechnical, structural, construction management, materials, planning, water resources, and field survey.
	comprehensive knowledge and understanding of the fundamentals and theories of science, engineering, and mathematics and advanced specialized knowledge in Civil Engineering.
Generic learning outcomes	The graduates should be able to demonstrate the ability of creativity, critical thinking, and innovation in solving the complex problems that do not have simple solutions
	The graduates should be able to demonstrate the skills of excellent communication, writing, and understanding the technical documents in more than one recognized language.
	<i>Coordinating/ collaborating with others:</i> working effectively either individually or in groups, with the ability to lead work teams flexibly and effectively and having the skills of listening and communicating effectively.
	Commitment to professional ethics that are compatible with societal and cultural values, participation in finding valuable solutions to some societal issues, and a commitment to responsible citizenship.
	Having the attribute of lifelong learning to keep up with the latest developments in the field of specialization, as well as to use modern digital technologies and applications to analyze and process data and information.
	The graduates should be able to demonstrate the ability to identify and to address their own educational needs

	in a changing world in ways sufficient to maintain their competence and to allow them to contribute to the advancement of knowledge. The graduates should be able to evaluate critically and apply knowledge, methods and skills through self-identified sources and self-directed learning for locating, accessing, and utilizing relevant information sources as related to civil engineering. The graduates should be able to demonstrate the ability of mitigating the effects of environmental degradation, climate change, and pollution, effective waste management, conservation of forest and sustainable development and living. The graduates should be able to demonstrate the capability to participate in community-engaged services/ activities for promoting the well-being of society.
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Programme Learning outcomes: An Undergraduate Certificate (Civil Engineering) is awarded to students who have demonstrated the achievement of the outcomes located at level 4.5:

Element of the Descriptor	Programme learning outcomes relating to Undergraduate Certificate
The graduates should be able to demonstrate the acquisition of:	
Knowledge and understanding	knowledge of facts, concepts, principles, theories, and processes in basic sciences, multidisciplinary learning contexts within engineering
	understanding of the linkages between the fundamentals of engineering and its application
	procedural knowledge required for performing skilled or paraprofessional tasks associated with the electrical, mechanical, and computing fields.
General, technical and professional skills required to perform and accomplish tasks	a range of cognitive and technical skills related to manufacturing practices, computing, economics, sciences, communication skills for accomplishing assigned tasks in civil engineering
Application of knowledge and skills	The graduates should be able to demonstrate the ability to apply the acquired operational or technical and theoretical knowledge, and a range of cognitive and practical skills to select and use basic methods, tools, materials, and information to generate solutions to specific problems
Generic learning outcomes	The graduates should be able to demonstrate the ability of effective communication, critical thinking, self-directed and self-managed learning, gather and interpret relevant quantitative and qualitative data, critically evaluate principles and theories associated with the basic sciences and engineering, make judgment and take decisions, based on analysis of data and evidence, for formulating responses to issues/problems.
Constitutional, humanistic, ethical, and moral values	The graduates should be able to demonstrate the willingness to practice constitutional, humanistic, ethical, and moral values in one's life, and practice these values in real-life situations
Employability and job-ready skills, and entrepreneurship skills and capabilities/qualities and mindset	ability to exercise responsibility for the completion of assigned tasks and for the outputs of own work, and to take some responsibility for group work and output as a member of the group.
Credit requirements	The successful completion of the first year (two semesters) of the undergraduate programme of 48 credit hours

	followed by an exit 4-credit 8-weeks internship/industrial training.
Entry requirements	Passed 10+2 (physics, Chemistry, Mathematics) with at least 45% in the aggregate.

Program Structure

SEMESTER: 1st									
Course Code	Course Title	Type of Courses	L	T	P	No. of Credits	Int.	Ext.	Total Marks
BCE1100	Engineering Mathematics–I	Major Core Course	3	1	0	4	30	70	100
BCE1101	Engineering Chemistry	Major Core Course	3	0	0	3	30	70	100
BCE1102	Introduction to Civil Engineering	Minor Course	4	0	0	4	30	70	100
BCE1103	Communication Skills - I	Ability Enhancement Course	2	0	0	2	30	70	100
BCE1104	Manufacturing Practices	Skill Enhancement Course	0	0	6	3	30	70	100
BCE1105	Engineering Chemistry Lab	Major Core Course	0	0	2	1	30	70	100
BCE1106	Principles of Economics	Multidisciplinary Course	3	0	0	3	30	70	100
VAC0001	Environment Education	Value Added Course	2	0	0	2	30	70	100
BCE1107	Entrepreneurship Setup & Launch	Skill Enhancement Course	0	0	4	2	30	70	100
Total			17	1	12	24	270	630	900

SEMESTER: 2nd									
Course Code	Course Title	Type of Courses	L	T	P	No. of Credits	Int.	Ext.	Total Marks
BCE2150	Engineering Mathematics–II	Major Core Course	3	1	0	4	30	70	100
BCE2151	Engineering Physics	Major Core Course	3	0	0	3	30	70	100
BCE2152	Introduction to Concrete Technology	Minor Course	4	0	0	4	30	70	100
BCE2153	Engineering Graphics & Drawing	Discipline Skill Enhancement Course	4	0	0	4	30	70	100
BCE2154	Computer Proficiency	Skill Enhancement Course	2	0	0	2	30	70	100
BCE2155	Communication Skills - II	Ability Enhancement Course	2	0	0	2	30	70	100
BCE2156	Engineering Physics Lab	Major Core Course	0	0	2	1	30	70	100
BCE2157	Computer Proficiency Lab	Skill Enhancement Course	0	0	2	1	30	70	100
BCE2158	Indian Constitution	Multidisciplinary Course	3	0	0	3	30	70	100
VAC0002	Human Values and Professional Ethics	Value Added Course	2	0	0	2	30	70	100
Total			23	1	4	26	270	630	900

Criteria for Multiple Exit After 2nd Semester:

A **8-weeks** internship/industrial training at a recognized organization. This training must be related the Civil Engineering field. A student needs to obtain the permission from the University before applying for an internship/industrial training. The student will also submit the approval letter from the concerned official from the organization. This official will act as the off-campus faculty member, who will evaluate the student's performance during the internship/industrial training.

Undergraduate Certificate (Civil Engineering) will be given to the students on submitting the completion certificate from the organization.

Programme learning outcomes: An Undergraduate Diploma (Civil Engineering) is awarded to students who have demonstrated the achievement of the outcomes located at level 5:

Element of the Descriptor	Programme learning outcomes relating to Undergraduate Diploma
The graduates should be able to demonstrate the acquisition of:	
Knowledge and understanding	knowledge of facts, concepts, principles, theories, and processes in mechanics, materials, and planning.
	procedural knowledge required for preparing the civil engineering drawing
	knowledge of ancient Indian science for understanding the fundamentals modern engineering
Skills required to perform and accomplish tasks	a range of cognitive and technical skills required in the field of Transportation, soil, survey, and construction materials
	cognitive skills required to identify, analyze and synthesize the results of experimentation
	cognitive and technical skills required for civil engineering survey for highway and building construction
Application of knowledge and skills	The graduates should be able to demonstrate the ability to apply the acquired knowledge in materials testing & characterization, structural analysis, and field investigation in construction practices
Generic learning outcomes	• The graduates should be able to demonstrate the ability to express thoughts and ideas effectively in writing and orally and present the results/findings of the experiments carried out in a clear and concise manner to different groups. • The graduates should be able to demonstrate the ability to make judgment and take decisions, based on analysis of experimental data
Constitutional, humanistic, ethical, and moral values	The graduates should be able to demonstrate the willingness to put forward convincing arguments to respond to the ethical and moral issues associated with the construction section.
Employability and job-ready skills, and entrepreneurship skills and capabilities/qualities and mindset	knowledge and a basket of soil analysis for foundation, concrete mix design, highway geometric design, analysis of structural performance required to perform the construction activities effectively
Credit requirements	The successful completion of the first two years (four semesters) of the B.Tech (Civil Engineering) involving 98

	credit hours followed by an exit 4-credit internship/industrial training.
Entry requirements	• UG Certificate (Civil Engineering) • Continuation of study or lateral entry in the second year of the undergraduate programme will be possible for those who have met the entrance requirements, including specified levels of attainment, specified in the programme regulations. The continuation of the study will be based on the evaluation of documentary evidence (including the academic record and/or evidence relating to the assessment and certification of prior learning) of the applicant's ability to pursue an undergraduate programme of study. Lateral entry into the programme of study at NHEQF level 5 will be based on the validation of prior learning outcomes achieved, including those achieved outside of formal learning or through learning and training in the workplace or in the community, through continuing professional development activities, or through independent/self-directed learning activities.

SEMESTER: 3rd									
Course Code	Course Title	Type of Courses	L	T	P	No. of Cr.	Int.	Ext.	Total Marks
BCE3200	Concrete Technology	Major Core Course	3	0	0	3	30	70	100
BCE3201	Solid Mechanics	Major Core Course	3	0	0	3	30	70	100
BCE3202	Fluid Mechanics	Minor Course	3	0	0	3	30	70	100
BCE3203	Building Materials & Construction	Discipline Skill Enhancement Course	4	0	0	4	30	70	100
BCE3204	Building Planning and Computer-aided Civil Engineering drawing	Skill Enhancement Course	3	0	0	3	30	70	100
BCE3205	Concrete Technology Lab	Major Core Course	0	0	2	1	30	70	100
BCE3206	Solid Mechanics Lab	Major Core Course	0	0	2	1	30	70	100
BCE3207	Fluid Mechanics Lab	Minor Course Lab	0	0	2	1	30	70	100
BCE3208	Professional Communication	Ability Enhancement Course	2	0	0	2	30	70	100
BCE3209	Sustainable Development	Multidisciplinary Course	3	0	0	3	30	70	100
IKS0001	Bharatavarsha—A Land of Rare Natural Endowments	Value Added Course	2	0	0	2	30	70	100
Total			23	0	6	26	300	700	1000

SEMESTER: 4 th									
Course Code	Course Title	Type of Courses	L	T	P	No. of Credits	Int.	Ext.	Total Marks
BCE4250	Structural Analysis I	Major core course	3	1	0	4	30	70	100
BCE4251	Transportation Engineering	Major Core Course	3	0	0	3	30	70	100
BCE4252	Geotechnical Engineering	Major Core Course	3	0	0	3	30	70	100
BCE4253	Surveying and Geomatics	Vocational Course	3	0	0	3	30	70	100
BCE4254	Transportation Engineering Lab	Major core course	0	0	2	1	30	70	100
BCE4255	Geotechnical Engineering Lab	Major core course	0	0	2	1	30	70	100
BCE4256	Surveying and Geomatics Lab	Vocational Course	0	0	2	1	30	70	100
BCE4257	Report Writing	Ability Enhancement Course	0	0	4	2	30	70	100
IKS0008	Indian Architecture and Town Planning	Value Added Course	2	0	0	2	30	70	100
Discipline Specific Elective (DSE) Course 1 (Any one of the following)									
BCE4259	Construction Engineering & Management	Discipline Specific Elective	3	1	0	4	30	70	100
BCE4260	Materials, Testing & Evaluation								
Total			17	2	10	24	300	700	1000

Programme learning outcomes: The Bachelor of Vocational (Civil Engineering) is awarded to students who have demonstrated the achievement of the outcomes located at level 5.5:

Element of the Descriptor	Programme learning outcomes relating to Bachelor of Vocational (Civil Engineering)
The graduates should be able to demonstrate the acquisition of:	
Knowledge and understanding	The graduates should be able to demonstrate the acquisition of underlying principles and theories relating to multidisciplinary fields of estimation, structural analysis, water supply, hydrology, advanced surveying techniques, transportation, construction equipments.
	knowledge of the current and emerging issues and developments in advanced analysis, water quality analysis, engineering surveys, and hydraulics.
General, technical and professional skills required to perform and accomplish tasks	cognitive and technical skills required for performing and accomplishing complex tasks relating to Civil Engineering.
	cognitive and technical skills required to evaluate and analyze complex issues in water supply and sanitation, Reinforced concrete structures, sustainable construction methods, use of construction equipments, and traffic issues.
Application of knowledge and skills	The graduates should be able to demonstrate the ability to apply the acquired specialized technical or theoretical knowledge, and cognitive and practical skills to gather and analyze quantitative/ qualitative data to assess the appropriateness of different approaches to solving problems. To employ the right approach to generate solutions to problems related to the chosen fields of learning.
Generic learning outcomes	The graduates should be able to demonstrate the ability to: • make coherent arguments to support the findings/results of the study undertaken to field engineers and government agencies • Pursue self-paced and self-directed learning to upgrade knowledge and skills on advance level of courses in civil engineering • critically evaluate evidence for taking actions to generate solutions to real life problems
Constitutional, humanistic, ethical, and moral values	The graduates should be able to demonstrate the willingness and ability to formulate coherent arguments about environmental and sustainable development issues, from different civil engineering structures' perspectives.
Employability	knowledge and essential skills set and competence that

and job-ready skills, and entrepreneurship skills and capabilities/qualities and mindset	are necessary to take up a professional job in the field of structural design, construction equipments, water supply and treatment, cost estimation, advanced engineering survey, traffic engineering, and material testing.
Credit requirements	The successful completion of the first three years (six semesters) of the B.Tech (Civil Engineering) involving 140 credit hours.
Entry requirements	• Under Graduate Diploma (Civil Engineering) • Continuation of study or lateral entry into the third year of the B.Tech will be possible for those who have met the specified levels of attainment, specified in the programme admission regulations. The continuation of the study will be based on the evaluation of documentary evidence (including the academic record and/or evidence relating to the assessment and certification of prior learning) of the applicant's ability to pursue and complete the undergraduate programme of study. Lateral entry into the programme of study at NHEQF level 5.5 will be based on the validation of prior learning outcomes, including those achieved outside of formal learning or through learning and training in the workplace or in the community, through continuing professional development activities, or through independent/self-directed learning activities.

SEMESTER: 5 th									
Course Code	Course Title	Type of Courses	L	T	P	No. of Credits	Int.	Ext.	Total Marks
BCE5300	Structural Analysis II	Major core course	3	1	0	4	30	70	100
BCE5301	Environmental Engineering	Major core course	3	0	0	3	30	70	100
BCE5302	Engineering Economics, Estimation & Costing	Vocational Course	3	0	0	3	30	70	100
BCE5303	Environmental Engineering Lab	Major core course	0	0	2	1	30	70	100
BCE5304	Engineering Economics, Estimation & Costing Lab	Vocational Course	0	0	2	1	30	70	100
BCE5305	Survey Camp	Skill	0	0	0	2	30	70	100
Discipline Specific Elective (DSE) Course 2 (Any one of the following)									
BCE5306	Hydrology & Water Resources Engineering	Discipline Specific Elective Course	3	1	0	4	30	70	100
BCE5307	Traffic Engineering and Management								
Discipline Specific Elective (DSE) Course 3 (Any one of the following Along with same practical course)									
BCE5308	Total station and GPS surveying	Discipline Specific Elective Course	3	0	0	3	30	70	100
BCE5309	Plumbing (Water and Sanitation)								
BCE5310	Total station and GPS surveying Lab	Discipline Specific Elective Course	0	0	2	1	30	70	100
BCE5311	Plumbing (Water and Sanitation)								
Total			15	2	06	22	270	630	900
*The Survey Camp will be organized at a hilly terrain. It will be organized after the final Examinations of 4 th semester and will be evaluated in the 5 th semester. The total Expenditure will be paid by the students themselves.									

SEMESTER: 6 th									
Course Code	Course Title	Type of Courses	L	T	P	No. of Credits	Int.	Ext.	Total Marks
BCE6350	Design of Concrete Structures	Major core course	3	0	0	3	30	70	100
BCE6351	Hydraulic Engineering	Major core course	3	0	0	3	30	70	100
BCE6352	Sustainable and Green construction	Vocational Course	3	1	0	4	30	70	100
BCE6353	Design of Concrete Structures Lab	Major core course	0	0	2	1	30	70	100
BCE6354	Hydraulic Engineering Lab	Major core course	0	0	2	1	30	70	100
Discipline Specific Elective (DSE) Course 4 (Any one of the following)									
BCE6355	Railway Engineering	Discipline Specific Elective Course	3	1	0	4	30	70	100
BCE6356	Advanced Concrete Technology								
Discipline Specific Elective (DSE) Course 5 (Any one of the following)									
BCE6357	Intelligent Transportation Systems	Discipline Specific Elective Course	3	1	0	4	30	70	100
BCE6358	Construction Equipment & Automation								
Total			15	3	4	20	210	490	700

Programme learning outcomes: The Bachelor of Technology (Civil Engineering) is awarded to students who have demonstrated the achievement of the outcomes located at level 6:

Element of the Descriptor	Programme learning outcomes relating to Bachelor of Technology (Civil Engineering)
The graduates should be able to demonstrate the acquisition of:	
Knowledge and understanding	advanced knowledge about various fields of civil engineering
	a coherent understanding of the established methods and techniques of design of foundation, cost estimation, water resources and irrigation, design of concrete and steel structures, highway management.
	industry ready skills and practical knowledge
General, technical and professional skills required to perform and accomplish tasks	Generate solutions to complex problems independently, requiring the exercise of full personal judgement, responsibility, and accountability for the output of the initiatives taken as a practicing civil engineer.
	cognitive and technical skills required to solve modern construction issues
Application of knowledge and skills	The graduates should be able to demonstrate the ability to apply the acquired specialized technical or theoretical knowledge, and cognitive and practical skills to gather and analyze quantitative/ qualitative data to assess the appropriateness of different approaches to solving problems. To employ the right approach to generate solutions to problems related to the chosen fields of learning.
Generic learning outcomes	The graduates should be able to demonstrate the ability to: • make coherent arguments to support the findings/results of the study undertaken to field engineers and government agencies • Pursue self-paced and self-directed learning to upgrade knowledge and skills on advance level of courses in civil engineering critically evaluate evidence for taking actions to generate solutions to real life problems
Constitutional, humanistic, ethical, and moral values	The graduates should be able to demonstrate the willingness and ability to formulate coherent arguments about environmental and sustainable development issues, from different civil engineering structures' perspectives.
Employability and job-ready skills, and entrepreneurship skills and	knowledge and essential skills set and competence that are necessary to take up a professional job in the field of structural design, construction equipments, water supply and treatment, cost estimation, advanced engineering survey, traffic engineering, and material testing.

capabilities/qualities and mindset	
Credit requirements	The successful completion of the 4- years (eight semesters) of the B.Tech (Civil Engineering) involving 160 credit hours.
Entry requirements	• B.Voc (Civil Engineering) Continuation of undergraduate programme leading to the bachelor's degree (Honours/ Honours with Research) will be open to those who have met the entrance requirements, including specified levels of attainment, in the programme admission regulations. Continuation of the programme of study will be based on the evaluation of documentary evidence (including the academic record and/or evidence relating to the assessment and certification of prior learning) of the applicant's ability to pursue study during the fourth year (semesters 7 & 8) of the 4-year Bachelor's degree (Honours/ Honours with Research) programme. Lateral entry into the programme of study at NHEQF level 6 will be based on the validation of prior learning outcomes, including those achieved outside of formal learning or through learning and training in the workplace, through continuing professional development activities, or through independent/self-directed/self-managed learning activities.

SEMESTER: 7th									
Course Code	Course Title	Type of Courses	L	T	P	No. of Credits	Int.	Ext.	Total Marks
BCE7400	Design of Steel Structures	Major core course	3	1	0	4	30	70	100
BCE7401	Project	Minor Course	0	0	8	4	30	70	100
Discipline Specific Elective (DSE) Course 6 (Anyone of the Following)									
BCE7402	Foundation Engineering	Discipline Specific Elective Course	3	1	0	4	30	70	100
BCE7403	Ground Improvement Techniques								
Discipline Specific Elective (DSE) Course 7 (Anyone of the Following)									
BCE7404	Contracts Management	Discipline Specific Elective Course	3	1	0	4	30	70	100
BCE7405	Advanced Structural Design								
Discipline Specific Elective (DSE) Course 8 (Anyone of the Following)									
BCE7406	Airport Planning and Design	Discipline Specific Elective Course	3	1	0	4	30	70	100
BCE7407	Construction Cost Analysis								
Total			12	4	8	20	150	350	500

SEMESTER: 8th									
Course Code	Course Title	Type of Courses	L	T	P	No. of Credits	Int.	Ext.	Total Marks
BCE8450	Internship	Skill	0	0	0	20	30	70	100
Total			0	0	0	20	30	70	100

Total Credits and Marks

Semester	L	T	P	Total Credits	Total Marks	Qualification
I	17	1	8	22	900	Undergraduate Certificate (Civil Engineering)
II	23	1	4	26	900	
III	23	0	6	26	1000	Undergraduate Diploma (Civil Engineering)
IV	17	2	10	24	1000	
V	15	2	6	22	900	Bachelor of Vocational (Civil Engineering)
VI	15	3	4	20	700	
VII	12	4	8	20	500	Bachelor of Technology (Civil Engineering)
VIII	0	0	0	20	100	
Total				180	6000	

Semester – I

Course Title: Engineering Mathematics-I	L	T	P	Cr.
Course Code: BCE1100	3	1	0	4

Total Hours: 60

Course Learning Outcomes: After completion of this course, the learner will be able to:

1. Apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.
2. Classify of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
3. Illustrate the Tool of power series and Fourier series for learning advanced Engineering Mathematics.
4. Use of functions of several variables that is essential in most branches of engineering and tools of matrices and linear algebra in a comprehensive manner.

Course Content**UNIT I****16 Hours**

Calculus: Evaluates and involutes; Evaluation of definite and improper integrals; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions.

Rolle's Theorem, Mean value theorems, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and Hospital's rule; Maxima and minima.

Advanced Calculus: Differentiation: Limit continuity and partial derivatives, directional derivatives, total derivative; Tangent plane and normal line; Maxima, minima and saddle points; Method of Lagrange multipliers; Gradient, curl and divergence.

Integration: Multiple Integration: double and triple integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes by (double integration) Center of mass and Gravity (constant and variable densities). Theorems of Green, Gauss and Stokes, orthogonal curvilinear coordinates, Simple applications involving cubes, sphere and rectangular parallelepipeds.

UNIT II**14 Hours**

Trigonometry: Hyperbolic and circular functions, logarithms of complex number resolving real and imaginary parts of a complex quantity, De Moivre's Theorem.

Theory of equations: Relation between roots and coefficients, reciprocal Equations, transformation of equations and diminishing the roots.

UNIT III**15 Hours**

Sequences and series: Convergence of sequence and series, tests for convergence; Power series, Taylor's series, series for exponential, trigonometric and logarithm functions; Fourier series: Half range sine and cosine series, Parseval's theorem.

UNIT IV**15 Hours**

Algebra: Vector Space, linear dependence of vectors, basis, dimension; Linear transformations (maps), range and kernel of a linear map, rank and nullity, Inverse of a linear transformation, rank- nullity theorem, composition of linear maps, Matrix associated with a linear map.

Eigen values, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, Eigen bases, Diagonalization; Inner product spaces, Gram-Schmidt orthogonalization.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- G.B. Thomas and R.L. Finney. (2002). *Calculus and Analytic geometry*. Pearson.
- Veerarajan T. (2008). *Engineering Mathematics for first year*. Tata McGraw-Hill, New Delhi.
- Ramana B.V. (2010). *Higher Engineering Mathematics*. Tata McGraw Hill New Delhi.
- N.P. Bali and Manish Goyal. (2010). *A text book of Engineering Mathematics*. Laxmi Publications.
- B.S. Grewal. (2000). *Higher Engineering Mathematics*. Khanna Publishers.
- V. Krishnamurthy, V.P. Mainra and J.L. Arora. (2005). *An introduction to Linear Algebra*. Affiliated East-West press.
- Erwin Kreyszig. (2006). *Advanced Engineering Mathematics*. John Wiley & Sons.

Course Title: Engineering Chemistry	L	T	P	Cr.
Course Code: BCE1101	3	0	0	3

Total Hours: 45**Learning Outcomes:** After completion of this course, the learner will be able to:

1. Rationalize periodic properties such as ionization potential, electro-negativity, Oxidation states and electro-negativity.
2. Demonstrate Schrodinger equation, Particle in a box solution and their applications for conjugated molecules and Nano particles,
3. Distinguish the ranges of Vibrational and rotational spectroscopy of diatomic molecules, Applications, Nuclear magnetic resonance and magnetic resonance imaging
4. Demonstrate organic reactions involving addition, substitution, elimination

Course Content**UNIT I****12 Hours**

Periodic properties: Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries,

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis. Isomerism in transitional metal compounds.

UNIT II**11 Hours**

Atomic and molecular structure: De Broglie hypothesis and Heisenberg uncertainty principle, Schrodinger equation, Particle in a box solution. Valence Bond theory, its postulates and limitations, Molecular orbital theory and its application for diatomic molecules and plots of the multicenter orbitals. Energy level diagrams of diatomic. Pi-molecular orbitals of butadiene and benzene, Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties.

UNIT III**12 Hours**

Spectroscopic techniques and applications: Principles of spectroscopy and selection rules, electronic spectroscopy, Vibrational and rotational spectroscopy of diatomic molecules, Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques, Fluorescence and its applications.

Ionic, Dipolar and Vander Waals interactions, Equations of state of real gases and Critical phenomena.

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. The Nernst equation and applications.

UNIT IV**10 Hours**

Organic reactions and synthesis of a drug molecule: Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. Synthesis of a commonly used drug molecule.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- Mahan, B. H. (1987). *University chemistry*.
- Sienko, M. J. & Plane, R. A. *Chemistry. (1979): Principles and Applications*. New York: McGraw-Hill.
- Banwell, C. N. (1966). *Fundamentals of Molecular Spectroscopy*. New York, McGraw-Hill.
- Tembe, B. L., Kamaluddin & Krishnan, (2008). *M. S. Engineering Chemistry (NPTEL Web-book)*.

Course Title: Introduction to Civil Engineering	L	T	P	Cr.
Course Code: BCE1102	4	0	0	4

Total Hours: 60**Learning Outcomes:**

On successful completion of this course, the students would be able to:

1. Have the role of civil engineer in society and to relate the various disciplines of Civil Engineering.
2. Explain different types of buildings, building components, building materials and building construction.
3. Describe the importance, objectives and principles of surveying.
4. Summarise the basic infrastructure services MEP, HVAC, elevators, escalators and ramps.

Course Content**Unit-I****7 Hours**

Relevance of Civil Engineering in the overall infrastructural development of the country. Responsibility of an engineer in ensuring the safety of built environment. Brief introduction to major disciplines of Civil Engineering like Transportation Engineering, Structural Engineering, Geo-technical Engineering, Water Resources Engineering and Environmental Engineering. Introduction to buildings: Types of buildings, selection of site for buildings, components of a residential building and their functions.

Unit-II**8 Hours**

Surveying: Importance, objectives and principles.

Construction materials, Conventional construction materials: types, properties and uses of building materials: bricks, stones, cement, sand and timber

Cement concrete: Constituent materials, properties and types.

Steel: Steel sections and steel reinforcements, types and uses.

Unit-III**7 Hours**

Building Construction: Foundations: Bearing capacity of soil (definition only), functions of foundations, types – shallow and deep (brief discussion only).

Brick masonry: - Header and stretcher bond, English bond & Flemish bond random rubble masonry.

Unit-IV**8 Hours**

Roofs and floors: - Functions, types; flooring materials (brief discussion only).

Basic infrastructure services: elevators, escalators and ramps (Civil Engineering aspects only), fire safety for buildings.

Green buildings: - Materials, energy systems, water management and environment for green buildings. (Brief discussion only).

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. Penn, M. and P. Parker, Introduction to Infrastructure (2012), John Wiley & Sons, Inc., New York [ISBN978-0-470-41191-9].

Course Title: Communication Skills-I	L	T	P	Cr.
Course Code: BCE1103	2	0	0	2

Total Hours: 30

Course Learning Outcomes: After completion of this course, the learner will be able to:

1. Develop vocabulary and improve the accuracy in Grammar.
2. Apply the concepts of accurate English while writing and become equally ease at using good vocabulary and language skills.
3. Develop and Expand writing skills through Controlled and guided activities.
4. Compose articles and compositions in English.

Course Content

UNIT I

8 Hours

Vocabulary Building: The concept of Word Formation, Root words from foreign languages and their use in English, Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives. Synonyms, antonyms, and standard abbreviations.

UNIT II

7 Hours

Basic Writing Skills: Sentence Structures, use of phrases and clauses in sentences, Importance of proper punctuation, creating coherence, organizing principles of paragraphs in documents, Techniques for writing precisely.

UNIT III

8 Hours

Identifying Common Errors in Writing: Subject-verb agreement, Noun-pronoun agreement, Misplaced modifiers, Articles, Prepositions, Redundancies, Cliché

UNIT IV

7 Hours

Nature and Style of sensible Writing: Describing, Defining, Classifying, providing examples or evidence, writing introduction and conclusion

Writing Practices: Comprehension, Précis Writing, Essay Writing.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning.

Suggested Readings

- Swan, Michael. (1995). *Practical English*. OUP.
- Wood, F.T. (2007). *Remedial English Grammar*. Macmillan.
- Zinsser, W. (2001). *On Writing Well*. Harper Resource Book.
- Lyons, L. H. & Heasley, B. (2006). *Study Writing*. Cambridge University Press.
- Kumar, S & Lata, P. (2011). *Communication Skills*. Oxford University Press. CIEFL, Hyderabad. *Exercises in Spoken English. Parts. I-III*. Oxford University Press.

Course Title: Manufacturing Practices	L	T	P	Cr.
Course Code: BCE1104	0	0	6	3

Total Hours: 45

Course Learning Outcomes: After completion of this course, the learner will be able to:

1. Apply the various manufacturing methods in different fields of engineering.
2. Use the different fabrication techniques
3. Learn about the practices in manufacturing of simple components using different materials.
4. Understand the advanced and latest manufacturing techniques being used in engineering industry

Course Content

UNIT I

8 Hours

Manufacturing Methods- casting, forming, machining, joining, advanced manufacturing methods.

UNIT II

6 Hours

CNC machining, Additive manufacturing, Fitting operations & power tools

UNIT III

6 Hours

Electrical & Electronics Carpentry, Plastic moulding, glass cutting

UNIT IV

10 Hours

Metal casting, welding (arc welding & gas welding), brazing [More hours can be given to Welding for Civil Engineering students as they may have to deal with Steel structures fabrication and erection; 3D Printing is an evolving manufacturing technology and merits some lectures and hands-on training.]

Workshop Practice:

1. Machine shop
2. Fitting shop
3. Carpentry
4. Electrical & Electronics
5. Welding shop (Arc welding + gas welding)

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- Raghuwanshi, B.S. (2009). *A Course in Workshop Technology, Vol 1 & II*. Dhanpat Rai & Sons.
- Jain, R.K. (2010). *Production Technology*. Khanna Publishers.
- Singh, S. (2003). *Manufacturing Practice*. S.K. Kataria & Sons.

Course Title: Engineering Chemistry Lab	L	T	P	Cr.
Course Code: BCE1105	0	0	2	1

Course Learning Outcomes: After completing all the units, students will learn:

1. Evaluate the estimate rate constants of reactions from concentration of reactants/products as a function of time.
2. Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.
3. Apply the theoretical concepts for result analysis and interpret data obtained from experimentation.
4. Identify the compound using a combination of qualitative test and analytical methods

Course Content

List of Experiments:

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry - determination of redox potentials and emfs
9. Synthesis of a polymer/drug
10. Saponification/acid value of an oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Determination of the partition coefficient of a substance between two immiscible liquids
16. Adsorption of acetic acid by charcoal
17. Use of the capillary viscosimeters to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

Course Title: Principles of Economics	L	T	P	Cr.
Course Code: BCE1106	3	0	0	3

Total Hours: 45

Course Learning Outcomes: After completion of this course, the learner will be able to:

1. Students will be able to apply economic principles and calculations to solve engineering projects.
2. To students will be efficient to get the idea of production activities and its applications in industries
3. To estimate the present and future value of money on their various investment plans.
4. Develop the ability to account for time value of money using engineering economy factors and formulas, as well as the implications and importance of considering taxes, depreciation, and inflation.

Course Content

Unit 1

10 Hours

General Overview of Economics: Nature and Scope of Economics in engineering perspective; Theory of Demand Analysis: Meaning and Types, Law of demand, Exceptions to the Law of Demand, Elasticity of Demand; Theory of Supply Analysis: Law of Supply and Elasticity of Supply; Mathematical Explanation on cost, revenue and profit function.

Unit 2

15 Hours

Production Function and Its Applications: Production Function: Short-run and long-run Production Function; Mathematical Explanation: Laws of Returns to Scale & Law of Diminishing Returns Scale; Concept of Cost and Its Types: Total cost, fixed cost, variable cost, average variable cost, average fixed cost, marginal cost, explicit and implicit cost; Break-Even-Analysis: Importance and graphical presentation, mathematical problems.

Unit 3

10 Hours

Time Value of Money and Project Evaluation: Time Value of Money: Simple and Compound, Uniform Series Compound Interest Formula, Present Worth Analysis, Future Worth Analysis, Future Value through Annuity, Rate of Return Analysis, Cash flow diagrams; Depreciation: Introduction, Straight Line and Declining Balance Method of Depreciation; Taxes and insurances: Tax and types of taxes, Insurance and types of insurance; Depreciation: types of depreciation, services life, salvage value, present value, Methods for determining depreciation, single unit and group depreciation.

Project Evaluation Techniques: Present Worth Method, Future Worth Method, Annual Worth Method; Benefit Cost Analysis: Conventional and Modified B/C Ratio with PW method.

Profitability: alternative investments and replacements, profitability standards, discounted cash flow Capitalized cost, pay out period, alternative investments, analysis with small investments, increments and replacements.

Unit 4**10 Hours**

Financial Accounting: Accounting concepts and Conventions, Accounting Equation, Double-Entry system of Accounting, Rules for maintaining Books of Accounts, Journal, Posting to Ledger, Preparation of Trial Balance, Elements of Financial Statements, Preparation of Final Accounts.

Banking and Finance Banking Sector: Functions of the Commercial Bank and Central Bank, Financial Institutions; Financial Market: Money Market and Capital Market; Monetary and Fiscal Policy: Objectives, Instruments, Tools in Indian Economy; Inflation: Causes, Effects and Methods to Control it, Measurement of Inflation- Consumer Price Index and Whole Price Index; Deflation and Stagflation; Business Cycles: Various phases, Control and Measurement, Impact on business cycles on economic activities.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- Pravin Kumar (2015). *Fundamental of Engineering Economics*. Raj Kamal Press, New Delhi.
- Riggs J.L., Dedworth, Bedworth D.B., and Randhawa, S.U. (1996). *Engineering Economics*. McGraw Hill International, New Delhi
- Panneer Selvam R. (2001). *Engineering Economics*. Prentice Hall of India Ltd, New Delhi.
- L.M. Bhole (2007). *Financial Institutions and Markets*. Tata McGraw Hill, New Delhi.
- D.D. Chaturvedi, S.L. Gupta. (2013). *Business Economics - Theory and Applications*, International Book House Pvt. Ltd.
- Dhanesh K Khatri. (2011). *Financial Accounting*, Tata McGraw Hill.
- Geethika Ghosh, Piyali Gosh, Purba Roy Choudhury. (2012). *Managerial Economics*, 2e, Tata McGraw Hill Education Pvt. Ltd.
- S.N. Maheshwari, Sunil K Maheshwari, Sharad K Maheshwari. (2013). *Financial Accounting*, 5e, Vikas Publications.

Course Title: Environment Education	L	T	P	Cr.
Course Code: VAC0001	2	0	0	2

Total Hours: 30**Course Learning Outcomes:** After completing all the units, students will learn:

1. Grasp the concept of Environmental Science, its components, types of natural resources, their distribution, and usage, with a focus on India.
2. Discuss the factors impacting biodiversity loss and ecosystem degradation in India and the world.
3. An overview of Contemporary Environmental Issues i.e National and Global efforts to address climate change adaptation and mitigation.
4. To understand environmental laws for monitoring pollution.
5. Principles guiding human responsibility toward the environment.
6. Toxic chemicals and analytical methods for monitoring environmental pollutants.

Course Content**Unit-I****6 Hours**

Human – Environment Interaction, Natural Resources, and Sustainable Development: The man-environment interaction: Humans as hunter-gatherers; Mastery of fire; Origin of agriculture; Emergence of city-states; Great ancient civilizations and the environment, Indic Knowledge and Culture of sustainability; Middle Ages and Renaissance; Industrial revolution and its impact on the environment; Population growth and natural resource exploitation; Global environmental change. Environmental Ethics and emergence of environmentalism: Anthropocentric and eco-centric perspectives (Major thinkers); The Club of Rome- Limits to Growth; UN Conference on Human Environment 1972; World Commission on Environment and Development and Rio Summit. Natural resources: Definition and Classification. Microbes as a resource; Status and challenges. Environmental impact of over-exploitation, issues and challenges; Water scarcity and Conflicts over water. Mineral resources and their exploitation; Environmental problems due to extraction of minerals and use; Soil as a resource and its degradation. Energy resources: Sources and their classification. Implications of energy use on the environment. Introduction to sustainable development: Sustainable Development Goals (SDGs)- targets and indicators, challenges and strategies for SDGs.

Unit-II**6 Hours**

Biodiversity Conservation and Environmental Issues: Biodiversity as a natural resource; Levels and types. Biodiversity in India and the world; Biodiversity hotspots; Species and ecosystem threat categories. Major ecosystem types in India, their services, classification, significance and characteristics of forests, wetlands, grasslands, agriculture, coastal and marine; Threats to biodiversity and ecosystems: Land use and land cover change; Commercial exploitation of species; Invasive species; Fire, disasters and climate change. Major conservation policies: in-situ and ex-situ approaches; National and International Instruments for biodiversity conservation; the role of traditional knowledge, community-based conservation; Gender and conservation. Environmental issues and scales: micro-, meso-, synoptic and planetary scales; Temporal and spatial extents of local,

regional, and global phenomena. Pollution: Types of Pollution- air, noise, water, soil, thermal, radioactive; municipal solid waste, hazardous waste; transboundary air pollution; acid rain; smog. Land use and Land cover change: land degradation, deforestation, desertification, urbanization. Biodiversity loss: past and current trends, impact. Global change: Ozone layer depletion; Natural Disasters – Natural and Man-made (Anthropogenic).

Unit-III

8 Hours

Environmental Pollution, Health, Climate Change: Impacts, Adaptation and Mitigation: Definition of pollution; Point and non-point sources. Air pollution: sources, Impacts, Primary and Secondary pollutants; Criteria pollutants- carbon monoxide, lead, nitrogen oxides, ground-level ozone, particulate matter and sulphur dioxide; Other important air pollutants- Volatile Organic compounds (VOCs), Peroxyacetyl Nitrate (PAN), Polycyclic aromatic hydrocarbons (PAHs) and Persistent organic pollutants (POPs); Indoor air pollution; National Ambient Air Quality Standards. Water pollution: Sources; River, lake and marine pollution, groundwater pollution, impacts; Water quality parameters and standards. Soil pollution: sources and pollutants. Solid and hazardous waste, its impacts. Noise pollution: Definition, Unit of measurement, sources, noise standards; adverse impacts. Thermal and Radioactive pollution: Sources and impacts. Climate change: natural variations in climate due to greenhouse gas emission- past, present & future. Structure of atmosphere. Projections of global climate change with special reference to temperature, rainfall, climate variability and extreme events; Importance of 1.5 °C and 2.0 °C limits to global warming; Climate change projections for the Indian sub-continent. Impacts, vulnerability and adaptation to climate change: Observed impacts of climate change on ocean and land systems; Sea level rise, changes in marine and coastal ecosystems; Impacts on forests, natural ecosystems, animal species, agriculture, health, urban infrastructure; the concept of vulnerability and its assessment; Adaptation vs. resilience; Climate-resilient development; Indigenous knowledge for adaptation to climate change. Mitigation of climate change: Synergies between adaptation and mitigation measures; Green House Gas (GHG) reduction vs. sink enhancement; Concept of carbon intensity, energy intensity and carbon neutrality; National and international policy instruments for mitigation, decarbonizing pathways and net zero targets for the future; Energy efficiency measures; Carbon capture and storage, National climate action plan and Intended Nationally Determined Contributions (INDCs); Climate justice.

Unit-IV

10 Hours

Introduction to environmental laws and regulation: Article 48A, Article 51A (g) and other environmental rights; Introduction to environmental legislations on the forest, wildlife and pollution control. Environmental management system: ISO 14001 Concept of Circular Economy, Life cycle analysis; Cost-benefit analysis Environmental audit and impact assessment; Environmental risk assessment Pollution control and management; Waste Management- Concept of 3R (Reduce, Recycle and Reuse) and sustainability; Ecolabeling /Ecomark scheme. Bilateral and multilateral agreements on international co-operation of instruments; conventions and protocols; binding and nonbinding measures; Conference of the Parties (COP) Major International Environmental Agreements:- Convention on Biological Diversity (CBD); Cartagena Protocol on Biosafety; Nagoya Protocol on Access and Benefit-

sharing; Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES); Ramsar Convention on Wetlands of International Importance; United Nations Convention to Combat Desertification (UNCCD); Vienna Convention for the Protection of the Ozone Layer; Montreal Protocol on Substances that Deplete the Ozone Layer and the Kigali Amendment; Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal; Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade; Stockholm Convention, Minamata Convention, United Nations Framework Convention on Climate Change (UNFCCC); Kyoto Protocol; Paris Agreement; India's status as a party to major conventions

Major Indian Environmental Legislations: The Wild Life (Protection) Act, 1972; The Water (Prevention and Control of Pollution) Act, 1974; The Forest (Conservation) Act, 1980; The Air (Prevention and Control of Pollution) Act, 1981; The Environment (Protection) Act, 1986; The Biological Diversity Act, 2002; The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006; Noise Pollution (Regulation and Control) Rules, 2000; Industry-specific environmental standards; Waste management rules; Ramsar sites; Biosphere reserves; Protected Areas; Ecologically Sensitive Areas; Coastal Regulation Zone; Production and consumption of Ozone Depleting substances, Green Tribunal; Some landmark Supreme Court judgements

Major International organisations and initiatives: United Nations Environment Programme (UNEP), International Union for Conservation of Nature (IUCN), World Commission on Environment and Development (WCED), United Nations Educational, Scientific and Cultural Organization (UNESCO), Intergovernmental Panel on Climate Change (IPCC), and Man and the Biosphere (MAB) programme.

Suggested Readings: -

- Chahal, M. K. (2024). *Environmental Science and Hazards Management (Ecology and Risk Management)*, ISBN:978-93-6440-586-7.
- Baskar, S. and Baskar, R. (2009). *Natural Disasters (Earth's Processes & Geological Hazards)*, ISBN: 978-81-7806-168-9.
- Tiefenbacher, J (ed.) (2022), *Environmental Management - Pollution, Habitat, Ecology, and Sustainability*, Intech Open, London. 10.5772/
- Kanchi Kohli and Manju Menon (2021) *Development of Environment Laws in India*, Cambridge University Press.
- Bhagwat, Shonil (Editor) (2018) *Conservation and Development in India: Reimagining Wilderness*, Earthscan Conservation and Development, Routledge.
- Manahan, S.E. (2022). *Environmental Chemistry (11th ed.)*. CRC Press. <https://doi.org/10.1201/9781003096238>.
- William P. Cunningham and Mary A. (2015) *Cunningham Environmental Science: A Global Concern*, Publisher (Mc-Graw Hill, USA)
- Central Pollution Control Board Web page for various pollution standards. <https://cpcb.nic.in/standards/>
- Theodore, M. K. and Theodore, Louis (2021) *Introduction to Environmental Management*, 2nd Edition. CRC Press.
- Ministry of Environment, Forest and Climate Change (2019) *A Handbook on*

International Environment Conventions & Programmes. <https://moef.gov.in/wp-content/uploads/2020/02/convention-V-16-CURVE-web.pdf>

Webo-graphy:

- Environmental Science - Course (nptel.ac.in)
- Environmental Studies - Course (swayam2.ac.in)
- Environmental studies | PPT (slideshare.net)
- PPT - CHAPTER 1 Introduction to Environmental Studies PowerPoint Presentation - ID:9436089 (slideserve.com)

Course Code: BCE1107	L	T	P	Cr.
Course Title: Entrepreneurship Setup & Launch	0	0	04	02

Introduction:

This semester lays the foundation for the learner to understand what entrepreneurship is, beyond just starting a business. It introduces key ideas like problem-solving, value creation, and self-awareness. The learner will begin exploring basic business concepts while discovering their own interests and strengths.

Learners Objective:

1. Understand the core concepts of entrepreneurship through relatable, real-life examples.
2. Begin to see themselves as problem-solvers and creators.
3. Learn about business paths and choose one to try based on interest or local fit.
4. Launch a micro-hustle (online or offline) to earn their first income.
5. Build confidence and self-belief by doing.

Outcome: By the end of this semester, learners will start a simple business activity, earn their first income, and build belief in their ability to do business.

Guiding Principles/Approach:

This syllabus is built on principles of **experiential learning**, **growth mindset development**, and **identity-first learning**. Drawing from learning science and behavior design, the course shifts students from passive learning to *active doing*, where they try out small business activities in real contexts. The design helps students not just learn entrepreneurship, but begin to see themselves as entrepreneurs. Emphasis is placed on *small wins*, *peer collaboration*, and *locally relevant opportunities* to ensure learning feels achievable and connected to their realities. The curriculum focuses on conceptual understanding without heavy theory, combining *practical action*, *reflection*, and

collaboration. By making progress visible and success feel possible, it plants the seeds of self-reliance, initiative, and long-term motivation.

Semester Syllabus:

Format: 12 weeks, 4 hours/week | 2 credits

Revenue Target: ₹10,000

Week	Learning Goal	Measurable Outcome
1	Understand what entrepreneurship is and who can be an entrepreneur	Students define entrepreneurship in their own words and list 2 entrepreneurs from their local area or community
2	Connect personal identity to entrepreneurship (strengths, interests, struggles)	Students create a “value map” showing how a skill/interest/problem from their life could become a business opportunity
3	Learn about 5 business paths: content creation, dropshipping, cloud kitchen/food business, gig economy and local services	Students explore 1–2 examples from each domain and share one they’re most curious to try and why
4	Choose a path and generate a basic business idea	Students write down a clear offer (what, for whom, why) and one way to reach their customer
5	Take first real action: message, post, pitch, or sell	Students reach out to or serve 1 real potential customer and record what happened

6	Reflect on first attempt and share with peers	Students share their result, a challenge faced, and one idea to improve next time
7	Improve and try again: aim for first ₹100	Students apply a change, try again, and aim to make their first ₹100 or get meaningful response
8	Learn how to identify and understand your target customer	Students talk to 2 potential customers or observe them and list 3 insights about their needs
9	Learn how to serve your target audience better	Students improve one part of their offer (product, delivery, messaging, or interaction) based on customer feedback or need
10	Explore core entrepreneurial values (resilience, honesty, effort)	Students reflect on 1 value they're building and show it in a business task or peer story
11	Focus on earning and staying consistent	Students complete a second earning task and track their consistency (e.g., same product or message for 3 days)
12	Reflect on earnings, grit, and how to keep going	Students record total earnings, one resilience moment, and one support system or habit they'll continue with

Weekly Component:

Component	Duration	Description
Learning Module	~1.5 hrs	- Introduces key concepts in a simple and engaging way - Includes, examples, and 1–2 interactive discussions or quizzes

Action Lab	~2 hrs	- Hands-on task on the weekly concept - Includes step-by-step guidance, templates, and worksheets - Ends with a submission (e.g., video, reflection, or proof of action)
Resources	Self-paced	- Supplementary videos, short readings, real-life stories, and tools to deepen understanding at their own pace

Evaluation Criteria

Evaluation Component	Description	Weightage
Weekly Task Completion	Timely submission of weekly tasks including reflections, activities, quizzes etc.	40%
Target Completion	Performance-based evaluation on hitting revenue or profit targets (e.g., generating ₹10,000 revenue)	30%
Final Project	A comprehensive project based on the semester's theme	30%

SEMESTER- II

Course Title: Engineering Mathematics –II	L	T	P	Cr.
Course Code: BCE2150	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Demonstrate the methods of forming and solving Ordinary differential equations and solve linear differential equations with constant and variable coefficients
2. Explain the concept of differential equation and classifies the differential equations with respect to their order and linearity.
3. Solve first-order ordinary and exact differential equations and converts separable and homogeneous equations to exact differential equations by integrating factors.
4. Apply the method of undetermined coefficients to solve the non-homogeneous linear differential equations with constant coefficients.

Course Content**UNIT-I****14 Hours**

First order ordinary differential equations: Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type.

Ordinary differential equations of higher orders: Second order linear differential equations with variable coefficients, method of variation of parameters, Cauchy-Euler equation; Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

UNIT-II**15 Hours**

Complex Variable – Differentiation: Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; Conformal mappings, Mobius transformations and their properties.

UNIT-III**15 Hours**

Complex Variable–Integration: Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals using the Bromwich contour.

UNIT-IV**16 Hours**

Transform Calculus: Laplace Transform, Properties of Laplace Transform, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs and PDEs by Laplace Transform method. Fourier transforms.

Transaction Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning.

Suggested Reading

- *Thomes, G.B. and Finney, R.L. (2010) Calculus and Analytic Geometry; Ninth Edition; Pearson Education*
- *Kreyszig, E. (1998) Advanced Engineering Mathematics; Eighth Edition, John Wiley and sons.*
- *Grewal, B.S. (1965) Higher Engineering Mathematics; Khanna Publishers, New Delhi.*
- *BabuRam (2009) Advance Engineering Mathematics; First Edition; Pearson Education.*
- *Richard Courant and Fritz John (2012) Introduction to Calculus and Analysis, Volume II, V Springer Publication*
- *Harold M. Edwards (2013) Advanced Calculus: A Differential Forms Approach, Birkhauser.*

Course Title: Engineering Physics	L	T	P	Cr.
Course Code: BCE2151	3	0	0	3

Total Hours: 45

Course Learning Outcomes: After completion of this course, the learner will be able to:

1. Apply knowledge of electricity and magnetism to explain natural physical processes and related technological advances.
2. Use the knowledge regarding calculus along with physical principles to effectively solve problems encountered in everyday life, further study in science, and in the professional world.
3. Design experiments and acquires data in order to explore physical principles, effectively communicate results, and evaluate related scientific studies.
4. Assess the contributions of physics to our evolving understanding of global change and sustainability while placing the development of physics in its historical and cultural context.

Course Content

UNIT I

12 Hours

Electrostatics: Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations for electrostatic potential, Boundary conditions of electric field and electrostatic potential; method of images. Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; boundary conditions on displacement; solving simple electrostatics problems in presence of dielectrics – Point charge at the center of a dielectric sphere, charge in front of a dielectric slab, dielectric slab and dielectric sphere in uniform electric field.

UNIT II

13 Hours

Magneto statics: Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; vector potential and its solution for given current densities. Properties of magnetic materials: magnetic susceptibility and ferromagnetic, paramagnetic and diamagnetic materials.

Time Varying Field and Maxwell's Equation: Laws of Electromagnetic Induction, Self and Mutual induction, Concept of Displacement Current, Difference between Conduction Current and Displacement Current, Eddy Current, Maxwell's Equations, Derivation of Maxwell's Equations, Propagation of Electromagnetic Waves in Free Space, Solution of propagation of Plane Electromagnetic Wave in free space.

UNIT III

10 Hours

Semiconductors: Intrinsic and extrinsic semiconductors, Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Semiconductor materials of interest for optoelectronic devices.

Modern Physics: Particle properties of wave: Planck's hypothesis, Qualitative discussion of Photoelectric effect and Compton Effect. Wave properties of particle: De Broglie wave as matter waves, Heisenberg's uncertainty principle and its application. Quantum Mechanics: Interpretation of wave function, Schrödinger equation (time dependent and time independent), particle in a box,

UNIT IV

10 Hours

Wave Optics: Interference due to division of wavefront, Young's double slit expt., Principle of Superposition, Interference from parallel thin films, Newton rings, Michelson interferometer. Diffraction: Fresnel Diffraction, Diffraction at a straight edge, Fraunhofer diffraction due to N slits, Diffraction grating, dispersive and resolving power of Grating. Polarization: production of plane polarized light by different methods, Brewster and Malus Laws. Double refraction, Quarter & half wave plate, Nicol prism, specific rotation, Laurent's half shade polarimetry.

Laser: Introduction, principle of Laser, stimulated and spontaneous emission, Einstein's Coefficients, He-Ne Laser, Ruby Laser, Application of Lasers.

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

- David J Griffiths. (1999). *Introduction to Electrodynamics*. Prentice Hall.
- Walker, Jearl, David Halliday, and Robert Resnick. (2011). *Fundamentals of Physics*. Hoboken, N.J: Wiley.
- Saslow, W. (2008). *Electricity, magnetism and light*. e-book.

Course Title: Introduction to Concrete Technology	L	T	P	Cr.
Course Code: BCE2152	4	0	0	4

Total Hours: 60**Learning Outcomes:**

On successful completion of this course, the students would be able to:

1. To define and understand concepts related Concrete technology which involves types and property of concrete and different adhesive materials and its vital use for safe, economic development for the buildings.
2. To present the foundations of many basic Engineering tools and concepts related to Concrete technology and Civil Engineering.
3. To give an experience in the implementation of engineering concepts which are applied in field of Civil Engineering.

Course Content**Unit-I****15 Hours**

Basics: Historical background, composition of concrete, general note on strength mechanism, recent practice and future trends.

Unit-II**15 Hours**

Cement: Basics of Chemical composition, hydration, heat of hydration, hydrated structure, various types of cement.

Unit-III**15 Hours**

Aggregates: Utility in Aggregates, classification, effect of geometry & texture, strength, mechanical properties, moisture content, water absorption, bulking of sand.

Water: General Requirements & limiting values of impurities.

Unit-IV**15 Hours**

Fresh concrete: Methods of mixing, transporting and placing of concrete. Workability – Definition and requirement, factors affecting workability. Segregation and bleeding, re-tempering. Curing: necessity and various methods, micro-cracking.

Transaction Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning.

Suggested Readings:

1. M S Shetty; *Concrete Technology*, S.Chand Publication New Delhi
2. P Kumar Mehta, Monteiro; *Concrete Technology*, Indian Concrete Institute
3. A R Santhakumar; *Concrete Technology*, Oxford University Press
4. A.M.Neville ; *Properties of Concrete* , Pearson Education
5. M L Gambhir; *Concrete Technology* , Tata McGraw Hill

Course Title: Engineering Graphics & Drawing	L	T	P	Cr.
Course Code: BCE2153	4	0	0	4

Total Hours:60

Course Learning Outcomes: After completion of this course, the learner will be able to:

1. Understand about engineering drawing applications and its importance in society.
2. Learn about the visual aspects of engineering design.
3. Discuss the engineering graphics standards.
4. Classify the concept of solid modeling techniques.

Course Content

UNIT I

15 Hours

Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales – Plain, Diagonal and Vernier Scales;

Orthographic Projections covering, Principles of Orthographic Projections- Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

UNIT II

15 Hours

Projections of Regular Solids covering, those inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

UNIT III

15 Hours

Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

Overview of Computer Graphics covering, listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, shares, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects.; Isometric Views of lines, Planes, Simple and compound Solids];

Customization & CAD Drawing consisting of set up of the drawing page and the printer, including scale settings, setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerance; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles;

UNIT IV

15 Hours

Annotations, layering & other functions covering applying dimensions to objects, applying annotations to drawings; Setting up and use of Layers, layers to Credits ate drawings, Credits ate, edit and use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and project the true shape of the sectioned surface; Drawing annotation, Computer-aided design (CAD) software modeling of parts and assemblies. Parametric and non-parametric solid, surface and wireframe models. Part editing and two-dimensional documentation of models. Planar projection theory including sketching of perspective, isometric, multi view, auxiliary, and section views. Spatial visualization exercises. Dimensioning guidelines, tolerance techniques; dimensioning and scale multi views of dwelling;

Demonstration of a simple team design project that illustrates Geometry and topology of engineered components: Creation of engineering models and their presentation in standard 2D blueprint form and as 3D wire-frame and shaded solids; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerance; Use of solid-modeling software for Credits eating associative models at the component and assembly levels; floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc. Applying color coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modeling (BIM).

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Self-Learning, Collaborative Learning and Cooperative Learning.

Suggested Readings

- Gill, P. S. (2001). *Engineering Drawing*. S.K; Kataria and Sons, Ludhiana.
- Bhatt, N. D. (2012). *Engineering Drawing*. Charotar Book Stall, Tulsi Sadan, Anand.
- French, T.E. and Vierck. C. J. (1993). *Graphic Science*. McGraw-Hill, New York.
- Zozzora, F. (1958). *Engineering Drawing*. McGraw Hill, NewYork. (Corresponding set of) CAD Software Theory and User Manuals.

Course Title: COMPUTER PROFICIENCY	L	T	P	Credits
Course Code: BCE2154	2	0	0	2

Total hours: 30

Course Learning Outcomes: After completion of this course, the learner will be able to:

1. Develop the ability to analyze and solve AI-related problems using intelligent agents, search strategies, optimization techniques, and decision-making frameworks, preparing for real-world applications in diverse fields
2. Acquire practical knowledge and skills in PC maintenance, security, and troubleshooting, including software updates, hardware cleaning, file management, and resolving basic technical issues to ensure efficient computer performance.
3. Develop foundational knowledge of computer networks, internet applications, web security, and troubleshooting, along with practical skills in using web browsers, search engines, and online collaboration tools.
4. Understand the latest trends in IECT, e-Governance, cloud and mobile computing, digital signatures, and their applications in governance and project management, ensuring a comprehensive foundation for modern digital systems.

Course Content

UNIT I

5 Hours

Introduction: Definition – Future of Artificial Intelligence – Characteristics of Intelligent Agents Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

Problem solving Methods: Search Strategies- Uninformed – Informed – Heuristics – Local Search Algorithms and Optimization Problems – Searching with Partial Observations – Constraint Satisfaction Problems – Constraint Propagation – Backtracking Search – Game Playing – Optimal Decisions in Games – Alpha – Beta Pruning – Stochastic Games.

UNIT II

10 Hours

PC Maintenance, Security & Troubleshooting: Computer Maintenance and Security: Overview of Computer Maintenance and Security, Inbuilt PC Security, tools, Securing documents, Antivirus, Upgrading Operating System and Application software. security; Cleaning the monitor, keyboard, CPU; Deleting unnecessary programs and files: Disk cleanup, deleting toolbars; defrag hard drive; Computer maintenance programs: Ccleaner, myDefrag, Spinrite etc.; Basic troubleshooting: restart computer, checking cables, uninstalling a software, start windows in safe mode etc.; Windows installation and upgrades, CPUs and motherboards, Memory systems, Expansion cards, Data storage devices, Ports, connectors, and cables, Printers and scanners, Display devices, Portable computers and devices, Networking, Security, Maintaining the PC environment.

UNIT III**10 Hours**

Basic of Computer Networks: LAN, WAN, Wi-Fi, Broadband, Bluetooth; Internet: Concept of Internet, Applications of Internet, Connecting to the Internet, Troubleshooting; WWW, TCP/IP, DNS, Search Engine; Key web browser features, Brief about switch, router, gateway; Various applications of Internet: e-mail, information gathering, retailing etc.; Methods of connecting to the Internet: Dial up, ISDN and broadband; Brief introduction to Internet addressing, Internet protocols (TCP/IP, FTP and HTTP); Define and understand the terms: Internet Service Provider (ISP), Uniform Resource Locator (URL), hyperlink; Internet protocols (TCP/IP, FTP and HTTP); Define and understand the terms: Internet Service Provider (ISP), Uniform Resource Locator (URL), hyperlink; Know how to identify a secure web site: https, lock symbol; Security Considerations: Know about security threats from web sites like: viruses, worms, Trojan horses, spyware.

Using Favorites Folder, Downloading Web Pages, Printing Web Pages, Understanding URL, Set the web browser Home Page/Start page; Bookmark a web page, Delete a bookmark, Publishing on the Web, Downloading Web Pages, Printing Web Pages; Complete a web-based form using: text boxes, drop-down menus, list boxes, check boxes, radio buttons; Understanding benefits of Search Engines and Popular Search Engines (Google, Alta Vista, Excite); Commerce on Internet, Impact of Internet on Society.

Overview of use of search engines and e-mail messages; Instant Messaging and Collaboration: Using Instant messaging, Instant messaging providers, Use of Social Networking Sites viz. Facebook, Twitter etc.; Introduction to the concepts of IPv4 and IPv6 networks; Network troubleshooting.

UNIT IV**5 Hours**

Latest trends in IECT & e-Governance: Applications of IECT: e-governance, Multimedia and Entertainment; Project Management using IT tools & related applications; Introduction to Cloud Computing: What is cloud computing, Properties & Characteristics, Service models, Deployment models; Concepts of: IaaS (Infrastructure as a Service), PaaS (Platform as a Service), SaaS (Software as a service), DaaS (Desktop as a Service); Introduction to Mobile Computing, its components and characteristics; Digital signature: definition as per ITA 2000, how digital signature works; role of certifying authorities: Digital Certificates and their uses, Certifying Authority regulation in India, Obtaining a trial version of a Digital Certificate; legal aspect covering digital signatures in India; how to use digital signatures on electronic documents. Legal aspects covering digital signatures in India.

e-Governance: Definition of e-Governance, Pillars of e-Governance, Infrastructure for e-Governance, Mission Mode Projects (At least 5), Familiarization with terminology like change management, processing engineering, Govt. Processing engineering and Governance, e-Governance project life cycle, electronically delivery of services, messaging system and case study of any 5 public utility portal related with the Department (especially, public grievance redressal system, RTI, Vigilance, Department working and financial inclusion, linkage with Aadhar etc.)

Transaction Modes

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning.

Suggested Readings

- *Stuart Russell and Peter Norvig. (2020). **Artificial Intelligence: A Modern Approach.** PHI.*
- *David L. Poole and Alan K. Mackworth. (2017). **Artificial Intelligence: Foundations of Computational Agents.** Cambridge University Press.*
- *Scott Mueller. (2015). **Upgrading and Repairing PCs.** QUE.*
- *Behrouz A. Forouzan. (2017). **Data Communications and Networking.** McGraw Hill.*
- *Thomas Erl et al. (2013). **Cloud Computing: Concepts, Technology & Architecture.** Pearson Education.*
- *Darrell M. West. (2005). **Digital Governance: Leveraging Digital Technology for Governance, Growth and Inclusion.** Princeton University Press.*
- *C.S.R. Prabhu. (2006). **e-Governance: Concepts and Case Studies.** PHI.*

Course Title: COMMUNICATION SKILLS-II	L	T	P	Credits
Course Code: BCE2155	2	0	0	2

Total Hours: 30

Course Learning Outcomes: On successful completion of this course, the students would be able to:

1. Start conversations, respond appropriately, use visuals, and build vocabulary with various tools like synonyms and idioms.
2. Develop techniques for skimming, scanning, guessing meanings, and critical reading and master professional writing formats like resumes, emails, and technical reports.
3. Strengthen oral and written presentation skills with seminars, posters, and assignments.
4. Improve group dynamics, body language, and prepare with mock interviews.

Course Content

Unit I

5 Hours

Fundamentals of Inter-personal Communication and Building Vocabulary:

Starting a conversation – responding appropriately and relevantly – using the right body language – Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

Unit II

10 Hours

Reading Comprehension: General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.

Writing Skills: Structure and presentation of different types of writing – letter writing/Resume writing/ e-correspondence/Technical report writing/ – planning for writing – improving one's writing

Unit III

8 Hours

Presentation Skills: Oral presentations (individual and group) through JAM sessions/seminars/PPTs and written presentations through posters/projects/reports/ emails/assignments etc.

Unit IV

7 Hours

Group Discussion and Interview Skills: Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

Transaction Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Self-Learning, Collaborative Learning.

Suggested Readings:

- *M Asharaf Rizvi. (2022). Effective Technical Communication. McGraw Hill Education (India) Pvt. Ltd.*
- *Stephen Bailey. (2018). Academic Writing: A Handbook for International Students. Routledge.*
- *Shiv K. Kumar and Hemalatha Nagarajan. (2007). Learn Correct English – A Book of Grammar, Usage and Composition. Pearson.*
- *Aruna Koneru. (2016). Professional Communication. McGraw Hill Education (India) Pvt. Ltd.*
- *Meenakshi Raman & Sangeeta Sharma. (2009). Technical Communication. Oxford University Press.*
- *Paul V. Anderson. (2007). Technical Communication. Cengage Learning pvt. Ltd. New Delhi.*
- *English Vocabulary in Use series, Cambridge University Press 2008.*
- *David A. McMurrey & Joanne Buckley. (2012). Handbook for Technical Communication. Cengage Learning.*
- *Leena Sen. (2009). Communication Skills. PHI Learning Pvt Ltd.*
- *Colm Downes. (2008). Job Hunting. Cambridge University Press.*
- *Aysha Vishwamohan. (2009). English for Technical Communication for Engineering Students. Tata McGraw Hill.*

Course Title: ENGINEERING PHYSICS LAB	L	T	P	Cr.
Course Code: BCE2156	0	0	2	1

Total Hours: 15

Course Learning Outcomes On successful completion of this course, the students would be able to:

1. Illustrate the working p-n junction diode.
2. Analyse and solve various engineering problems.
3. Understand principle, concept, working and application of new technology and comparison of results with theoretical calculations.
4. Design new instruments with practical knowledge.

Course Content

List of experiments

1. To study the V-I characteristics of P-N junction.
2. To verify the logic gates.
3. To calculate the acceleration due to gravity “g” using simple pendulum.
4. To find the moment of inertia of flywheel.
5. To measure the diameter of a small spherical/cylindrical body using Vernier calipers/screw gauge.
6. To draw V-I characteristics of Zener diode and determine reverse breakdown voltage.
7. To study the controls and obtain a wave using Cathode Ray Oscilloscope.
8. To find the resolving power of the prism.
9. To determine the angle of the given prism.
10. To determine the refractive index of the material of a prism.
11. To understand the phenomenon Photoelectric effect as a whole.
12. To draw kinetic energy of photoelectrons as a function of frequency of incident radiation.
13. To determine the Planck's constant from kinetic energy versus frequency graph.
14. To plot a graph connecting photocurrent and applied potential.
15. To determine the stopping potential from the photocurrent versus applied potential graph.

Note: Students will perform/study 7-8 experiments from the syllabus.

Course Title: COMPUTER PROFICIENCY LAB	L	T	P	Credits
Course Code: BCE2157	0	0	2	1

Total Hours 15

Course Learning Outcomes: After completion of this course, the learner will be able to:

1. Understand the concept of input and output devices of Computers
2. Study to use the Internet safely, legally, and responsibly.
3. discuss an operating system and its working, and solve common problems related to operating systems
4. Learn basic word processing, Spreadsheet and Presentation Graphics Software skills

Course Content

1. Various Components of a Computer.
2. Introduction to Microsoft Word & Presentation.
3. use 3D effects on prescribed presentation
4. Applications of MS-Office MS-Word, MS-Excel, MS-PowerPoint.
5. Create web pages using different tags.
6. Web Browser and E-Mail
7. Conversion of a word documents into PDF/ Image conversion using image file format.
8. Computer Hardware.

Course Title: Indian Constitution	L	T	P	Cr.
Course Code: BCE2158	3	0	0	3

Total Hours: 45

Course Learning Outcomes: On successful completion of this course, students would be able to:

1. Acquire general knowledge and legal literacy and thereby to take up competitive examinations
2. Comprehend state and central policies, fundamental duties, Electoral Process, and special provisions
3. Analyze powers and functions of Municipalities, Panchayats and Co-operative Societies, and
4. Apply Engineering ethics and responsibilities of Engineer and an awareness about basic human rights in India.

Course Content

Unit I

10 Hours

Introduction to the Constitution of India, The Making of the Constitution and Salient features of the Constitution.

Preamble to the Indian Constitution Fundamental Rights & its limitations.

Unit II

15 Hours

Directive Principles of State Policy & Relevance of Directive Principles State Policy Fundamental Duties.

Union Executives – President, Prime Minister Parliament Supreme Court of India.

State Executives – Governor, Chief Minister, State Legislature High Court of State.

Electoral Process in India, Amendment Procedures, 42nd, 44th, 74th, 76th, 86th & 91st Amendments.

Unit III

10 Hours

Special Provision for SC & ST Special Provision for Women, Children & Backward Classes Emergency Provisions. Human Rights –Meaning and Definitions, Legislation Specific Themes in Human Rights- Working of National Human Rights Commission in India

Powers and functions of Municipalities, Panchyats and Co – Operative Societies.

Unit IV

10 Hours

Scope & Aims of Engineering Ethics, Responsibility of Engineers Impediments to Responsibility.

Risks, Safety and liability of Engineers, Honesty, Integrity & Reliability in Engineering.

Transaction Mode

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Self-Learning, Collaborative Learning.

Suggested Readings:

- *Basu, D.D. (2001). Introduction to the Constitution on India. Prentice Hall.*
- *Charles E. Haries, Michael S Pritchard and Michael J. Robins “Engineering Ethics” Thompson Asia, 2003-08-05.*
- *Pylee, M.V. (2002). An Introduction to Constitution of India. Vikas Publishing.*
- *Govindarajan, M., Natarajan, S. & Senthil kumar, V.S. (2004). Engineering Ethics. Prentice Hall of India Pvt. Ltd. New Delhi.*
- *Sharma, B.K. (2011). Introduction to the Constitution of India. PHI Learning Pvt. Ltd., New Delhi.*
- *Latest Publications of Indian Institute of Human Rights, New Delhi.*

Course Title: Human Values and Professional Ethics	L	T	P	Cr.
Course Code: VAC0002	2	0	0	2

Total Hours: 30

Course Learning Outcomes: After completion of this course, the learner will be able to:

1. Understand the essence of Indian ethos, cultural values and ethical principles derived from scriptures, integrating self-exploration with scientific inquiry.
2. Analyze human values, self-awareness and ethical decision-making by distinguishing between perspectives, ideologies and universal moral principles.
3. Evaluate constitutional values, global responsibilities and the role of ethics in citizenship while promoting inclusivity and social welfare.
4. Develop essential life skills, stress management techniques and holistic well-being through mindfulness, self-discipline and personality development.

Course Content

Unit-I

7 Hours

Introduction to Indian Etho: Meaning of ethos and cultural essence of India, Scriptures as the base of the Indian Knowledge System (IKS), Integrating the two methodologies: interiorization process for self-exploration and exterior scientific pursuit for the prosperity of world, The Law of Karma and Nishkama Karma (The Law of action and selfless action), Practical: Five hours of Yoga practice per week, Ethics through Music and Indian Poetry, Community Engagement

Unit-II Human Values and Ethics

8 Hours

Human Values and Ethics: Knowing the Self and the universal values that we stand for. This is self-enquiry & self-discovery, Background conversations and deep listening, recognizing the assumptions that we make, the biases we have and the implications for ethical action. Self-identity: distinguishing and embracing oneself (and others) four profiles (inner potential, social, professional, personality), Distinguish ideology, perspectives beliefs from embodying values. Practical: Self discovery, self enquiry and Mindfulness, Yama & Niyama of Ashthang Yoga

Unit-III

7 Hours

Constitutional Values, Global Responsibility & Skills for Youth: Values embedded in the Preamble of the Indian Constitution, Integration of Human Rights and duties. Principles and responsibilities: as citizens of India, towards global environment, Loksangraha and Vasudhaiva Kutumbakam, Conscious Full Spectrum Response model. Distinguishing judgement from discernment, Practical: Development of concentration among students through music, fine arts, mathematics, sports, yoga and mindfulness

Unit-IV**8 Hours**

The three gunas (qualities of sattva—purity and harmony, rajas —activity and passion, tamas —darkness and chaos), the four antah-karanas (inner instruments) and panch kosha (five sheaths), Stress management, Oneness, non-duality and equanimity, Physical, mental, social and spiritual well-being. Practical: Talks on importance of the Ayurvedic concept of well-being and nutrition, sports activities.

Reference Books:

- Mahadevan, B., Bhat, V.R. and Nagendra, P.R.N. 2022. Introduction to Indian Knowledge System. Delhi: PHI.
- Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010.
- Kashyap, Subhash C. 2019. Constitution of India. A handbook for students. New Delhi: National Book Trust.
- Dr. Awadesh Pradhan, Mahamana ke Vichara“. (B.H.U., Varanasi 2007)
- Harold Koontz & Heinz Weihrich, Essentials of Management, Tata McGraw Hill.
- Lama, D. 2012. Beyond Religion: Ethics for a Whole World. India: Harper Collins.
- Shrimad Bhagavad-Gita (Part of the Mahabharata). 1994. Gorakhpur: Gita Press. Swami Harshananda. 2000. The Birds' Eye View of the Vedas. Bangalore: Ramakrishna Math.
- Fontaine, D. K., Rushton, C. H. and Sharma, M. 2013. Cultivating Compassion and Empathy. In: M. Plews-Ogan and G. Beyt (Eds.), Wisdom Leadership in academic Health Science Centers- Leading Positive Change. London: Radcliffe Publishing.
- Blanchard, Kenneth and Peale, Norman Vincent. 1988. The Power of Ethical Management. New York: William Morrow and Company, Inc.
- Gandhi, Mohandas Karamchand. 1971. Pathway to God compiled by MS Deshpande. Ahmedabad: Navajivan Mudranalaya, Navjivan Trust.
- Gardner, H. 2006. Five Minds for the Future. Boston: Harvard Business School Press.
- Rodriguez, S. and Juvva, S. 2018. Embodying Universal Values and Ethical Leadership in Higher Education: Creating Change Agents for Social Transformation. In B. Chatterjee, A. Banerji and P. Arya (Eds.). Resolution to Resolve: Sustainability Practices in Industry and Education. New Delhi: Bloomsbury
- [ISBN: 978-938-74-7168-9]
- Sharma, M. 2017. Radical Transformational Leadership: Strategic Action for Change Agents. Berkeley, US: North Atlantic Books.

Web Sources:

- <https://www.holy-bhagavad-gita.org/>
- <https://iksindia.org/>
- NPTEL Course: Exploring Human Values: Visions of Happiness and Perfect Society
- <https://ebooks.inflibnet.ac.in/hrmp01/>

Semester – III

Course Title: Concrete Technology	L	T	P	Cr.
Course Code: BCE3200	3	0	0	3

Total Hours: 45

Course Learning Outcomes: On the completion of the course, the students will be able to

1. Interpret the relevance of different properties of constituent materials on properties of concrete.
2. Comprehend the behavior and durability aspects of concrete under different loading and exposure conditions.
3. Evaluate the issues involved in production and use of concrete.
4. Design of concrete mixes as per BIS specifications.

Course Content

Unit-I

10 Hours

CEMENTS & ADMIXTURES: Portland cement – chemical composition – Hydration, Setting of cement – Structure of hydrate cement – Test on physical properties – Different grades of cement – Admixtures – Mineral and chemical admixtures.

Unit II:

10 Hours

AGGREGATES: Classification of aggregate – Particle shape & texture – Bond, strength & other mechanical properties of aggregate – Specific gravity, Bulk density, porosity, adsorption & moisture content of aggregate – Bulking of sand – Deleterious substance in aggregate – Soundness of aggregate – Alkali aggregate reaction – Thermal properties – Sieve analysis – Fineness modulus – Grading curves – Grading of fine & coarse Aggregates – Gap graded aggregate – Maximum aggregate size.

Unit III:

15 Hours

Properties of Concrete: Workability – Factors affecting workability – Measurement of workability by different tests – Setting times of concrete – Effect of time and temperature on workability – Segregation & bleeding – Mixing and vibration of concrete – Steps in manufacture of concrete – Quality of mixing water, Abram's Law, Factors affecting strength; Characteristics strength of concrete, Target strength, Modulus of elasticity, Modulus of rupture.

Unit IV:

10 Hours

MIX DESIGN: Factors in the choice of mix proportions – Durability of concrete – Quality Control of concrete – Statistical methods – Acceptance criteria – Proportioning of concrete mixes by various methods – BIS method

of mix design.

Special concretes: Types and specifications; Fibre reinforced and steel reinforced concrete; Polymer concrete; Light weight concrete, High strength concrete, Prestressed concrete, Self-Compacting Concrete, Pervious Concrete, Self-Healing Concrete.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *Properties of Concrete*, A. M. Neville, Prentice Hall
2. *Concrete Technology*, M. S. Shetty, S. Chand & Co.
3. *Concrete Technology*, M. L. Gambhir, Tata McGraw Hill Publishers, New Delhi
4. *Concrete Technology*, A. R. Santha Kumar, Oxford University Press, New Delhi

Course Title: Solid Mechanics	L	T	P	Cr.
Course Code: BCE3201	3	0	0	3

Total Hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Interpret the concept of static equilibrium, deformations, and material constitutive behavior.
2. Comprehend the concepts of stress, strain and elastic behavior of materials including Hooke's law relationships to analyze structural members subjected to tension, compression and torsion.
3. Develop SFD and BMD for different type of beams subjected to different types of loads
4. Plot elastic curves for beams undergoing displacements under different loadings

Course Content

Unit-I: 10 Hours

Simple Stresses and Strains: Concept of stress and strain, St. Venant's principle, stress and strain diagram, Elasticity and plasticity – Types of stresses and strains, Hooke's law – stress – strain diagram for mild steel – Working stress – Factor of safety – Lateral strain, Poisson's ratio and volumetric strain – Elastic moduli and the relationship between them – Bars of varying section – composite bars – Temperature stresses.

Compound Stresses and Strains: Two-dimensional system, stress at a point on a plane, principal stresses and principal planes, Mohr circle of stress, ellipse of stress and their applications. Two-dimensional stress-strain system, principal strains and principal axis of strain, circle of strain and ellipse of strain. Relationship between elastic constants.

Unit-II: 15 Hours

Bending moment and Shear Force Diagrams: Bending moment (BM) and shear force (SF) diagrams. BM and SF diagrams for cantilevers simply supported and fixed beams with or without overhangs. Calculation of maximum BM and SF and the point of contra flexure under concentrated loads, uniformly distributed loads over the whole span or part of span, combination of concentrated loads (two or three) and uniformly distributed loads, uniformly varying loads, application of moments.

Unit-III: 10 Hours

Flexural Stresses-Theory of simple bending: Assumptions – Derivation of bending equation: $M/I = f/y = E/R$ - Neutral axis – Determination of bending

stresses – Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections – Design of simple beam sections.

Slope and deflection- Relationship between moment, slope and deflection, Moment area method, Macaulay's method. Use of these methods to calculate slope and deflection for determinant beams.

Unit-IV:

10 Hours

Shear Stresses- Derivation of formula – Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

Torsion- Derivation of torsion equation and its assumptions. Applications of the equation of the hollow and solid circular shafts, torsional rigidity, Combined torsion and bending of circular shafts, principal stress and maximum shear stresses under combined loading of bending and torsion.

Transactional Mode:

Lecture based Instruction, Project based learning, Field trip visits, Problem based learning, Interactive workshops & Seminars, peer group discussion, Case studies, Problem based learning

Suggested Readings:

1. D.S. Bedi, "Strength of Materials", Khanna Book Publishing Co.
 2. AICTE Prescribed Textbook: Physics (Introduction to Mechanics), Bhattacharya, A.B., Khanna Book Publishing Co., 2023.
 3. Timoshenko, S. and Young, D. H., "Elements of Strength of Materials", DVNC, New York, USA.
 4. Kazmi, S. M. A., "Solid Mechanics" TMH, Delhi, India.
 5. Hibbeler, R. C. Mechanics of Materials. 6th ed. East Rutherford, NJ: Pearson Prentice Hall, 2004
 6. Crandall, S. H., N. C. Dahl, and T. J. Lardner. An Introduction to the Mechanics of Solids. 2nd ed. New York, NY: McGraw Hill, 1979
 7. Laboratory Manual of Testing Materials - William Kendrick Hall
 8. Mechanics of Materials - Ferdinand P. Beer, E. Russel Johnston Jr., John T. DEwolf – TMH 2002.
- Strength of Materials by R. Subramanian, Oxford University Press, New Delhi.

Course Title: Fluid Mechanics	L	T	P	Cr.
Course Code: BCE3202	3	0	0	3

Total Hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Interpret the basic terms used in fluid mechanics and its broad principles
2. Estimate the forces induced on a plane/ submerged bodies
3. Formulate expressions using dimensionless approach and able to determine design parameters by creating replica of prototype at appropriate scale.
4. Apply the continuity, momentum and energy principles and design the pipelines used for water supply or sewage under different situation.

Course Content

Unit-I: 12 Hours

Basic Concepts and Definitions – Distinction between a fluid and a solid; Density, Specific weight, Specific gravity, Kinematic and dynamic viscosity; variation of viscosity with temperature, Newton law of viscosity; vapour pressure, boiling point, cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

Fluid Statics - Fluid Pressure: Pressure at a point, Pascal's law, Piezometer, U-Tube Manometer, U-Tube Differential Manometer, Micro manometers, pressure gauges, Hydrostatic pressure and force: horizontal, vertical and inclined surfaces. Buoyancy and stability of floating bodies.

Unit-II: 13 Hours

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

Fluid Dynamics - Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation: venturi meter, orifice meter and pitot tube; Momentum principle; Forces exerted by fluid flow on pipe bend; Dimensional Analysis and Dynamic Similitude - Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π -Theorem.

Unit-III: 10 Hours

Laminar Flow & Turbulent Flow - Laminar flow through: circular pipes,

parallel plates. Stoke's law, Reynolds experiment, Transition from laminar to turbulent flow. Prandtl's mixing length theory, universal velocity distribution equation. Flow through Pipes: Loss of head through pipes, Darcy-Wiesbach equation, minor losses, total energy equation, hydraulic gradient line, Pipes in series, equivalent pipes, pipes in parallel

Boundary Layer Analysis- Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, laminar and Turbulent boundary layers on a flat plate; Laminar sub- layer, smooth and rough boundaries. Local and average friction coefficients. Separation and Control.

Unit-IV:

10 Hours

Open Channel Flow - Introduction, Comparison between open channel flow and pipe flow, geometrical parameters of a channel, Uniform Characteristics of uniform flow, Chezy's formula, Manning's formula. Most economical section of channel. Specific energy, Specific energy curve, critical flow, discharge curve Specific force Specific depth, and Critical depth. Channel Transitions. Theory of hydraulic jump, Elements and characteristics of hydraulic jump in a rectangular Channel, length and height of jump, location of jump, Types, applications and location of hydraulic jump. Energy dissipation and other uses.

Transactional Mode:

Lecture based Instruction, Project based learning, Field trip visits, Problem based learning, Interactive workshops & Seminars, peer group discussion, Case studies, Problem based learning

Suggested Readings:

1. *Fluid Mechanics & Hydraulic Machines: Dr. R.K. Bansal*
2. *Hydraulic and Fluid Mechanic by P.N. Modi & S.M. Seth*
3. *Engineering Fluid Mechanics by R.J. Garde & A.G. Mirajgaoker*
4. *Fluid Mechanics by Douglas JF, Gasiorek JM, Swaffield JP; Pitman*

Course Title: Building Materials & Construction	L	T	P	Cr.
Course Code: BCE3203	4	0	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Comprehend the properties of different building materials.
2. Analyze quality control tests on Cement.
3. Interpret the importance of building components and building services.
4. Evaluate the impact of building construction on society and demonstrate awareness of contemporary issues.

Course Content

Unit-I: 15 Hours

Building Stones & Bricks: General, Characteristics of a good building stone, Deterioration and preservation of stones, Artificial Stones, Composition of good brick earth, Qualities of good bricks, Classification of bricks, Tests on bricks, Varieties of fire bricks.

Cement: Composition of cement, Raw Materials, Manufacturing process, Varieties of cement, Hydration of cement, Properties, testing of cement.

Unit-II: 15 Hours

Concrete: Introduction, Constituents of concrete, batching of materials, Manufacturing process of cement concrete, workability and factors affecting it, Methods to determine workability, segregation and bleeding of concrete, Strength of concrete and factors affecting it.

Timber: Structure of a tree, classification of trees, Defects in timber, Qualities of good a timber, Seasoning of timber, Decay of timber, Preservation of timber

Miscellaneous materials: Paints, Distempering, Glass, Plastics.

Unit-III: 15 Hours

Foundation and Walls: Definition, types of foundations, causes of failures of foundation and remedial measures, Types of walls and thickness considerations.

Brick and stone masonry: Terms used, Types of bonds & their merits and demerits, rubble and ashlar joints in stone masonry, cement concrete hollow blocks and their advantages and disadvantage.

Damp Proofing: Sources, causes and bad effects of dampness, preventive measures for dampness in buildings.

Unit-IV: 15 Hours

Roofs: Terms used, Classification of roofs and roof trusses, Different roof covering materials.

Plastering and pointing: Objects, Methods of plastering, Materials and types, Defects in plastering, Special material for plastered surface, distempering white washing and colour washing.

Floors: General, Types of floors used in building & and their suitability, factors for selecting suitable floor for building.

Miscellaneous topics: Building Services – Plumbing service, Electrical services, Air conditioning, Accoustics and sound insulation, Fire protection measures, Lift

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. Rangwala – Building materials
2. Bindra SP, Arora KR Building construction
3. Shetty MS, Concrete Technology
4. Punmia BC, Building construction
5. Singh, Parbin, Building materials
6. Sushil Kumar, Building Construction

Course Title: Building Planning and Computer- aided Civil Engineering drawing	L	T	P	Cr.
Course Code: BCE3204	3	0	0	3

Total: 45 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

- 1) Implement principles of planning of buildings
- 2) Design and draw various constructional drawing of the buildings.
- 3) Plan various building services.

Course Content

UNIT I: 10 Hours

Principles of Residential and Public Buildings: Concept of built environment and its application in planning. Recommendation of National building code., Green building, Introduction-Benefits, National priorities, rating system, check list, Site selection and planning, Water efficiency, Energy efficiency, Materials, Indoor environmental quality, Innovation and design process

Principle of Planning for differently abled publics: Standardization and Contextualization of accessibility in built environment, Overview of accessibility codes (National and International Perspectives), Design for Inclusion : A holistic Approach (User centric approach to design, WINIT Model), Accessibility Elements of Built Environment in urban and rural Contexts (Kerb Ramps, Bollards, Level and gratings, Ramps, Gradients and other relevant elements) Principle of site planning and approaches for accessibility, Accessibility in public Sanitation System (Washroom typologies and Accessibility perspectives emergency evacuation systems and codes)

UNIT II: 10 Hours

Planning of Building: - Preparation of constructional details and drawings-plan, elevation, section, site plan, foundation plan, terrace plan, waterproofing treatment, typical door and window. Planning of building such as Residential building –Load bearing structure, RCC framed structure. Building for Education – school, college. Library Building for health – Dispensary, Hospital Industrial structure Building for entertainment-Theatre, club house, sports club. Other structure-Office, Hostel, Guest house.

Building's Water Supply and Drainage & Solid Waste Collection and Disposal System: - Design of water supply, waste water and storm water collection system for various types of buildings. Pumps and Pump House. Wet and dry solid waste segregation, Vermi-composting etc. Provision of Chutes. Accessibility in public Sanitation Systems.

UNIT III: 10 Hours

Electrical Services: - Domestic Supply, Distribution Circuits, basic wiring systems. Design and planning: - Lighting of staircase, corridors. Automatic Water Level controller, Closed Circuit Security Monitors with Intercom/

EPBX facility, Common Dish TV antenna, Use of Solar Panels as source of power, Lightning Conductor for High-rise Buildings.

Fire Protection System: - Introduction, Fire protection, requirement of water quantity estimation. Systems of firefighting external and internal. Wet and dry risers, smoke alarm, Sprinkler system. Safety corridors in Highrise structures.

UNIT IV:

15 Hours

Elevators: - Introduction, types of elevators. Essential features of lifts its size and requirement of minimum numbers, norms for safety doors, Operation and maintenance, Safety norms. Control systems, electrical requirement, and generator back-up, Escalators in Industry and in malls-multiplex. Design of Accessible Circulation System for differently abled publics.

Heating Ventilation and Air Conditioning Ventilation, functional requirement, Heat balance system of ventilation, General rules and regulations in artificial ventilation system, Central air conditioning: - ducting and glass claddings. Operation and maintenance

Building Management System: - Security Guard's Cabin, Postage collection boxes, Parking space.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. M.G.Shah, Kale, Patki, Building Drawing with an Integrated Approach to Built Environment, Tata McGraw-Hill Education India, 5th edition, 2011, (ISBN: 9780071077873, 0071077871).
2. Building Services Environmental And Electro Mechanical Services, Second Revised, 2014, (ISBN: 9788175259805)

Course Title: Concrete Technology Lab	L	T	P	Cr.
Course Code: BCE3205	0	0	2	1

Total: 15 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Evaluate the different properties of constituent materials on properties of concrete.
2. Interpret the behavior and durability aspects of concrete under different loading and exposure conditions.
3. Evaluate the issues involved in production and use of concrete and interpret special type of non-conventional concretes.
4. Design of concrete mixes as per BIS specifications.

Course Content

The following experiments are to be performed in the Concrete Lab.

1. To Determine the Specific Gravity of cement.
2. To Determine the Standard Consistency, Initial and Final Setting Times of Cement.
3. To Determine Soundness of Cement.
4. To Determine the Compressive Strength of Cement.
5. To Determine the Compressive Strength of Bricks/Tiles.
6. To Determine the Fineness Modulus of Fine and Coarse Aggregates.
7. To Determine the Bulk Density, Water Absorption and Sp. Gr. of Fine and Coarse Aggregates.
8. To Determine the Slump, Compaction Factor and Vee-Bee Time of Concrete.
9. Mix Design of Concrete.
10. To carry out the Tensile and Flexural tests of Concrete.
11. To determine the Compressive Strength of hardened Concrete by Non-Destructive Test

Suggested Readings:

1. Concrete Manual by Dr. M.L. Gambhir, Dhanpat Rai & Sons Delhi.
2. Concrete Lab Manual by TTTI Chandigarh

Course Title: Solid Mechanics Lab	L	T	P	Cr.
Course Code: BCE3206	0	0	2	1

Total: 15 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Comprehend the importance of physical properties of steel.
2. Identify and comprehend code provisions for testing different properties of steel.
3. Develop stress-strain curve for axial compression, axial tension and shear.
4. Assess hardness and impact strength of steel.

Course Content

1. Tension test
2. Bending tests on simply supported beam and Cantilever beam.
3. Shear test
4. Determination of bending moments in beams
5. Measurement of deflections in statically determinate beam
6. Measurement of strain in a bar
7. Bend test steel bar
8. Yield/tensile strength of steel bar.

Course Title: Fluid Mechanics Lab	L	T	P	Cr.
Course Code: BCE3207	0	0	2	1

Total: 15 Hours

Learning Outcomes: After completion of this course, the learner will be able to:

1. Select appropriate pressure measuring device under different condition of flow.
2. Determine the stability of a floating body and apply Bernoulli's theorem practically.
3. Find discharge of fluid through pipe, orifices and in open channel.
4. Estimate the major and minor losses in pipe, and various elements and energy losses in hydraulic jump.

Course Content

1. To study of pressure measuring devices as piezometer, U-tube manometer, and pressure gauges.
2. To verify Bernoulli's Theorem
3. To determine the meta centric height of a of Floating Body under different condition.
4. To determine the coefficient of discharge of a Venturimeter.
5. To determine the coefficient of discharge of an Orifice Meter
6. To determine the coefficient of friction of different diameter pipes.
7. To estimate the minor losses as energy loss in pipe bend, sudden contraction or enlargement in pipe.
8. To determine the coefficient of discharge on rectangular and V-notches.
9. To determine the various element of a hydraulic jump.

Suggested Readings

1. *Fluid Mechanics and Machinery*, C.S.P. Ojha, R. Berndts son and P.N. Chadramouli, Oxford University Press, 2010
2. *Hydraulics and Fluid Mechanics*, PM Modi and SMSeth, Standard Book House
3. *Theory and Applications of Fluid Mechanics*, K. Subramanya, Tata McGraw Hill
4. *Fluid Mechanics with Engineering Applications*, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, Mc GrawHill.

Course Title: PROFESSIONAL COMMUNICATION	L	T	P	Credits
Course Code: BCE3208	2	0	0	2

Total hours 30

Course Learning Outcomes: After completion of this course, student will be able to:

1. Use English Language effectively in spoken and written forms.
2. Comprehend the given texts and respond appropriately.
3. Communicate confidently in various contexts and different cultures.
4. Acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Course Content

UNIT I

10 Hours

Introduction to Soft Skills– Hard skills & soft skills – employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs.

Self-Introduction-organizing the material – Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice – presenting the visuals effectively – 5 minute presentations.

UNIT II

10 Hours

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics – brainstorming the topic — questioning and clarifying -GD strategies- activities to improve GD skills.

UNIT III

5 Hours

Interview etiquette – dress code – body language – attending job interviews-telephone/skype interview – one to one interview & panel interview – FAQs related to job interviews.

UNIT IV

5 Hours

Recognizing differences between groups and teams- managing time – managing stress – networking professionally – respecting social protocols- understanding career management – developing a long-term career plan – making career changes.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *Butterfield. (2015). Jeff Soft Skills for Everyone. Cengage Learning: New Delhi.*
- *E. Suresh Kumar et al. (2015). Communication for Professional Success. Orient Blackswan: Hyderabad.*

- *Interact English Lab Manual for Undergraduate Students. Orient Black Swan: Hyderabad, 2016.*
- *Raman, Meenakshi and Sharma. S. (2014). Professional Communication. Oxford University Press: Oxford.*
- *S. Hariharanetal. Soft Skills. (2010). MJP Publishers: Chennai.*

Course Title: SUSTAINABLE DEVELOPMENT	L	T	P	Credits
Course Code: BCE3209	3	0	0	3

Total hours 45

Course Learning Outcomes: On the completion of the course, the students will be able to

1. Elucidate the basics of sustainable development, sustainable engineering and its role in engineering
2. Application of Sustainable Engineering Concepts and Principles in Engineering
3. Apply the Principle, and methodology of Life Cycle Assessment Tool to engineering systems
4. Understand integration methods of sustainability to Engineering Design

Course Content

Unit-I

10 Hours

Sustainable Development and Role of Engineers: Introduction, Why and What is Sustainable Development, THE SDFs, Paris Agreement and Role of Engineering, Sustainable Development and the Engineering Profession, Key attributes of the Graduate Engineering Sustainable Engineering Concepts: Key concepts – Factor 4 and Factor 10: Goals of sustainability, System Thinking, Life Cycle Thinking and Circular Economy

Unit-II

15 Hours

Sustainable Engineering and Concepts, Principles and Frame Work: Green Economy and Low Carbon Economy, Eco Efficiency, Triple bottom Line, Guiding principles of sustainable engineering, Frameworks for sustainable Engineering. Tools for sustainability Assessment: Environmental Management System, Environmental Auditing, Cleaner Production Assessment, Environmental Impact Assessment, Strategic Environmental Assessment Life Cycle Management

Unit-III

10 Hours

Fundamentals of Life Cycle Assessment Why and What is LCA, LCA Goal and Scope, Life cycle inventory, Life Cycle Impact Assessment, Interpretation and presentation of Results, Iterative Nature of LCA, Methodological Choices, LCI Databases and LCA Software's, Strength and Limitations of LCA.

Unit-IV

10 Hours

Environmental Life Cycle Costing, Social Life Cycle Assessment, and Life Cycle Sustainability Assessment: Introduction, Environmental Life Cycle Costing, Social Life Cycle Assessment, Life Cycle Sustainability, LCA Applications in Engineering: Environmental Product Declarations and Product Category Rules, Carbon and Water Foot Printing, Energy systems, Buildings and the Built Environment, Chemical and Chemical Production Food and Agriculture Introduction to Environmental Economics

Transactional Mode

Seminars, Group discussion, Team teaching, Focused group discussion, Assignments, Project-based learning, Simulations, reflection and Self-assessment.

Suggested Readings

- Franco, I.B. and Tracey, J. (2019), "Community capacity-building for sustainable development: Effectively striving towards achieving local community sustainability targets", *International Journal of Sustainability in Higher Education*, Vol. 20 No. 4, pp. 691-725
- *Our Common Journey: A Transition Toward Sustainability*. National Academy Press, Washington D.C. Soubbotina, T. P. 2004.
- Elliott, Jennifer. (2012). *An Introduction to Sustainable Development*. 4th Ed. Routledge, London.
- Rogers, Peter P., Kazi F. Jalal, and John A. Boyd. (2012). *An introduction to sustainable development*. Taylor Francis.
- Sachs, J. D. (2015). *The Age of Sustainable Development*. Columbia University Press, New York.
- Soubbotina, Tatyana P. (2004). *Beyond Economic Growth: An Introduction to Sustainable Development*. WBI learning resources series. Washington DC; World Bank.
- Kerr, Julie. (2017). *Introduction to energy and climate: Developing a sustainable environment*. CRC Press.
- Saito, Osamu. (2020). *Sharing Ecosystem Services*. Springer Singapore.
- Nhamo, Godwell, and Vuyo Mjimba. (2020). *Sustainable Development Goals and institutions of higher education*. Springer.

Course Title: Bharatavarsha—A Land of Rare Natural Endowments	L	T	P	Cr.
Course Code: IKS0001	2	0	0	2

Total Hours: 30

Course Learning Outcomes: On the completion of the course, the students will be able to

1. Understand the concept and meaning of the Bharatavarsha
2. Discuss the role and impact of civilizations of India.
3. Describe the distinctive features of Indian vegetation, animal and mineral wealth.
4. Trace the influence and significance of geographical features on Indian culture.

Course Content

Unit-I

8 Hours

Ancient India- Bharat Varsha: People of Ancient Bharat Varsha; Our great natural heritage: The great Himalayas and the rivers.

Unit-II

8 Hours

The civilizations of the Sindhu-Ganga valley, and the Brahmaputra valley; Our coastal plains; Our Nature: Forests and Minerals; Ancient Indian Traditional Knowledge and Wisdom about nature and climate.

Unit-III

7 Hours

Abundant rains, sunshine and warmth, vegetation, animals and mineral wealth. Most populous country in the world. India's prosperity held the world in thrall.

Unit-IV

7 Hours

Splendid geographical isolation of India and the uniqueness of Indian culture. Characteristics of Indian culture, Significance of Geography on Indian Culture

Transactional Mode

Seminars, Group discussion, Team teaching, Focused group discussion, Assignments, Project-based learning, Simulations, reflection and Self-assessment

Suggested Readings

- Baladev Upadhyaya, *Sanskṛta Śāstrom ka Itihās*, Chowkhambha, Varanasi, 2010.
- D. M. Bose, S. N. Sen and B. V. Subbarayappa, Eds., *A Concise History of Science in India*, 2nd Ed., Universities Press, Hyderabad, 2010.
- Chakravarti, Ranabir: Merchants, Merchandise & Merchantmen, in: Prakash, Om (ed.): *The Trading World of the Indian Ocean, 1500-1800*

(History of Science, Philosophy and Culture, 362 in Indian Civilization, ed. by D.P. Chattopadhyaya, vol. III, 7), Pearson, Delhi, 2012, pp. 53-116.

- Chaudhuri, Kirti N.: Trade and Civilisation in the Indian Ocean, CUP, Cambridge, 1985.
- Malekandathil, Pius: Maritime India: Trade, Religion and Polity in the Indian Ocean, Primus Books, Delhi, 2010.
- McPherson, Kenneth: The early Maritime Trade of the Indian Ocean, in: ib.: The Indian Ocean: A History of People and The Sea, OUP, 1993, pp. 16-75.
- Christie, J.W., 1995, State formation In early Maritime Southeast Asia, BTLV
- Christie, J.W., 1999, The Banigrama in the Indian Ocean and the Java sea during the early
- Asian trade boom, Communarute's maritimes de l'ocean indien, Brepols
- De Casparis, J.G., 1983, India and Maritime Southeast Asia: A lasting Relationship, Third Sri Lanka Endowment Fund Lecture.
- Hall, K.R., 1985, Maritime Trade and State development in early Southeast Asia, Honolulu. Walters, O.W., 1967, Early Indonesian Commerce, Ithaca.

SEMESTER- IV

Course Title: Structural Analysis I	L	T	P	Cr.
Course Code: BCE4250	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Analyze the determinate structure and its reaction diagram.
2. Analyze the indeterminate structure by using different methods.
3. Draw the influence line diagram for rolling loads.
4. Interpret the various methods of structural displacements.

Course Content**UNIT I: 15 Hours**

Structural Engineering, role of structural engineer, engineer, architect, builder; Objectives of designing a structure, safety, sustainable development in performance.

Types of Structures, Different types of loading and supports, Static and Kinematic Indeterminacy, Displacement computation for beams and trusses using real work and virtual work method, Displacement due to lack of fit, temperature variation, support movements. Method of Consistent Deformation (Force Method) for Beams, Frames and trusses.

UNIT II: 15 Hours

Determinate Structures: Concept of determinacy; Analysis of determinate structural elements—truss, arch, beam, frame, cables; Internal forces in determinate structures; Reaction diagram-- Bending moment, shear force, radial shear, normal thrust diagrams for the determinant structures.

UNIT III: 15 Hours

Strain Energy: Resilience and Proof Resilience, Elastic Strain Energy in Materials subjected to Tension, Compression, Shear, Bending and Torsion. Theories of Elastic Failure. Gradually and suddenly applied Loads. Impact and Falling Loads.

Columns and Struts: Long and Short Columns, Axial and Eccentric Loads. Euler's Theory and Rankine's Formula for Axially Loaded Columns. Eccentrically Loaded Columns, ISI-Formula for Columns, Introduction to Beam-Column behaviour and Column with Lateral Loads.

UNIT IV: 15 Hours

Moving Loads and Influence Line Diagrams: Concept of influence line diagram, rolling loads; Bending moment and shear force diagrams due to single and multiple concentrated rolling loads, uniformly distributed moving loads; Equivalent UDL; Muller Breslau principle; Influence lines for beams, girders with floor beams and frames; calculation of the maximum and absolute maximum shear force and bending moment; Concept of envelopes; Influence line for displacements; Influence line for bar force in trusses.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *Ramamurtham, Theory of Structure, Dhanpat Rai New Delhi, Edition 2015*
2. *Punmia B.C., Strength of Material and Mechanics of Structure, Vol. II, Standard Publishers Distributors, 12th Edition, 2004.*
3. *Reddy C.S., Basic Structural Analysis, TMH New Delhi, 3rd Edition, 2011.*

Course Title: Transportation Engineering	L	T	P	Cr.
Course Code: BCE4251	3	0	0	3

Total Hours: 45**Course Outcomes:**

After completing this course, the student must demonstrate the knowledge and ability to:

1. Appreciate the importance of different modes of transportation and characterize the road transportation.
2. Alignment and geometry of pavement as per Indian Standards according to topography.
3. Assess the properties of highway materials in laboratory
4. Understand the importance of railway infrastructure planning and design.
5. Identify the functions of different component of railway track.
6. Outline the importance of Airport Infrastructure

Course Content**Unit I:****10 Hours**

Introduction: Importance of Transportation, Different Modes of Transportation, Characteristics of Road Transport.

Highway Development & Planning: Principles of Highway Planning, Road Development in India, Classification of Roads, Road Patterns, Planning Surveys.

Unit II:**10 Hours**

Highway Alignment: Requirements, Alignment of Hill Roads, Engineering Surveys.

Highway Geometric Design: Cross Section Elements, Carriageway, Camber, Sight Distances, Horizontal Curves, Extra-widening, Super-elevation, Vertical Curves.

Unit III:**13 Hours**

Highway Materials: Properties of Sub-grade and Pavement Component Materials, Tests on Sub-grade Soil, Aggregates and Bituminous Materials.

Highway Construction: Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements

Unit IV:**12 Hours**

Highway Drainage and Maintenance: Importance of drainage and maintenance, Surface Drainage and Subsoil Drainage, Construction in Water-logged areas, Pavement Failures, Pavement Evaluation, Maintenance and Strengthening Measures.

Highway Economics & Financing: Total Transportation Cost, Economic Analysis, Sources of Highway Financing.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

References

- Khanna S.K., and Justo, C.E.G. "Highway Engineering", Nem Chand and Brothers, Roorkee, 1998.
- Kadiyali, L.R. "Principles and Practice of Highway Engineering", Khanna Publishers, New Delhi, 1997.
- Flaherty, C.A.O. "Highway Engineering", Volume 2, Edward Arnold, London, 1986.
- Sharma, S.K. "Principles, Practice & Design of Highway Engineering", S. Chand & Company Ltd., New Delhi, 1985.

Course Title: Geotechnical Engineering	L	T	P	Cr.
Course Code: BCE4252	3	0	0	3

Total Hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Interpret the origin of soil, identify different types of soil and apply the knowledge of soil and rock to judge its behavior and suitability for civil engineering structures.
2. Comprehend the Darcy's law for the flow of water through saturated soils; determine the coefficient of permeability and equivalent hydraulic conductivity in stratified soil.
3. Interpret the various physical and engineering characteristics of different types of soil.
4. Calculate seepage, pore water pressure distribution, uplift forces and seepage stresses for simple geotechnical systems

Course Content

UNIT I:

10 Hours

Basic Concepts: Definition of soil and soil mechanics common soil problems in Civil Engineering field. Principal types of soils. Important properties of very fine soil i.e., adsorbed water, Base Exchange and soil structure. Characteristics of main Clay mineral groups i.e. montmorillonite, illite and kaolinite, and Basic definitions in soil mechanics. Weight volume relationship, theory and determination of specific gravity from pycnometer test. Field density from sand replacement method and other methods.

UNIT II:

10 Hours

Index Properties: Grain size analysis. Stokes' law and Hydrometer analysis. Consistency and sensitivity of Clay, Atterbergs Limits Flow Index and Toughness Index. Classification of soils as per Indian standard classification system (IS-1498-1970).

Compaction: Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Compaction in field, compaction specifications and field control.

UNIT III:

10 Hours

Consolidation: Introduction, comparison between compaction and consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, interpretation of consolidation test results, Terzaghi's theory of consolidation, Concept of various consolidation characteristics i.e., a_v , m_v and c_v , primary and secondary consolidation concept of c_v , t_v & U . Consolidation test: determination of c_v from curve fitting methods, Pre consolidation pressure determination. Normally consolidated and over consolidated clays. Causes of over consolidation. Effect disturbance on e -Log σ curves of normally consolidated clays, importance of consolidation

settlement in the design of structures. Final settlement of soil deposits, computation of consolidation settlement and secondary consolidation.

UNIT IV:

15 Hours

Permeability and Seepage: Concept of effective stress principal, seepage pressure, critical hydraulic gradient and quicks and condition. Capillary phenomenon in soil. Darcy's Law and its validity, seepage velocity, coefficient of permeability and its determination in the laboratory. Average permeability of stratified soil mass, factors affecting 'K' and brief discussion.

Shear Strength: Stress analysis of a two-dimensional stress system by Mohr circle. Coulomb's law of shear strength coulomb-Mohr strength theory. Direct, triaxial and unconfined shear strength tests. Triaxial shear tests based on drainage conditions. Derivation of skempton's pore pressure parameters. Stress strain and volume change characteristics of sands.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *Soil Mech. & Foundation Engg, by K.R. Arora*
- *Geotechnical Engineering, by P. Purshotama Raj*
- *Soil Mech. & Foundation Engg., by V.N. S. Murthy*

Course Title: Surveying and Geomatics	L	T	P	Cr.
Course Code: BCE4253	3	0	0	3

Total Hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Interpret the concept, various methods and techniques of surveying
Compute angles, distances and levels for given area.
2. Apply the concept of tachometry survey in difficult and hilly terrain.
3. Select appropriate instruments for data collection and survey purpose to
Analyze, retrieve the information from remotely sensed data, and interpret the data for survey.
4. Comprehend the concepts related to GIS and GPS and analyze the geographical data.

Course Content

Unit-I: 15 Hours

Introduction to Surveying: Principles, Survey stations, Survey lines- ranging, direct & indirect ranging, Bearing and its measurement with prismatic compass, calculation of angles from bearings, Local Attraction
Leveling: Principles of leveling- booking and reducing levels; differential, reciprocal leveling, profile leveling and cross sectioning. Digital and Auto Level, Errors in leveling; contouring Characteristics, methods, uses; areas and volumes. Setting up the plane table and methods of plane tabling (Radiation and three-point problem only).

Unit-II: 10 Hours

Triangulation and Trilateration: Theodolite survey: Instruments, Measurement of horizontal and vertical angle; Balancing of Traverse, Omitted Measurements, Tachometry: Definition, determination of tachometer constants and reduced level from tachometric observations. Triangulation - network- Signals. Baseline choices - extension of base lines - corrections - Trigonometric leveling.

Unit-III: 10 Hours

Curves: Elements of simple and compound curves – Method of setting out
Transition curve – length of curve – Elements of transition curve.
Photogrammetry Surveying: Introduction, Basic concepts, flight planning; Stereoscopy, photographic mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.

Unit-IV: 10 Hours

Modern Field Survey Systems: Principle of Electronic Distance

Measurement, Modulation, Types of EDM instruments, Total Station – Parts of a Total Station – Accessories –Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, LADAR (drone and vehicle based)

Remote Sensing: Introduction – Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings

1. Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill
2. Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Surveying Vol. I, II & III, Laxmi Publications
3. Agor, R., Surveying, Khanna Publishers
4. Bhavikatti, S.S. Surveying & Levelling Volume I & II

Course Title: Transportation Engineering Lab	L	T	P	Cr.
Course Code: BCE4254	0	0	2	1

Total Hours: 15

Learning Outcomes: After completion of this course, the learner will be able to:

1. Appreciate the importance of different modes of transportation and characterize the road transportation.
2. Alignment and geometry of pavement as per Indian Standards according to topography.
3. Assess the properties of highway materials in laboratory.
4. Comprehend the importance of railway infrastructure planning and design.

Course Content

1. Tests on Sub-grade Soil

IS Compaction Test

California Bearing Ratio Test

2. Testson Road Aggregates

Gradation Test Crushing Value Test, Abrasion Value Test, Impact Value Test

Specific Gravity & Water Absorption Test

Shape Test

Marshal Stability Test

3. Tests on Bituminous Materials

Penetration Test, Ductility Test, Softening Point Test

Flash & Fire Point Test

Bitumen Extraction Test

4. Field Tests

Roughness Measurements of Road by Profilograph

Suggested Readings:

1. Khanna S.K., and Justo, C. E. G. "Highway Testing Manual", Nem Chand and Brothers, Roorkee, 1998.

Course Title: Geotechnical Engineering Lab	L	T	P	Cr.
Course Code: BCE4255	0	0	2	1

Total Hours: 15

Learning Outcomes: After completion of this course, the learner will be able to:

1. Interpret the origin of soil and to identify different types of soil and apply the knowledge of soil and rock to judge its behavior and suitability for civil engineering structures.
2. Analyze the Darcy's law for the flow of water through saturated soils; determine the coefficient of permeability and equivalent hydraulic conductivity in stratified soil
3. Comprehend the various physical and engineering characteristics of different types of soil
4. Calculate seepage, pore water pressure distribution, uplift forces and seepage stresses for simple geotechnical systems

Course Content

Experiments on the following:

1. Determination of in-situ density by core cutter method.
2. Determination of in-situ density by sand replacement method.
3. Determination of Liquid Limit & plastic Limit by Casagrande apparatus and Penetrometer method.
4. Determination of specific gravity of soil solids by pycnometer method.
5. Grain size analysis of a given sample of sand and determination of coefficient of uniformity and coefficient of curvature.
6. Direct shear and triaxial test on a given soil sample. Unconfined compression test for fine grained soil.
7. Determination of permeability by constant Head Method and variable head method.
8. Compaction test (proctor) and modified proctor test.
9. Determination of Relative Density of soil.

Course Title: Surveying and Geomatics Lab	L	T	P	Cr.
Course Code: BCE4256	0	0	2	1

Total Hours: 15

Learning Outcomes: After completion of this course, the learner will be able to:

1. Assess horizontal & vertical angles by Theodolite.
2. Survey the area using different methods of plane tabling and compass survey and to adjust the compass traverse graphically.
3. Compute the reduce levels using various methods of leveling.
4. Predict the location of any point horizontally and vertically using Tachometry.

Course Content

1. Measurement of bearing and angles with compass, adjustment of traverse by graphical method.
2. Different methods of leveling, height of instrument, rise & fall methods.
3. Measurement of horizontal and vertical angle by theodolite.
4. Determination of tachometric constants and determination of reduced levels by tachometric observations.
5. Plane table survey, different methods of plotting, Three-point problem.
6. Determination of height of an inaccessible object.
7. Setting out of circular curves in the field using different methods.
8. Plotting of traverse using the Total Station and GPS.

Course Title: REPORT WRITING	L	T	P	Credits
Course Code: BCE4257	0	0	4	2

Total Hours: 30

Course Learning Outcomes: After completion of this course, the learner will be able to:

1. Explain the basic related to writing the reports.
2. Understanding the concepts related to formatting and structuring the report.
3. To comprehend the concept of proofreading, proposals and practice.

Course Content

UNIT I

8 Hours

Introduction: An introduction to writing technical reports, technical sentences formation, using transitions to join sentences, Using tenses for technical writing.

Planning and Structuring: Planning the report, identifying reader(s), Voice, Formatting and structuring the report, Sections of a seminar/technical report, Minutes of meeting writing.

UNIT II

7 Hours

Drafting report and design issues: The use of drafts, Illustrations and graphics.

Final edits: Grammar, spelling, readability and writing in plain English: Writing in plain English, Jargon and final layout issues, Spelling, punctuation and Grammar, Padding, Paragraphs, Ambiguity.

UNIT III

8 Hours

Proofreading and summaries: Proofreading, summaries, Activities on summaries. Presenting final reports: Printed presentation, Verbal presentation skills, Introduction to proposals and practice.

Using word processor: Adding a Table of Contents, Updating the Table of Contents, Deleting the Table of Contents, Adding an Index, Creating an Outline, Adding Comments, Tracking Changes, Viewing Changes, Additions, and Comments, Accepting and Rejecting Changes

UNIT IV

7 Hours

Using word processor: Working with Footnotes and Endnotes, Inserting citations and Bibliography, Comparing Documents, Combining Documents, Mark documents final and make them read only., Password protect Microsoft Word documents., Using Macros.

Nature of Intellectual Property: Patents, Designs, Trade and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property.

Transaction Mode: Seminars, Group discussion, Team teaching, Focused group discussion, Assignments, Project-based learning, Simulations, reflection and Self-assessment

Suggested Readings:

- Meenakshi R and Sangeeta S. (2008). *Technical Communication- Principles & Practice*. Oxford.
- B.N. Basu. (2008). *Technical writing*. PHI learning.
- Alok J, Pravin S.R. Bhatia, A.M. Sheikh. (2006). *Professional Communication Skills*. S Chand.
- Andrea J Rutherford. (2001). *Basic Communication Skills for technology*. Pearson.
- T. Ramappa. (2008). *Intellectual Property Rights Under WTO*, S. Chand Publishers.
- R. P. Merges, P. S. Menell, Mark A. Lemley. (1997). *Intellectual Property in New Technological Age*.

Webo-graphy:

- <https://www.udemy.com/course/reportwriting/>
- <https://www.udemy.com/course/professional-business-english-and-technical-report-writing/>
- <https://www.udemy.com/course/betterbusinesswriting/>

Course Title: Indian Architecture and Town Planning	L	T	P	Cr.
Course Code: IKS0008	2	0	0	2

Total Hours: 30

Course Learning Outcomes: On the completion of the course, the students will be able to

1. Explore the historical development of Indian architecture from the Indus Valley Civilization to modern times, including key styles such as Buddhist, Hindu, Mughal, and colonial architecture.
2. Study ancient Indian town planning concepts from texts like *Manasara* and *Shilpa Shastra*, including Vastu Shastra, grid-based city layouts, water management, and sustainable urban planning techniques.
3. Investigate how geography, climate, materials, and cultural diversity influenced architectural styles in different regions of India, such as Dravidian, Nagara, and Indo-Saracenic architecture.
4. Development the relevance of ancient Indian architectural principles in contemporary urban planning, smart cities, and sustainable architecture in India.

Course Content

Unit-I

8 Hours

Introduction, The importance of Sthapatya-veda. The ancient cities of the Indus Saraswati region. Town planning and drainage systems. Examples of the significance of architecture and materials in Ramayana and Mahabharata.

Unit – II:

8 Hours

Public opulence and private austerity in Indian architecture. Why there are many more of Temples than Palaces.

Unit – III:

8 Hours

Important texts of Architecture and Sculpture. The prevalence of high Indian architecture in almost all parts of India except the Ganga plains. Examples of high Indian architecture from ancient and medieval periods from different parts of India.

Unit – IV:

6 Hours

The building of Jaipur in the 18th century. How temple art and architecture continues to flourish in modern India

Transactional Mode

Seminars, Group discussion, Team teaching, Focused group discussion, Assignments, Project-based learning, Simulations, reflection and Self-assessment

Suggested Readings

- "Indian Architecture (Buddhist and Hindu Periods)" – Percy Brown

- "The History of Indian Architecture" – James Fergusson
- "Concepts of Space in Traditional Indian Architecture" – Yatin Pandya
- "Vastu Shastra: The Ancient Indian Science of Architecture" – B. B. Puri
- Brown, P. (1942). *Indian Architecture (Buddhist and Hindu Periods)*. D. B. Taraporevala Sons & Co.
- Fergusson, J. (1910). *History of Indian and Eastern Architecture*. John Murray.
- Tadgell, C. (1990). *The History of Architecture in India*. Phaidon Press.
- Acharya, P. K. (1997). *Architecture of Manasara: Translated from Sanskrit*. Munshiram Manoharlal Publishers.
- Grover, S. (2003). *Buddhist and Hindu Architecture in India*. CBS Publishers.
- Rao, S. R. (1985). *Lothal and the Indus Civilization*. Asia Publishing House.
- Sharma, S. (2014). Influence of Vastu Shastra in Indian Town Planning. International Journal of Engineering Research and Applications

Course Title: Construction Engineering & Management	L	T	P	Cr.
Course Code: BCE4259	3	1	0	4

Total Hours: 60**Course Outcomes:**

1. Be able to apply theoretical and practical aspects of project management techniques to achieve project goals
2. Possess organizational and leadership capabilities for effective management of construction projects
3. Be able to apply knowledge and skills of modern construction practices and techniques
4. Have necessary knowledge and skills in accounting, financing, risk analysis and contracting.

Course Content**UNIT I:****15 Hours**

CONSTRUCTION PLANNING: Basic Concepts in the Development of Construction Plans – Choice of Technology and Construction Method – Defining Work Tasks – Defining Precedence Relationships among Activities – Estimating Activity Durations – Estimating Resource Requirements for Work Activities – Coding Systems.

UNIT II**15 Hours**

QUALITY CONTROL AND SAFETY DURING CONSTRUCTION Quality and Safety Concerns in Construction – Organizing for Quality and Safety – Work and Material Specifications – Total Quality Control – Quality Control by Statistical Methods – Statistical Quality Control with Sampling by Attributes – Statistical Quality Control with Sampling by Variables – Safety

UNIT III**15 Hours****COST ANALYSIS AND CONTRACT:**

Type of costs, cost time relationships, cost slopes, conducting a crash programmer, determining the minimum total cost of project, flexible budgets, cost & quality control, profit planning control & decision making, cost accounting systems, numerical problems. Updating a project, when to update, time grid diagram, resource scheduling. Planning of different components of civil engineering projects such as a house, workshop, dam, and tunnel.

UNIT IV**15 Hours**

MANPOWER PLANNING- Manpower Planning process, Organising, Staffing, directing, and controlling – Estimation, manpower requirement – Factors influencing supply and demand of human resources – Role of HR manager – Personnel Principles.

MANAGEMENT AND DEVELOPMENT METHODS 9 Wages and Salary,

Employee benefits, Employee appraisal and assessment – Employee services – Safety and Health Management – Special Human resource problems – Productivity in human resources – Innovative approach to designing and managing organization – Managing New Technologies – Total Quality Management – Concept of quality of work life – Levels of change in the organizational Development – Requirements of organizational Development – System design and methods for automation and management of operations – Developing policies, practices and establishing process pattern – Competency upgradation and their assessment – New methods of training and development – Performance Management.

Transactional Mode:

Video based teaching, Group Discussion, Cooperative teaching, Demonstration, Open Talk

Recommended Books:

- Calin M. Popescu, ChotchaiCharoenngam, "Project Planning, Scheduling and Control in Construction: An Encyclopedia of terms and Applications", Wiley, New York, 1995.
- Willis, E. M., "Scheduling Construction Projects", John Wiley & Sons, 1986..
- Charles D Pringle, Justin GooderiLongenecter, Management, CE Merril Publishing Co. 1981.
- Chitkara, K.K. "Construction Project Management: Planning, Scheduling and Control", McGraw-Hill Publishing Company, New Delhi, 1998.

Course Title: Materials, Testing & Evaluation	L	T	P	Cr.
Course Code: BCE4260	3	1	0	4

Total Hours: 60**Learning Outcomes**

1. Appraisal about the role of materials in civil engineering
2. Introduce common measurement instruments, equipment's and devices to capture the material response under loading
3. Exposure to a variety of established material testing procedures/techniques and the relevant codes of practice
4. Ability to write a technical laboratory report.

Course Content**Unit-I: 15 Hours**

Introduction to Engineering Materials: Types, properties, advantages and uses of: Cement; Concrete; Admixtures; Glass and Plastics; Paints and Varnishes, Acoustical material; Geo-synthetics, Bitumen and Asphalt; Ceramics and Refractory's; Bricks; Concrete hollow blocks & Interlocking tiles.

Sand: Composition, types, Physical Properties, uses. Fly ash: Source, types, properties and uses Timbers: Properties, Seasoning, defects, preservation methods, laminates and adhesives,

Unit-II: 10 Hours

Ferrous and nonferrous metals, Importance of Structural steel; Their characteristics and mechanical behavior (elastic, plastic and elasto plastic, strength and durability w.r.t Climatic variation); Creep – fundamentals and characteristics, concept of fatigue of materials; Impact test, toughness – different materials.

Unit-III: 10 Hours

Testing Procedures for bricks, reinforcing steel, fine aggregates, coarse aggregates, Physical identification of tests for soils. Documenting the experimental program, including the test procedures, collected data, method of interpretation and final results.

Unit-IV: 10 Hours

Quality control- Use of test data/ testing reports in the material selection for various civil engineering projects /construction, Sampling, Acceptance criterion, Code of practice and guidelines in this regard for Cements; Aggregates; Concrete (plain and reinforced); Soils; Bitumen and asphaltic

materials; Timbers; Glass and Plastics; Structural Steel.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Text/Suggested Readings:

1. Chudley, R., Greeno (2006), 'Building Construction Handbook' (6th ed.), R. Butterworth-Heinemann
2. Khanna, S.K., Justo, C.E.G and Veeraragavan, A, ' Highway Materials and Pavement Testing', Nem Chand & Bros, Fifth Edition
3. Various related updated & recent standards of BIS, IRC, ASTM, RILEM, AASHTO, etc. corresponding to materials used for Civil Engineering applications
4. Kyriakos Komvopoulos (2011), Mechanical Testing of Engineering Materials, Cognella
5. E.N. Dowling (1993), Mechanical Behaviour of Materials, Prentice Hall International Edition
6. American Society for Testing and Materials (ASTM), Annual Book of ASTM Standards (post 2000)

Semester: V

Course Title: Structural Analysis II	L	T	P	Cr.
Course Code: BCE5300	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Interpret the concept of Concrete & Steel.
2. Analyze the load on singly & doubly reinforced beams.
3. Evaluate the concept of Columns & design the Columns (axially loaded & Eccentric loaded)
4. Evaluate the concept of stairs & design the Staircase.

Course Content**UNIT I** **15 Hours**

Indeterminate Structures: Concept of indeterminate /redundant structures; Static and kinematic indeterminacies; stability of structures; internal forces; Conditions of stress-strain relationships, equilibrium and compatibility of displacements.

Slope-Deflection Method: Slope-deflection equations. Application to indeterminate Fixed and Continuous beams and Portal frames with Vertical and Inclined legs.

UNIT II **15 Hours**

Moment Distribution Method: Development of Method of Moment Distribution. Application to Beams and Portal Frames. Analysis of Multibay Multi-storeyed frames and Frames with Gable Top.

Kani's Method of Analysis: Development of Method. Application to Portal Frames a, Multibay, and Multi-storeyed Frames.

UNIT III **15 Hours**

Analysis of Fixed beam using Area Moment Method and Continuous Beams using Three Moment Theorem subjected to different kind of loadings. Effect of Partial Fixity and settlement of Supports.

Influence lines for indeterminate beams using Muller Breslau principle. Influence lines for Arches and stiffening girders.

UNIT IV **15 Hours**

Analysis of Cables and Suspension Bridges: General cable theorem, shape, elastic stretch of cable, maximum tension in cable and back-stays, pressure on supporting towers, suspension bridges, three hinged stiffening girders.

Arches: Horizontal Thrust, Radial Shear, Normal Thrust, BMD. Influence Lines Diagrams: Arches, Cables and suspension bridges, Two-hinge & three-hinge stiffened suspension bridges

Transactional Mode: Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Text/Reference Books

1. *R. L. Jindal., Indeterminate Structures., S. Chand Publication., 4th Edition., 1994*
2. *Gere J. Mad, Weaver W., Analysis of Framed Structures, D. Van Nostrand Co.*
3. *Ramamurtham, Theory of Structure, Dhanpat Rai New Delhi, Edition 2015*

Course Title: Environmental Engineering	L	T	P	Cr.
Course Code: BCE5301	3	0	0	3

Total Hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Understand the impact of humans on environment and environment on humans.
2. Be able to identify and value the effect of the pollutants on the environment: atmosphere, water and soil.
3. Be able to plan strategies to control, reduce and monitor pollution.
4. Be able to select the most appropriate technique for the treatment of water, wastewater solid waste and contaminated air.
5. Be conversant with basic environmental legislation.

Course Content

UNIT I

10 Hours

Water: Sources of Water and quality issues, water quality requirement for different beneficial uses, Water quality standards, water quality indices, water safety plans, Water Supply systems, Need for planned water supply schemes, Water demand-industrial and agricultural water requirements, Components of water supply system-Transmission of water, Distribution system, Various valves used in W/S systems.

Water Treatment: aeration, sedimentation, coagulation flocculation, filtration, disinfection, advanced treatments like adsorption, ion exchange, membrane processes.

UNIT II

13 Hours

Sewage: Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage- Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage, Sewer appurtenances, Design of sewerage systems. Small bore systems, Storm Water- Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, National River cleaning plans,

Wastewater treatment: aerobic and anaerobic treatment systems, suspended and attached growth systems, recycling of sewage-quality requirements for various purposes. Government authorities and their roles in water supply and sewerage disposal.

UNIT III

10 Hours

Air: Composition and properties of air, Quantification of air pollutants, Monitoring of air pollutants, Air pollution- Occupational hazards, Urban air pollution, automobile pollution, Chemistry of combustion, Automobile engines, quality of fuel, operating conditions and interrelationship. Air quality standards, Control measures for Air pollution, construction and limitations.

Noise: Basic concept, measurement and various control methods.

UNIT IV**12 Hours**

Solid waste management: Municipal solid waste, Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Special MSW: waste from commercial establishments and other urban areas, solid waste from construction activities, biomedical wastes, Effects of solid waste on environment: effects on air, soil, water surface and ground health hazards. Disposal of solid waste-segregation, reduction at source, recovery and recycle. Disposal methods- Integrated solid waste management. Hazardous waste: Types and nature of hazardous waste as per the HW Schedules of regulating authorities. Role of Government authorities in Solid waste management and monitoring/control of environmental pollution.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Text/Reference Books

1. Environmental Engineering, M.P. Poonia, SC. Sharma, Santosh Kumar, Khanna Book Publishing Co., New Delhi.
2. Air Pollution and Control, Keshav Kant, Rajni Kant, Khanna Book Publishing Co., New Delhi.
3. Introduction to Environmental Engineering and Science by Gilbert Masters, Prentice Hall, New Jersey.
4. Introduction to Environmental Engineering by P. Aarne Vesilind, Susan M. Morgan, Thompson /Brooks/Cole; Second Edition 2008.
5. Peavy, H.s, Rowe, D.R, Tchobanoglous, G. Environmental Engineering, Mc-Graw-Hill International Editions, New York 1985.
6. Integrated Solid Waste Management, Tchobanoglous, Theissen & Vigil. McGraw Hill Publication.

Course Title: Engineering Economics, Estimation & Costing	L	T	P	Cr.
Course Code: BCE5302	3	0	0	3

Total Hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Have an idea of Economics in general, Economics of India particularly for public sector agencies and private sector businesses
2. Be able to carry out and evaluate benefit/cost, life cycle and breakeven analyses on one or more economic alternatives.
3. Be able to understand the technical specifications for various works to be performed for a project and how they impact the cost of a structure.
4. Be able to quantify the worth of a structure by evaluating quantities of constituents, derive their cost rates and build up the overall cost of the structure.
5. Be able to understand how competitive bidding works and how to submit a competitive bid proposal.

Course Content

UNIT I

12 Hours

Basic Principles and Methodology of Economics, Demand/Supply–elasticity–Government Policies and Application. Theory of the Firm and Market Structure. Basic Macroeconomic Concepts (including GDP/GNP/NI/Disposable Income) and Identities for both closed and open economies. Aggregate demand and Supply (IS/LM). Price Indices (WPI/CPI), Interest rates, Direct and Indirect Taxes. Welfare, Externalities, Labour Market, Components of Monetary and Financial System.

Elements of Business/Managerial Economics and forms of organizations. Cost & Cost Control –Techniques, Types of Costs, Lifecycle costs, Budgets, Break even Analysis, Capital Budgeting, Application of Linear Programming. Investment Analysis – NPV, ROI, IRR, Payback Period, Depreciation market. Indian economy: Brief overview of post-independence period – plans. Post reform Growth, Structure of productive activity. Issues of Inclusion – Sectors, States/Regions, Groups of people (M/F), Urbanization. Employment–Informal, Organized, Unorganized, Public, Private. Challenges and Policy Debates in Monetary, Fiscal, Social, External sectors.

UNIT II

12 Hours

Estimation / Measurements for various items: Introduction to the process of Estimation; Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams, Estimating Earthwork and Foundations, Estimating Concrete and Masonry, Finishes, Interiors, MEP works; BIM and quantity take-offs; adding equipment costs; labour costs; rate analysis; Material survey-Thumb rules for computation of materials requirement for different materials for buildings, percentage breakup of the cost, cost sensitive index, market survey of basic materials. Use of Computers in quantity surveying.

UNIT III**10 Hours**

Specifications: Types, requirements and importance, detailed specifications for buildings, roads, minor bridges and industrial structures.

Rate analysis: Purpose, importance and necessity of the same, factors affecting, task work, daily output from different equipment/ productivity.

UNIT IV**11 Hours**

Tender: Preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, extra work and Changes, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc.

Preparing Bids: Bid Price buildup: Material, Labour, Equipment costs, Risks, Direct & Indirect Overheads, Profits; Bid conditions, alternative specifications; Alternative Bids. Bid process management

Introduction to Acts pertaining to-Minimum wages, Workman's compensation, Contracts, Arbitration, Easement rights.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Text/Reference Books

1. Premvir Kapoor, Sociology & Economics for Engineers, Khanna Publishing House
2. Mankiw Gregory N. (2002), Principles of Economics, Thompson Asia
3. Misra, S.K. and Puri (2009), Indian Economy, Himalaya
4. M Chakravarty, Estimating, Costing Specifications & Valuation
5. Joy P K, Handbook of Construction Management, Macmillan
6. B.S. Patil, Building & Engineering Contracts

Course Title: Environmental Engineering Lab	L	T	P	Cr.
Course Code: BCE5303	0	0	2	2

Total Hours: 15

Learning Outcomes: After completion of this course, the learner will be able to:

1. Describe the knowledge of physical, chemical and biological parameters of water and their importance.
2. Identify the significance to conduct experiments on water purity.

Course Content

Experiments on the following:

1. To measure the pH value of a water/waste water sample.
2. To determine optimum Alum dose for Coagulation.
3. To find MPN for the bacteriological examination of water.
4. To find the turbidity of a given waste water/water sample
5. To find B.O.D. of a given waste water sample.
6. To measure D.O. of a given sample of water.
7. Determination of Hardness of a given water sample
8. Determination of total solids, dissolved solids, suspended solids of a given water sample.
9. To determine the concentration of sulphates in water/wastewater sample.
10. To find chlorides in a given sample of water/waste water.
11. To find alkalinity of a given water sample
12. To determine the COD of a wastewater sample

Course Title: Engineering Economics, Estimation & Costing Lab	L	T	P	Cr.
Course Code: BCE5304	0	0	2	1

Total Hours: 15

Learning Outcomes: After completion of this course, the learner will be able to:

1. Provide practical experience in applying economic principles to engineering projects, including cost analysis, estimation techniques, and project evaluation.
2. Equipping students with the skills to make informed financial decisions in engineering.

Course Content

LIST OF EXPERIMENT

1. Estimation of building (long wall and short wall method)
2. Estimation of building (center line method)
3. Analysis of rate for concrete work
4. Analysis of rate for brick work
5. Analysis of rate for plaster work
6. Estimate quantity of reinforcement
7. Preparation for approximate estimate for road project
8. Estimating cost of building on plinth area method

Course Title: Survey Camp	L	T	P	Cr.
Course Code: BCE5306	0	0	0	2

Learning Outcomes: After completion of this course, the learner will be able to:

1. Comprehend the concept, various methods and techniques of surveying: compute angles, distances and levels for given area.
2. Apply the concept of tachometry survey in difficult and hilly terrain.
3. Select appropriate instruments for data collection and survey purpose.
4. Analyze and retrieve the information from remotely sensed data and interpret the data for survey.

Course Content

The students will be required to make a topographic map of an undulating hilly terrain measuring about 250 acres.

The work will be as under: Reconnaissance, selection of main stations, measurement of horizontal and vertical angles, measurement of base line, determination of R.L. of main station by double leveling from B.M., measurement of bearing of any one line, computation of coordinates of station points, plotting of details, interpolation of contours. The duration of survey camp is of 4weeks.

Course Title: Hydrology and Water Resource Engineering	L	T	P	Cr.
Course Code: BCE5306	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Understand the interaction among various processes in the hydrologic cycle
2. Understand the basic aquifer parameters and estimate groundwater resources for different hydro-geological boundary conditions
3. Understand application of systems concept, advanced optimization techniques to cover the socio-technical aspects in the field of water resources
4. Application of fluid mechanics and use of computers in solving a host of problems in hydraulic engineering and water resources engineering.

Course Content

UNIT I

15 Hours

Introduction: hydrologic cycle, water-budget equation, history of hydrology, world water balance, applications in engineering, sources of data.

Precipitation: forms of precipitation, characteristics of precipitation in India, measurement of precipitation, rain gauge network, mean precipitation over an area, depth- area duration relationships, maximum intensity/depth duration-frequency relationship, Probable Maximum Precipitation (PMP), rainfall data in India.

Abstractions from precipitation: evaporation process, evaporimeters, analytical methods of evaporation estimation, reservoir evaporation and methods for its reduction, evapotranspiration, measurement of evapotranspiration, evapotranspiration equations, potential evapotranspiration over India, actual evapotranspiration, interception, depression storage, infiltration, infiltration capacity, measurement of infiltration, modelling infiltration capacity, classification of infiltration capacities, infiltration indices.

UNIT II

15 Hours

Runoff: runoff volume, SCS-CN method of estimating runoff volume, flow duration curve, flow-mass curve, hydrograph, factors affecting runoff hydrograph, components of hydrograph, base flow separation, effective rainfall, unit hydrograph, surface water resources of India, environmental flows.

Ground water and well hydrology: forms of subsurface water, saturated formation, aquifer properties, geologic formations of aquifers, well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifers, aquifer tests.

UNIT III

15 Hours

Water withdrawals and uses: water for energy production, water for agriculture, water for hydroelectric generation; flood control. Analysis of surface water supply.

Water requirement of crops: Crops and crop seasons in India, cropping pattern, duty and delta; Quality of irrigation water; Soil-water relationships, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation; Methods of applying water to the fields: surface, sub-surface, sprinkler and trickle / drip irrigation.

Distribution systems: canal systems, alignment of canals, canal losses, estimation of design discharge. Design of channels- rigid boundary channels, alluvial channels, Kennedy's and Lacey's theory of regime channels. Canal outlets: non-modular, semi-modular and modular outlets. Water logging: causes, effects and remedial measures. Lining of canals, types of lining. Drainage of irrigated lands: necessity, methods.

UNIT IV

15 Hours

Dams and spillways: embankment dams: Classification, design considerations, estimation and control of seepage, slope protection. Gravity dams: forces on gravity dams, causes of failure, stress analysis, elementary and practical profile. Arch and buttress dams. Spillways: components of spillways, types of gates for spillway crests; Reservoirs- Types, capacity of reservoirs, yield of reservoir, reservoir regulation, sedimentation, economic height of dam, selection of suitable site.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Text/Reference Books

1. K Subramanya, Engineering Hydrology, Mc-Graw Hill.
2. Santosh Kumar Garg, Irrigation Engineering, Khanna Book Publishing Co.
3. G L Asawa, Irrigation Engineering, Wiley Eastern.
8. L W Mays, Water Resources Engineering, Wiley.
5. C S P Ojha, R Berndtsson and P Bhunya, Engineering Hydrology, Oxford.

Course Title: Traffic Engineering and Management	L	T	P	Cr.
Course Code: BCE5307	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. To have an overall knowledge of the traffic components and assess the traffic characteristics and related problems.
2. To develop a strong knowledge base of traffic planning and its management in any transportation area.
3. To provide knowledge of traffic control devices and its techniques in transportation interaction.

Course Content

UNIT I

15 Hours

Traffic Forecast: General travel forecasting principles, different methods of traffic forecast - Mechanical and analytical methods, Demand relationships, methods for future projection; Design Hourly Volume for Varying Demand Conditions: Concept of Design vehicle units and determination of PCU under mixed traffic conditions, Price-volume relationships, demand functions.

UNIT II

15 Hours

Determination of design hourly volume; critical hour concept; Highway Capacity: Factors affecting capacity, level of service; Capacity studies - Capacity of different highway facilities including unsignalised and signalised intersections.

UNIT III

15 Hours

Problems in Mixed Traffic flow; Case studies; Accident Analysis: Analysis of individual accidents and statistical data; Methods of representing accident rate; Factors in traffic accidents; influence of roadway and traffic conditions on traffic safety; accident coefficients; Driver strains due to roadway and traffic conditions.

UNIT IV

15 Hours

Traffic Flow Theory: Fundamental flow relationship and their applications, Traffic flow theories and applications; Shock waves; Queuing theory and applications; Probabilistic Aspects of Traffic Flow: Vehicle arrivals, distribution models, gaps and headway distribution models; gap acceptance merging parameters, delay models, applications; Simulation: Fundamental principle, application of simulation techniques in traffic engineering-formulation of simulation models, Case studies.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Recommended Books:

1. Roess, RP., McShane, WR. And Prassas, ES.(1998), Traffic Engineering, Prentice Hall.
2. May,A. D.(1990), Fundamentals of Traffic Flow,Prentice Hall.
3. Papacostas, C.S.(1987), Fundamentals of Transportation Engineering, Prentice Hall.
4. Kadiyali, LR (1987), Traffic Engineering and Transportation Planning, Khanna.
5. Highway Capacity Manual (2000), Transportation Research Board, USA.
6. Khanna,S.K. and Justo, C.E. G.(1991), Highway Engineering, Nemchand.
7. Pingnataro, G. J.(1970),Principles of Traffic Engineering, McGraw – Hill

Course Title: Total station and GPS surveying	L	T	P	Cr.
Course Code: BCE5308	3	0	0	3

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Comprehend the concept, various methods and techniques of surveying: distances and levels for given area.
2. To understand the working of Total Station and GPS and solve the surveying problems.
3. Understand the principles of differential GPS (DGPS)
4. GPS data surveying.

Course Content

Unit I

15 Hours

Fundamentals of Total Station And Electromagnetic Waves, Methods of Measuring Distance, Basic Principles of Total Station, Historical Development, Classifications, applications and comparison with conventional surveying – Applications of Electromagnetic waves, Propagation properties, wave propagation at lower and higher frequencies – Refractive index (RI) – factors affecting RI -Computation of group for light and near infrared waves at standard and ambient conditions – Computation of RI for microwaves at ambient condition – Reference refractive index -Real-time application of first velocity correction. Measurement of atmospheric parameters – Mean refractive index – Second velocity correction -Total atmospheric correction – Use of temperature -pressure, transducers.

Unit II

10 Hours

Electro-Optical and Microwave, Electro-optical system: Measuring principle, Working principle, Sources of Error, Infrared and Laser Total Station instruments. Microwave system: Measuring principle, working principle, Sources of Error, Microwave Total Station instruments. Comparison between Electro-optical and Microwave system. Care and maintenance of Total Station instruments. COGO functions: Area, Inverse / MLM, REM, Resection, offsets and stakeout – Land survey applications. Total Station: Traversing and Trilateration measurement and adjustment

Unit III

10 Hours

Satellite System, Basic concepts of GPS – Historical perspective and development – applications -Geoid and Ellipsoid – satellite orbital motion – Keplerian motion – Kepler's Law – Perturbing forces -Geodetic satellite – Doppler effect – Positioning concept – GNSS and IRNSS – SBAS: GAGAN and WAAS Different segments – space, control and user segments – satellite configuration – GPS signal structure – Orbit determination and representation – Anti Spoofing and Selective Availability -Task of control segment – GPS receivers.

Unit IV**10 Hours**

GPS Data Processing, GPS observables – code and carrier phase observation – linear combination and derived observables – concept of parameter estimation – downloading the data – RINEX Format–Differential data processing – software modules – solutions of cycle slips, ambiguities – Multi path and other observational errors – satellite geometry and accuracy measures – Continuously Operating Reference System (CORS)– long baseline processing – use of different processing software's: Open Source, Scientific and Commercial.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Textbooks/Reference books:

Rueger, J.M. Electronic Distance Measurement, Springer-Verlag, Berlin, 4th Edition, 1996.

Satheesh Gopi, R Sathish Kumar, N. Madhu, – Advanced Surveying, Total Station GPS and Remote Sensing – Pearson education, 2nd Edition, 2017. isbn: 978-81317 00679.

Gunter Seeber, Satellite Geodesy, Walter De Gruyter, Berlin, 2nd Edition, 2003.

R. Subramanian, Surveying and Levelling, Oxford University Press, Second Edition, 2012.

Course Title: Plumbing (Water and Sanitation)	L	T	P	Cr.
Course Code: BCE5309	3	0	0	3

Total Hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Study plumbing codes and good engineering practices Coordinate plumbing works from inception to completion with Owners, Architects, other consultants and contractors.
2. Select proper plumbing materials and systems & Read and interpret plumbing drawings.
3. Supervise code based plumbing installations.
4. Understand methods to conserve water and energy.

Course Content

UNIT I

15 Hours

Codes and Standards: Scope, purpose; codes and standards in the building industry, UIPC-I, NBC and other codes, Local Municipal Laws, approvals, general regulations, standards, water supply, sewerage system, drainage system, workmanship, water conservation, protection of pipes and structures, waterproofing.

Architectural and Structural coordination: Provisions for plumbing systems, coordination during the planning stage, various agencies involved and their roles, space planning for plumbing systems, water tanks, pump room, centralized hot water systems, toilet locations, water treatment, sewage treatment, toilet planning, plumbing shafts, basements and terraces planning. Structural parameters, sunken toilets, location of columns and beams, posttension slabs, importance of ledge walls, water proofing.

Plumbing Terminology: Definitions, use/purpose of terms- Plumbing Fixtures: accessible, readily accessible, aerated fittings, AHJ, bathroom group, carrier, flood level rim, floor sink, flushometer valve, flush tanks, lavatories, macerating toilet, plumbing appliances, plumber. Traps: indirect waste, vent, blow off, developed length, dirty arm, FOG, indirect waste, receptors, slip joints, trap, and vent. Drainage: adapter fitting, adjusted roof area, AAV, air break, air gap, area drain, base, bell and spigot joint, building drain, branch, DFU, grease interceptor, joints, roof drain, smoke test, stack. Water supply: angle valve, anti-scald valve, backflow, bypass, check valve, cross connection, ferrule, gate valve, gray water, joints, PRV.

UNIT II

10 Hours

Plumbing Fixtures and Fittings: Definitions of plumbing fixtures, fittings, appliances and appurtenances; maximum flow rates, water closets, bidets, urinals, flushing devices, washbasins, bath/shower, toilets for differently abled, kitchen sinks, water coolers, drinking fountain, clothes washer, dish washer, mop sink, overflows, strainers, prohibited. fixtures, floor drains, floor slopes, location of valves, hot water temperature controls, installation standard dimensions in plan and elevation.

Traps, Interceptors, Indirect Waste and Vents: Traps required, trap arms, developed length, trap seals, venting to traps, trap primers, prohibited traps, building traps. Discharge for indirect waste piping, nature of contents or systems, proper methods to install indirect waste piping, air gap and air break, sink traps, dish washers, drinking fountains, waste receptors, sterile equipment, appliances, condensers, point of discharge, venting. Vent requirement, purpose of venting, trap seal protection, materials, vent connections, flood rim level, termination, vent stacks, water curtain and hydraulic jump, cleanouts, venting of interceptors, introduction to vent sizing

UNIT III

10 Hours

Sanitary Drainage and Storm Drain: Preamble, one pipe and two pipe systems, different pipe materials and jointing methods, special joints, hangers and supports, protection of pipes and structures, alternative materials, workmanship, prohibited fittings and practices, hydraulic jump, change in direction of flow, T and Y fittings, cleanouts, pipe grading, fixtures below invert level, suds relief, testing, building sewers, trenching, testing, sumps and pumps, introduction to Drainage Fixture Units (DFU) and sizing of horizontal and vertical pipes. Storm drain required, prohibited connections, subsoil drains, sub-drains, gutters, channels or scuppers, roof drains, strainers, leaders, conductors and connections, catchment, collect/capture storm water, discharging storm water, sizing case study as per NBC, safety, traps required, prohibited installations. Rain Water Harvesting (RWH) definition, need, catchment, conduits, settlement tanks, treatment, possible uses, recharging pits, NBC requirements, MOEF&CC requirements, and advantages of RWH.

Water Supply, Gray and Reclaimed Water: Preamble, sources of water, potable and non-potable water, reclaimed water, calculating daily water requirement and storage, hot and cold water distribution system, backflow prevention, air gap, cross connection control, pressure and velocity, pipe materials and jointing methods, alternative materials, hangers and supports, workmanship, prohibited fittings and practices, protection of pipes and structures, pressure controls, unions, thermal expansion, types of valves, installation and testing, disinfection, protection of underground pipes, color codes and arrow marking, introduction to Water Supply Fixture Units (WSFU) and sizing. Hot water systems. Definition of gray water, approvals, specifications and drawings, safety, total gray water discharge, holding tanks, valves and piping. Reclaimed water systems, definition of reclaimed water, pipe identification, installation, safety signs, valves, cross connection, approved uses.

UNIT IV

10 Hours

Pumping Systems: Terminology, pump heads, types of Pumps, applications, pump selection, pump characteristics, pumps and motors, pump efficiency, motor efficiency, Hydro Pneumatic Systems (HPS), Zoning, Storm Water and Drainage Pumps, introduction to starters and control panels.

Introduction to WTP and STP: Introduction to Net Zero concept, need to reduce and reuse, rating of Water Efficient Plumbing fixtures and fittings,

24x7 water supply, metering and sub-metering, typical daily water and wastewater calculations for a project. Sources, utility and treatment of water, parameters of water quality, parts of water treatment plant (WTP), disinfection methods, storage conditions, RO water systems, rainwater harvesting treatment, desalination. Grey water and black water, characteristics of domestic sewage, sewage treatment methods, aerobic and anaerobic treatment, level of treatment, reclaimed water, comparison of various methods.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Text/Reference Books

1. Uniform Illustrated Plumbing Code-India (UIPC-I) published by IPA and IAPMO (India)
2. National Building Code (NBC) of India
3. IS 17650 Part 1 and Part 2 for Water Efficient Plumbing Products
4. Water Efficient Products-India (WEP-I) published by IPA and IAPMO (India)
5. Water Efficiency and Sanitation Standard (WE.Stand) published by IPA and IAPMO (India)
6. Water Pollution, Berry, CBS Publishers.
7. Elements of Water Pollution Control Engineering, O.P. Gupta, Khanna Book Publishing, New Delhi.
8. 'A Guide to Good Plumbing Practices', a book published by IPA.

Course Title: Total Station and GPS Surveying Lab	L	T	P	Cr.
Course Code: BCE5310	0	0	2	1

Course Content

1. Introduction and Setup of Total Station
2. Measurement of Horizontal and Vertical Angles using Total Station
3. Distance and Coordinate Measurement using Total Station
4. Traverse Survey using Total Station
5. Topographic Survey and Contouring using Total Station
6. Introduction to GPS and Setting up the GPS Receiver
7. Static Surveying using GPS
8. GIS Mapping using GPS (Mapping of Area/Features)

Course Title: Plumbing (Water and Sanitation) Lab	L	T	P	Cr.
Course Code: BCE5311	0	0	2	1

List of Practical:

1. Attend demonstration by a reputed manufacturer (Min. 2) of water supply pipes and fittings. Cut and joint water supply pipes and fittings as recommended, for the given dimensions.
2. Measure the flow of various plumbing fixtures and fittings in residential, commercial and institutional toilets in liters per minute or liters per flush and give your comments.
3. Attend demonstration by a reputed manufacturer of DWV pipes and fittings. Cut and joint a trap, drainage pipes and fittings as recommended, for the given dimensions.
4. Site visit: Visit any plumbing site and submit a report on observations on plumbing system, architectural and structural provisions, pipe materials, work methods, site conditions, safety and recommendations based on the provisions of UIPC-I/ NBC.

List of Mandatory Assignments:

1. Draw plan and elevation of any toilet at your residence. Give standard dimensions.
2. Refer to attached plan of the toilet and draw section of sunken toilet floor along with civil and plumbing details for two consecutive floors.
3. Prepare layout of internal water supply and drainage pipes and fittings for a public toilet.
4. Visit a plumbing shop and obtain rates of various plumbing fixtures and fittings. Prepare a list with description, brand names and prices.

SEMESTER- VI

Course Title: Design of Concrete Structures	L	T	P	Cr.
Course Code: BCE6350	3	0	0	3

Total Hours: 45

Learning Outcomes: After completion of this course, the learner will be able to:

1. Implement concept of working stress method for analysis and design of RCC structural elements.
2. Implement concept of limit state method for analysis and design of RCC structural elements.
3. Apply principles of pre-stressed concrete for design of PC sections

Course Content**UNIT I 10 Hours**

Working stress method and ultimate load method of design: Reinforced Concrete Fundamentals (working Stress Method): Concept of reinforced concrete, stress strain characteristics of concrete and steel reinforcement, elastic theory, singly reinforced, balanced section, under reinforced section and over reinforced section.

UNIT II 12 Hours

Limit state method: Concepts of probability and reliability, characteristic loads, characteristic strength, partial safety factors for loads and materials, introduction to limit states of collapse in flexure, direct compression, shear and limit states of serviceability in deflection and cracking, design of singly and doubly reinforced rectangular and T sections for flexure. Design of members in shear and bond. Design of columns for Axial Load, Uni-axial bending moment and Bi-axial bending moment as per IS Code method.

UNIT III 13 Hours

Limit state method: Design of one-way and two-way slabs. Design of beam subjected to bending and torsion. Design of Isolated square and rectangular footings subjected to axial load and moments, Design of combined foundations. Design of Doglegged, Open well type staircases. Design of Flat slab and Post tensioned slab.

UNIT IV 10 Hours

Pre-stressed concrete: Basic principles of pre-stressed concrete: materials used and their properties, methods and systems of pre-stressing. Losses in pre-stress, analysis of various types of sections subjected to pre-stress and external loads. Prestressed and post tensioned members, Different types of Prestressed sections, Box Section, Girder.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Text/Reference Books

1. Jain and Jaikrishna, Plain and Reinforced Concrete, Vol. I, Nemchand Brothers.(ISBN-8185240086/978-8185240084).
2. Shrikhandt Vanakudre, Prestressed Concrete (Materials, Analysis and Design), Khanna Publishing House, (ISBN: 9789386173317)
3. V. L. Shah and Karve, Limit State Design - Reinforced Concrete Structures Publications. (ISBN-9788190371711/8190371711).
4. N. Krishna Raju, Pre-stressed Concrete, Tata McGraw Hill. (ISBN-9789387886209/9387886204).

Recommended Reading

1. P. Dayaratnam, Design of Reinforced Concrete Structures, Oxford & IBH. (ISBN-9789386479785/9386479788).
2. T.Y. Lin, Design of Prestressed Concrete Structures, John Wiley and Sons Inc., 2010. (ISBN1539788126528035/978-8126528035).
3. P.D. Arthur and V. Ramkrishnan, Ultimate Strength Design for Structural Concrete, Wheeler&Co. Pvt Ltd. (ISBN- 0273403230, 978-0273403234).
4. B.P. Hughes, Limit State Theory for Reinforced Concrete Design, Pitman. (ISBN- 0273010239, 978-0273010234).
5. IS456 (2000), Plain and Reinforced Concrete.
6. IS 875 (1987), Part I- Design Loads (Other than earthquake) for Buildings and Structures (Dead Loads).
7. IS 875 (1987), Part II- Design Loads (Other than earthquake) for Buildings and Structures (Imposed Loads).
8. IS 875 (2015), Part III- Design Loads (Other than earthquake) for Buildings and Structures (Wind Loads).
9. IS 875 (1987), Part IV- Design Loads (Other than earthquake) for Buildings and Structures (Snow Loads).

Course Title: Hydraulic Engineering	L	T	P	Cr.
Course Code: BCE6351	3	0	0	3

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Become familiar with different water resources terminology like hydraulics of pipelines and open channel.
2. Understand and be able to use the energy and momentum equations.
3. Analyze flow in closed pipes, and design and selection of pipes including sizes.
4. Become familiar with open channel cross sections, hydrostatic pressure distribution and Manning's law.

Course Content

UNIT I: 12 Hours

Introduction to Open Channel Flow: Difference between Open Channel Flow and Pipe Flow, Types of Channel, Geometric parameters of a channel, Classification of Open Channel Flow, Continuity and Momentum equation. Uniform flow: Resistance flow formula, Velocity distribution, Equivalent roughness coefficient, Velocity coefficients, Uniform flow in rigid boundary channel, Uniform flow in mobile boundary channel.

UNIT II: 10 Hours

Energy and Momentum Principle: Concept of Specific Energy, Critical Depth, Alternate depth, Specific Force, Sequent depth. Non-Uniform Flow: Governing equation of GVF, Classification of Gradually Varied Flow, Computation of GVF profile, Rapidly Varied Flow, hydraulic Jump, Flow over a Hump, Flow in Channel Transition.

UNIT III: 13 Hours

Canal Design: Concept of best hydraulic section, Design of rigid boundary canal, design of channel in alluvial formation- Kennedy's theory, Lacy's theory, Method of Tractive force, Free-board in canal. Unsteady Flow: Wave and their classification, Celerity of wave, Surges, Characteristic equation

UNIT IV: 10 Hours

Pipe Flow: Losses in pipes, Pipe in series and parallel, Pipe network analysis, Water hammer, Surge tank. Hydraulic Model Study: Important dimensionless flow parameters, Similitude: Geometric, Kinematic and Dynamic Similarity, Model scales.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- Chow, V.T. Open Channel hydraulics McGraw Hill Publication
- Subramanya, K., Flow through Open Channels, TMH, New Delhi
- RangaRaju, K.G., Flow through open channels, T.M.H. New Delhi
- Rajesh Srivastava, Flow through Open Channels, Oxford University Press
- Streeter, V.L. & White E.B., Fluid Mechanics McGraw Hill Publication
- Modi & Seth Hydraulics & Fluid Mechanics Standard Publications.
- RK Bansal Fluid Mechanics and Hydraulic Machines Laxmi Publication
- AK Jain Fluid Mechanics Khanna Publication.
- Houghtalen, Fundamentals of Hydraulics Engineering Systems 4/e Pearson Education, Noida

Course Title: Sustainable and Green Construction	L	T	P	Cr.
Course Code: BCE6352	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Identify major types of environmental pollution and evaluate waste management practices
2. Apply sustainable water management practices in construction
3. Apply concepts of construction and demolition (C&D) waste management
4. Evaluate various financial incentives and business models

Course Content

Unit I:

15 Hours

Introduction to sustainable Development: Definition and principles of sustainable development, Historical context and evolution of sustainability, Global and local challenges related to sustainability. Environment Science and Ecology: Fundamentals of ecology, Biodiversity and conservation, Climate change and its impacts, Environmental pollution and waste management. Sustainable construction Material and Technology: Green building materials and technologies, Life cycle assessment of materials, Resource efficiency and waste reduction in construction, Low-impact construction methods

Unit II:

15 Hours

Energy Efficiency in Buildings: Principles of energy-efficient design, Renewable energy integration in building design, Energy-efficient HVAC systems, Building energy modeling and simulation Water Management in Construction: Sustainable water use in construction processes, Rainwater harvesting and greywater recycling, Water-efficient construction practices, Strategies for mitigating water pollution on construction sites Sustainable Site Planning: Site selection and evaluation for sustainable construction, green space planning and landscaping, Sustainable stormwater management.

Unit III:

15 Hours

Sustainable Building Design: Principles of green building design, Passive design strategies for energy efficiency, Daylighting and natural ventilation, Integration of sustainable technologies in design Construction and Demolition Waste Management: Waste reduction and recycling in construction, Responsible demolition practices, Circular economy concepts

in construction. Building Certifications and Standards: LEED (Leadership in Energy and Environmental Design) certification, BREEAM (Building Research Establishment Environmental Assessment Method), Other regional and international green building certifications Environmental Regulations and Policy: - Building codes and regulations for sustainable construction - Environmental impact assessments - Government policies promoting green construction

Unit IV:

15 Hours

Economics of Sustainable Construction: - Cost-benefit analysis for green building projects - Financial incentives for sustainable construction - Business models for green technologies in construction Project Management for Sustainable Construction: - Sustainable project planning and execution - Stakeholder engagement and communication - Monitoring and evaluating sustainability performance Ethics and Social Responsibility in Construction: - Ethical considerations in sustainable construction - Social impacts of green construction projects - Community engagement and stakeholder involvement.

Transactional Mode:

Lecture based Instruction, Project based learning, Field trip visits, Problem based learning, Interactive workshops & Seminars, peer group discussion, Case studies, Problem based learning

Suggested Readings:

1. "The Future We Choose: Surviving the Climate Crisis" by Christiana Figueres and Tom Rivett-Carnac.
2. "Doughnut Economics: Seven Ways to Think Like a 21st-Century Economist" by Kate Raworth
3. "Drawdown: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming" edited by Paul Hawken

Course Title: Design of Concrete Structures Lab	L	T	P	Cr.
Course Code: BCE6353	0	0	2	1

Learning Outcomes: After completion of this course, the learner will be able to:

1. Analyze and design beam, column, slab, foundation, staircases and cantilever and counterfort retaining walls.
2. Draw detailed structural drawings for slab, beam, column, foundation, staircases and cantilever and counterfort retaining walls.

Course Contents

1. Design and drawing of singly reinforced, doubly reinforced rectangular and T-section simply supported and continuous beam.
2. Design and drawing of one way, two way simply supported and continuous slab system.
3. Design and drawing of Dog-legged and open wall type staircases.
4. Design and drawing of columns and foundation.
5. Design and drawing of Retaining wall. (Cantilever and counterfort)

Course Title: Hydraulic Engineering Lab	L	T	P	Cr.
Course Code: BCE6354	0	0	2	1

Learning Outcomes: After completion of this course, the learner will be able to:

1. Become familiar with hydraulics of pipelines and open channel.
2. Understand and be able to use the energy and momentum equations.
3. Analyze the losses in closed pipes, and design and selection of pipes.
4. Become familiar with open channel cross sections, flow profiles, velocity distribution and Manning's law.

Course Content

Experiments on the following

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.
2. Determination of Specific energy curve of an open channel.
3. Study on Gradually Varied Flow Profile.
4. To study the characteristics of a Hydraulic Jump in a channel.
5. To study the flow characteristics over a hump placed in an open channel.
6. To study the flow through a horizontal contraction in a rectangular channel.
7. Study on Pipe friction.
8. Study on Water hammer.

Course Title: RAILWAY ENGINEERING	L	T	P	Cr.
Course Code: BCE6355	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Apply the knowledge of railway track components, materials and fixtures and fastenings.
2. Solve problems of railway track geometrics, train resistance, points and crossings, Signaling and control system.
3. Carry out feasibility study of rail tracks.
4. Compute economical spans, hydraulic design of bridge and carry out erection and maintenance of bridge

Course Content

Unit-I **15 Hours**

Introduction to Railway Engineering

Role of railways in transportation system, railways and highways comparisons, classification of Indian railways, railway zones in India, railway gauges, creep, coning of wheels and traction resistance

Unit-II **15 Hours**

Permanent Ways

Rail & rail joints (welding of rails, LWR, SWR, CWR), Sleepers, Ballast, Formation and its drainage, track fitting and fastening, Stresses in railway tracks; Construction of Railway Tracks.

Unit-III **15 Hours**

Geometric Design of Railway Tracks

Alignment and grades, cross section and its elements (at filling & cutting), grade compensation, cant and cant deficiency, negative cant and widening of gauges on curves, curves used for railway track (horizontal and vertical curves), level crossing, points and crossing, stations and yards, signals and interlocking system

Railway System in the Urban Area: Surface railways, Elevated railways, Underground railway.

Unit-IV **15 Hours**

High Speed Rail Engineering

Development, engineering, design and construction of high-speed rail (HSR) passenger transport systems with particular emphasis on the unique engineering elements of HSR technology. Key elements of HSR systems and sub-systems including: core systems (trains, power, signal, communication and control), track system and civil infrastructure (earthwork, bridges, viaducts and tunnels). Also covered are basic design and construction of HSR stations and rolling stock maintenance facilities.

Transactional Mode:

Lecture based Instruction, Project based learning, Field trip visits, Problem based learning, Interactive workshops & Seminars, peer group discussion, Case studies, Problem based learning

Suggested Readings:

1. *"Railway Engineering" by S. C. Saxena*
2. *"Fundamentals of Railway Engineering" by V. N. M. P. Srinivas*
3. *"Railway Track Engineering" by John W. Dick*
4. *"Railway Engineering: Track and Structure" by S. K. Sharma*

Course Title: Advanced Concrete Technology	L	T	P	Cr.
Course Code: BCE6356	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

- Discuss the concrete ingredients and its influence at gaining strength.
- Design of concrete mix and grade as per IS codes.
- Summarise the concepts of conventional concrete and its differences with other concretes like no fines, light weight etc.
- Describe the application and use of fiber reinforced concrete.
- Design and develop the self-compacting and high-performance concrete.

Course Content

Unit I:

15 Hours

Properties of cement, fine aggregate and coarse aggregates, Additives and Admixtures in Concrete, Rheology of Concrete.

Unit II:

15 Hours

Manufacturing and methods of concreting, Properties of fresh and hardened concrete, mix design by I.S. method, Design and manufacture of normal concrete, Light weight concrete – Cellular concrete – No fines concrete – Aerated & foamed concrete

Unit III:

15 Hours

Design and manufacture of fiber reinforced concrete – Polymer concrete – Fly ash concrete

Unit IV:

15 Hours

Design and manufacture of Self compacting concrete – High performance concrete – Very high strength concrete – High density concrete

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. Neville, A.M., "Properties of Concrete", 3rd Edition, Longman Scientific and General, 1992.
2. Shanta Kumar A.R., "Concrete Technology", 2 nd Edition, Oxford University Press, New Delhi, 2000.
3. Krishna Raju. N, "Design of Concrete Mixes", 2nd Edition, CBS Publishers and Distributors, 2009.

4. Shetty, M.S., “Concrete Technology”, 3 rd Edition, S.Chand Publications, 2008.

Course Title: Intelligent Transportation Systems	L	T	P	Cr.
Course Code: BCE6357	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Understand ITS & ATIS
2. Explain about Advanced Transportation Management System
3. Know about APTS, CVO, new technology and ETC
4. Details about regional architecture, integration of infrastructure and operational planning
5. Summarizes about ITS issues in terms of various factors and emerging issues.

Course Content

UNIT I

15 Hours

Introduction to Intelligent Transportation Systems (ITS) – Definition of ITS and Identification of ITS Objectives, Historical Background, Benefits of ITS - ITS Data collection techniques – Detectors, Automatic Vehicle Location (AVL), Automatic Vehicle Identification (AVI).

UNIT II

15 Hours

Geographic Information Systems (GIS), video data collection. Telecommunications in ITS – Importance of telecommunications in the ITS system, Information Management, Traffic Management Centres (TMC). Vehicle – Road side communication – Vehicle Positioning System

UNIT III

15 Hours

ITS functional areas – Advanced Traffic Management Systems (ATMS), Advanced Traveler Information Systems (ATIS), Commercial Vehicle Operations (CVO), Advanced Vehicle Control Systems (AVCS), Advanced Public Transportation Systems (APTS), Advanced Rural Transportation Systems (ARTS)

UNIT IV

15 Hours

ITS User Needs and Services – Travel and Traffic management, Public Transportation Management, Electronic Payment, Commercial Vehicle Operations, Emergency Management, Advanced Vehicle safety systems, Information Management; Automated Highway Systems - Vehicles in Platoons – Integration of Automated Highway Systems. ITS Programs in the World – Overview of ITS implementations in developed countries, ITS in developing countries

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Text/Reference Books

1. Ghosh, S., Lee, T.S. Intelligent Transportation Systems: New Principles and Architectures, CRC Press, 2000.
2. Mashrur A. Chowdhury, and Adel Sadek, Fundamentals of Intelligent Transportation Systems Planning, Artech House, Inc., 2003.
3. R.P Roess, E.S. Prassas, W.R. McShane. Traffic Engineering, Pearson Educational International, Third Edition, 2004.

Course Title: Construction Equipment & Automation	L	T	P	Cr.
Course Code: BCE6358	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Select appropriate equipment for specific construction projects based on site conditions and requirement.
2. Identify and describe the different types of construction equipment used in the industry.
3. Understand the capabilities and limitations of drones in construction projects.
4. Recognize emerging trends and innovations in automation for construction

Course Content

Unit I: 15 Hours

Introduction: Distinctive characteristics of construction equipment, Necessity of construction equipment, Importance of equipment in construction projects, Trends and innovations in construction equipment

Unit II: 15 Hours

Construction Equipment: Excavating Equipment, Pavers, Rollers, plastering machines, Cranes and Hoists, Concrete Batching Plants, Hauling and conveying equipment; Capacity, Feasibility, Safety, owning and operating cost of Different Construction Equipment

Unit III: 15 Hours

Automation in Construction Industry: Emerging Trends in Automation in Construction; Need, Challenges and Benefit of automation; Automated equipment and machinery for construction: Automation in Canal lining, Automation in Highway Construction, Automation in concrete technology.

Unit IV: 15 Hours

Drones and Robotics in Construction:

Drones: Photogrammetry, Project Monitoring- real time data, aerial mapping, land survey, quantity survey, quality survey, structural health monitoring survey, under water survey.

Robotics: Introduction, Benefits of Robotics in construction industry with respect to time, cost, quality, safety. Robotics Applications: Brick laying, Demolition, Material Handling, Structural steel cutting, Rebar tying/bending, Form work production, 3D printing parts and objects of homes, buildings, bridges and roads.

Transactional Mode: Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. Construction Project management, Theory & Practice, Kumar Neeraj Jha, Pearson Education India.
2. Construction Planning, Methods and Equipment, R.L Peurifoy, McGraw Hill, 2011
3. Construction equipment and its planning and application Mahesh Varma Metropolitan Book Co
4. BIM and Construction Management: Proven Tools, Methods, and Workflows By Brad Hardin, Dave McCool, John Wiley & Sons
5. Enhancing BIM Methodology with VR Technology, Open access peer
6. Robotics and Automation in Construction, Open access peer- reviewed edited volume
7. Automation in Construction Management: Automated management of Construction Materials Using RFID Technology, Javad Majrouhi Sardroud, Scholars' Press

Semester VII

Course Title: Design of Steel Structures	L	T	P	Cr.
Course Code: BCE7400	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Recall and interpret the fundamentals of steel structures.
2. Calculate the plastic moment of different cross section and design of bolted and welded connections
3. Analyze and design the tension, compression & column bases member under axial and combined loading
4. Comprehend the pre-engineered buildings, bridges & trusses

Course Content**Unit I: 15 Hours**

Properties of materials; loads and stresses, Design of semi-rigid, rigid and moment resistant connections;

Unit II: 15 Hours

Built-up sections Design of tension members subjected to axial tension and bending, splicing of tension member, Design of compression members, Beam-column connections,

Unit III: 15 Hours

Design of columns and their bases Design of flexural members and Plate girder; loads, specification and design Industrial buildings; loads, design of purlins, trusses, bracings; gantry girders;

Unit IV: 15 Hours

Introduction to Plastic analysis; Simple cases of beams and frames; All design steps/process to as per the most recent BIS code of practices

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

- *Limit state design of steel structures: S K Duggal, Mc Graw Hill*
- *Design of steel structures: N Subramanian Oxford Higher Education*
- *Design of steel structures (Vol. 1): Ram Chandra Standard Book House - Rajsons*

- *Design of steel structures (by limit state method as per IS: 800-2007): S. S.Bhavikatti. I K International Publishing House*
- *IS 800: 2007 (General construction in steel-Code of practice)*

Course Title: Foundation Engineering	L	T	P	Cr.
Course Code: BCE7402	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Interpret the origin of soil and to identify different types of soil and apply the knowledge of soil and rock to judge its behavior and suitability for civil engineering structures.
2. Evaluate the Darcy's law for the flow of water through saturated soils; determine the coefficient of permeability and equivalent hydraulic conductivity in stratified soil
3. Classify the various physical and engineering characteristics of different types of soil
4. Calculate seepage, pore water pressure distribution, uplift forces and seepage stresses for simple geotechnical systems

Course Content

Unit-I

15 Hours

Shallow Foundation-I:

Type of shallow foundation Depth and factors affecting it. Definition of ultimate bearing capacity, safe b.c. and allowable b.c. Rankine's analysis and Terzaghi's analysis. Types of failures. Factors affecting bearing capacity. Skempton's equation. B.I.S. recommendations for shape, depth and inclination factors. Plate Load test and standard penetration Test. Their procedure, merits and demerits Factors affecting 'N' value Corrections to be applied to observed value. Boussinesq equation for a point load, uniformly loaded circular and rectangular area, pressure distribution diagrams. Newmark's chart and its construction. Two - to - one method of load distribution. Comparison of Boussinesq and Westergaard analysis for a point load. Limitations of elastic formula

Shallow Foundation-II:

Contact pressure Distribution. Causes of settlement of structures, comparison of Immediate and consolidation settlement calculation of settlement by plate load Test and Static Cone penetration test data. Allowable settlement of various structures according to I.S. Code. Situation most suitable for provision of rafts. Proportioning of rafts in sand-s and Clays. Various methods of designing raft. Floating foundation.

Unit-II

15 Hours

Soil Investigation:

Object of soil investigation for new and existing structures. Depth of

exploration for different structures. Spacing of bore Holes. Methods of soil exploration and relative merits and demerits. Types of soil sample. Design features of sampler affecting sample disturbance. Essential features and application of the various types of samples. Geophysical exploration by seismic and resistivity methods. Bore Hole log for S.P.T

Unit-III

15 Hours

Pile Foundations – I: Necessity and uses of piles classification of piles. Merits and demerits of different types based on composition. Types of pile driving hammers & their comparison. Effect of pile driving on adjacent ground. Use of engineering News Formula and Hiley's Formula for determination of allowable load. Limitations of pile driving formulae. Pile load test-object, pre-requisites, test arrangement, procedure and assessment of safe load. Separation of skin friction and point resistance using cyclic pile load test data. Related numerical problems.

Pile Foundation – II: Determination of point resistance and frictional resistance of a single pile by Static formulas. Piles in Clay-Safe load on a Friction and point Bearing pile. Pile in sand Spacing of piles in a group. Efficiency of pile group by converse - Labare formula. Bearing capacity of a pile group in clay by block failure and individual action approach.

Unit-IV

15 Hours

Caissons and Wells: Major areas of use of caissons advantages and disadvantages of open box and pneumatic caissons. Essential part of a pneumatic caisson. Components of a well foundation. Calculation of allowable bearing pressure. Conditions for stability of a well, Terzaghi's analysis for lateral stability for a light well-embedded in sand. Modification of the analysis for a heavy well. Forces acting on a well foundation. Computation of scour depth.

Earth Pressure: Terms and symbols used for a retaining wall. Movement of soil and the lateral earth pressure. Earth pressure at rest. Rankine states of plastic equilibrium and derivations of expressions for K_a and K_p for horizontal backfills. Rankine's theory both for active and passive earth pressure for Cohesion less backfill with surcharge and fully submerged case. Cohesive backfill condition. Rankine's Earth pressure for a cohesion less backfill with sloping surface (with proof) concept of active and passive Earth pressure on the basis of stability of a sliding wedge. Coulomb's method for cohesionless backfill. Merits and demerits of Rankine and Coulomb's theories graphical construction and Rebhan's graphical construction (without surcharge load).

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *Soil Mechanics & Foundation Engineering* by B.C. Punmia
2. *Geotechnical Engineering* by Alam Singh

Course Title: Ground Improvement Techniques	L	T	P	Cr.
Course Code: BCE7403	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Explain the need and objective of ground improvement techniques
2. List the different techniques that are available for improvement
3. Choose the suitable technique depending upon the condition of soil and requirements
4. Know different methods that are available for Compaction or densifying the soil
5. Identify the type of techniques required for various soils.

Course Content

Unit-I

10 Hours

Need for Ground Improvement, Different types of problematic soils, Emerging trends in ground Improvement

Unit-II

20 Hours

Mechanical stabilization

Shallow and deep compaction requirements, Principles and methods of soil compaction. Shallow compaction and methods, Properties of compacted soil and compaction control, Deep compaction and Vibratory methods, Dynamic compaction.

Hydraulic modification

Ground Improvement by drainage, Dewatering methods, Design of dewatering systems, Preloading, Vertical drains, vacuum consolidation, Electro-kinetic dewatering, design and construction methods.

Unit-III

15 Hours

Modification by admixtures

Cement stabilization and cement columns, Lime stabilization and lime columns, Stabilization using bitumen and emulsions, Stabilization using industrial wastes, Construction techniques and applications,

Grouting

Permeation grouting, compaction grouting, jet grouting, different varieties of grout materials, grouting under difficult conditions

Unit-IV

15 Hours

In situ soil treatment methods & Case studies

Soil nailing, rock anchoring, micro-piles, design methods, construction techniques, Case studies of ground improvement projects.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested reading

1. *"Principles of Soil Stabilization and Ground Improvement"* by S. K. Garg
2. *"Ground Improvement Techniques"* by P. Purushothama Raj
3. *"Ground Improvement, Third Edition"* by Kerry Rowe
4. *"Engineering Principles of Ground Modification"* by Manfred R. Hausmann

Course Title: Contracts Management	L	T	P	Cr.
Course Code: BCE7404	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. The course covers techniques for managing contracts, including monitoring performance, tracking progress, and managing changes
2. Participants learn to identify, assess, and mitigate potential risks associated with contracts, developing strategies to minimize negative impacts
3. Participants learn to draft clear, enforceable contracts, understand key terms and conditions, and

Course Content

Unit-I

15 Hours

Contract Management: Introduction, Importance of Contracts, Overview of Contract Management, Overview of Activities in Contract Management; Planning and People- Resource Management; Types of Contracts, Parties to a Contract;

Unit-II

15 Hours

Contract Formation, Formulation of Contract, Contract Start-Up, Managing Relationships; Common contract clauses (Notice to proceed, rights and duties of various parties, notices to be given, Contract Duration and Price. Performance parameters; Delays, penalties and liquidated damages; Force Majeure, Suspension and Termination.

Unit-III

15 Hours

Changes & variations, Notices under contracts; Conventional and Alternative Dispute Resolution methods. Various Acts governing Contracts; Contract Administration and Payments- Contract Administration, Payments; Contract Management in Various Situations- Contract Management in NCB Works, Contract Management in ICB Works Contracts, Contract of Supply of Goods- Design, Supply and Installation Contracts, Contract Management in Consultancy.

Unit-IV

15 Hours

Managing Risks and Change- Managing Risks, Managing Change; Contract Closure and Review- Ending a Contract, Post- Implementation Review; Legal Aspects in Contract Management- Contract Management Legal View, Dispute Resolution, Integrity in Contract Management; Managing Performance- Introduction, Monitoring and Measurement.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested readings

1. Nunnally, S.W. Construction Methods and Management, Prentice Hall, 2006
2. Rajoria, K.B., Case Studies in Construction Project Management, Khanna Publishing House, 2023.
3. Jha, Kumar Neeraj., Construction Project management, Theory & Practice, Pearson Education India, 2015
4. Punmia, B.C., Khandelwal, K.K., Project Planning with PERT and CPM, Laxmi

Course Title: Advanced structural Design	L	T	P	Cr.
Course Code: BCE7405	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. With the knowledge of this subject students shall be capable of designing and detailing of complex RCC structures.
2. Understand the principles of detailing and develop analytical skills.

Course Content

Unit I 15 Hours

Design of Slender Columns: Concentrically loaded slender columns, eccentrically loaded slender columns, Slender columns subjected to axial and transverse loads, Structural behavior of columns in braced and unbraced frames, Codal procedure for design of slender columns.

Unit II 15 Hours

Flat Slabs: Elements of flat slabs, Codal procedure for design of flat slabs, Behavior of flat slab in shear, One way and two way shear, Equivalent Frame Method, Openings in flat slabs, Effect of pattern loading in flat slabs.

Deep Beams: General features, Parameter influencing design, Flexural bending and shear stresses in deep beams. Design provisions of IS-456, Checking for local failures, Strut and tie analysis of deep beams, Detailing of reinforcement in deep beams.

Unit III 15 Hours

Over Head Service Reservoir: Special design considerations, Design requirements of materials, membrane analysis and compatibility analysis of reservoir, complete design and drawing details of an overhead service reservoir.

Unit IV 15 Hours

Yield Line Analysis: Design of slabs of various shapes and having various support conditions using yield line analysis approach.

Design of Beam Column Joints: Types of joints, Joints in multistoried buildings, Forces acting on joints, Design of joints for strength, Anchorage requirement in joints and detailing of reinforcement in joints.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested Readings:

1. *Advanced R. C. Design* by Krishna Raju. 2005

2. *Reinforced Concrete Structures by Park and Pauley. 1975*
3. *Reinforced Concrete Structural Elements – Behaviour Analysis and Design by Purushothaman. 1984*

Course Title: AIRPORT PLANNING AND DESIGN	L	T	P	Cr.
Course Code: BCE7406	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. Develop the knowledge of Airport Engineering in the context of regional mass transportation systems
2. Design of Air transportation systems along with infrastructures required for Airports.
3. Estimate the environmental and other impacts impended due to Airport projects.
4. Design of runway, taxiway, aprons and cargo facilities with pavement design.
5. Design of parking configurations and apron facilities at Airport.

Course Content

Unit-I 15 Hours

AIR TRANSPORTATION

Airport terminology, component parts of Aero plane, Classification and size of airports; Aircraft characteristics. Air traffic control need for ATC, Air traffic control network, Air traffic control aids – enroute aids, landing aids. Airport site location and necessary surveys for site selection, airport obstructions.

Unit-II 15 Hours

PLANNING

Airport master plan –FAA recommendations, Regional Planning, ICAO recommendations, Estimation of future airport traffic needs layout of AirPort.

Unit-III 15 Hours

RUNWAYS

Runway orientation – Wind rose diagram, basic runway length, corrections for elevation, temperature and gradient, runway geometric design, Airport drainage.

TAXIWAYS AND APRONS

Loading aprons –holding aprons –Geometric design standards, exit taxiways –optimal location, design, and fillet and separation clearance.

Unit-IV 15 Hours

OTHER FACILITIES

Lighting, visual airport marking, airport lighting aids.

OPERATIONS AND SCHEDULING

Ground transportation facilities; Airport capacity, runway capacity and delays.

Transactional Mode: Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested readings

1. *"Airport Engineering: Planning, Design, and Development of 21st Century Airports"* by S. K. Agarwal
2. *"Airport Planning and Management"* by S. K. Khanna and M. G. Arora
3. *"Airport Planning and Design"* by B. S. Tiwari
4. *"Airport Planning and Design"* by G. S. P. Raghavan
5. *"Airport Design and Operation"* by Johannes W. R. S. de S. Tavares

Course Title: Construction Cost Analysis	L	T	P	Cr.
Course Code: BCE7408	3	1	0	4

Total Hours: 60

Learning Outcomes: After completion of this course, the learner will be able to:

1. To recognize ethical and professional responsibilities in construction cost analysis situations related to engineering codes and standards, the semester project, and response to issues in the course.
2. To identify, formulate, and solve complex engineering problems in construction cost analysis related to overheads, labor, equipment, excavation, concrete, masonry and associated project items.
3. To analyze and apply construction costs to meet specified needs with consideration to civil engineering project from inception to design and construction.
4. Demonstrate communication skills in both oral and written during the semester project presentation
5. To acquire and apply new knowledge with emphasis on construction cost analysis using appropriate learning strategies.

Course Content

Unit-I

15 Hours

Engineering Economics

Basic principles – Time value of money, Quantifying alternatives for decision making, Cash flow diagrams, Equivalence- Single payment in the future (P/F, F/P), Present payment compared to uniform series payments (P/A, A/P), Future payment compared to uniform series payments (F/A, A/F), Arithmetic gradient, Geometric gradient.

Unit-II

15 Hours

Comparison of alternatives

Present, future and annual worth method of comparing alternatives, Rate of return, Incremental rate of return, Break-even comparisons, Capitalized cost analysis, Benefit-cost analysis.

Unit-III

15 Hours

Depreciation, Inflation and Taxes

Depreciation, Inflation, Taxes. Equipment economics: Equipment costs, Ownership and operating costs, Buy/Rent/Lease options, Replacement analysis.

Unit-IV**15 Hours****Cost estimating**

Types of Estimates, Approximate estimates – Unit estimate, Factor estimate, Cost indexes, Parametric estimate, Life cycle cost. Financial management: Construction accounting, Chart of Accounts, Financial statements – Profit and loss, Balance sheets, Financial ratios, Working capital management.

Transactional Mode:

Lecture, Seminar, e-Team Teaching, e-Tutoring, Dialogue, Peer Group Discussion, Mobile Teaching, Self-Learning, Collaborative Learning and Cooperative Learning

Suggested reading

1. *"Construction Cost Analysis and Estimating"* by Phillip F. Ostwald
2. *"Costing and Estimating for Engineers and Architects"* by R. R. Garge
3. *"Estimating and Costing in Civil Engineering: Theory and Practice"* by B. N. Dutta
4. *"Estimating Construction Costs"* by Robert L. Peurifoy and Garold D. Oberlender

Semester VIII

Course Title: Internship	L	T	P	Cr.
Course Code: BCE8450	0	0	0	20

The Internship will normally contain:

- 1.** Get experience of real life working environment.
- 2.** Gain practical knowledge, new skills and be aware of current technologies.
- 3.** Provide opportunities to students to be as prospective employees.
- 4.** Analyze problems and find/suggest possible solutions.
- 5.** Present a project report both in oral and written form based on work experiences.