2020

SYLLABUS SCHEME

B. TECH IN CIVIL ENGINEERING

VEER MADHO SINGH BHANDARI
UTTARAKHAND TECHNICAL UNIVERSITY

SHIVALIK
COLLEGE OF ENGINEERING

EVALUATION SCHEME & SYLLABUS

W.E.F. ACADEMIC SESSION 2020-21

Uttarakhand Technical University, Dehradun

Scheme of Examination as per AICTE Flexible Curricula

Evaluation Scheme & Syllabus

I Year (Common to All Branches)

W.E.F. Academic Session 2020-21

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula
Bachelor of Technology (B. Tech.) I Year
W.E.F. Academic Session - 2020-21

I Semester - GROUP A: (Branches for Group "A" to be decided by the Institutes)

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical						
				End Sem.	Mid Sem.	Quiz/ Assignment	End Sem.	Lab work & Sessional		L	T	P	
Mandatory Induction Program (First three weeks)				Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations									
Fourth week onwards classes will start													
1.	BAST 101 BASP 101	BSC-1	Engineering Chemistry	100	30	20	30	20	200	3	1	2	5
2.	BAST 102	BSC-2	Mathematics-I	100	30	20	-	-	150	3	1	-	4
3.	BAST 103 BASP 103	HSMC-1	English for Communications	100	30	20	30	20	200	3	-	2	4
4.	BEET 101 BEEP 101	ESC-1	Basic Electrical Engineering	100	30	20	30	20	200	3	1	2	
5.	BCST 101 BCSP 101	ESC-6	Fundamentals of Computers & Programming in C	100	30	20	30	20	200	3	1	2	5
6.	BMEP 101	ESC-3	Manufacturing Practices / Workshop	-	-	-	30	20	50	1	-	2	2
7.	BASP 102	DLC-1	Internship-I (60 Hrs Duration) at the Institute level	To be completed during or at the end of the second semester. Its evaluation/credit to be added in third semester.									
8.	BASP 105	DLC-2	Swachh Bharat Summer Internship Unnat Bharat Abhiyan (100Hrs)/ Rural Outreach				15	10	25*	-	-	4	-
			Total	**500**	**150**	**100**	**150**	**100**	**1000**	**16**	**4**	**10**	**25**

*It is non credit course. Student must clear it to be promoted in II Year; Marks will not be added to the total

Note: The Meaning of last Character of Subject Code (T – Theory and P – Practical)

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	**1 Credit**	**1 Credit**

Uttarakhand Technical University, Dehradun
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I Semester - GROUP B: (Branches for Group "B" to be decided by the Institutes)

S.No .	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem Exam.	Quiz/ Assignment	End Sem.	Lab work & Sessional		L	T	P	
1.	BAST 104 BASP 104	BSC-3	Engineering Physics	100	30	20	30	20	200	3	1	2	5
2.	BAST 102	BSC-2	Mathematics-I	100	30	20	-	-	150	3	1	-	4
3.	BMET 102 BMEP 102	ESC-4	Basic Mechanical Engineering	100	30	20	30	20	200	3	1	2	5
4.	BECT 101 BECP 101	ESC-5	Basic Electronics Engineering	100	30	20	30	20	200	3	1	2	5
5.	BMEP 103	ESC-2	Engineering Graphics	-	-	-	50	25	75	1	-	2	2
6.	BASP 106	HSMC-2	Language Lab & Seminars	-	-	-	50	25	75	1	-	2	2
7.	BEST 101	BSC	Environmental Studies	70	Not Credit Course. Student must clear it to complete the degree.			30 (Field & Project Work)	100	3	-	-	-
8.	BASP 102	DLC-1	Internship-I - (60 Hrs Duration) at the Institute level	To be completed during first/second semester. Its evaluation/credit to be added in third semester.									
			Total	**470**	**120**	**80**	**190**	**140**	**1000**	**17**	**4**	**10**	**23**

Note: The Meaning of last Character of Subject Code (T – Theory and P – Practical)

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	**1 Credit**	**1 Credit**

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II Semester - GROUP A: (Branches for Group "A" to be decided by the Institutes)

S.No .	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory Slot			Practical Slot						
				End Sem.	Mid Sem Exam.	Quiz/ Assignment	End Sem.	Lab work & Sessional		L	T	P	
1.	**BAST 104 BASP 104**	BSC-3	**Engineering Physics**	100	30	20	30	20	200	3	1	2	5
2.	**BAST 105**	BSC-4	**Mathematics-II**	100	30	20	-	-	150	3	1	-	4
3.	**BMET 102 BMEP 102**	ESC-4	**Basic Mechanical Engineering**	100	30	20	30	20	200	3	1	2	5
4.	**BECT 101 BECP 101**	ESC-5	Basic Electronics Engineering	100	30	20	30	20	200	3	1	2	5
5.	**BMEP 103**	ESC-2	**Engineering Graphics**	-	-	-	50	25	75	1	-	2	2
6.	**BASP 106**	HSMC-2	**Language Lab & Seminars**	-	-	-	50	25	75	1	-	2	2
7.	**BEST 101**	**BSC**	**Environmental Studies**	70	Not Credit Course. Student must clear it to complete the degree.			30 (Field & Project Work)	100	3	-	-	-
8.	**BASP 102**	DLC-1	**Internship-I - (60 Hrs Duration) at the Institute level**	**To be completed during first/second semester. Its evaluation/credit to be added in third semester.**									
			Total	**470**	**120**	**80**	**190**	**140**	**1000**	**17**	**4**	**10**	**23**

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II Semester - GROUP B: (Branches for Group "B" to be decided by the Institutes)

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Total Credits
				Theory			Practical						
				End Sem.	Mid Sem.	Quiz/ Assignment	End Sem.	Lab work & Sessional		L	T	P	
Mandatory Induction Program (First three weeks)				Physical Activity, Creative Arts, Universal Human Values, Literary, Proficiency Modules, Lectures by Eminent People, Visits to local Areas, Familiarization to Dept./Branch & Innovations									
Fourth week onwards classes will start													
1.	**BAST 101 BASP 101**	BSC-1	**Engineering Chemistry**	100	30	20	30	20	200	3	1	2	5
2.	**BAST 105**	BSC-4	**Mathematics-II**	100	30	20	-	-	150	3	1	-	4
3.	**BAST 103 BASP 103**	HSMC-1	**English for Communication**	100	30	20	30	20	200	3	-	2	4
4.	**BEET 101 BEEP 101**	ESC-1	**Basic Electrical Engineering**	100	30	20	30	20	200	3	1	2	5
5.	**BCST 101 BCSP 101**	ESC-6	**Fundamentals of Computers & Programming in C**	100	30	20	30	20	200	3	1	2	5
6.	**BMEP 101**	ESC-3	**Manufacturing Practices / Workshop**	-	-	-	30	20	100	1	-	2	2
7.	**BASP 102**	DLC-1	**Internship-I (60 Hrs Duration) at the Institute level**	**To be completed during or at the end of the second semester. Its evaluation/credit to be added in third semester.**									
8.	**BASP 105**	DLC-2	Swachh Bharat Summer Internship Unnat Bharat Abhiyan (100Hrs)/ Rural Outreach				15	10	25*	-	-	4	-
			Total	**500**	**150**	**100**	**150**	**100**	**1000**	**16**	**4**	**10**	**25**

*It is non credit course. Student must clear it to be promoted in II Year; Marks will not be added to the total

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1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	**1 Credit**	**1 Credit**

BAST-101 **BASP-101**	**Engineering Chemistry**	**3 1 2**	**05 Credits**

Course Contents:

Periodic Properties (5 Lectures)

Effective Nuclear Charge, Atomic & Ionic sizes, Electron affinity, Electro negativity, Ionization Potential, Ploarizability, Oxidation States & Hydrogen Bonding.

Phase equilibrium (5 Lectures)

Gibbs Phase Rule, Phase diagram of single component system (Water & Sulphur) Phase diagram of Binary Eutectic System (Cu-Ag.)

Water Analysis - (8 Lectures)

Soft and Hard Water, Degree of Hardness, Determination of hardness by EDTA method (related numerical problems), Softening methods (Lime-Soda, Zeolite and Ion Exchange Methods), Alkalinity & It's determination.

Boiler Feed Water, Sludge & Scale, Priming & Foaming, Boiler Corrosion, Caustic Embrittlement.

Polymers (8 Lectures)

Introduction, Types of polymerization, Classification, Thermoplastic & Thermosetting polymers Elementary idea of Biodegradable polymers, Conducting Polymers & Nano Particles, Preparation, properties & uses of the following polymers - PVC, PMMA, Teflon, Nylon 6, Nylon 6:6, Polyester & Bakelite, Rubbers, Vulcanization of Rubber.

Corrosion (4 Lectures):

Introduction, Dry Corrosion, Wet Corrosion, Mechanism of Corrosion, Factors affecting corrosion and Prevention of corrosion.

Lubricants (6 Lectures)

Introduction, Mechanism of lubrication, Classification of lubricants, significance & determination of Viscosity and Viscosity Index, Flash & Fire Points, Cloud & Pour Points, Aniline & Mixed Aniline Points, Acid Number, Saponification Number.

Spectroscopic techniques and application (4 Lectures)

Principle and Applications of UV – visible, IR, Raman & NMR, Spectroscopy.

Course Outcomes

The concepts developed in this course will aid in quantification of several concepts in chemistry that have been introduced at the 10+2 levels in schools. Technology is being increasingly based on the electronic, atomic and molecular level modifications.

Quantum theory is more than 100 years old and to understand phenomena at nanometer levels, one has to base the description of all chemical processes at molecular levels. The course will enable the student to:

- Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.
- Rationalise bulk properties and processes using thermodynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
- Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.
- List major chemical reactions that are used in the synthesis of molecules.

Practical List

NOTE: Choice of 10-12 experiments of the following core experiments must be performed during the session.

1. Determination of hardness of water using EDTA method (Complexometric Titration).

2. Determination of alkalinity of water.
3. Determination of chloride content of water (Mohr's Method)
4. Determination of viscosity of unknown sample using Ostwald's viscometer
5. Determination of surface tension of unknown sample using stalagmometer.
6. Determination of saponification value of oil sample
7. Determination of acid value of oil sample
8. Synthesis of a polymer.
9. Determination of percentage moisture content in a coal sample.
10. Determination of percentage volatile matter in a coal sample.
11. Determination of ash content in a coal sample.
12. Separation of binary mixture by thin layer chromatography.
13. Separation of binary mixture by ascending paper chromatography.
14. Determination of adsorption isotherm of acetic acid on charcoal.
15. Determination of percentage purity of ferrous ammonium sulphate and copper sulphate.
16. Chemical analysis of salt (mixture of one acidic and one basic radical)

Reference Books :

1 Chemistry in Engineering and Technology - Vol.1 &2 Kuriacose and Rajaram , McGraw Hill Education
2 Fundamental of Molecular Spectroscopy C.N. Banwell , McGraw Hill Education
3 Engineering Chemistry – B.K. Sharma, Krishna Prakashan Media (P) Ltd., Meerut.
4 Basics of Engineering Chemistry – S.S. Dara & A.K. Singh, S. Chand &Company Ltd., Delhi.
5 Applied Chemistry – Theory and Practice, O.P. Viramani, A.K. Narula, New Age International Pvt. Ltd. Publishers, New Delhi.
6 Elementary Spectroscopy ,Y .R. Sharma , S. Chand Publishing
7 Polymer Science, Vasant R. Gowariker, N. V. Viswanathan, Jayadev Sreedhar, New Age International Pvt. Ltd
8 Advanced Inorganic Chemistry, G.R. Chatwal, Goal Publishing house
9 Engineering Chemistry (NPTEL Web-book) B.L. Tembe, Kamaluddin and M.S. Krishna
10 Advanced Physical Practical Chemistry by JB Yadav.

BAST-102	MATHEMATICS-I	3 1 0	04 Credits

OBJECTIVES: The objective of this course is to familiarize the prospective engineers with techniques in calculus, multivariate analysis and linear algebra. It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics and applications that they would find useful in their disciplines. More precisely, the objectives are:

To introduce the idea of applying differential and integral calculus to notions of curvature and to improper integrals. Apart from some applications it gives a basic introduction on Beta and Gamma functions.

To introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.

To familiarize the student with functions of several variables that is essential in most branches of engineering.

To develop the essential tool of vector spaces, matrices and linear algebra in a comprehensive manner.

Course Contents:

Module 1: Calculus: (10 hours): Rolle's theorem, Mean Value theorems, Expansion of functions by Maclaurin's and Taylor's for one variable; Taylor's theorem for function of two variables, Partial Differentiation, Maxima & Minima (two and three variables), Method of Lagranges Multipliers.

Module 2: Calculus: (8 hours): Definite Integral as a limit of a sum and Its application in summation of series; Beta and Gamma functions and their properties; Applications of definite integrals to evaluate surface areas and volumes of revolutions. Multiple Integral, Change the order of the integration.

Module 3: Vector Calculus : (10 hours) : Differentiation of Vectors, Scalar and vector point function, Gradient, Geometrical meaning of gradient, Directional Derivative, Divergence and Curl, Line Integral, Surface Integral and Volume Integral, Gauss Divergence, Stokes and Green theorems (without proof).

Module 4: Vector Spaces (6 hours): Vector Space, Vector Sub Space, Linear Combination of Vectors,Linearly Dependent, Linearly Independent, Basis of a Vector Space,Linear Transformations.

Module 5: Matrices (6 hours): Rank of a Matrix, Solution of Simultaneous Linear Equations by Elementary Transformation, Consistency of Equation, Eigen Values and Eigen Vectors, Diagonalization of Matrices, Cayley-Hamilton theorem and its applications to find inverse.

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition,Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11thReprint, 2010.
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

BAST 103 & BASP 103	English for Communication	3L-0T-2P	4 Credits

COURSE CONTENTS:

Unit-I

Identifying Common errors in writing: Articles, Subject-Verb Agreement, Prepositions, Active and Passive Voice, Reported Speech: Direct and Indirect, Sentence Structure.

Unit-II

Vocabulary building and Comprehension:

Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives, synonyms, antonyms, Reading comprehension.

Unit-III

Communication:

Introduction, Meaning and Significance, Process of Communication, Oral and Written Communication, 7 c's of Communication, Barriers to Communication and Ways to overcome them, Importance of Communication for Technical students, nonverbal communication.

Unit-IV

Developing Writing Skills:

Planning, Drafting and Editing, Precise Writing, Précis, Technical definition and Technical description. Report Writing: Features of writing a good Report, Structure of a Formal Report, Report of Trouble, Laboratory Report, Progress Report.

Unit-V

Business Correspondence:

Importance of Business Letters, Parts and Layout; Application, Contents of good Resume, guidelines for writing Resume, Calling/ Sending Quotation, Order, Complaint, E-mail and Tender.

Books Recommended:

1. 'Technical Communication : Principles and practice', Meenakshi Raman and Sangeeta Sharma (Oxford)
2. 'Effective Business Communication', Krizan and merrier (Cengage learning)
3. 'Communication Skill, Sanjay Kumar and pushlata, OUP2011
4. "Practical English Usage Michael Swan OUP, 1995.
5. "Exercises in spoken English Parts I-III CIEFL, Hyderabad, Oxford University Press
6. On writing well, William Zinsser, Harper Resource Book 2001.
7. Remedial English Grammar, F.T. Wood,Macmillan2007.

Course Outcomes:

The student will acquire basic proficiency in English including reading and listening comprehension, writing and speaking skills.

Communicative Language Laboratory:

Course objective: The language laboratory focuses on the practice of English through audio-visual aids and Computer software. It intends to enable the students to speak English correctly with confidence and intends to help them to overcome their inhibitions and self –consciousness while speaking in English.

Topics to be covered in the Language laboratory sessions:

1. Listening Comprehension.
2. Pronunciation, Intonation, Rhythm
3. Practising everyday dialogues in English
4. Interviews.
5. Formal Presentation

Final Assessment should be based on assignment, assessment, presentation and interview of each candidate.

BEET 101 & BEEP 101	Basic Electrical Engineering	3L-1T-2P	5 Credits

Course outcomes:

The final outcome of the subject will result into an enhancement in understanding the basic concepts of Core Electrical Engineering subjects.

The topics covered under this subject will help to enhance the basic understanding of Electrical machines and power systems and basic electronics.

Course Contents:

UNIT 1 :

DC Circuits (8 hours)

Electrical circuit elements (R, L and C), voltage and current sources, Kirchoff current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin , Norton Theorems and maximum power transfer theorem . Star to Delta conversion. Time-domain analysis of first-order RL and RC circuits.

UNIT 2:

AC Circuits (8 hours)

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance. Three phase balanced circuits, voltage and current relations in star and delta connections and power measurement

UNIT 3:

Transformers (6 hours)

Magnetic circuits and materials, BH characteristics, Basic laws of electromagnetism, single phase transformer. ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

UNIT 4:

Electrical Machines (8 hours)

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor construction and workings . Construction, working, torque-speed characteristic and speed control of separately and self excited dc machines . Construction and working of synchronous generators

Unit 5:

Electrical Installations (6 hours)

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing methods. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

References

1. D.P. Kothari & I.J. Nagrath, Basic Electrical Engineering, Tata McGraw Hill, latest edition.
2. S.N. Singh , Basic Electrical Engineering, P.H.I.,2013
3. Rajendra Prasad, Fundamentals of Electrical Engineering, Prentice Hall,2014
4. M.S. Sukhija, T. K. Nagsarkar, Basic Electrical and electronics engineering, Oxford University press, 2012
5. C.L. Wadhwa, Basic Electrical Engineering. New Age International.
6. B.L. Theraja & A.K Theraja Textbook of Electrical Technology - Vol. 1, S. Chand Publication
7. E. Hughes & I.M. Smith Hughes Electrical Technology Pearson
8. Vincent Del Toro Electrical Engineering Fundamentals

List of experiments/demonstrations:

1. Basic safety precautions. Introduction and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.

2. Measurement of steady-state and transient response of R-L, R-C, and R-L.
3. Sinusoidal steady state response of R-L, and R-C circuits – impedance calculation and verification. Observation of phase differences between current and voltage. Resonance in R-L- C circuits.
4. Verification of Network theorems.
5. To perform Load test on single phase Transformer.
6. To study the Starting and reversal of 3 phase induction motor.
7. Study of Speed control of a DC shunt Motor by Field Control Method.
8. Study the characteristic of DC Motor.
9. Study the characteristic DC generator.

Institute can add upto two experiment of their own choice.

BMET 105	Engineering Graphics	1L-0T-2P	2 Credits

Course Objective:

All phases of manufacturing or construction require the conversion of new ideas and design concepts into the basic line language of graphics. Therefore, there are many areas (civil, mechanical, electrical, architectural and industrial) in which the skills of the CAD technicians play major roles in the design and development of new products or construction. Students prepare for actual work situations through practical training in a new state-of-the-art computer designed CAD laboratory using engineering software. This course is designed to address:

- to prepare you to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- to prepare you to communicate effectively
- to prepare you to use the techniques, skills, and modern engineering tools necessary for engineering practice

Goals & Outcomes:

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modeling
- Exposure to computer-aided geometric design
- Exposure to creating working drawings
- Exposure to engineering communication

Course Contents:

UNIT 1: Introduction to Engineering Drawing covering, Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Orthographic Projections covering, Principles of Orthographic Projections- Conventions - Projections of Points

UNIT 2: Projection of lines inclined to both planes; vertical and horizontal traces. Projections of planes - Auxiliary Planes; Projections of Regular Solids in simple position, projection of solids with base on ground and axis perpendicular to HP, Projection of solids with axis parallel to both the principal planes. Projection of solids inclined to both the Planes- Auxiliary Views; Draw simple annotation, dimensioning.

UNIT 3: Sections and Sectional Views of Right Angular Solids covering, Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Frustums and truncated solids. 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) . Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Isometric axes, Conventions; Isometric Views of solids, Box method, coordinate method, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;

UNIT 4: Introduction of CAD in engineering drawing. 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, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable),

UNIT 5: Customization & CAD Drawing consisting of set up of the drawing page and the printer, including scale settings, Setting up of units and drawing limits Applying various ways of drawing circles; ; Setting up and use of Layers, layers to create drawings, Create, 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 of lines, circles, polygons using CAD technique. Introduction of solids. Multi views.

Text/Reference Books:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
   B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
3. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
4. (Corresponding set of) CAD Software Theory and User Manuals

BMEP 101	Manufacturing Practices/Workshop	1L-0T-2P	2 Credits

Course Objective:

Manufacturing is fundamental to the development of any engineering product. The course on Engineering Workshop Practice is intended to expose engineering students to different types of manufacturing / fabrication processes, dealing with different materials such as metals, ceramics, plastics, wood, glass etc. While the actual practice of fabrication techniques is given more weightage, some lectures and video clips available on different methods of manufacturing are also included.

Course Outcomes:

At the end of this course, students will demonstrate the ability to

- Understanding different manufacturing techniques and their relative advantages/ disadvantages with respect to different applications.
- Selection of a suitable technique for meeting a specific fabrication need.
- Acquire a minimum practical skill with respect to the different manufacturing methods and develop the confidence to design & fabricate small components for their project work and also to participate in various national and international technical competitions.
- Introduction to different manufacturing methods in different fields of engineering.
- Practical exposure to different fabrication techniques.
- Creation of simple components using different materials.
- Exposure to some of the advanced and latest manufacturing techniques being employed in the industry.

Course Contents:

Lectures & videos: (10 hours)

1. Manufacturing Methods- casting, forming, machining, joining, Introduction to Lathe, Drilling etc. **(3 lectures)**
2. CNC machining, Additive manufacturing **(1 lecture)**
3. Fitting operations & power tools **(1 lecture)**
4. Electrical &Electronics **(1 lecture)**
5. Carpentry **(1 lecture)**
6. Plastic moulding, glass cutting **(1 lecture)**
7. Metal casting **(1 lecture)**
8. Welding (arc welding & gas welding), brazing **(1 lecture)**

(ii) Workshop Practice:(60 hours)

1. Machine shop **(10 hours)**
2. Fitting shop **(8 hours)**
3. Carpentry **(6 hours)**
4. Electrical & Electronics- Soldering, Brazing, Winding etc.**(8 hours)**
5. Welding shop **(8 hours (Arc welding 4 hrs + gas welding 4 hrs)**
6. Casting **(8 hours)**
7. Smithy **(6 hours)**
8. Plastic moulding/ Glass Cutting/ Sheet Metal Shop (6 hours)

Note: Examinations could involve the actual fabrication of simple components, utilizing one or more of the techniques covered above.

Laboratory Outcomes

- Upon completion of this laboratory course, students will be able to fabricate components with their own hands.
- They will also get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.
- By assembling different components, they will be able to produce small devices of their interest.

BAST 104 & BASP 104	Engineering Physics	3L-1T-2P	5 Credits

Course Contents:

Module 1: Wave nature of particles and the Schrodinger equation (8 lectures)

Introduction to Quantum mechanics, Wave nature of Particles, Free-particle wave function and wave-packets, Group Velocity and Phase Velocity and relation, Uncertainty principle, wave function, Born interpretation of wave function, operators, Time-dependent and time-independent Schrodinger equation for wave function, Application: Particle in a One-dimensional Box.

Module 2: Wave optics (8 lectures)

Huygens' principle, superposition of waves and interference of light by wave front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, Mach- Zehnder interferometer.

Fraunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

Module 3: Introduction to solids (8 lectures)

Free electron theory of metals, Fermi level of Intrinsic and extrinsic, density of states, Bloch's theorem for particles in a periodic potential. V-I characteristics of PN junction, Zener diode, Solar Cell, Hall Effect, concept of zero resistivity and superconductivity, Meissner effect, Type - I and Type - II superconductors, applications of superconductivity.

Module 4: Lasers (8 lectures)

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, different types of lasers: gas lasers (He-Ne, CO_2), solid-state lasers (ruby, Neodymium), Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine. Introduction to Optical fiber, acceptance angle and cone, Numerical aperture, V number, attenuation.

Module 5: Electrostatics in vacuum (8 lectures)

Gradient, Divergence and curl, Stokes' theorem, Gauss Theorem, Calculation of electric field and electrostatic potential for a charge distribution; Electric displacement, Basic Introduction to Dielectrics, Continuity equation for current densities; Maxwell's equation in vacuum and non-conducting medium; Poynting vector.

List of Experiment*

1. To determine the dispersive power of prism.
2. To determine the wave length of sodium light with the help of newton's Ring.
3. Resolving Power of Telescope.
4. YDSE (Young's double slit Experiment).
5. To determine the frequency of AC mains supply.
6. V-I Characteristics of P-N junction diode.
7. To determine the wave length of diode loses by single slit diffraction.
8. To determine the plank's constant with the help of photocell.
9. Hall's effect experiment.
10. Calibration of ammeter by using reference zener diode.

11. To study the effect of temperature on reverse saturation current in P-N junction diode and to determine the energy band gap.
12. To determine the wave length of sodium by using plane diffraction grating.
13. To determine the prominent lines of mercury source by plane diffraction grating.
14. To determine the numerical aperture of an optical fiber.
15. To determine wave length of given laser by plane diffraction grating.
16. To determine the variation of magnetic field along the axis of current carrying circular coil and the estimation the radius of coil. 1. To determine the resistivity and band gap by four probe method.
17. Use of Michelson-Morley interferometer for determining the wavelength of He-Ne laser
18. To determine the specific rotation of sugar solution using Loren's half shade polarimeter.
19. To calculate the dielectric constant of the given dielectric material.
20. To find the capacitance and permittivity of the given material.
21. Measurement of length (or diameter) using vernier calliper, screw gauge and travelling microscope
22. To determine g by bar pendulum and Kater's pendulum.
23. To determine g and velocity for a freely falling using digital timing technique.
24. To study the motion of a spring and calculate (a) spring constant (b) value of g
25. To determine the height of an object using a sextant.
26. Determination of the value of e/m of an electron by helical method/ Thomson method.

**** Minimum 15 experiment are mandatory to perform out of above list of experiments as well other than these experiments 3-4 more experiments can be considered as per their availability***

Suggested Reference Books

1. A. Ghatak, Optics.
2. O. Svelto, Principles of Lasers.
3. David Griffiths, Introduction to Electrodynamics.
4. D.J. Griffiths, Quantum Mechanics.
5. Halliday & Resnick, Physics.
6. HC Verma, Quantum Physics
7. MN Avdhanulu, PG Kshirsagar et all, Engineering Physics

BAST 105	MATHEMATICS-II	3L-1T-0P	4 Credits

OBJECTIVES: The objective of this course is to familiarize the prospective engineers with techniques in Ordinary and partial differential equations, complex variables and vector calculus. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines. More precisely, the objectives are:

- To introduce effective mathematical tools for the solutions of ordinary and partial differential equations that model physical processes.
- To introduce the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems.
- To acquaint the student with mathematical tools available in vector calculus needed various field of science and engineering.
- To develop the tool of Series and Fourier series for learning advanced Engineering Mathematics.

Course Contents:

Module 1:Ordinary Differential Equations I :(8 hours) : Differential Equations of First Order and First Degree (Leibnitz linear, Bernoulli's, Exact), Differential Equations of First Order and Higher Degree, Higher order differential equations with constants coefficients, Homogeneous Linear Differential equations, Simultaneous Differential Equations.

Module 2:Ordinary differential Equations II:(8 hours) : Second order linear differential equations with variable coefficients, Method of variation of parameters, Power series solutions; Legendre polynomials, Bessel functions of the first kind and their properties.

Module 3: Partial Differential Equations : (8 hours) : Formulation of Partial Differential equations, Linear and Non-Linear Partial Differential Equations, Homogeneous Linear Partial Differential Equations with Constants Coefficients.

Module 4: Sequences and series: (8 hours): Convergence of sequence and series, tests for convergence; Comparison Test; Ratio Test; D'Alembert's Ratio Test, Raabe's Test, Logarithmic Test, Cauchy Root Test, Weierstrass M Test; Alternating Series, Uniform Conversions, Fourier series: Half range sine and cosine series, Parseval's theorem.

Module 5: Functions of Complex Variable :(8 hours) : Functions of Complex Variables: Analytic Functions, Harmonic Conjugate, Cauchy-Riemann Equations (without proof), Line Integral, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Singular Points, Poles & Residues, Residue Theorem, Application of Residues theorem for Evaluation of Real Integral (Unit Circle).

Textbooks/References:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., McGraw Hill, 2004.
8. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
9. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

BMET 102 **BMEP 102**	**Basic Mechanical Engineering**	**3L-1T-2P**	**5 Credits**

Course Contents:

UNIT-1:Fundamental Concepts and Definitions

Definition of thermodynamics, System, Surrounding and universe, Phase, Concept of continuum,Macroscopic & microscopic point of view. Density, Specific volume, Pressure, temperature.Thermodynamic equilibrium, Property, State, Path, Process, Cyclic and non cyclic processes,Reversible and irreversible processes, Quasi static process, Energy and its forms, Enthalpy.

UNIT-2:

Zeroth law: Zeroth law, Different temperature scales and temperature measurement

First law: First law of thermodynamics. Processes - flow and non-flow, Control volume, Flow work and non-flow work, Steady flow energy equation, Unsteady flow systems and their analysis.

Second law: Limitations of first law of thermodynamics, Essence of second law, Thermal reservoir, Heat engines. COP of heat pump and refrigerator. Statements of second law and their equivalence,Carnot cycle, Carnot theorem, Thermodynamic temperature scale, Clausius inequality. Concept of entropy.

UNIT-3:

Properties of steam: Properties of steam, Phase transformation process and its graphical representation on P-V, T-V& T-s diagram, Mollier diagram and Steam Tables, Processes involving steam in closed and open systems.

Introduction to I.C. Engines: Two & four stoke S.I. and C.I. engines. Otto cycle, Diesel cycle, Dual cycle.

UNIT-4:Force system and Analysis

Basic concept: Review of laws of motion, transfer of force to parallel position, resultant of planer force system,Free Body Diagrams, Equilibrium. **Friction:** Introduction, Laws of Coulomb friction,Equilibriumof bodies involving dry fiction.

Structure Analysis

Beams: Introduction, Shear force and bending moment, Shear force and bending moment diagram for statically determinate and indeterminate beams.

Trusses: Introductio n, Simple Trusses, Determination of forces in simple truss members, Method of Joints and Method of section.

UNIT-5

Stress and Strain Analysis

Simple stress and strain: Introduction, Normal shear stresses, Stress-strain diagrams for ductile and brittle materials,Elastic constants, One dimensional loading of members of varying cross section, Strain energy,Thermal stresses.

Compound stress and strains: Introduction, State of plane stress, Principal stress and strain, Mohr's circle for stress and strain.

Pure Bending of Beams: Introduction, Simple bending theory, Stress in beams of different cross sections.

Torsion: Introduction, Torsion of Shafts of circular section, Torque and Twist, Shear stress due to Torque.

References:

1. Van Wylen G.J. & Sonntag R.E. : Fundamentals of classical thermodynamics, John Wiley &Sons, Inc.NY.
2. Holman, J.P. : Thermodynamics, Mc Graw Hill book Co. NY.
3. Singh Onkar, Bhavikatti S.S., Chandra Suresh : Introduction to Mechanical Engineering: Thermodynamics, Mechanics and Strength of Materials, New Age International Publishers
4. Yadav R. : Thermodynamics and Heat Engines, Vol I & II (SI Editio n) Central Publishing House Allahabad.
5. G. H. Ryder : Strength of Materials, Mc Millan Publishers India Ltd.
6. Timoshenko : Strength of Materials, D. Van Nostrand Company Inc.

MECHANICAL ENGINEERING LAB

List of Practical **L T P 0 0 2**

A minimum of 8 experiments from the following :

1. Study of Steam engine and steam turbine models.
2. Study of 2-stroke and 4 -stroke I.C.E. models.
3. Study of Fiat engine and/ or Diesel engine prototype.
4. Study of a vapour compression Refrigeration unit tutor/refrigerator.
5. Study of a window type air conditioner.
6. To conduct the tensile test on a UTM and determine ultimate Tensile strength, percentage elongation for a steel specimen.
7. To conduct the compression test and determine the ultimate compressive strength for a specimen.
8. To conduct the Impact test (Izod / charpy) on the Impact testing machine and to find the impact strength.
9. To determine the value of acceleration due to gravity by Atwood's Machine appratus.
10. To verify the principle of moment by Bell Crank Lever Appratus
11. To determine the moment of inertia of a flywheel apparatus about its axis of rotation.
12. To find out coefficient of friction by combined inclined plane & friction slide apparatus.

BecT 101 **BECP 101**	**Basic Electronics Engineering**	**3L-1T-2P**	**5 Credits**

Course Contents:

Module	Basic Electronics(BECT101,BECP101)	Hr
1.	**Semiconductor Diodes** Semiconductor materials- intrinsic and extrinsic types , Ideal Diode , Terminal characteristics of diodes: p-n junction under open circuit condition p-n junction under forward bias and reverse bias conditions p-n junction in breakdown region , Diode small signal model Zener diode and applications , Rectifier Circuits, Clipping and Clamping circuits	**8**
2	**DIODE APPLICATIONS:** Rectifiers and filter circuit: Half wave rectifier, Full wave rectifier, bridge rectifier and their analysis, L,C and Pi filters, Series and shunt diode clippers, Clipping at two independent levels, Clamping operation , Clamping circuit, Practical clamping circuits, Basic regulator supply using zener diode	**7**
3	**Bipolar Junction Transistors (BJTs)** Physical structure and operation modes, Active region operation of transistor, D.C. analysis of transistor circuits, Transistor as an amplifier, Biasing the BJT: fixed bias, emitter feedback bias, collector feedback bias and voltage divider bias, Basic BJT amplifier configuration: common emitter, common base and common collector amplifiers, Transistor as a switch: cut-off and saturation modes , High frequency model of BJT amplifier	**10**
4	**Field Effect Transistor (FET**) ***Enhancement-type MOSFET***: structure and physical operation, current-voltage characteristics Depletion-type MOSFET , D.C. operation of MOSFET circuits, MOSFET as an amplifier, Biasing in MOSFET amplifiers , Basic MOSFET amplifier configuration: common source, common gate and common drain types , High frequency model of MOSFET amplifier , Junction Field-Effect Transistor (JFET)	**10**
5	**Operation Amplifier (Op-amps)** ***Ideal Op-amp Differential amplifier*:** differential and common mode operation common mode rejection ratio (CMRR) , ***Practical op-amp circuits***: inverting amplifier, non -inverting amplifier, weighted summer, integrator, differentiator , Large signal operation of op-amps , Other ***applications of op-amps*:** instrumentation circuits, active filters, controlled sources, logarithmic amplifiers, waveform generators, Schmitt triggers, comparators	**10**

TEXT BOOKS:

1. Integrated devices & Circuits by Millman & Halkias.
2. Electronics Devices and Circuit Theory by R. Boylestad.

REFERENCE BOOKS:

1. Electronics Devices and Circuits-II by A.P.Godre & U.A. Bakshi.
2. Electronics Devices and Circuit by G.K. Mithal.

Basic Electronics Lab

Sr.	Experiment
1	CRO-Applications
2	V-I Characteristics of Silicon & Germanium PN Junction diodes
3	V-I Characteristics of Zener Diode
4	Characteristics of BJT in Common Emitter Configuration
5	Characteristics of JFET in Common Source Configuration
6	Half Wave and Full Wave Rectifier With Filter
7	Common Emitter BJT Amplifier for audio signal amplification
8	Applications of Operational Amplifier as adder and Subtractor
9	Applications of Operational Amplifier as differentiator and integrator
10	All logic Gate's truth table validation

BCST 101 & BCSP 101	Fundamentals of Computer & Programming in C	3L-1T-2P	5 Credits

Course Objective

1. To learn basics of computers
2. To learn basics of Operating System
3. To learn basics of C Language
4. To learn basics of Programming

Course Outcomes:

1. The student will learn to formulate simple algorithms for arithmetic and logical problems.
2. To translate the algorithms to programs (in C language).
3. To test and execute the programs and correct syntax and logical errors.
4. To implement conditional branching, iteration and recursion.
5. To decompose a problem into functions and synthesize a complete program using divide and conquer approach.
6. To use arrays, pointers and structures to formulate algorithms and programs.
7. To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.
8. To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration

Detailed Contents

Module I

Introduction to Programming - Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.)

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm Flowchart/Pseudocode with examples.

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code

Module II

Arithmetic expressions and precedence, Conditional Branching and Loops, Writing and evaluation of conditionals and consequent branching, Iteration and loops,

Arrays - Arrays (1-D, 2-D), Character arrays and Strings

Module III

Basic Algorithms - Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required)

Function - Functions (including using built in libraries), Parameter passing in functions, call by value, Passing arrays to functions: idea of call by reference

Module IV –

Recursion - Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, Ackerman function etc. Quick sort or Merge sort.

Structure - Structures, Defining structures and Array of Structures

Module V

Pointers - Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

File handling - (only if time is available, otherwise should be done as part of the lab)

Experiments

The laboratory should be preceded or followed by a tutorial to explain the approach or algorithm to be implemented for the problem given.

Tutorial 1: Problem solving using computers:
Lab1: Familiarization with programming environment

Tutorial 2: Variable types and type conversions:
Lab 2: Simple computational problems using arithmetic expressions

Tutorial 3: Branching and logical expressions:
Lab 3: Problems involving if-then-else structures

Tutorial 4: Loops, while and for loops:
Lab 4: Iterative problems e.g., sum of series

Tutorial 5: 1D Arrays: searching, sorting:
Lab 5: 1D Array manipulation

Tutorial 6: 2D arrays and Strings
Lab 6: Matrix problems, String operations

Tutorial 7: Functions, call by value:
Lab 7: Simple functions

Tutorial 8 &9: Numerical methods (Root finding, numerical differentiation, numerical integration):
Lab 8 and 9: Programming for solving Numerical methods problems

Tutorial 10: Recursion, structure of recursive calls
Lab 10: Recursive functions

Tutorial 11: Pointers, structures and dynamic memory allocation
Lab 11: Pointers and structures

Tutorial 12: File handling:
Lab 12: File operations Laboratory

Suggested Text Books

1. Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
2. E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill Suggested

Reference Books

1. Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India

13. WAP to illustrate constructor & Destructor
14. WAP to illustrate Object and classes.
15. WAP to illustrate Operator overloading
16. WAP to illustrate Function overloading
17. WAP to illustrate Derived classes & Inheritance
18. WAP to insert and delete and element from the Stack
19. WAP to insert and delete and element from the Queue
20. WAP to insert and delete and element from the Linked List

Recommended Text Books:

1. Fundamentals of Computers : E Balagurusamy, TMH
2. Basic Computer Engineering: Silakari and Shukla, Wiley India
3. Fundamentals of Computers : V Rajaraman, PHI
4. Information Technology Principles and Application: Ajoy Kumar Ray & Tinku Acharya PHI.

Recommended Reference Books:

1. Introduction of Computers : Peter Norton, TMH
2. Object Oriented Programming with C++ :E.Balagurusamy, TMH
3. Object Oriented Programming in C++: Rajesh K.Shukla, Wiley India
4. Concepts in Computing: Kenneth Hoganson, Jones & Bartlett.
5. Operating Systems – Silberschatz and Galvin - Wiley India
6. Computer Networks:Andrew Tananbaum, PHI
7. Data Base Management Systems, Korth, TMH

BASP 206	**Language Lab and Seminars**	**0L-0T-2P**	**1 Credits**

Course objective: This course intends to impart practical training in the use of English Language for Communicative purposes and aims to develop students' personality through language Laboratory.

Topics to be covered in the Language laboratory sessions:

1. Introducing oneself, family, social roles.
2. Public Speaking and oral skills with emphasis on conversational practice, extempore speech, JAM(Just a minute sessions), describing objects and situations, giving directions, debate, telephonic etiquette.
3. Reading Comprehension: Intensive reading skills, rapid reading, and reading aloud (Reading material to be selected by the teacher).
4. To write a book review. Standard text must be selected by the teacher.
5. Role plays: preparation and delivery topic to be selected by teacher/faculty.
6. Practice of Communication Skills using Language Lab

BEST 101	Environmental Studies	L - T - P 3 0 0	0 Credits

AS Per UGC Syllabus

Total Marks - 100

The structure of the question paper and Marks Distribution:

University Examination
Part A - Short answer pattern - 20 marks
Part B - Essay type with inbuilt choice - 50 marks

Internal Evaluation at Institute Level
Part C - Field & Project Work - 30 marks

AIM of Environmental Studies Subject

The aim of E.V.S. (environmental studies) is to develop a world population that is aware of and concerned about the environment and its associated problems and which has the knowledge ,Skills, attitudes ,motivations and commitment to work individually and collectively towards solutions of current problems and prevention of new ones. In view of this aim, environmental studies should form an integral part of the educational process, be centered in practical problems and be of an interdisciplinary/multidisciplinary character.

OBJECTIVES of Environmental Studies Subject

- Awareness: To help social groups and individuals acquire awareness of and sensitively to the total environment and it's allied problems.
- Knowledge: To help social groups and individuals gain a variety of experiences and acquire a basic understanding of environment and it's associated problems.
- Attitudes: To help social groups and individuals acquire a set of values and feelings of concern for environment.
- Skills: To help the individuals in acquiring skills for identifying and solving environmental problems.
- Participation: To provide social groups and individuals with an opportunity to be actively involved at all levels in working towards the resolution of environmental problems.

Detailed Content

Unit I –

Introduction: Introduction to environmental studies, Multidisciplinary nature of environmental studies; Scope and importance; the need for environmental education. Concept of sustainability and sustainable development.

Natural Resources:
Renewable and non-renewable resources: Natural resources and associated problems.

- Forest resources : Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- Water resources : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- Food resources : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- Energy resources : Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.

- Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
- Role of an individual in conservation of natural resources.
- Equitable use of resources for sustainable lifestyles.

Unit II : **Ecosystems**:

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystem :-
  - Forest ecosystem
  - Grassland ecosystem
  - Desert ecosystem
  - Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit III: **Biodiversity and Conservation**

- Introduction – Definition : genetic, species and ecosystem diversity.
- Biogeographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels.
- Inida as a mega-diversity nation
- Hot-sports of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.
- Endangered and endemic species of India
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

Unit IV : **Environmental Pollution**

Definition

- Cause, effects and control measures of :-
  - Air pollution
  - Water pollution
  - Soil pollution
  - Marine pollution
  - Noise pollution
  - Thermal pollution
  - Nuclear hazards
- Solid waste Management : Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution.
- Pollution case studies.
- Disaster management : floods, earthquake, cyclone and landslides.

UNIT V - Social Issues and the Environment

- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people; its problems and concerns. Case Studies
- Environmental ethics: Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.

- Wasteland reclamation.
- Consumerism and waste products.
- Environment Protection Act.
- Air (Prevention and Control of Pollution) Act.
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation.
- Public awareness.

UNIT VI - Human Population and the Environment

- Population growth, variation among nations.
- Population explosion – Family Welfare Programme.
- Environment and human health.
- Human Rights.
- Value Education.
- HIV/AIDS.
- Women and Child Welfare.
- Role of Information Technology in Environment and human health.
- Case Studies. (6 lectures)

Note: Introduction and familiarize students with the following

Global Environmental Issues and Environmental Laws

Pollution Tragedies: Love canal, Bhopal Gas, Endosulfan, Minamata and Flint water. UN Initiatives and International agreements: Montreal and Kyoto protocols, Paris Climate Summit (2015) and Convention on Biological Diversity (CBD). Environment Laws: Environment Protection Act (1986); Air (Prevention & Control of Pollution) Act (1981); Forest Conservation Act (1980); Water (Prevention and control of Pollution) Act (1974); Wildlife Protection Act (1972).

Field work

1. Visit to a local area to document environmental assets river / forest / grassland / hill / mountain
2. Visit to a local polluted site-Urban / Rural / Industrial / Agricultural
3. Study of common plants, insects, birds.
4. Study of simple ecosystems-pond, river, hill slopes, etc.
5. Plantation at least 2 fruits tree in Surroundings. Pic is to taken.
6. Any useful daily good from waste materials.
7. Taken at least 5 pics of surrounding by mobile in relation to environmental/social issues.
8. Development of detailed list of flora and fauna of college campus.
9. Manufacturing of any technical prototype/model in relation to Climatic Change mitigation.

Note: Minimum Five activities shall be done by each class and reports shall submit to University after host institute verification.

Text Books:

1. Basu, M. and Xavier, S.,Fundamentals of Environmental Studies, Cambridge University Press, 2016.
2. Mitra, A. K and Chakraborty, R., Introduction to Environmental Studies, Book Syndicate, 2016.
3. Enger, E. and Smith, B., Environmental Science: A Study of Interrelationships, Publisher: McGraw-Hill Higher Education; 12th edition, 2010.
4. Basu, R.N, Environment, University of Calcutta, 2000.

Suggested Readings:

1. Odum, E.P., Odum, H.T. & Andrews, J. 1971. Fundamentals of Ecology. Philadelphia: Saunders.
2. Pepper, I.L., Gerba, C.P. & Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press.
3. Gleeson, B. and Low, N. (eds.) 1999. Global Ethics and Environment, London,Routledge.
4. Gleick, P. H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute, Oxford Univ. Press.
5. Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36-37.
6. McCully, P. 1996. Rivers no more: the environmental effects of dams (pp. 29-64). Zed Books.
7. McNeill, John R. 2000. Something New Under the Sun: An Environmental History of the Twentieth Century.
8. Ghosh Roy, MK, Sustainalble Development (Environment, Energy and Water Resources), Ane Books Pvt. Ltd., 2011.
9. Karpagam, M and GeethaJaikumar, Green Management, Theory and Applications, Ane Books Pvt. Ltd., 2010.
10. Bala Krishnamoorthy, Environmental Management, PHI learning PVT Ltd, 2012.

Uttarakhand Technical University, Dehradun

Scheme of Examination as per AICTE Flexible Curricula

Evaluation Schemes for B. Tech 2nd to 4th Year

W.E.F. Academic Session 2020-21

III to VIII SEMESTER

Bachelor of Technology (B. Tech.)

[Civil Engineering]

Uttarakhand Technical University, Dehradun
Scheme of Examination as per AICTE Flexible Curricula
Evaluation Scheme & Syllabus for B. Tech Second Year
W.E.F. Academic Session 2019-20
II Year (III SEMESTER) – Civil Engineering

S. No.	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours / week			Total Credits
				Theory			Practical						
				End Sem	Mid Sem Exam.	Quiz/ Assignment	End Sem	Lab Work & Term work Sessional		L	T	P	
1.	BAST 301	BSC-5	Mathematics-III	100	30	20	-	-	150	3	1	-	4
2.	BCET 302	DC-1	Construction Materials	100	30	20	-	-	150	4	-	-	4
3.	BCET 303 BCEP 303	DC-2	Surveying	100	30	20	30	20	200	3	1	2	5
4.	BCET 304 BCEP 304	DC-3	Building Planning & Architecture	100	30	20	30	20	200	3	-	2	4
5.	BCET 305 BCEP 305	DC-4	Strength of Materials	100	30	20	30	20	200	3	1	2	5
6.	BCEP 306	DLC-3	Study of Historical & Ancient Civil Engineering Practices	-	-	-	30	20	50	-	-	4	2
7.	BASP 107	DLC-1	Evaluation of Internship - I - completed at I year level	-	-	-	-	50	50			4	2
8.	BASP 307	DLC-4	90 hrs Internship based on using various softwares –Internship-II	completed anytime during Third / Fourth semester. Its evaluation/credit to be added in fifth semester.									
			Total	500	150	100	120	130	1000	16	3	14	25
		NSS/NCC											

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	**1 Credit**	**1 Credit**

Uttarakhand Technical University, Dehradun
Scheme of Examination as per AICTE Flexible Curricula
Evaluation Scheme & Syllabus for B. Tech Second Year
W.E.F. Academic Session 2019-20
II Year (III SEMESTER) – Civil Engineering

S. No	Subject Code	Category	Subject Name	Maximum Marks Allotted					Total Marks	Contact Hours per week			Credits
				Theory			Practical			L	T	P	
				End Sem.	Mid Sem	Quiz/Assignment	End Sem.	Term work / Lab Work & Sessional					
1.	BCET 401	ESC	Energy & Environmental Engineering	50	30	20	-	-	100	2	1	-	3
2.	BCET 402 BCEP 402	DC	Concrete Technology	100	30	20	30	20	200	3	1	2	5
3.	BCET 403 BCEP 403	DC	Structural Analysis-I	100	30	20	30	20	200	3	1	2	5
4.	BCET 404 BCEP 404	DC	Transportation Engineering-I	100	30	20	30	20	200	3	1	2	5
5.	BCET 405 BCEP 405	DC	Engineering Geology & Remote Sensing	100	30	20	30	20	200	3	0	2	4
6.	BHUT401	BA	Universal Human Values	50	30	20			100	2	0	0	2
7.	BCEP 407	DLC	90 hrs Internship based on using various software's – Internship –II	To be completed anytime during fourth semester. Its evaluation/credit to be added in fifth semester.									3
			Total	500	150	100	150	100	1000	14	4	8	24
8.	BCST 408	MC	Cyber Security	Non-credit course									
			NSS/NCC										

***A minimum of 2 hours per week should be allotted for the Virtual Lab along with the slot fixed for the conventional lab classes.**

MST: Minimum of two mid semester tests to be conducted.

1 Hr Lecture	1 Hr Tutorial	2 Hr Practical
1 Credit	**1 Credit**	**1 Credit**

Uttarakhand Technical University, Dehradun

Scheme of Examination as per AICTE Flexible Curricula

Evaluation Scheme & Syllabus for B. Tech Third Year

W.E.F. Academic Session 2020-21

V & VI SEMESTER

Bachelor of Technology (B.Tech.)

[Civil Engineering]

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Scheme of Examination as per AICTE Flexible Curricula
W.E.F. Academic Session 2020-21
Bachelor of Technology (B.Tech.) [Civil Engineering]

V Semester

S. No.	Subject code	category	Subject name	Maximum marks alloted					Total marks	Contact hours per week			Total credit
				Theory			Practical						
				End sem	Mid sem	Quiz/ Assignment	End sem	Term work / lab work & sessional		L	T	P	
1.	BCET 501 BCEP 501	DC	Design of RC Elements	100	30	20	30	20	200	3	1	2	5
2.	BCET 502 BCEP 502	DC	Geotechnical Engineering I	100	30	20	30	20	200	3	1	2	5
3.	BCET 503 BCEP 503	DC	Fluid Mechanics	100	30	20	30	20	200	3	1	2	5
4.	BCET 504 (A/B/C/D)	DE	Departmental Electives	100	30	20	-	-	150	3	1	0	4
5.	BOEC 505 (A/B/C/D)	OE	Open Electives	100	30	20	-	-	150	3	1	0	4
6.	BCEP 506	O/E Lab	Material Testing Lab	-	-	-	30	20	50	0	0	2	1
7.	BCEP 507	DLC -1	Evaluation of Internship-II completed at II year level	-	-	-	-	50	50	-	-	2	1
8.		IN	Internship -III	To be completed any time during Fifth/ Sixth semester. Its evaluation/credit to be added in Seventh semester.									
TOTAL				500	150	100	120	130	1000	15	5	10	25

DEPARTMENTAL ELECTIVES			OPEN ELECTIVES	
BCET 504(A)	Structural Analysis II		BOEC 505 (A)	Renewable Energy Resources
BCET 504(B)	Quantity Surveying and Costing		BOEC 505 (B)	Transportation Engineering II
BCET 504(C)	Environmental Impact Assessment		BOEC 505 (C)	Operations Research
BCET 504(D)	Disaster Preparedness and Planning		BOET 504 (D)	Innovation and Entrepreneurship

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VI Semester

S. No.	Subject code	category	Subject name	Maximum marks alloted					Total marks	Contact hours per week			Total credit
				Theory			Practical						
				End sem	Mid sem	Quiz/ Assignment	End sem	Term work / lab work & sessional		L	T	P	
1.	BCET 601 BCEP 601	DC	Design of RC Structures	100	30	20	30	20	200	3	1	2	5
2.	BCET 602 BCEP 602	DC	Environmental Engineering I	100	30	20	30	20	200	3	1	2	5
3.	BCET 603 BCEP 603	DC	Open Channel Flow	100	30	20	30	20	200	3	1	2	5
4.	BCET 604 (A/B/C/D)	DE	Departmental Electives	100	30	20	-	-	150	3	1	0	4
5.	BOEC 605 (A/B/C/D)	OE	Open Electives	100	30	20	-	-	150	3	1	0	4
6.	BCEP 606	O/E Lab	OE Lab/ Advance Surveying Lab	-	-	-	30	20	50	0	0	2	1
7.	BCEP 507	P	Minor Project I	-	-	-	-	50	50	-	-	2	1
8.		IN	Internship –III	During semester 5/6									
TOTAL				500	150	100	60	90	1000	15	5	10	25

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DEPARTMENTAL ELECTIVES			OPEN ELECTIVES	
BCET 604(A)	Geotechnical Engineering II		BOEC 605 (A)	Principles of Management
BCET 604(B)	Precast and Modular Construction		BOEC 605 (B)	Environmental Management & Sustainable Development
BCET 604©	Cost Effective and Eco Friendly Structures		BOEC 605 (C)	Advance Pavement Design
BCET 604(D)	Urban and Town Planning		BOEC 605 (D)	Subject from SWAYAM

Civil Engineering, V-Semester

BCET 501, Design of RC Elements

3L, 1T, 2P

COURSE OBJECTIVES:

- To study about materials involved in reinforced concrete structures.
- To study about the methods of reinforced concrete construction.
- To study the behavior and design of reinforced concrete beams and one-way slabs considering deflections, flexure, shear and anchorage.
- To study the behavior and design of columns including slenderness effects.
- To learn design of staircase, footings and retaining walls.

COURSE OUTCOMES:

- Students will understand the general mechanical behavior of reinforced concrete.
- Students will be able to analyze and design reinforced concrete flexural members.
- Student will be able to analyze and design reinforced concrete compression members.
- Students will be able to analyze and design for vertical and horizontal shear in reinforced concrete.
- Students will be able to analyze transfer and development length of concrete reinforcement.
- Students will be able to analyze and design for deflection and crack control of reinforced concrete members.
- Students will be able to identify and apply the applicable industry design codes relevant to the design of reinforced concrete members.

SYLLABUS DETAILS:

S.NO.	TOPICS
1.	**Properties of Concrete:** Compressive strength, tensile strength, stress-strain behaviour, modulus of elasticity, shrinkage, creep, characteristic strength, grades of concrete, design stress-strain curve of concrete, reinforcing steel, types and grades, stress-strain curve.
2.	**Basic Concepts of Reinforced Concrete Design:** Working stress and limit state design methods.Design of R.C Beams in Flexure &Torsion: Singly and doubly reinforced rectangular/flanged sections, design for shear, bond and anchorage of reinforcement, limit states of deflection and cracking.
3.	**Slab & Staircase:** One-way and two-way slabs, design of staircases.
4.	**Design of compression members:**Design of compression members for axial loads and axial load plus uniaxial moment.Foundation types, design of isolated footings, introduction to combined footings.
5.	**Retaining walls:** Stability analysis of retaining wall, design of gravity wall, cantilever type retaining walls.

SUGGESTED BOOKS:

S.NO.	Name of Books / Author / Publisher	Year of publication
1.	Shah,V.L. et.al., “Limit State Theory and Design of Reinforced Concrete”,	2007

Structures Publications.
2. Pillai ,S.U. and Menon, D., “Reinforced Concrete Design”, Tata McGrawHill. 2003
3. Varghese,P.C., “Limit State Design of Reinforced Concrete”, Prentice-Hall. 2002
4. Park, R. and Pauley, T., “Reinforced Concrete Structures”, John Wiley 1976
5. Gambhir, M.L., “Fundamentals of Reinforced Concrete Design”, PrenticeHall of India. 2006

Laboratory Work: BCEP 501 -- Constructive details

Laboratory work will be based on the above course as required for engineering projects.

1. Singly and Doubly reinforced rectangular & Flanged Beams.
2. Slabs spanning in one direction, Slabs spanning in two directions, Circular slabs.
3. Staircases with waist slab having equal and unequal flights with different support conditions, Slabless tread-riser staircase. Design of staircases.
4. Square, Rectangular and Circular columns
5. Isolated and combined footings, Strap footing.
6. Retaining walls and basement walls.

BCET 502, Geotechnical Engineering

3L, 1T, 2P

COURSE OBJECTIVES

- To understand the basic properties of soil and different laboratory methods for determination of these basic properties of soil.
- Tounderstand the Engineering behavior of the soil and different laboratory methods for determination of these engineering properties of soil.
- Tounderstand the basic application of the concepts of the soil mechanics
- Tounderstand the principles of compaction and its control
- Toidentify shear strength parameters for field conditions

COURSE OUTCOMES (COs)

- Determine soil physical characteristics (including unit weight / density - water content relationship)
- Determine the coefficient of permeability and equivalent hydraulic conductivity in stratified soil
- Describe the purposes and different phases of a soil investigation, soil exploration program, soil exploration methods and soil identification in the field.
- Discuss the concept of effective stress and determine stress distribution within a soil mass.
- Explain the 'shear strength' of soil, describe the direct shear test method and interpret direct shear test results.

PROPOSED SYLLABUS:

UNIT 1: Soil Formation, Physical Properties & Classification: Soil types, Major soil deposits of India, Composition, Three phase relations, Volumetric and weight volume relationship, Index properties determination: Specific gravity, Water content, Atterberg's Limit. Grainsize distribution curves, consistency of soils, Unified soilclassification system, IS soil classification system, field identification tests.

UNIT 2: Capillarity, Permeability: Capillarity in soils, Permeability in soils, Darcy's law, determination of permeability, equivalent permeability in stratified soil, in-situ permeability test, 1-D flow, Laplace's equation, flow nets, Effective Stress Principle, seepage, quick sand condition, confined and unconfined flows, piping, filter criteria.

UNIT 3: Compaction & Stress Distribution: General principles, tests, factors affecting compaction, field compaction, compaction techniques.
Importance of estimation of stresses in soils – Boussinesq's and Westergaard's theories for point loads, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal planes – Newmark's influence chart.

UNIT 4: Compressibility and Consolidation: Compressibility and its types, Stress history of clay, Terzaghi's 1-D consolidation, normally and over-consolidation clays, void ratio-pressure relationships, time rate of consolidation, coefficient ofconsolidation, settlement types and estimation, secondary consolidation, 3-D consolidation, vertical sand drains.

UNIT5:Shear Strength & soil stability: Definition and use of shear strength, Principle of effective stress, Mohr-Coulomb failure criterion, direct shear test, unconfined compression test, Triaxial shear test, vane shear test, shear strength of clays and sands, factor affecting shear strength of granular soils and cohesive soils.

Type of slopes, failures of slopes, slip circle method, Taylor's stability charts and their uses, stabilization of soil slopes.

TEXT/REFERENCE BOOKS:

- A Text Book of Soil Mechanics and Foundation Engineering by V.N.S. Murthy, Saikripa Technical consultants, Bangalore.
- Geotechnical Engineering by S. K. Gulati et. al., TMH Publication Co. Ltd., New Delhi
- Basic and applied Soil Mechanics by Gopal Ranjan and A. S. R. Rao, Wiley Eastern Ltd., New Delhi.
- Soil Mechanics and Foundation Engineering by K. R. Arora, Standard Pub. and Dist., Delhi
- Soil Mechanics in Engineering Practice by Terzaghi and Pech, John Wiley and Sons Inc New York.
- Soil Mechanics by Lambe and Whitman, Wiley Eastern Pvt. Ltd., New Delhi.
- Fundamentals of Soil Mechanics by Taylor, John Wiley and Sons Inc New Delhi.

LIST OF PRACTICALS: BCEP 502

1. Determination of Specific gravity of soil solids by Pycnometer method
2. Determination of Specific gravity of soil solids by Density bottle
3. Determination of water content of soil solids oven drying method.
4. Determination of water content of soil solids by Pycnometer method.
5. Determination of in-situ density by Core cutter method
6. Determination of in-situ density by Sand replacement method
7. Determination of particle size distribution by sieving (Grain size analysis)
8. Determination of liquid limit of fine soil by Casagrande apparatus
9. Determination of Plastic limit of the soil
10. Determination of Shrinkage limit of the soil
11. Determination of maximum dry density and optimum moisture content by Standard Proctor compaction method
12. Determination of co-efficient of permeability by Constant head
13. Determination of co-efficient of permeability by variable head method
14. Determination of liquid limit of fine soil by Cone Penetration Method
15. Determination of shear parameters by Direct shear test of soil
16. Determination of unconfined compressive strength of soil
17. Vane Shear Test
18. Demonstration of Miscellaneous Equipments

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Civil Engineering, V-Semester

BCET 503, Fluid Mechanics

3L, 1T, 2P

COURSE OBJECTIVE:

- To introduce and explain fundamentals of Fluid Mechanics, which is used in the applications of Aerodynamics, Hydraulics, Marine Engineering, etc.
- To give fundamental knowledge of fluid, its properties and behaviour under various conditions of internal and external flows.
- To give fundamental knowledge of fluid, its properties and behaviour under various conditions of internal and external flows.
- To develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow.
- To imbibe basic laws and equations used for analysis of static and dynamic fluids.
- To inculcate the importance of fluid flow measurement and its applications in Industries.
- To determine the losses in a flow system, flow through pipes, boundary layer flow and flow past immersed bodies.

EXPECTED OUTCOMES:

- Understand the broad principles of fluid statics, kinematics and dynamics
- Understand definitions of the basic terms used in fluid mechanics
- Understand classifications of fluid flow
- Be able to apply the continuity, momentum and energy principles
- Be able to apply dimensional analysis

PROPOSED SYLLABUS:

UNIT 1: 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; vapor pressure, boiling point, Cavitation; surface tension, capillarity, Bulk modulus of elasticity, compressibility.

UNIT 2: Fluid Statics - Fluid Pressure: Pressure at a point, Pascal law, and pressure variation with temperature, density and altitude. Piezometer, U-Tube Manometer, Single Column 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 3: Fluid Kinematics- Classification of fluid flow : steady and unsteady flow; uniform and non-uniform flow; laminar and turbulent flow; rotational and irrotational flow; compressible and incompressible flow; ideal and real fluid flow; one, two and three dimensional flows; Stream line, path line, streak line and stream tube; stream function, velocity potential function. One-, two- and three - dimensional continuity equations in Cartesian coordinates

UNIT 4: Fluid Dynamics & Dimensional Analysis - Surface and body forces; Equations of motion - Euler's equation; Bernoulli's equation – derivation; Energy Principle; Practical applications of Bernoulli's equation; venturimeter, orifice meter and pitot tube; Momentum principle; Forces exerted by

fluid flow on pipe bend; Vortex Flow – Free and Forced;Definitions of Reynolds Number, Froude Number, Mach Number, Weber Number and Euler Number; Buckingham's π-Theorem.

UNIT5:Laminar & Turbulent Flow, Boundary Layer Analysis - Equation of motion for laminar flow through pipes, Stokes law, transition from laminar to turbulent flow, turbulent flow, types of turbulent flow, scale and intensity of turbulence, measurement of turbulence, mixing length concept and velocity distribution in turbulent flow over smooth and rough surfaces, Flow through pipes and pipe networks, Head loss in pipes, Equivalent pipes.
Boundary layer thickness, boundary layer over a flat plate,application of momentum equation, turbulent boundary layer, laminarsub layer, separation and its control, Drag and lift, drag on a sphere.

TEXT/REFERENCE BOOKS:

- P. Balachandran, "Engineering Fluid Mechanics", Prentice-Hall of India Pvt. Ltd.
- Dr. R. K. Bansal, "A Textbook of Fluid Mechanics and Hydraulic Machines", Laxmi Publications.
- Fluid Mechanics and Machinery, C.S.P.Ojha, R. Berndtsson and P. N. Chadramouli, Oxford University Press, 2010
- Hydraulics and Fluid Mechanics, P M Modi and S M Seth, Standard Book House
- Theory and Applications of Fluid Mechanics, K. Subramanya, Tata McGraw Hill
- Fluid Mechanics with Engineering Applications, R.L. Daugherty, J.B. Franzini and E.J. Finnemore, International Student Edition, McGraw Hill.

LIST OF PRACTICALS: BCEP 503

1. Measurement of viscosity
2. Study of pressure measurement devices
3. Hydrostatic force and center of pressure on flat/curved surfaces
4. Stability of Floating body
5. Study Characteristics of Laminar and Turbulent flows (Reynolds experiment)
6. Verification of Bernoulli Theorem
7. Determine Hydraulic coefficients of a small circular orifice.
8. Calibration of flow measuring devices (Venturimeter, Orificemeter, Rectangular and V-notch)
9. Pipe friction
10. Similitude and Model Studies

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BCET 504 (A), Structural Analysis II

3L, 1T, 0P

Course Objectives

- To equip the students with the force and displacement methods of structural analysis with emphasis on analysis of continuous beams and frames.

Course Outcomes

The students will be able to

- Analyze structures using force method
- Analyze structures using displacement method
- learn Clapeyrons theorem and its applications
- Analyze structures using matrix methods
- Analyze structures using plastic analysis

Detailed Syllabus

UNIT NO	TOPICS
1.	**Slope Deflection Method**: Analysis of continuous beams with various loadings - beams with overhang- analysis of rigid - frames without sway and with sway - different types of loads - settlement effects
2.	**Moment Distribution Method**: Distribution factors, Analysis of continuous beams with various loadings - beams with overhang- analysis of rigid frames without sway and with sway – sinking effect
3.	**Plastic Analysis:**Plastic theory – Statically indeterminate structures – Plastic moment of resistance – Plastic modulus – Shape factor – Load factor – Plastic hinge and mechanism – collapse load – Static and kinematic methods – Upper and lower bound theorems – Plastic analysis of indeterminate beams and frames.
4.	**Clapeyrons Theorem (Three Moment Equation):** Derivation of three moment equation - application of three moment equation for analysis of continuous beams under the effect of applied loads and uneven support settlement.
5.	**Matrix Methods:** Introduction to Matrix Methods: Analysis of two and three span continuous Beams and simple frame by Flexibility and Stiffness Matrix methods.

Text/Reference Books

- Reddy, C.S., “Basic Structural Analysis”, Tata MCGraw Hill.
- James, M. Gere, “Mechanics of Materials”, 5th Ed., Nelson Thorens
- Ramamrutham. S ,Narayan R, Theory of structures, DhanpatRai Publishing company, edition 9
- Hibbler RC, structural Analysis, Pearson, 9th edition

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Civil Engineering, V-Semester

BCET 504 (B), Quantity Surveying and Costing

3L, 1T, 0P

Course Objectives

- Determination of quantities of items and labour requirement of civil engineering works.
- Preparation of estimate of the civil engineering works.
- Preparation of specification of construction items.
- To introduce the students in depth knowledge of professional practice as well the quantity analysis of construction works like, multi-storied structures, Water works & sanitary works, Irrigation works, Road estimates, culverts, etc.

Course Outcomes

- The students will get a diverse knowledge of estimating, costing and professional practice, which will be use full in tackling real life problems.
- The students will be able to understand the procedure to carry out the estimation and steps to prepare reports of construction works.
- The students will learn the purpose and importance of valuation

Detailed Syllabus

UNIT NO	TOPICS
1.	**Introduction & Estimation of Buildings:** Importance of estimation in Civil Engineering, Different types of Estimates, methods in Estimation, Study of various drawings with estimates, Concept of measurement, units of measurement. Methods of taking out quantities and cost by Centre line method and long wall and short wall method. Preparing of detailed estimates and abstract for the building, flat and sloped roof. Estimate of repair works and demolition of Civil Engineering structures.
2.	**Estimation of R.C.C. Structures:** Estimates of components RCC works in beams, column footings and roof slabs, Estimation of septic tank, manhole and RCC slab culverts. Estimation of industrial building with steel truss, Estimation of framed structures.
3.	**Specifications and Rate Analysis:** Definition of specifications, objectives of writing specification, essentials of specification of various items of working in buildings. Importance working out quantities and rates for the following standard items of works-earth works in different types of soils, cement concrete of different mixes, Brick masonry, Stone masonry, Plastering, Painting and steel works, wooden works for doors, windows and ventilator
4.	**Estimation of Earth Work and Road Projects:** Methods for computation of Earthwork-cross sections-mid sections formula, trapezoidal and average end area or mean sectional formula, proportional formula for different terrains. Estimation of Road Works - WBM, Bituminous mixes and cement concrete roads
5.	**Valuation:** Purpose of valuation, types of property- Depreciation, Sinking fund, Lease hold and free hold property, obsolescence, Gross income, Outgoing and Net income, Capitalized value and year's purchase. Rental method of valuations, and typical problems.

Text/Reference Books

1. B. N. Dutta, Estimating and Costing In Civil Engineering, Ubs Publishers Distributors Ltd.
2. S. C. Rangwala, Estimating and Costing, Charotar Publishing House, Anand
3. G. S. Biridi, Textbook of Estimating & Costing, DhanapatRai& Sons. Delhi.
4. M.Chakroborti, Estimating, Costing, Specification and Valuation.Calcutta.
5. P.W.D. Hand Book Is Codes
6. Rangwala, S.C., Elements of Estimating and Costing, Professional practice, Charotar Publishing House, Anand.

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Civil Engineering, V-Semester

BCET 504 (C), Environmental Impact Assessment

3L, 1T, 0P

COURSE OBJECTIVES

- Appreciate the purpose and role of EIA in the decision-making process;
- Understand strengths & limitations of environmental management;
- Know procedures
- Understand screening & scoping processes Interpret options for evaluating environmental and social impacts;
- Know formats of EIA Report (Environmental Impact Statement, or Environmental Statement);
- Understand the purpose of developing follow-up procedures, and options for designing these procedures.

COURSE OUTCOMES

After studying this course, the students will be able to

- Understand the different steps within environmental impact assessment
- Discuss the implications of current jurisdictional and institutional arrangements in relation to environmental impact assessment
- Communicate both orally and in written form the key aspects of environmental impact assessment
- Understand how to liaise with and the importance of stakeholders in the EIA process
- Be able to access different case studies/examples of EIA in practice

SYLLABUS DETAILS:

UNIT-I

Concept of EIA : Introduction of EIA, Utility and scope of EIA, Significant Environmental Impacts, Stage of EIA, Environmental Inventory, Environmental Impact Statement (EIS)

UNIT-II

Methods of Impact Identification: Environmental Indices and indicators for describing the affected environment, matrix methodologies, network, checklist, and other method.

UNIT-III

Impact analysis: Framework, statement predication and assessment of impact of air, water, noise and socio-economic environment.

UNIT-IV

Preparation of written documentation: Initial planning phase, detailed planning phase, writing phase, organizing relevant information, co-ordination of team writing effort.

UNIT-V

Public Participation in Environmental Decision making: Basic definitions, Regulatory requirements, Advantages & disadvantages of Public Participation, Selection of Public participation techniques, Practical considerations for implementation.

Reference Books:-

1. A Handbook of Environment Impact Assessment by V. S. Kulkarni, Dr. S. N. Kaul, R. K. Trivedy
2. Introduction To Environmental Impact Assessment (Natural and Built Environment Series) 4th Edition by John Glasson & RikiTherivel
3. Environmental Impact Assessment by R.R. Barthwal
4. Environmental Impact Assessment: A Guide to Best Professional Practices by Charles H. Eccleston

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BCET 504 (D), Disaster Preparedness and Planning

3L, 1T, 0P

COURSE OBJECTIVES:

1. Understanding of the roles of the various phases of disaster management and issues concerning planning and policies in those phases.
2. Understanding of comprehensive emergency management from a planning and policy perspective
3. Understanding of the role of federal, state, and local governments in disaster planning and policies Knowledge of mitigation planning and policy strategies.
4. Understanding of comprehensive emergency management and related plans
5. Understanding of factors affecting short and long-term recovery and rebuilding and the role of planners and policy-makers.
6. Understanding of the factors that give rise to disaster vulnerabilities (e.g. natural, physical, social, economic, policies, and governance).
7. Understanding of the factors that give rise to differential vulnerabilities and levels of community resilience
8. Knowledge and capabilities to assess and manage these vulnerabilities through disaster planning and policy-making.
9. Data, methods, tools, and geospatial techniques (including GIS) that can enhance vulnerability assessments and knowledge building.
10. Competencies to utilize mapping in mitigation planning and response operations

COURSE OUTCOMES:

1. Understanding foundations of hazards, disasters and associated natural/social phenomena
2. Familiarity with disaster management theory (cycle, phases)
3. Knowledge about existing global frameworks and existing agreements (e.g. Sendai)
4. Methods of community involvement as an essential part of successful DRR
5. Humanitarian Assistance before and after disaster
6. Technological innovations in Disaster Risk Reduction: Advantages and problems
7. Experience on conducting independent DM study including data search, analysis and presentation of disaster case study

SYLLABUS DETAILS:

Unit I: Introduction, Definitions and classification:

Concepts and definition –Disaster, Hazard, Vulnerability, Resilience, Risks.
Natural disasters; Cloud bursts, earth quakes, Tsunami, snow, avalanches, landslides, forest fires, diversion of river routes (ex. Kosi river), Floods, Drought, Cyclones, volcanic hazards/ disasters (Mud volcanoes): causes and distribution, hazardous effects and environmental impacts of natural disasters, mitigation measures, natural disaster prone areas in India, major natural disasters in India with special reference to Uttarakhand.

Man-induced disasters: water logging, subsidence, ground water depletion, Soil Erosion, release of toxic gases and hazardous chemicals into environment, nuclear explosions.

Unit II: Inter-relationship between Disasters and Development

Factors affecting vulnerabilities, differential impacts, impacts of development projects such as dams, embankments, changes in land use etc., climate change adaption, relevance of indigenous knowledge, appropriate technology and local resources, sustainable development and its role in disaster mitigation, roles and responsibilities of – community, panchayat raj institutions/urban local bodies, state, centre and other stake holders in disaster mitigation.

Unit III: Disaster Management (Pre-disaster stage, Emergency stage and Post disaster stage)

1. Pre- disaster stage (preparedness): Preparing hazard zonation maps, Predictability/ forecasting & warning, Preparing disaster preparedness plan, Land use zoning, Preparedness through (IEC) Information, education & Communication; Pre-disaster stage (mitigation), Disaster resistant house construction, Population reduction in vulnerable areas, Awareness.
2. Emergency Stage: Rescue training for search & operation at national & regional level, immediate relief, assessment surveys
3. Post Disaster stage-Rehabilitation and reconstruction of disaster affected areas; urban disaster mitigation: Political and administrative aspects, social aspects, economic aspects, environmental aspects.

Unit IV: Disaster Management Laws and Policies in India

Environmental legislations related to disaster management in India: Disaster Management Act, 2005; Environmental policies & programmes in India- Institutions & national centres for natural disaster mitigation: National Disaster Management Authority (NDMA): structure and functional responsibilities, National Disaster Response Force (NDRF): Role and responsibilities, National Institute of Disaster Management (NIDM): Role and responsibilities.

Unit V: Case studies: Natural and Man-made disasters in India

A. Natural disasters in India with special reference to Uttarakhand:

1. Earth quakes: Uttarkashi earth quake, 20th October,1991; Kutch earth quake, 2001; Sikkim earth quake, 18th September, 2011;
2. Cloud Bursts : Uttarkashi cloud bursts, August, 2012;
3. Landslides along Himalayan and other regions: Malpa (Pithoragarh) landslide, 11th& 17th August, 1998; Varunavrat hill landslide at Uttarkashi, 24th September, 2003
4. Floods : Orissa floods, September, 2011
5. Tsunami : Indian Ocean earth quake and Tsunami, 26th December, 2004
6. Cyclones: Thane Cyclone, 30th December, 2011
7. Droughts: Karnataka droughts, October, 2011
8. Snow Avalanche.

B. Man-induced disasters in India:

1. Forest fires: Forest fires in Uttarakhand, 2004 & 2012
2. Industrial disasters: Bhopal gas tragedy, 3rd December, 1984
3. Mining: Chasnala (Bihar) mining disaster, 27th December, 1975
4. Oil spills: Mumbai oil spill, 7th August, 2010.
5. Nuclear disaster accidents: Narora atomic power station, Blandshahar (31st March, 1993); Kalpakkam atomic power station (22nd October, 2002); Kota Atomic power station, Rajasthan (2nd Feb, 1995)

C. Disaster relevant to the area specific to the discipline of the students.

Mock shows:

Mock shows will be organized and conducted by expert agencies for understanding the vulnerability of areas in and around campus along with adopting the preventive measures.

References

1. K.J. Anandha Kumar, AjinderWalia, ShekherChaturvedi, India Disaster Report, 2011, National Institute of Disaster Management, June, 2012
2. R.B.Singh (Ed) Environmental Geography, Heritage Publishers New Delhi,1990
3. Savinder Singh Environmental Geography, PrayagPustakBhawan, 1997
4. Kates,B.I& White, G.F The Environment as Hazards, oxford, New York, 1978
5. R.B. Singh (Ed) Disaster Management, Rawat Publication, New Delhi, 2000
6. H.K. Gupta (Ed) Disaster Management, Universiters Press, India, 2003
7. R.B. Singh, Space Technology for Disaster Mitigation in India (INCED), University of Tokyo,1994
8. Dr. Satender , Disaster Management in Hills, Concept Publishing Co., New Delhi, 2000
9. A.S. Arya Action Plan For Earthquake, Disaster, Mitigation in V.K. Sharma (Ed) Disaster Management IIPA Publication New Delhi, 1994
10. R.K. Bhandani An overview on Natural &Man made Disaster & their Reduction ,CSIR, New Delhi
11. M.C. Gupta Manuals on Natural Disaster management in India, National Centre for Disaster Management, IIPA, New Delhi, 2001

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula
Civil Engineering, V-Semester

BOEC 505 (A), Renewable Energy Sources

3L, 1T, 0P

COURSE OBJECTIVES

1. Understanding basic characteristics of renewable sources of energy and technologies for their utilization.
2. To give review on utilization trends of renewable sources of energy.
3. To give review on legislative and regulatory rules related to utilization of renewable sources of energy.
4. Make interpretation about the energy sources.
5. To comprehend the energy & its resources.

COURSE OUTCOMES

1. Understand the need of energy conversion and the various methods of energy storage.
2. Explain the field applications of solar energy.
3. Identify Winds energy as alternate form of energy and to know how it can be tapped.
4. Explain biomass generation and its impact on environment.
5. Understand the Geothermal &Tidal energy, its mechanism of production and its applications.
6. Illustrate the energy efficient motors & equipments for better applications.

SYLLABUS DETAILS:

Unit - I

Renewable Energy Systems Energy Sources, Comparison of Conventional and nonconventional, renewable and non-renewable sources. Statistics of world resources and data on different sources globally and in Indian context. Significance of renewable sources and their exploitation. Energy planning, Energy efficiency and management.

Unit – II

Wind Energy System Wind Energy, Wind Mills, Grid connected systems. System configuration, working principles, limitations. Effects of wind speed and grid conditions. Grid independent systems - wind-battery, wind- diesel, and wind-hydro biomass etc. wind operated pumps, controller for energy balance. Small Hydro System Grid connected system, system configuration, working principles, limitations. Effect of hydro potential and grid condition. Synchronous versus Induction Generator for standalone systems. Use of electronic load controllers and self excited induction generators. Wave Energy System: System configuration: grid connected and hybrid Systems.

Unit - III

Solar Radiation Extraterrestrial solar radiation, terrestrial solar radiation, Solar thermal conversion, Solar Phototonic System Solar cell, Solar cell materials, efficiency, Characteristics of PV panels under varying insulation. PV operated lighting and water pumps, characteristics of motors and pumps connected to PV panels. Biomass Energy System: System configuration, Biomass engine driven generators, feeding loads in stand-alone or hybrid modes, Biomass energy and their characteristics.

Unit - IV

Energy from oceans Ocean temperature difference, Principles of OTEC, plant operations, Geothermal Energy Electric Energy from gaseous cells, Magneto-hydro generated energy, Non hazardous energy from nuclear wastes, Possibilities of other modern nonconventional energy sources.

Unit - V

Electric Energy Conservation Energy efficient motors and other equipment. Energy saving in Power Electronic controlled drives. Electricity saving in pumps, airconditioning, power plants, process industries, illumination etc. Methods of Energy Audit. Measurements systems; efficiency measurements. Energy regulation, typical case studies, various measuring devices analog and digital, use of thyristers.

Reference Books:-:

1. John Twidell& Toney Weir, Renewable Energy Resources, E & F N Spon.
2. El-Wakil, Power Plant Technology, McGraw Hill.
3. Rai G D, Non-conventional Energy Resources, Khanna.
4. F Howard E. Jordan, "Energy-Efficient Electric Motor & their Application-II", Plenum Press, New York USA
5. Anna Mani, "Wind Energy Resource Survey in India-Ill", Allied Publishers Ltd., New Delhi,
6. S.P. Sukhatme: Solar Energy, TMH- 4e,
8. Solanki –Renewable Energy Technologies – PHI Learning
9. Sawhnew –Non Conventional Energy Resources – PHI Learning

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula
Civil Engineering, V-Semester

BOEC 505 (B), Transportation Engineering- II

3L, 1T, 0P

COURSE OBJECTIVES:

The objective of this course is to:

1. To develop a fundamental understanding of the Pavement Materials used for road construction
2. To visualize the relationship between key materials and their properties along with the behavior of pavement component systems
3. To know about the methods and equipments Used in the Construction of Roads and their Operational approach
4. To learn about the various construction procedures of both Flexible and Rigid pavements
5. Have a better understanding of the characteristics of the flexible and rigid pavements

To impart knowledge on statistical analyses of traffic data; use of speed-flow-density relationships; conduct shock wave analysis and compute road and intersection capacity; as well as the design of traffic signals

COURSE OUTCOMES:

At the end of the course students are able to:

1. Understand concepts of pavement performance.
2. Characterize traffic loads for pavement design and analysis
3. Understand pavement construction procedures; and Design flexible and rigid pavements.
4. Fully conversant with topics like design and performance of pavement surface, thick plate theory, subgrade theory, load transfer systems and joint behavior considerations, design concepts for jointed and continuously reinforced pavements.
5. Understand the principles of construction and maintenance of highway.
6. Understand various traffic characteristics and analysis and use the data for road design

SYLLABUS DETAILS:

UNIT 1: Design and Construction of Pavement: Pavement component functions, factors affecting pavement design and basic pavement design of Flexible and Rigid pavement as per IRC guidelines, Steps for construction of highway on embankment and in cutting. Construction of embankment and subgrade, soil stabilization.

UNIT 2: Design and Construction of Flexible Pavement: Construction of Granular Sub-Base/Drainage layer, Construction of Granular Base Course-WBM and WMM, Construction of bituminous pavement layers- base course and surface course, prime coat and tack coat.

UNIT 3: Design and Construction of Rigid Pavement: Types of cement concrete pavement, components of cement concrete pavement and its functions, construction of cement concrete pavement, joints in cement concrete pavement-function and construction.

UNIT 4: Pavement Maintenance: Objective and classification of highway maintenance works. Distresses and maintenance measures in flexible and rigid pavements. Concept of pavement evaluation: Functional and Structural

UNIT 5: Traffic Engineering: Traffic characteristics, Traffic studies: Traffic Volume study, Spot speed studies, Travel time - Delay study, PCU, Origin and Destination studies, Parking studies, Road accident studies. Traffic regulations and control devices. Types of Intersections. Road safety aspect

Reference Books:-:

1. Khanna S.K., Justo C.E.G., Highway Engineering, Nem Chand & Bros., Roorkee.
2. Bindra S.P., A course in Highway Engineering, DhanpatRai Publications
3. Kadiyali L. R. and Lal, N. B., Principles & Practice of Highway Engineering, Khanna Publishers, Delhi.
4. IRC:58-2015, Guidelines for the Design of Plain Jointed Rigid Pavement for Highways
5. IRC:37-2018, Guidelines for the Design of Flexible Pavements,
6. Mannering F. L., Kilareski W. P. and S. S. Washburn, Principles of Highway Engineering and Traffic Analysis. Wiley India Pvt. Ltd., New Delhi.
7. Atkins H.N., Highway Construction and Maintenance, Soils, and Concretes, Reston Publishing Company, Reston VA, 1983.
8. Watson J. P., Highway Construction and Maintenance, Longman Scientific and Technical, New York, 1989.
9. Dr. Sharma S. K., Principles, Practice and Design of Highway Engineering (Including Airports), S. Chand & Company Ltd.
10. ChakrabortyPartho, Das Animesh, Principles of Transportation Engineering, PHI

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Civil Engineering, V-Semester

BOEC 505 (C), Operations Research

3L, 1T, 0P

COURSE OBJECTIVES:

The course aims at building capabilities in the students for analyzing different situations in the industrial/ business scenario involving limited resources and finding the optimal solution within constraints.

COURSE OUTCOMES:

1. Analyze any real life system with limited constraints and depict it in a model form.
2. Convert the problem into a mathematical model.
3. Solve the mathematical model manually as well as using soft resources/software such as solver, TORA etc.
4. Understand variety of problems such as assignment, transportation, travelling salesman etc.
5. Solve the problems mentioned in point 4 using linear programming approach using software.
6. Understand different queuing situations and find the optimal solutions using models for different situations.
7. Simulate different real life probabilistic situations using Monte Carlo simulation technique.

SYLLABUS DETAILS:

Unit I
Linear Models: The phase of an operation research study – Linear programming – Graphical method– Simplex algorithm – Duality formulation – Sensitivity analysis.

Unit II
Transportation Models and Network Models: Transportation Assignment Models –Traveling Salesman problem-Networks models – Shortest route – Minimal spanning tree – Maximum flow models –Project network – CPM and PERT networks – Critical path scheduling – Sequencing models.

Unit III
Inventory Models: Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

Unit IV
Queueing Models: Queueing models – Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

Unit V

Decision Models: Decision models – Game theory – Two person zero sum games – Graphical solution- Algebraic solution– Linear Programming solution – Replacement models – Models based on service life – Economic life– Single / Multi variable search technique – Dynamic Programming – Simple Problem.

Reference books:-

1. H.A. Taha, Operations Research, An Introduction, PHI, 2008
2. H.M. Wagner, Principles of Operations Research, PHI, Delhi, 1982.
3. J.C. Pant, Introduction to Optimisation: Operations Research, Jain Brothers, Delhi, 2008
4. Hitler Libermann Operations Research: McGraw Hill Pub. 2009
5. Pannerselvam, Operations Research: Prentice Hall of India 2010
6. Harvey M Wagner, Principles of Operations Research: Prentice Hall of India 2010

Uttarakhand Technical University, Dehradun
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Civil Engineering, V-Semester

BCEP 506, Material Testing Lab

0L, 0T, 2P

COURSE OBJECTIVES:

The objectives of this course are to make students to learn:

1. Ability to apply knowledge of mathematics and engineering in calculating the mechanical properties of structural materials.
2. Ability to function on multi-disciplinary teams in the area of materials testing.
3. Ability to use the techniques, skills and modern engineering tools necessary for engineering.
4. Understanding of professional and ethical responsibility in the areas of material testing.
5. Ability to communicate effectively the mechanical properties of materials.

COURSE OUTCOMES:

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

1. Reproduce the basic knowledge of mathematics and engineering in finding the strength in tension, compression, shear and torsion.
2. Identify, formulate and solve engineering problems of structural elements subjected to flexure. 3. Evaluate the impact of engineering solutions on the society and also will be aware of contemporary issues regarding failure of structures due to unsuitable materials.

List of Experiments:
1. To determine the normal consistency of cement.
2. To determine the initial and final setting time of cement.
3. To determine compressive strength of cement.
4. To determine the soundness of cement.
5. To determine the fineness modulus of fine aggregate & course aggregate.
6. Mix design of concrete by IS code Method.
7. Slump test for determining workability of concrete.
8. Compressing strength of concrete cube.
9. To determine the flexure strength of concrete.

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Civil Engineering, VI-Semester

BCET 601, Design of RC Structures

3L, 1T, 2P

COURSE OBJECTIVES

- To Identify, formulate and solve engineering problems of RC elements, bridges water tanks etc subjected to different kinds of loading involving gravity loads and earthquake loads.
- Follow a procedural knowledge in designing various structural RC elements, frames.

COURSE OUTCOMES

1. Be able to perform analysis and design of reinforced concrete members and connections.
2. Be able to identify and interpret the appropriate relevant industry design codes
3. To become familiar with professional and contemporary issues in the design and fabrication of reinforced concrete members.
4. Understand the properties and role of various constituent materials used in concrete making
5. Understand the theory and principles of design and solution of Reinforced Concrete structures.

SYLLABUS DETAILS

UNIT	TOPICS
1.	Design of continuous RC beams, moment redistribution.
2.	Design loads on buildings, wind and earthquake loads.
3.	**Frame Structures:** Analysis and design of RC framed buildings; Framing systems, member proportioning, loadings, static and dynamic analysis and component design, provisions of ductile detailing.
4.	**Design of Bridge:** Design of T-beams bridge, standard specifications and general design considerations.
5.	**Design of Water Tanks:** Design of overhead water tanks, general design consideration for circular &Intze tanks

SUGGESTED BOOKS:

S.NO.	Name of Books / Author / Publisher	Year of Publication
1.	Jain A.K., "Reinforced Concrete", Limit State Design, 5th edition, Nem Chand and Bros.	2006
2.	Krishna J. and Jain O.P., "Plain and Reinforced Concrete", Vol. 2, Nem Chand & Bros.	1983
3.	Pillai, S.U., "Reinforced Concrete Design", Tata McGrawHill.	2003
4.	Sinha, S.N., "Reinforced Concrete Design", Tata McGraw Hill.	

Laboratory Work: BCEP 601 -- Constructive details

Laboratory work will be based on the above course as required for engineering projects.

1. Reinforcement Details of Continuous Beams and Slabs.
2. RCC FRAME detailing.
3. a) Cross section of the T-beam; (b) longitudinal section of T-Beam.
4. Elevated water Tank detailing and design structure.
5. R.C.C. Water tank Resting over Firm Ground.
6. RCC bottom slab of that UGWT.

Reference Books:-:

1. Jain A.K., "Reinforced Concrete", Limit State Design, 5th edition, Nem Chand and Bros.
2. Krishna J. and Jain O.P., "Plain and Reinforced Concrete", Vol. 2, Nem Chand & Bros
3. Pillai, S.U., "Reinforced Concrete Design", Tata McGrawHill.
4. Varghese P.C., "Advanced reinforced concrete design", Prentice hall of India pvt ltd

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Civil Engineering, VI-Semester

BCET 602, Environmental Engineering I

3L, 1T, 2P

COURSE OBJECTIVES

1. To provide a sound understanding of different sources of water.
2. To understand the different methods used to calculate water demands.
3. To learn different plumbing methods to transport water to different sources.
4. To study about wastewater and its physical, chemical & biological aspects.
5. To study different types of sewers and its layout.

COURSE OUTCOMES

1. Identify the source of water and water demand apply the water treatment concept.
2. Select the treatment to raw water with suitable intake with usefulness for domestic and construction purpose.
3. Laying the pipe-network for water supply and Sewage disposal effectively.
4. Check physicochemical parameters of raw water as per the standards.
5. Plan and implement plumbing work effectively by choosing suitable materials.
6. Calculate waste water generation with suitable water carriage system.

DETAILED SYLLABUS

UNIT-I

Water supply: Water demands and domestic use, variation in demands; population forecasting by various methods using logistic curve method; per capita supply, basic needs and factors affecting consumption; design period.

Sources of water: Kinds of water sources and their characteristics, collection of surface and groundwater; quality of surface and ground waters; factors governing the selection of a source of water supply; intakes and their design for lakes, streams and rivers, impounding reservoir and canal; determination of the capacity of impounding reservoir.

UNIT-2

Transmission of water: Various types of conduits, capacity and sizes including economical sizes of rising main, structural requirements; laying and testing of water supply pipelines; pipe materials, joints, appurtenances and valves; leakages and control; water hammer and its control measures.

UNIT-3

Storage and distribution of water: Methods of distribution, pressure and gravity distribution systems, concept of service and balancing reservoirs, capacity of distribution reservoirs; general design guidelines for distribution system, Hardy - Cross method, Newton –Raphson's method and equivalent pipe method of pipe network analysis; rural water supply distribution system.

Water supply, plumbing systems in buildings and houses: water connections, different cocks and pipe fittings, hot water installation.

UNIT-4

Wastewater & its Characteristics: Quality and Quantity Perspectives of Sewage: Physical, chemical and biological characteristics of sewage, analysis of sewage, Systems of sanitation and wastewater collection, estimation of dry weather flow, estimation of storm water flowand variations in wastewater flows.Storm water**:** Collection and estimation of storm water by different formulae.

UNIT -5

Flow in sewers: Flow in full and partially full sewers and design of sewers; types of sewers, materials and construction of sewers, joints and sewer appurtenances, layout and construction of sewer lines.Plumbing systems for waste water disposal, types of sewers, design considerations, construction & maintenance, storm water sewers.

TEXT/ REFERENCE BOOKS

1. Nazaroff: Environmental Engineering Science, Wiley India
2. Hammer and Hammer Jr.: Water and Wastewater Technology
3. Steel & McGhee: Water Supply & Wastewater Disposal
4. S.K. Garg: Water supply Engineering – Environmental Engineering (Vol I)- Khanna Publishers
5. P.N. Modi: Water supply Engineering–Environmental Engineering (Vol.I)-Standard Book

BCEP 602 LIST OF EXPERIMENTS:

1. Determination of pH in water
2. Determination of Color in water
3. Determination of Turbidity in water
4. Determination of TS, TDS and TSS in water
5. Determination of CO2 in water
6. Determination of Alkalinity in water
7. Determination of Hardness in water
8. Determination of Chloride in water
9. Determination of Total Iron in Water
10. Determination of Arsenic in water
11. Determination of percentage of available chlorine in bleaching powder, Determination of Residual Chlorine

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Civil Engineering, VI-Semester

BCET 603, Open Channel Flow

3L, 1T, 2P

COURSE OBJECTIVES:

1. Enable to understand and apply the fundamental principles governing open channel hydraulics to the design of engineering systems.
2. Natural and engineered hydraulic systems affect many aspects of the physical world, and modern human conveniences (e.g., water supplies).
3. This course represents a stepping stone in your professional development; it is intended to aid you in developing the skills you will need for systematic decomposition and solution of real-world problems.

COURSE OUTCOME:

1. Ability to solve open channel flow problems through the selection and use of appropriate equations.
2. An ability to apply your knowledge of mathematics, science, and engineering.
3. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.
4. Ability to explain the physical mechanisms of hydraulic jumps, surges, and critical, uniform, and gradually-varying flows.
5. Ability to explain and apply mathematical relationships for hydraulic jumps, surges, and critical, uniform, and gradually-varying flows

SYLLABUS DETAILS:

UNIT–I:Uniform Flow: Basic concepts of free surface flows, velocity and pressure distribution, Mass, energy and momentum principle for prismatic and non-prismatic channels, Review of Uniform flow: Standard equations, hydraulically efficient channel sections, compound sections,
Energy-depth relations: Concept of specific energy, specific force, critical flow, critical depth, hydraulic exponents, and channel transitions.

UNIT–II:Gradually Varied Flow (GVF): Equation of gradually varied flow and its limitations, flow classification and surface profiles, Control sections, Computation methods and analysis: Integration of varied flow equation by analytical, graphical and advanced numerical methods, Transitions of subcritical and supercritical flow, flow in curved channels.

UNIT–III: **Rapidly Varied Flow (RVF):** Characteristics of rapidly varied flow, Classical hydraulic jump, Evaluation of the jump elements in rectangular and non-rectangular channels on horizontal and sloping beds, Hydraulic jump in gradually and suddenly expanding channels, submerged hydraulic jump, rolling and sky jump, use of jump as an energy dissipater, 8 Flow measurement: by sharp crested and broad crested weirs, critical depth flumes, sluice gate, Free over fall.

UNIT-IV:Unsteady flow: Equation of motion for unsteady flow, “Celerity” of the gravity wave, deep and shallow water waves, open channel positive and negative surge.

UNIT –V:Spatially Varied Flow (SVF): Basic principles, Differential SVF equations for increasing and decreasing discharge, Classifications and solutions, Numerical methods for profile computation, Flow over side-weir and Bottom-rack.

REFERENCES:

1. Chow, V.T., Open channel Hydraulics, McGraw Hill International
2. Henderson, F.M., Open Channel Flow, McGraw Hill International
3. Subramanya, K., Flow in Open Channels, Tata McGraw Hill
4. RangaRaju, K.G., Flow through open channels, T.M.H.
5. M. Hanif Chaudhry, Open Channel Flow, PHI
6. French, R.H., Open channel Hydraulics, McGraw Hill International.
7. Srivastava, Flow through Open Channels, Oxford University Press.
8. Open Channel Flow by Madan Mohan Das.

BCEP 603 LIST OF EXPERIMENTS:

1. Determination of state of flow and critical depth in open channel
2. Flow over a broad-crested weir
3. Flow through a Venturi flume
4. Flow through a cut throat flume
5. Flow beneath a sluice gate
6. Study on hydraulic jump
7. Development of generalized specific energy and specific force curves
8. Velocity distributions in open channel
9. Determination of discharge and mean velocity of an open channel

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BCET 604 (A), Geotechnical Engineering II

3L, 1T, 0P

COURSE OBJECTIVES

- To determine the earth pressures on foundations and retaining structures.
- To analyze shallow and deep foundations.
- To calculate the bearing capacity of soils and foundation settlements.
- To understand the pile and well foundation.
- To understand soil exploration methods.

COURSE OUTCOMES (COs)

- Determine bearing capacity of soil and retaining wall.
- Determine the settlement of different type of foundation.
- Understand the purposes of soil investigation, soil exploration program, soil exploration methods and soil identification in the field.
- Obtain the effective stress and determine stress distribution within a soil mass.
- Calculate the 'shear strength' of soil, describe the direct shear test method and interpret direct shear test results.

DETAILED SYLLABUS:

UNIT 1: Earth Pressure and Retaining Walls: Earth pressure at rest, active and passive earth pressure, Rankine and Coulomb's earth pressure theories, earth pressure due to surcharge, Culmann's graphical construction. Retaining walls, stability analysis of retaining walls, proportioning and design of retaining walls.

UNIT 2: Shallow Foundations: Types of foundations, mechanism of load transfer in shallow and deep foundations, shallow foundations, Terzaghi's bearing capacity theory, computation of bearing capacity in soils, effect of various factors, use of field test data in design of shallow foundations, stresses below the foundations, settlement of footings and rafts, proportioning of footings and rafts, sheeting and bracing of foundation excavation.

UNIT 3: Pile Foundation: Types and method of construction, estimation of pile capacity, capacity and settlement of group of piles, proportioning of piles, in-situ penetration tests, piles load test, Negative skin friction.

UNIT 4: Well Foundations: Types of casissons, Methods of construction, Component parts and forces, tilt and shift, remedial measures, bearing capacity, settlement and lateral stability of well foundation.

UNIT5: Machine Foundations & Soil Exploration: Types of machine foundations, mathematical models, response of foundation – soil system to machine excitation, cyclic plate load test, block resonance test, criteria for design. Methods of soil exploration; boring, sampling, penetration tests, correlations between penetration resistance and soil design parameters.

TEXT/REFERENCE BOOKS:

- A Text Book of Soil Mechanics and Foundation Engineering by V.N.S. Murthy, Saikripa Technical consultants, Bangalore.
- Geotechnical Engineering by S. K. Gulati et. al., TMH Publication Co. Ltd., New Delhi
- Basic and applied Soil Mechanics by GopalRanjan and A. S. R. Rao, Wiley Eastern Ltd., New Delhi.
- Soil Mechanics and Foundation Engineering by K. R. Arora, Standard Pub. and Dist., Delhi
- Soil Mechanics in Engineering Practice by Terzaghi and Pech, John Wiley and Sons Inc New York.
- Iqbal H Khan (2007): Geotechnical Engineering – Prentice Hall, Delhi.
- Das, BM (2009): Geotechnical engineering – Cengage learning, New Delhi.

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Civil Engineering, VI-Semester

BCET 604 (B), Precast and Modular Construction

3L, 1T, 0P

COURSE OBJECTIVES:

1. To understand the importance of Prefabrication
2. To know the process of prefabrication of various structural elements
3. To understand the assembling and dismantling of prefabricated components
4. To study the design considerations in the process of prefabrication
5. To understand the joining techniques in prefabrication

COURSE OUTCOMES:

At the end of the course the student will be able

1. To know the procedure of prefabrication
2. To design the structural prefabricated elements.
3. To familiarize with joining techniques used for prefabrication
4. To know abnormal loads which are hazardous to the prefabricated structures.

SYLLABUS DETAILS:

Unit – I
Introduction-Need for prefabrication – Principles – Materials – Modular coordination – Standardization –Systems – Production – Transportation – Erection.
Unit – II
Prefabricated components-Behavior of structural components – Large panel constructions – Construction of roof and floor slabs – Wall panels – Columns – Shear walls
Unit – III
Design Principles- Disuniting of structures- Design of cross section based on efficiency of material used – Problems in design because of joint flexibility – Allowance for joint deformation.
Unit – IV
Joints in Structural Members-Joints for different structural connections – Dimensions and detailing – Design of expansion joints
Unit – V
Design of abnormal load: Progressive collapse – Code provisions – Equivalent design loads for considering abnormal effects such as earthquakes, cyclones, etc., – Importance of avoidance of progressive collapse.

Reference Books: -
1. CBRI, Building materials and components, India, 1990
2. Gerostiza C.Z., Hendrikson C. and Rehat D.R., “Knowledge based process planning for construction and manufacturing”, Academic Press Inc., 1994
3. Allen E, Iano, J, Fundamentals of Building Construction subscription E Book, Material and Method, John Wiley and Sons, 2011.
4. Cameron K. Andres, Ronald C. Smith, Principles and Practices of Commercial Construction, 8th Ed., Prentice Hall, 2009.

Uttarakhand Technical University, Dehradun
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Civil Engineering, VI-Semester

BCET 604 (C), Cost Effective and Eco Friendly Structures

3L, 1T, 0P

COURSE OBJECTIVES

1. To understand the environmental issues due to building materials and the energy consumption in manufacturing building materials
2. To study the cost effective construction techniques and equipment's
3. To study how to make sanitation cost effective
4. To study how to make road construction eco-friendly
5. To understand the Green building rating system

COURSE OUTCOMES

Upon completion of the course the student should be able to:

1. Understand the Definition, Concept & Objectives of the terms cost effective construction
2. Apply cost effective techniques in construction
3. Apply cost effective Technologies and Methods in Construction
4. State the Concept of Green Building
5. Apply low cost and eco-friendly road construction techniques

SYLLABUS DETAILS:

Unit -I
Concepts of energy efficient & environment friendly materials and techniques. Cost effective materials: - Soil, Fly ash, Ferrocement, Lime, Fibres, Stone Dust, Red mud, Gypsum, Alternate Wood, Polymer. Energy Efficient & Environment friendly building material products: - Walls - Stabilised and sun dried, soil blocks & bricks, Solid & Hollow concrete blocks, stone masonry blocks, Ferrocement partitions. Roofs - Precast R.C. Plank & Joists roof, precast channel roof, Precast L-panel roof, Precast Funicular shells, Ferrocement shells, Filler Slab, SeasalFibre roof, Improved country tiles, Thatch roof, M.C.R. tile.

Unit -II
Cost effective construction techniques and equipments :- (a) Techniques: - Rat trap bond construction, Energy Efficient roofings, Ferrocement technique, Mud Technology. (b) Equipment's:- Brick moulding machine, Stablilised soil block making machine and plants for the manufacturing of concrete blocks, M.C.R. tile making machine, Ferrocement wall panel & Roofing channel making machine, R.C.C. Chaukhat making m/c.

Unit -III
Cost effective sanitation: - (a) Waste water disposal system (b) Cost effective sanitation for rural and urban areas (c) Ferrocement Drains

Unit -IV

Low Cost Road Construction: - Cost effective road materials, stabilization, construction techniques tests, equipment used for construction, drainage, maintenance.

UNIT-V

Cost analysis and comparison: - (a) All experimental materials (b) All experimental techniques Green Building rating systems

Reference books:-

1. Alternative Building Materials and Technologies – K S Jagadeesh, B V Venkatta Rama Reddy & K S NanjundaRao – New Age International Publishers
2. Integrated Life Cycle Design of Structures – AskoSarja –CRC Press
3. Non-conventional Energy Resources –D S Chauhan and S K Sreevasthava – New Age International Publishers
4. Buildings How to Reduce Cost – Laurie Backer - Cost Ford
5. Lynne Elizabeth, Cassandra Adams Alternative Construction: Contemporary Natural BuildingMethods ", Softcover, Wiley & Sons Australia, Limited, John,2005
6. Givoni, "Man, Climate, Architecture, Van Nostrand, New York, 1976.
7. Charles J. Kibert, Sustainable Construction: Green Building Design and Delivery,John Wiley & Sons,2005.
8. Eugene Eccli- Low Cost, Energy efficient shelter for owner & builder, Rodale Press, 1976

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula
Civil Engineering, VI-Semester

BCET 604 (D), Urban and Town Planning

3L, 1T, 0P

COURSE OBJECTIVES

1. The course is intended to develop an appreciation of the scope and breadth of planning practice as it has emerged historically
2. Provide an overview of the various fields within planning, such as housing, community development, transportation, environmental planning, urban sprawl and growth management. Our focus will be on the major policy issues and problems within each of the fields.
3. This course is designed to explore the capacities for planners to work collaboratively in addressing transportation and urban infrastructure challenges.

COURSE OUTCOMES

1. Provide the students an overview and understanding of the History of Town Planning Politics and policy making in modern cities and to assess modern and contemporary theories of Town and Country Planning.
2. The students will develop ability to conduct transportation planning, analysis and evaluation of systems. They will learn short & long range planning for alternative transport systems while designing for present and future cities and regions.
3. It will helps students to build a depth understanding of spatial and non-spatial data collection, presentation and interpretation in context for physical planning.

SYLLABUS DETAILS:

UNIT-I

Definition and classification of urban areas - Trend of urbanization - Planning process – Various stages of the planning process - Surveys in planning. Plans - Delineation of planning areas. Utility of spaces, future growth etc. Role of "Urban Planner "in planning and designing in relation with spatial organization, utility, demand of the area and supply

UNIT-II

Plan implementation- Urban Planning agencies and their functions - Financing- Public, private, Nongovernmental organizations- Public participation in Planning. Development control regulations. Sustainability and rationality in planning, Components of sustainable urban and regional development, Emerging Concepts: Global City, inclusive city, Safe city, etc. City of the future, future of the city.

UNIT-III

Town and country planning act- Building bye-laws. Elements of City Planning, Zoning and land use, Housing. Introduction to landscaping, importance , objectives, principles, elements, Urban Planning standards Urban renewal for quality of life and livability.

UNIT-IV

Traffic transportation systems: urban road, hierarchy, traffic management, Intelligent Transport Systems. Legal Issues in Planning and Professional Practice, Concepts and contents related to planning provision regarding property rights, Concept of Arbitration, State and Central government to deal with various matters concerning Town and Country Planning. Mechanism for preparation of DP: Land Acquisition Rehabilitation and Resettlement Act 2013.

UNIT-V

Types of Development plans: Master Plan, City Development Plan, Structure Plan, housing, land use, Water Supply & sanitation, etc., planning agencies for various levels of planning. Their organization and purpose (CIDCO-MHADA-MIDC, MMRDA/ PMRDA etc).

Reference Books:-

1. AdibKanafani. (1983). Transportation Demand Analysis. McGraw Hill Series in Transportation, Berkeley.
2. Hutchinson, B.G. (1974). Principles of Urban Transport Systems Planning. McGraw Hill Book Company, New York.
3. John W.Dickey. (1975). Metropolitan Transportation Planning. McGraw Hill Book Company, New York.
4. Papacostas, C.S., and Prevedouros, P.D. (2002). Transportation Engineering and Planning. 3rd Edition, Prentice - Hall of India Pvt Ltd., 318-436.
5. Khisty C.J., Transportation Engineering - An Introduction, Prentice Hall, India, 2002.
6. Yang. H. Huang, Pavement Analysis and Design, Second Edition, Prentice Hall Inc.
7. Rajib B. Mallick and Tahar El-Korchi, Pavement Engineering – Principles and Practice, CRC Press (Taylor and Francis Group)
8. Relevant IRC Codes
9. Bruton M J (1981), “Introduction to transportation planning”, Hutchinson of London
10. Dickey J W (1980), “Metropolitan Transportation Planning”, Tata McGraw Hill
11. Principles of Transportation Engineering: P. Chakraborty and A. Das
12. Traffic Engineering and Transport Planning: L.R. Kadyal

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula
Civil Engineering, VI-Semester

BOEC 605 (A), Principles of Management

3L, 1T, 0P

COURSE OBJECTIVES

1. To enable the students to study the evolution of Management,
2. To study the functions and principles of management.
3. To learn the application of the principles in an organization.
4. To enable the effective and barriers communication in the organization
5. To study the system and process of effective controlling in the organization.

COURSE OUTCOMES

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

1. Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, and have same basic knowledge on international aspect of management
2. To understand the planning process in the organization
3. To understand the concept of organization
4. Demonstrate the ability to directing, leadership and communicate effectively
5. To analysis isolate issues and formulate best control methods

SYLLABUS DETAILS:

UNIT 1
INTRODUCTION TO MANAGEMENT: Theories of management: Traditional behavioral, contingency and systems approach. Organization as a system.

UNIT 2
MANAGEMENT INFORMATION: Interaction with external environment. Managerial decision making and MIS.

UNIT 3
PLANNING APPROACH TO ORGANIZATIONAL ANALYSIS: design of organization structure; job design and enrichment; job evaluation and merit rating.

UNIT 4
MOTIVATION AND PRODUCTIVITY: Theories of motivation, leadership styles and managerial grid. Coordination, monitoring and control in organizations. Techniques of control. Japanese management techniques.

UNIT 5
Case Studies on above

Reference Books:-

1. Peter Drucker, Harper and Row: The Practice of Management.
2. Koontz: Essentials of Management, PHI Learning.
3. Schemerhorn" introduction to Management" 10th edition, John Wiley (India).
4. Staner: Management, PHI Learning.
5. Daft: Principles of Management, Cengage Learning.
6. T. N. Chhabra: Principle and Practice of Management, DhanpatRai, New Delhi.

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Civil Engineering, VI-Semester

BOEC 605 (B), Environmental Management &Sustainable Development

3L, 1T, 0P

COURSE OBJECTIVES:

1. A deep understanding of the current status and future trends in sustainable development and social corporate responsibility.
2. Application of environmental tools and techniques to integrate sustainable practices (economical, environmental and social concerns).
3. Adaptation to continuously increasing strictness of environmental legislation.
4. Understand the economic and social justifications for various environmental policy approaches made at different levels.

COURSE OUTCOME:

1. Innovative pollution control practices
2. Adaptation of strategic environmental assessment approaches in different contexts and different levels of decision making.
3. Evaluation of environmental policies in a cost benefit analysis concept

DETAILED SYLLABUS

UNIT1. **Introduction and scope:** inter-linkages of energy-environment and economy from engineering infrastructure perspective. Concepts of ecology, Systems approach and sustainability engineering.

UNIT II. **Environment and Energy:** Interaction between energy and environmental resources, Environmental quality Standards and Indices (Indian and International).Environmental monitoring, Analysis, statistics and Data interpretation.

UNIT III: **Environmental Guidelines:** Environmental management system, Guidelines for Environmental Management & Sustainable Development (ISO 14000 Series).

UNIT IV: **Environmental Impact:**Impact assessment, life cycle assessment and risk analysis of scientific and technological developments.

UNIT V: **Environmental Laws and Regulations:** Environmental legislations, ethics and social responsibility. Sustainable development within the context of global economy, Technology and climate change.

References:

1. Baker, S., “Sustainable Development”, Taylor & France’s. 2006
2. Krishnamurthy, B., “Environmental Management”, Prentice Hall of India. 2005
3. Friedman, F.B., “Practical Guide to Environmental Management”, Environmental Law Institute. 2003
4. Environmental Management Plans Demystified: A Guide to ISO 14001-Spam Press. 2001.
5. Calow, P.,“Handbook of Environmental Risk Assessment and Management”, Blackwell Publishing.19

Uttarakhand Technical University, Dehradun
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Civil Engineering, VI-Semester

BOEC 605 (C), Advance Pavement Design

3L, 1T, 0P

COURSE OBJECTIVES:

The objective of this course is to:

1. To understand the principles of Highway geometrics design as per IRC standards.
2. To visualize the relationship between key materials and their properties along with the behavior of pavement component systems
3. To know about the methods and equipments Used in the Construction of Roads and their Operational approach
4. To learn about the various construction procedures of both Flexible and Rigid pavements
5. provide better understanding of the characteristics of the flexible and rigid pavements

COURSE OUTCOMES:

At the end of the course students are able to:

1. Understand the basics of highway planning and design, and workout problems in design of road geometrics
2. Visualize the relationship between key materials and their properties along with the behavior of pavement component systems.
3. Learn about the various construction procedures of both Flexible and Rigid pavements and Recommend pavement preservation techniques
4. Evaluate topics like design and performance of pavement surface, thick plate theory, subgrade theory, load transfer systems and joint behavior considerations, design concepts for jointed and continuously reinforced pavements.
5. Apply the principles of construction, overlaying and maintenance of highway.

SYLLABUS DETAILS:

Unit -I

Equivalent Single Wheels Load concepts and applications, Relationship between wheel arrangements and loading effects, tyre contact area, Effect of load repetition, Effect of transient loads, Impact of moving loading, Factors to be considered in Design of pavements, Design wheel load, soil, climatic factors, pavement component materials, Environmental factors, Special factors such as frost, Freezing and thawing.

Unit -II

Flexible Pavements : Component parts of the pavement structures and their functions, stresses in flexible pavements, Stress distribution through various layers, Boussinesque's theory , Burmister's two layered theory, methods of design, group index method, CBR method, Burmister's method and North Dakota cone method.

Unit -III

Rigid Pavements: Evaluation of subgrade, Modulus-K by plate bearing test and the test details, Westergaard's stress theory stresses in rigid pavements, Temperature stresses, warping stresses, frictional stresses, critical combination of stresses, critical loading positions.

Unit -IV

Rigid pavement design: IRC method, Fatigue analysis, PCA chart method. AASHTO Method, Reliability analysis. PAVEMENT JOINTS: Types of joints, contraction and warping joints, dowel bars and tie bars, Temperature reinforcements, filling and sealing of joints.

Unit -V

Evaluation and Strengthening of Existing Pavements: Benkleman beam method, Serviceability Index Method. Rigid and flexible overlays and their design procedures.

Reference Books:--

1. Principles of pavement design by E.J.Yoder& M.W. Witczak
2. AASHO, "AASHO Interim Guide for Design of Pavement Structures", Washington, D.C. 3. Portland Cement Association, Guidlines for Design of Rigid Pavements, Washington
4. DSIR, Conc. Roads Design & Construction
5. Srinivasan M. "Modern Permanent Way"

Uttarakhand Technical University, Dehradun
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Civil Engineering, VI-Semester

BCEP 606, Advance Surveying Lab

0L, 0T, 2P

COURSE OBJECTIVES:

The main objectives of the course are

1. To make students aware with different advance surveying methodologies applied to carry out large scale survey works as modern instruments have largely changed the approach to survey works with the principles being same.
2. To prepare the students to handle the errors they are likely to come across any large scale survey works.

COURSE OUTCOMES:

1. On the successful completion of this course the students will get a diverse knowledge of surveying practices applied for real life problems.
2. The students will learn to work with various surveying equipments, like, Theodolite, Total station, etc. in order to apply the theoretical knowledge to carry out practical field work.
3. The knowledge of limits of accuracy will be obtained by making measurements with various surveying equipment employed in practice.

List of Experiments

1. Measurement of Distance by Chaining and Ranging.
2. Locating Various Objects by Chain or Cross-Staff Surveying.
3. Measurement of bearings of sides of traverse with prismatic compass and computation of correct included angle.
4. Determination of elevation of various points with dumpy level by collimation plane method and rise & fall method.
5. Fixing bench mark with respect to temporary bench mark with dumpy level by fly leveling and check leveling.
6. Measurement of vertical angles with theodolite.
7. Determination of horizontal distance between two inaccessible points with theodolite.
8. Locating given building by theodolite traversing
9. To perform complete survey with Total Station.

Uttarakhand Technical University, Dehradun

Scheme of Examination as per AICTE Flexible Curricula

Evaluation Scheme & Syllabus for B. Tech Third Year

W.E.F. Academic Session 2021-22

VII& VIII SEMESTER

Bachelor of Technology (B.Tech.)

[Civil Engineering]

Veer MadhosinghUniversity, Dehradun
Scheme of Examination as per AICTE Flexible Curricula
W.E.F. Academic Session 2020-21
Bachelor of Technology (B.Tech.) [Civil Engineering]

VII Semester

S. No.	Subject code	category	Subject name	Maximum marks alloted					Total marks	Contact hours per week			Total credit
				Theory			Practical						
				End sem	Mid sem	Quiz/ Assignment	End sem	Term work / lab work & sessional		L	T	P	
1.	BCET 701 BCEP701	DC	Environmental Engineering II	100	30	20	30	20	200	3	1	2	5
2.	BCET 702 BCEP702	DC	Design of Steel Structures	100	30	20	30	20	200	3	1	2	5
3.	BCET 703 (A/B/C)	DE	Departmental Elective	100	30	20	-	-	150	3	1	0	4
4.	BOEC 704 (A/B/C)	OE	Open Elective	100	30	20	-	-	150	3	1	0	4
5.	BCEP 705	D Lab	Open SourceS/w Lab	-	-	-	30	20	50	0	0	2	1
6.	BCEP 706	DL C- 1	Evaluation of Internship-III completed at III year level	-	-	-	-	50	50			2	1
7.	BCEP 707	P	Minor Project II	-	-	-	50	50	100	0	0	4	2
TOTAL				400	120	80	140	160	900	12	4	12	22

DEPARTMENTAL ELECTIVES			OPEN ELECTIVES	
BCET 703(A)	Railway& Airport Engineering		BOEC 704 (A)	Hydrology
BCET 703(B)	Bridge Engineering		BOEC 704 (B)	Infrastructure Planning and Management
BCET 703(C)	Ground Water Engineering		BOEC 704 (C)	Subject from SWAYAM

Veer MadhosinghUniversity, Dehradun
Scheme of Examination as per AICTE Flexible Curricula
W.E.F. Academic Session 2020-21
Bachelor of Technology (B.Tech.) [Civil Engineering]

VIII Semester

S. No.	Subject code	category	Subject name	Maximum marks alloted					Total marks	Contact hours per week			Total credit
				Theory			Practical						
				End sem	Mid sem	Quiz/ Assignment	End sem	Term work / lab work & sessional		L	T	P	
1.	BCET 801	DC	Construction Planning and Management	100	30	20	-	-	150	3	1	0	4
2.	BCET 802	DC	Seismology and Earthquake Resistance Design of Buildings	100	30	20	-	-	150	3	1	0	4
3.	BCET 803 (A/B/C)	DE	Departmental Elective	100	30	20	-	-	150	3	1	0	4
4.	BOEC 804 (A/B/C)	OE	Open Elective	100	30	20	-	-	150	3	1	0	4
5.	BCEP 805	P	Major Project	-	-	-	100	100	200	0	0	4	4
6.	BCEP 806	P	Virtual Lab	-	-	-	30	20	50	0	0	2	1
7.		GP	General Proficiency	-	-	-	-	50	50	0	0	0	0
TOTAL				400	120	80	100	200	900	12	4	4	21

DEPARTMENTAL ELECTIVES			OPEN ELECTIVES	
BCET 803(A)	Irrigation Engineering		BOEC 804 (A)	Hydropower Engineering
BCET 803(B)	River Engineering		BOEC 804 (B)	Prestressed Concrete
BCET 803(C)	Repair & Rehabilitation of Structures		BOEC 804 (C)	Subject using SWAYAM

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Civil Engineering, VII-Semester

BCET 701, Environmental Engineering II

3L: 1T:2P

COURSE OBJECTIVES

1. To introduce the students to the area of water and wastewater treatment.
2. The course will cover water chemistry; characteristics of water & wastewater; primary, secondary & tertiary treatment processes.
3. To learn about solid waste management and its disposal.
4. To have insight knowledge of Industrial waste that causes pollution on large basis.
5. To learn about purification of wastewater and its usage for various irrigation purposes.

COURSE OUTCOMES

1. Appreciate the importance and methods of operation and maintenance of wastewater supply systems.
2. Communicate effectively in oral and written presentations to technical and non-technical audiences the applications of waste water treatment and its significance in society.
3. Be able to understand the concept of sewerage system and its network layout.
4. Appreciate the understanding of different processes involved in the treatment of sewage.
5. Be able to apply the basis of an Environmental Management System (EMS) to an industrial activity.

DETAILED SYLLABUS:

UNIT-1
Wastewater Treatment: On site and centralized treatment systems. Various treatment systems involved to clean waste water

UNIT-2
Pre-and Primary Treatment: Screen, grit removal, oil and grease removal, sedimentation and flocculation tank, settling velocity and surface overflow rate.

UNIT-3
Secondary Treatment: Activated sludge process, conventional and extended aeration, waste stabilization ponds, UASB process, UASB post treatment.

UNIT-4
Tertiary Treatment: Advanced Wastewater Treatment. Reuse systems, wastewater disposal on and water bodies, disposal of sludge.

UNIT-5
Municipal Solid Waste& Industrial Waste: Collection, characterization, transport, treatment & Disposal. Liquid, solid, atmospheric and hazardous wastes: Characterization and treatment.

TEXT/ REFERENCE BOOKS

1. Davis, M.L. and Cornwell, D.A., "Introduction to Environmental Engineering", McGraw Hill.
2. Master, G.M., "Introduction to Environmental Engineering and Science", Prentice Hall of India.
3. P.N. Modi: Sewage treatment & Disposal and waste water Engineering – Environmental Engineering (Vol.II), Standard Book House.
4. S.K. Garg, Sewage Disposal and Air Pollution Engineering – Environmental Engineering (Vol.II), Khanna Publishers.
5. Metcalf & Eddy, Inc., Waste water Engineering Treatment and Reuse, McGraw Hill

BCEP 701 LIST OF EXPERIMENTS:

1. Determination of pH in waste water.
2. Determination of Color in water
3. Determination of Turbidity in water
4. Determination of Solids in Sewage
    a. Total Solids,
    b. Suspended Solids,
    c. Dissolved Solids,
    d. Volatile solids,
    e. fixed solids ,
    f. Settleable solids
5. Determination of Dissolved Oxygen
6. Determination of BOD
7. Determination of COD

Uttarakhand Technical University, Dehradun
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Civil Engineering, VII-Semester

BCET 702, Design of Steel Structures

3L: 1T:2P

COURSE OBJECTIVES

1. To introduce steel structures and its basic components.
2. To introduce structural steel fasteners like welding and bolting.
3. To design tension members, compression members, beams and beam-columns.
4. To design column splices and bases.

COURSE OUTCOMES (COs)

1. Identify and compute the design loads on a typical steel building.
2. Able to identify and interpret the appropriate relevant industry design codes.
3. Identify the different failure modes of steel tension and compression members and beams, and compute their design strengths.
4. Students will be able to check and specify the serviceability requirements of the designed steel structures.
5. Identify the different failure modes of bolted and welded connections, and determine their design strengths.

SYLLABUS DETAILS:

Unit I: **(10)**

INTRODUCTION: Properties of steel – Structural steel sections – Limit State Design Concepts – Loads on Structures – Metal joining methods using rivets, welding, bolting – Design of bolted, riveted and welded joints – Eccentric connections - Efficiency of joints – High Tension bolts.

Unit II: **(8)**

TENSION MEMBERS: Types of sections – Net area – Net effective sections for angles and Tee in tension – Design of connections in tension members – Use of lug angles – Design of tension splice – Concept of shear lag.

Unit III: **(8)**

COMPRESSION MEMBERS: Types of compression members – Theory of columns – Basis of current codal provision for compression member design – Slenderness ratio – Design of single section and compound section compression members – Design of lacing and battening type columns – Design of column bases – Gusseted base, Slab base.

Unit IV: **(8)**

BEAMS: Design of laterally supported and unsupported beams – Built up beams – Beams subjected to biaxial bending – Design of plate girders riveted and welded – Intermediate and bearing stiffeners – Web splices.

Unit V: **(8)**

ROOF TRUSSES AND INDUSTRIAL STRUCTURES: Elements ofRoof trusses – Roof and side coverings – Design loads, design of purlin.

Note: designs to be done both by Working stress and Limit state methods.

Laboratory Work: BCEP 702-- Constructive details.

Laboratory Work: Laboratory work will be based on the above course as required for engineering projects.

1. Structural steel sections
2. Simple connection
3. Eccentric connections
4. Connections in tension members
5. Lacing and battening type columns
6. Column bases – Gusseted base, Slab base.
7. Steel Truss

Reference Books: -

1. IS 800-2007 Indian Standard - General Construction in Steel – code of practice (3rd Revision).
2. SK Duggal "Limit State Design of Steel Structures" Tata McGraw-Hill Education, 1st Edition, TMH Publication, 2011.
3. N.Subramaniyan, "Design of Steel structures", 1st Edition, Oxford university press, 2008.
4. Ramachandra, S. and VirendraGehlot, "Design of Steel Structures – Vol. I & II", Standard Publication, New Delhi, 2007.
5. Bhavikatti, S. S. (2010). Design of Steel Structures (by Limit State Method as Per IS: 800-2007), IK International.

Uttarakhand Technical University, Dehradun
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Civil Engineering, VII-Semester

BCET 703(A), Railway &Airport Engineering

3L: 1T:0P

COURSE OBJECTIVE

The Course will try to introduce the basic engineering principles that helps in the planning, design, construction, operation and maintenance of Railways and Airports

COURSE OUTCOME

Upon completion of this course, Students are expected to attain the following outcomes

- Can handle the design, construction, and operation of railroads and mass transit systems that use a fixed guideway.
- Tasks that include determining horizontal and vertical alignment design, station location and design, and construction cost estimating.
- Will able to design and construct airports.
- Can account for the impacts and demands of aircraft in their design of airport facilities.

SYLLABUS DETAILS:

UNIT I:
Components of Railway Engineering: Permanent way components – Railway Track Gauge - Cross Section of Permanent Way - Functions of various Components like Rails, Sleepers and Ballast –Rail Fastenings – Creep of Rails- Theories related to creep – Adzing of Sleepers- Sleeper density – Rail joints.

UNIT II:
Geometric Design of Railway Track: Alignment – Engineering Surveys - Gradients- Grade Compensation- Cant and Negative Super elevation- Cant Deficiency – Degree of Curve – safe speed on curves – Transition curve – Compound curves – Reverse curves – Extra clearance on curves – widening of gauge on curves – vertical curves – cheek rails on curves.

UNIT III:
Turnouts &Controllers: Track layouts – Switches – Design of Tongue Rails – Crossings – Turnouts – Layout of Turnout – Double Turnout – Diamond crossing – Scissors crossing. Signal Objectives – Classification – Fixed signals – Stop signals – Signaling systems – Mechanical signaling system – Electrical signaling system – System for Controlling Train Movement – Interlocking – Modern signaling Installations.
UNIT IV:

Airport Planning & Design:Airport Master plan – Airport site selection – Air craft characteristics – Zoning laws – Airport classification – Runway orientation – Wind rose diagram – Runway length – Taxiway design – Terminal area and Airport layout – Visual aids and Air traffic control.

UNIT V:

Runway Design: Various Design factors – Design methods for Flexible pavements – Design methods for Rigid pavements – LCN system of Pavement Design – Airfield Pavement Failures – Maintenance and Rehabilitation of Airfield pavements – Evaluation & Strengthening of Airfield pavements – Airport Drainage – Design of surface and subsurface drainage.

Reference Books: -

1. " Principles Of Railway Engineering" by Rangawala S C
2. "A Text Book of Railway Engineering" by S C Saxena and S PArora.
3. "Railway Engineering" by Amit Gupta and B L Gupta.
4. "Highway Railway Airport and Harbour Engineering" by Subramaniam.
5. "Railway Track Engineering" by JS Mundrey.

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Civil Engineering, VII-Semester

BCET 703 (B), Bridge Engineering

3L: 1T: 0P

COURSE OBJECTIVES

- Familiarize with the types, suitability, selection, design criteria of various types of bridges
- To impart knowledge for analysis and design of various types of bridges
- To understand the design of slab culvert, Box culvert
- To understand the design of T beam bridge and substructures
- To understand the bridge bearings
- To understand the basic concepts of piers and footing

COURSE OUTCOMES (COs)

- Specify various sub-surface investigations required for bridge construction and further use them to calculate the hydraulic design requirements of different bridges.
- Students will be able to analyze and design all members of a bridge.
- Design Culvert, R.C.C T Beam Bridge.
- Understand the behavior of continuous bridges, box girder bridges
- Design Railway bridges, Plate girder bridges, different types of bearings , abutments, piers and various types of foundations for Bridges

SYLLABUS DETAILS:

UNIT 1: Basic Concepts & Hydraulic Calculation: Definition and types of bridge, Site investigations, selection of suitable type of bridge, hydraulic calculations, linear waterway, Economic span, afflux, scour depth.

UNIT 2: Analysis &Design of Concrete Bridge: design loads for multi-lane bridges, IRC Loading standards, Impact factor, analysis of deck slabs, effective width method, Design of T-Beam Bridge, Pigeard's method, Courbon' method. Prestressed concrete bridge, prestress losses, temperature and shrinkage stresses. Design of arch bridges.

UNIT 3: Culvert & Steel Bridge: Design of Pipe Culverts, Design of Box Culverts, Design of lattice girder steel bridge, introduction to cable bridges.

UNIT 4: Substructure & Foundation: Introduction to bridge sub structure, analysis & design of pier, piles & well foundation.

UNIT5: Construction & Maintenance: Various types of bearings and their design-Rocker & Roller Bearing, Elastomeric Bearing. Joints-expansion joints, Contraction joints, joint seals. Bridge maintenance management: inventory, inspection and rehabilitation.
Case studies of recently constructed major bridges and Critical studies of failure of major bridges.

TEXT/REFERENCE BOOKS:

1. Design of Bridges, N. KrishnaRaju, Oxford and IBH Publications
2. Essential of Bridge Engineering, Victor D.J, Oxford & I.B.H
3. Design of Bridge Structures, T. R. Jagadeesh, M. A. Jayaram, PHI Learning Private limited
4. Elements of Bridge Engineering, M. K. Pant, Katson Publications
5. Bridge Deck Analysis, E. J. O'Brien, and D. L. Keogh, Taylor and Francis
6. Design of Prestressed Concrete Structures, T. Y. Lin and N. H. Burns, John Wiley and Sons
7. Bridge Analysis Simplified, B. Bakht and L.G. Jaeger, McGraw Hill
8. Structural Bearings, H. Eggert and W. Kauschke, Ernst &Sohn

Uttarakhand Technical University, Dehradun
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Civil Engineering, VII-Semester

BCET 703 (C), Ground Water Engineering

3L: 1T: 0P

COURSE OBJECTIVE:

1. Create a simple conceptual model of an area's hydrogeology that can be used to guide a site investigation or engineering design project.
2. Compare methods for solving groundwater flow equations under a variety of situations, selecting the most appropriate modeling techniques based on an engineering project's goals and evaluating how their weaknesses may impact the final conclusions.
3. Develop a preliminary consulting report for a groundwater development or remediation project.

COURSE OUTCOME:

1. Understand the porous medium properties that control groundwater flow and transport, including porosity, hydraulic conductivity, and compressibility.
2. Derive effective hydraulic conductivity for various cases of heterogeneous subsurface formations.
3. Apply groundwater flow equations to confined and unconfined aquifers.
4. Analyze pump test data to determine aquifer properties.
5. Estimate travel times for groundwater contaminants in a saturated aquifer.
6. Design a groundwater pumping system to mitigate contaminant migration.

SYLLABUS DETAILS:

UNIT I: Introduction: Groundwater occurrence and its role in hydrologic cycle, groundwater bearing formations, attributes of an aquifer, aquifer classification, flow and storage characteristics of various types of aquifers, recharge processes, storage release mechanisms.

UNIT II: Groundwater Modeling: Differential equations governing groundwater flow in Cartesian coordinates, Dupuits-forchheimer assumptions, analytical solutions, numerical solutions, regional groundwater planning, stream-aquifer interflows.

UNIT III: Groundwater Analysis: Differential equations governing ground water flow in polar coordinates, well hydraulics, analytical solutions for confined, leaky confined and unconfined aquifers, image well theory, time-variant pumping rates, well interference, and analysis of pumping test data.

UNIT IV:Methods & Technology: Construction of wells, various drilling techniques. Estimation of recharge, lumped water balance, flow in unsaturated zone, experimental methods, GEC-97 norms.

UNIT V: Artificial recharge, induced recharge, roof water harvesting. Contamination of groundwater, Quality parameters and standards, river bank infiltration. Ground water modeling packages.

Reference Books:-

1. Todd, D.K., “Groundwater Hydrology”, Wiley.
2. Walton, W.C., “Ground Resource Evaluation”, McGraw-Hill
3. Jacob Bear, “Hydraulics of Groundwater”, McGraw-Hill.
4. Bouwer, H., “Groundwater Hydrology”, McGraw-Hill.
5. Kruseman, G.P. and Ridder, N.A., “Analysis and Evaluation of Pumping Test Data”, IILRI.
6. Rushton, K.R., “Groundwater Hydrology”, John Wiley.
7. Freeze, R.A. and cherry, J.A. “Groundwater”, Prentice Hall.

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Civil Engineering, VII-Semester

BOEC 704 (A), Hydrology

3L: 1T: 0P

COURSE OBJECTIVE:

1. To study occurrence movement and distribution of water that is a prime resource for development of a civilization.

2. To know diverse methods of collecting the hydrological information, which is essential, to understand surface and ground water hydrology.

3. To know the basic principles and movement of ground water and properties of ground water flow.

COURSE OUTCOME:

1. Provide a background in the theory of hydrological processes and their measurement.
2. Apply science and engineering fundamentals to solve current problems and to anticipate, mitigate and prevent future problems in the area of water resources management.
3. An ability to manipulate hydrological data and undertake widely-used data analysis.
4. A systematic understanding of the nature of hydrological stores and fluxes and a critical awareness of the methods used to measure, analyze and forecast their variability; and the appropriate contexts for their application.
5. Can define the key components of a functioning groundwater, can determine the main aquifer properties – permeability, transmissivity and storage Identify geological formations capable of storing and transporting groundwater.
6. Different methods and importance of rain water harvesting.

SYLLABUS DETAILS:

UNIT-I

Hydrology Cycle and Budget: Definitions, Space – time scales in hydrology, hydrologic cycle and budget; **Precipitation Measurement and Analysis :** Precipitation variability, rainfall and snow measurement techniques, design of precipitation gauging network, consistency of rain record, filling up of missing record, estimation of mean areal rainfall, IDF and DAD analysis, snow measurement and determination of snow melt.

UNIT-II

Hydrologic Abstraction: Infiltration, factors affecting infiltration, measurement of infiltration, empirical and analytical models of infiltration, evaporation: its measurement and estimation, evapo-

transpiration: its measurement and estimation, interception and depression storage, rain harvesting; Procedure and its design.

UNIT-III

Stream Flow: Measurement of stream flow, factors affecting stream flow, hydrograph analysis, base flow separation, unit hydrograph and curve number methods of steam flow determination, synthetic unit hydrograph, hydrological modeling for steam flow estimation, and methods for peak discharge estimation.

UNIT-IV

Frequency Analysis: Return period, random variable, checks forpersistency, frequency distributions, and frequency analysis of hydrological data; **Regression and Correlation Analysis:** Dependent and independent variables, simple correlation coefficient, method of least squares, variance analysis, partial correlation coefficient, simple and multiple regression analysis.

UNIT-V

Ground Water: Aquifers, hydraulic conductivity, transmissivity, well hydraulics. **Flood Routing:** Governing equations, reservoirs flood routing, hydrologic routing: Muskingum method.

Reference Books:-

1. Singh, V.P., “Elementary Hydrology”, Prentice Hall
2. Chow, V.T., Maidment, D.R. and Mays, W.L., “Applied Hydrology”, McGraw Hill.
3. Wanielista, M., Kersten, R. and Eaglin, R., “Hydrology”, John Wiley
4. Ojha, C.S.P., Berndtsson R. and Bhunya, P., “Engineering Hydrology”, Oxford University Press.

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula
Civil Engineering, VII-Semester

BOEC704 (B), Infrastructure Planning and Management

3L: 1T: 0P

COURSE OBJECTIVES:

1. To study the necessity of infrastructure and its management.
2. To study the infrastructural planning.
3. To study the theoretical concepts which are applied to real problems encountered in the planning, management and operation of infrastructure.
4. To study the finance management Fundamentals & Evaluation and managerial economics.

COURSE OUTCOMES:

1. Understand infrastructure organizations.
2. Achieve Knowledge of Planning and development of problem solving skills in management.
3. Understand the principles of financial fundamentals.
4. Prepare tender documents for infrastructure project contract.

SYLLABUS DETAILS:

UNIT 1	**Infrastructure:**
	Definitions of infrastructure, Governing Features, Historical overview of Infrastructure development in India, Infrastructure Organizations & Systems.
UNIT 2	**Infrastructure Planning:**
	Typical infrastructure planning steps, Planning and appraisal of major infrastructure projects, Screening of project ideas, Life cycle analysis, Multi-criteria analysis for comparison of infrastructure alternatives, Procurement strategies, Scheduling and management of planning activities, Infrastructure Project Budgeting and Funding, Regulatory Framework, Sources of Funding.
UNIT 3	**Project Management in Construction:**
	Introduction to project management processes - Initiating, Planning, Executing, Controlling, and Closing processes; Project Integration Management - Project plan development, Project plan execution, and Overall change control; Project Scope Management - Initiation, Scope planning, Scope definition, Scope verification, and Scope change control.
UNIT 4	**Contracts and Management of Contracts:**
	Engineering contracts and its formulation, Definition and essentials of a contract, Indian Contract Act 1872, types of contracts and clauses for contracts, Preparation of tender documents, Issues related to tendering process, Awarding contract.

References books: –

1. A. S. Goodman and M. Hastak, Infrastructure planning handbook: Planning, engineering, and economics, McGraw-Hill, New York, 2006.

2. J. Parkin and D. Sharma, Infrastructure planning, Thomas Telford, London, 1999.
3. P. Chandra, Projects: Planning, analysis, selection, financing, implementation, and review, Tata McGraw-Hill, New Delhi, 2009.
4. J. D. Finnerty, Project financing - Asset-based financial engineering, John Wiley & Sons, New York, 1996.
5. L. Squire and H. G.van der Tak, Economic analysis of projects, John Hopkins University Press, London, 1975.
6. T. Hegazy, Computer-based construction project management, Prentice Hall, New Jersey, 2002.
7. S. M. Levy, Project management in construction, 5th ed., McGraw Hill, New York, 2007.

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula
Civil Engineering, VIII-Semester

BCET 801, Construction Planning and Management

3L: 1T: 0P

Course Objectives

- To learn modern construction equipment's
- To have knowledge about construction contracts and its specifications
- To learn about planning for construction using networks.
- To learn about construction quality control

Course Outcomes

- An understanding of modern construction practices.
- A good idea of basic construction dynamics- various stakeholders, project objectives, Processes, resources required and project economics.
- A basic ability to plan, control and monitor construction projects with respect to time and cost.
- An idea how construction projects are administered with respect to contract structures and issues.

Detailed Syllabus

UNIT	TOPICS
1.	**Network Technique:** Introduction to network techniques; use of computer aided CPM and PERT for planning, scheduling and control of construction works; bar charts: Error in networks; Types of nodes and node numbering systems.
2.	**Construction Planning:** Planning for construction and site facilities using networks; preparation of construction schedules for jobs, materials, equipment, labour and budgets using CPM.
3.	**Construction Equipments and Methods:** Equipment for earthworks; Concrete construction; Aggregate production; Concrete production, handling and placement; Mixers, vibrations and temperature control.
4.	**Control on Construction:** Construction quality control and inspection;Significance of variability and estimation of risk; Construction cost control of networks
5.	**Construction Contracts & Specifications:** Introduction, types of contracts, contract document, specifications important conditions of contract, arbitration.

Text/Reference Books

- Srivastava, U.K., Construction, Planning Management, Galgotia
- Peurifoy, R.L., Construction Planning, Equipments and Methods, McGrawHill.
- Ahuja, H.N., Construction Performance Control by Networks, WileyInterscience.
- Moder and Philipese, Project Management with CPM and PERT, Van NOStrand.

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula
Civil Engineering, VIII-Semester

BCET 802, Seismology and Earthquake Resistance Design of Buildings

3L: 1T: 0P

COURSE OBJECTIVES:

- In introduce phenomenon involved in earthquake engineering.
- To present the foundations of many basic engineering concepts related earthquake Engineering
- To give an experience in the implementation of engineering concepts which are applied in field of earthquake engineering
- To involve the application of scientific and technological principles of planning, analysis, design of buildings according to earthquake design philosophy.

COURSE OUTCOMES (COs):

- The students will gain an experience in the implementation of Earthquake Engineering on engineering concepts which are applied in field Structural Engineering.
- The students will get a diverse knowledge of earthquake engineering practices applied to real life problems
- The students will learn to understand the theoretical and practical aspects of earthquake engineering along with the planning and design aspects

SYLLABUS DETAILS:

Unit	Topics	Contact hours
I.	**Basics of Seismology**: Earth and its interior, Plate Tectonics, Convection Currents, The Earth quake, Inter Plate Earthquake (Convergent Boundaries, Divergent Boundaries and Transform Boundaries), Intra Plate Earthquake (Faults and Types of Faults), Seismic Waves, Basic Terminology, Measuring Units and Instruments, Earthquake Effects: Ground failures, Local site effects, Effects on ground and structure.	6
II.	**Seismic Load & Forces:** Introduction to Dynamic Loads Static Load v/s Dynamic Load, Types of Dynamic forces, Force Control and Displacement Control	4
III.	**Concepts of SDOF & MDOF:** Fundamentals of Earthquake Vibrations of Structures Equation of Motion (Newton's Law and D'Alembert's Principle), Degrees of Freedom, Simplified Single Degree of Freedom, Mathematical Modelling, Equation of Motion for Free Vibration for Damped and Un damped System (Single Degree of Freedom System), Equation of Motion for Forced Vibration for Damped and Un damped System(Single Degree of Freedom System), Logarithmic Decrement, concepts of two degrees of freedom system and multiple degree of freedom system, mode shapes	12

IV.	**Earthquake Load Analysis**: Introduction to methods of Earthquake Load Analysis (Linear Static, Linear Dynamic, Non Linear Static, Non Linear Dynamic) Analysis of Structure by Linear Static Method (Seismic Coefficient Method) Analysis of Structure by Linear Dynamic Method (Random Response Method), Introduction to IS Code: 1893, Codal Provisions for evaluation of earthquake forces on buildings.	12
V.	**Seismic Hazard:** Analysis, Concepts of Risk and Hazard, Deterministic and Probabilistic Approaches, Introduction to hazard maps	6

Reference books

1. Krishna, Jai, chandrasekran, A.R. and Chandra, B. 'Elements of Earthquake Engineerng", 2nd Edition, South Asia Publisher, New Delhi 1994
2. Sinvhal A, "Understanding earthquake disasters", Tata McGraw Hill Publications, 2010
3. Pankaj Agrawal, Manish Shrikhande, Earthquake Resistant Design of Structures, PHI Learning Pvt. Ltd., 01-Jan-2006
4. Clough, R.W. and Penzien, J. "Dynamics of Structure", McGraw Hill Book Co., New York. 1993
5. Chopra, Anil K. "Dynamic of structures", 2 nd Edition. Pearson Education. 2001
6. IS: 1893 Indian Standard – "Criteria for Earthquake Resistant Design of Structures General Provisions and Buildings", Bureau of Indian Standard, ManakBhawan, New Delhi. 2016
7. S. K. Duggal; Earthquake Resistance Design of Structures; Oxford University Press, New Delhi

Uttarakhand Technical University, Dehradun
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Civil Engineering, VIII-Semester

BCET803 (A), Irrigation Engineering

3L: 1T: 0P

COURSE OBJECTIVES:

- The knowledge of hydrology is prerequisite for the irrigation engineering and also for design of hydraulic structure. So one of the objectives of this course is to impart the knowledge of hydrology that deals with the occurrence, distribution, movement and properties of water on the earth
- To impart the knowledge of various irrigation techniques, requirements of the crops.
- To learn about distribution systems for canal irrigation, design of unlined and lined irrigation canals design sediment problems associated with canal

COURSE OUTCOME:

- Various components of hydrologic cycle that affect the movement of water in the earth.
- Various Stream flow measurements technique.
- The concepts of movement of ground water beneath the earth.
- The basic requirements of irrigation and various irrigation techniques, requirements of the crops.
- Distribution systems for canal irrigation and the basics of design of unlined and lined irrigation canals design.
- Basic components of river Training works.
- Apply math, science, and technology in the field of water resource Engineering.

SYLLABUS DETAILS:

Unit I: Introduction- Definition, Necessity, Scope, Benefits and ill effects of irrigation, Types of irrigation schemes, Social and environmental considerations, Irrigation development in India. Water Requirement of Crops- Soil-water-plant relation- field capacity, wilting point, available water, consumptive use, Irrigation requirements – Net irrigation requirement, Field irrigation requirement, Gross Irrigation requirement, Soil moisture extraction pattern, Frequency of irrigation, Principal Indian crops, Gross command area, Culturable command area, Intensity of irrigation, Duty and delta relation, Introduction to various methods of application of irrigation water, Irrigation efficiency, assessment of irrigation water.

Unit II: Diversion Works: Different stages of a river and their flow characteristics, Weir and barrages, Various parts of a weir and their functions, Exit gradient, Principles of weir design on permeable formations -Bligh's creep theory and Khosla's theory; Storage and Outlet works: Types of earthen dams, Seepage in earth dams, Gravity dams, Forces acting on a gravity dam, Rock-fill dams, Spillways, Types of spillways, Spillways gates and energy dissipation works.

Unit III: Distribution works: Modes of conveying irrigation water- Types of irrigation canalscontour canal, ridge canal, side sloping canals, Canal sections-filling, cutting, partial cutting and partial filling, Balanced depth, Canal FSL, Capacity factor and Time factor, L-section, Losses of canal water, Silting and scouring of canals, Method of design of unlined section of irrigation canal, Silt theories, Lined canals, Design of lined canal, Link canals.

Unit IV: Regulating and Cross Drainage Works: Canal falls, Cross drainage works, Types of cross drainage works, Canal escapes, Head regulator and Cross regulator, Silt ejector, Flow meters - Parshall flume, Irrigation outlets and types of outlets.

Unit V: Water logging-causes, Reclamation, Drainage principles and practice.

Reference books:-

1. Irrigation & Water Power Engineering - Dr. B.C.Punmia & B.B.Pande, Laxmi Publications, (P) Ltd, New Delhi
2. Irrigation, Water Resources & Water Power Engineering - Dr. P.N.Modi, Standard Book House, Delhi
3. Irrigation, Water Power & Water Resources Engineering - Dr. K.R.Arora Standard Publishers Distributors, Delhi
4. Irrigation Engineering and Hydraulic Structures - S.K.Garg, Khanna Publishers, Delhi
5. Irrigation Engineering, S.K. Mazumder, Galgotia Publications Pvt Ltd., New Delhi

Uttarakhand Technical University, Dehradun
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Civil Engineering, VIII-Semester

BCET 803 (B), River Engineering

3L: 1T: 0P

COURSE OBJECTIVES

1. To get knowledge of fluvial geomorphology
2. To understand concept of analysis of river flow hydraulics
3. To be able to analyze hydraulic geometry and to design stable alluvial channels
4. To be able to do fluvial design for river bank protection

COURSE OUTCOMES

1. Ability to know about fluvial geomorphology
2. Ability to analyze river flow hydraulics
3. Ability to analyze hydraulic geometry and to design stable alluvial channels
4. Ability to have fluvial design for river bank protection

SYLLABUS DETAILS:

Unit I Elements of River Geomorphology: Origin and properties of sediments, river problems control of vegetation and river morphology; **Soil Erosion and Sediments Yield:** Types of erosion, mechanism of soil erosion, sediment delivery ratio, and process based modeling of soil erosion.

Unit II Hydraulics of Alluvial Streams: Incipient motion, modes of sediment transport, bed-forms., resistance to flow in alluvial rivers, bed load transport, suspended load transport.

Unit III River Geometry and Plan Forms: Stable channels and their geometry, flow around river bends, braided river, meandering river; **Gravel Bed Rivers:** Hydraulic geometry of gravel bed rivers, armoring, bed forms and resistance to flow in gravel Bed Rivers.

Unit IV Bed Level Variations in Steams: Degradation, local scour, aggradations, reservoir sedimentation, mathematical modeling for river bed variations.

Unit V Rivers and Environment: Environmental effects of hydraulic structures, river pollution, river action plans, stream restoration.

Reference books:-

1. Garde, R.J., “River Morphology”, New Age International.
2. Julin, P.Y., “Erosion and Sedimentation”, Cambridge University Press.
3. Jansen, P.P.H., “Principles of River Engineering”, VSSD Publications.
4. Rosgen, D., “Applied River Morphology”, Wildland Hydrology books, Pagosa Springs.
5. Graf, W.H. and Altinakar, M.S., “Fluvial Hydraulics: Flow and Transport Processes in Channels of Simple Geometry”, John Wiley.

Uttarakhand Technical University, Dehradun
New Scheme of Examination as per AICTE Flexible Curricula
Civil Engineering, VIII-Semester

BCET 803 (C), Repair & Rehabilitation of Structures

3L: 1T: 0P

COURSE OBJECTIVES:

1. The course seeks to recognize the mechanisms of degradation of concrete structures.
2. The course provides the knowledge of available techniques and their application for strengthening or upgrading existing structural systems.
3. It also provides how to conduct field monitoring and non-destructive evaluation of concrete structures.

COURSE OUTCOME:

After learning the course the students should be able to:

1. Identify and define all the terms and concepts associated with deterioration of concrete structures.
2. Carry out the damage assessment and Rapid Visual inspection of a building showing signs of deterioration and thus should be able to detect the possible cause /source of deterioration.
3. Develop a knowhow of the Concrete repair industry equipped with variety of repair materials and techniques.
4. Describe and apply the importance of quality control in concrete construction and significance of protection and maintenance of structures.

SYLLABUS DETAILS:

UNIT 1	**INTRODUCTION**
	Introduction: Overview of distress, deterioration in concrete structures, Scenario of distressed structures world over, Need for repairs and upgrading of structures, General introduction to process (Road-map) to a durable concrete repair.
UNIT 2	**DETERIORATION OF CONCRETE STRUCTURES**
	Types of Deterioration – Signs, causes & symptoms, Mechanism of deterioration, Contributing factors like permeability, inadequate durability & micro-structure of concrete. Physical deterioration due to moisture, temperature, shrinkage, freeze-thaw, abrasion, erosion, cavitation, crystallization of salts, Efflorescence, exposure to severe environment like marine exposure. Chemical deterioration due to corrosion of reinforcement (chloride induced, carbonation induced), Alkali-silica reaction, sulphate attack, Acid attack. Deterioration due to water leakage, fire Deterioration due to ageing, inadequate maintenance, Design & construction deficiencies, overloading etc. Visual deterioration of structures- Types of cracks, causes & characteristics of cracking in various structural components like beam, column, slab, masonry walls. Measurement of cracks, interpretation of the cause of particular type of crack. Detection & mitigation of the deteriorations.
UNIT 3	**CONDITIONAL/DAMAGE ASSESSMENT & EVALUATION OF STRUCTURES:**
	Structural Assessment: Conditional evaluation / Structural Appraisal of the structure –

	Importance, objective & stages, Conditional/damage assessment procedure, Preliminary &Detailed investigation – Scope, Objectives, Methodology & Rapid visual inspection of structures **Damage Assessment allied Tests (Destructive, Semi-destructive, Nondestructive):** Field & laboratory testing procedures for evaluating the structure for strength, corrosion activity, performance & integrity, durability. Interpretation of the findings of the tests.
UNIT 4	**REPAIRS, REHABILITATION & RETROFITTING OF CONCRETE STRUCTURES**
	Repair Materials: Criteria for durable concrete repair, Methodology, performance requirements, repair options, selection of repair materials, Preparatory stage of repairs, Different types of repair materials & their application, Types of repair techniques. **Retrofitting/Strengthening:** Need for retrofitting, Design philosophy of strengthening structures, Techniques available for strengthening including conventional and advanced techniques. Demolition techniques **Seismic retrofit of concrete structures:** Deficiencies in structure requiring seismic retrofit, Design philosophy, Techniques to enhance the seismic resistance of structures, advanced techniques for making seismic resistant structures.
UNIT 5	**STRUCTURAL HEALTH MONITORING:**
	An overview of Structural Health Monitoring, Structural Health Monitoring and Smart Materials, Structural Health Monitoring versus Non Destructive Testing, A broad overview of smart materials, Overview of Application potential of SHM.

REFERENCES/BOOKS:

1. Diagnosis and treatment of structures in distress by R.N.Raikar, Published by R&D Centre of Structural Designers & Consultants Pvt.Ltd., Mumbai, 1994.
2. Earthquake resistant design of structures by Pankaj Agarwal and Manish Shrikhande, Prentice-Hall of India, 2006.
3. Handbook on Repair and Rehabilitation of RCC buildings, Published by CPWD, Delhi, 2002.
4. Denison Campbell, Allen and Harold Roper , Concrete Structures, materials, maintenance and repair , Long man, Scientific and Technical UK 1991.

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Civil Engineering, VIII-Semester

BOEC 804 (A) Hydropower Engineering

3L: 1T: 0P

COURSE OBJECTIVES

1. To understand the concept of Hydropower.
2. To understand the various methods and procedure to plan and design a hydropower schemes.
3. To have the knowledge of different types of Hydropower Schemes and their purposes.
4. To learn to design and planning of different components of Hydropower plants.

COURSE OUTCOMES (CO's)

1. Students will get the understanding of different types of hydropower schemes and their purposes.
2. Students will get to learn how to plan and design the different types of hydraulic structures.
3. Student will learn concepts and aspects of Location, components Structures involved in a Hydropower plant.
4. Student will have proper understanding of various appurtenances used in any Hydro project.

SYLLABUS DETAILS:

UNIT–I:Introduction: Prospects of hydropower, sources of energy, hydropower potential, distribution and development, basin-wise development of hydropower, constraints in hydro power development; **Stream Flow Data and Hydropower Potential:** Flow and load duration curves, estimation of flow duration curve at ungauged site, primary and secondary power, storage and pondage, load factor, capacity factor, utilization factor, diversity factor.

UNIT–II:Types of Hydro Power Plants: Base and peak load Hydro-power plants, run-ofriver plants, valley dam plants, diversion canal plants, high head diversion plants, pumped-storage power plants; **Intake Structures:** Functions of intake structures, its location types, trash rackdimensions, design, spacing of bars, methods of cleaning; design of transition.

UNIT–III: **Conveyance System:** Power canal-location, site, surges in canals, penstockstypes, design and layout, economical diameter of penstock, hydraulic losses, branches, air vent, forebay.

UNIT-IV:Hydraulic Transients: Basic equations of Unsteady flow through conduits, method of characteristics, boundary conditions, single-pipeline applications for various valve opening conditions, functions of surge tank and its location, types and design of surge tank, introduction to transient softwares like HAMMER and HYTRAN etc.

UNIT –V:Hydraulic Turbines: Types of turbines, characteristics and efficiency of turbines, selection of turbines, selection of turbines, cavitations, casing, draft tubes, tail trace and their hydraulic design; **Small Hydropower Development:** Benefits and potential of small hydropower plants, components of small hydropower plants, trench weir, desilting tank, and turbines.

Reference Books:-:

1. Barrow, H.K., “Water Poer Engineering”, Tat McGraw-Hill
2. Varshney, R.S., “Hydro Power Structures”, Nem Chand & Bros.
3. Choudhary, M.H., “Applied Hydraulic Transients, Van Nastrand Reinhold.
4. Warnick, C.C., “Hydropower Engineering”, Prentice-Hall.
5. “Hydropower Development”, Vol.3,4,5,&6, Norwegian Institute of Technology, Division of Hydraulic Engineering.

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Civil Engineering, VIII-Semester

BOEC 804 (B) Pre-stressed Concrete

3L: 1T: 0P

COURSE OBJECTIVES

- To introduce the need for prestressing as well as the methods, types and advantages of prestressing to the students. Students will be introduced to the design of prestressed concrete structures subjected to flexure and shear.

COURSE OUTCOMES

- On completion of course, Student shall have a knowledge on methods of prestressing and able to design various prestressed concrete structural elements.

SYLLABUS DETAILS:

UNIT NO	TOPICS
1.	**Materials, Basic Principles of Pre-Stressing, Prestressing Systems:** Basic concepts of Prestressing, High strength concrete and steel, Stress-strain characteristics and properties, Various Prestressing systems, Pre-tensioning and Post- tensioning systems with anchorages, Advantages and limitations of Prestressed concrete.
2.	**Analysis of Sections for Flexure:** Basic assumptions, Analysis of stresses in concrete due to pre- stress and loads for different types of cross section, Pressure line or thrust line, Cable profile, Concept of load balancing, Cracking moment.
3.	**Losses of Pre-Stress & Deflections:** Nature of losses in pre-stress, Various losses encountered in Pre-tensioning and Post-tensioning methods, Deflection, Factors influencing deflection, Elastic deflection under transfer loads and due to different cable profile. Deflections limits as per IS-1343. Effects of creep on deflection crack widths
4.	**Flexural and Shear Strength of Prestressed Concrete Sections:** Types of flexural failure, IS code recommendations for flexure, Ultimate flexural strength of section. Shear and principal stresses, Ultimate shear resistance of Prestressed concrete members, Shear reinforcement.
5.	**Transfer of Prestress in Pre tensioned Members and Anchorage Zone Stresses in Post Tensioned Members:** Transmission of pre-stress in pre-tensioned members, Transmission length, Bond stresses, Codal provisions for bond and transmission length, Anchorage stress in post- tensioned member. Bearing stress and bursting tensile force, IS code provisions.

Text/Reference Books

- Krishna Raju N., "Prestressed concrete", 5th Edition, Tata McGraw Hill Company, New Delhi, 2012
- Pandit.G.S. and Gupta.S.P., "Prestressed Concrete", CBS Publishers and Distributers Pvt. Ltd, 2012.
- Rajagopalan.N, "Prestressed Concrete", Narosa Publishing House, 2002.
- Dayaratnam.P., "Prestressed Concrete Structures", Oxford and IBH, 2013