COURSE STRUCTURE AND SYLLABUS

For

B. Tech. Ist Year

Ist & IInd Semester

(Effective from the session: 2019-2020)

B.T.KUMAON INSTITUTE OF TECHNOLOGY

DWARAHAT, ALMORA, UTTARAKHAND

PIN-263653

COURSE STRUCTURE & EVALUATION SCHEME

New Scheme of Examination as per AICTE Flexible Curricula

Bachelor of Technology (B.Tech.) I Year

W.E.F. Academic session- 2019-20

I Semester – Group A

Sl. No.	Subject code	Category	Subject Name	PERIODS			Evaluation Scheme				Subject Total	Credits
							SESSIONAL EXAM			ESE		
A) THEORY												
				L	T	P	CT	TA	Total	ESE		
Induction Program				**(First three weeks) Mandatory for all B. Tech. I Year Students**								
1	BAST-101	BSC	Engineering Chemistry	3	1	0	30	20	50	100	150	4
2	BAST-102	BSC	Mathematics-I	3	1	0	30	20	50	100	150	4
3	BAST-103	HSMC	Technical English Communication	3	0	0	30	20	50	100	150	3
4	BEET-101	ESC	Basic Electrical Engineering	3	1	0	30	20	50	100	150	4
5	BCST-101	ESC	Fundamentals of Computers & Programming in C	3	1	0	30	20	50	100	150	4
B) PRACTICAL / TRAINNG / PROJECT												
6	BASP-101	BSC	Engineering Chemistry Lab	0	0	2	-	-	25	25	50	1
7	BEEP-101	ESC	Basic Electrical Engineering Lab	0	0	2	-	-	25	25	50	1
8	BCSP-101	ESC	Fundamentals of Computers & Programming in C Lab	0	0	2	-	-	25	25	50	1
9	BMEP-101	ESC	Manufacturing Practices/Workshop	1	-	3	-	-	50	50	100	3
			TOTAL	**16**	**4**	**13**	**-**	**-**	**-**	**-**	**1000**	**25**
10	BASP-105	DLC	Swachh Bharat Summer Internship Unnat Bharat Abhiyan (100Hrs)/ Rural Outreach	**-**	**-**	4	-	-	25	25	50*	-
11	BASP-102	DLC	Internship-I (60 Hrs Duration)	To be completed at the end of first or second semester during vacation period and its evaluation/ credit to be added in third semester of relevant branch.								

* Non credit course, mandatory for every student to be promoted in II Year

L-No. of Lecture hours per week

T-No. of Tutorial hours per week

P-No. of Practical hours per week

CT-Class Test Marks

TA-Marks of teacher's assessment including student's class performance and attendance

ESE-End Semester Examination Marks

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

New Scheme of Examination as per AICTE Flexible Curricula
Bachelor of Technology (B.Tech.) I Year
W.E.F. Academic session- 2019-20
I Semester – Group B

Sl. No.	Subject code	Category	Subject Name	PERIODS			Evaluation Scheme				Subject Total	Credits
							SESSIONAL EXAM			ESE		
A) THEORY												
				L	T	P	CT	TA	Total	ESE		
Induction Program				**(First three weeks) Mandatory for all B. Tech. I Year Students**								
1	BAST-104	BSC	Engineering Physics	3	1	0	30	20	50	100	150	4
2	BAST-102	BSC	Mathematics-I	3	1	0	30	20	50	100	150	4
3	BMET-102	ESC	Basic Mechanical Engineering	3	1	0	30	20	50	100	150	4
4	BCET-101	ESC	Basic Civil Engineering & Mechanics	3	1	0	30	20	50	100	150	4
B) PRACTICAL / TRAINNG / PROJECT												
5	BASP-104	BSC	Engineering Physics Lab	0	0	2	-	-	25	25	50	1
6	BMEP-102	ESC	Basic Mechanical Engineering Lab	0	0	2	-	-	25	25	50	1
7	BCEP-101	ESC	Basic Civil Engineering & Mechanics Lab	0	0	2	-	-	25	25	50	1
8	BASP-106	HSMC	Technical Communication Lab	1	-	2	-	-	25	25	50	2
9	BMEP-103	ESC	Engineering Graphics	1	-	3	-	-	50	50	100	3
			TOTAL	**14**	**4**	**11**	**-**	**-**	**-**	**-**	**900**	**24**
10	BEST-101	BSC	Environmental Studies*	3	-	-	-	-	30	70	100*	-
11	BASP-102	DLC	Internship-I (60 Hrs Duration)	To be completed at the end of first or second semester during vacation period and its evaluation/ credit to be added in third semester of relevant branch.								

* Non credit course, mandatory for every student to complete the degree
L-No. of Lecture hours per week
T-No. of Tutorial hours per week
P-No. of Practical hours per week
CT-Class Test Marks
TA-Marks of teacher's assessment including student's class performance and attendance
ESE-End Semester Examination Marks

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

New Scheme of Examination as per AICTE Flexible Curricula
Bachelor of Technology (B.Tech.) I Year
W.E.F. Academic session- 2019-20
II Semester – Group A

Sl. No.	Subject code	Category	Subject Name	PERIODS			Evaluation Scheme				Subject Total	Credits
							SESSIONAL EXAM			ESE		
A) THEORY												
				L	T	P	CT	TA	Total	ESE		
1	BAST-104	BSC	Engineering Physics	3	1	0	30	20	50	100	150	4
2	BAST-105	BSC	Mathematics-II	3	1	0	30	20	50	100	150	4
3	BMET-102	ESC	Basic Mechanical Engineering	3	1	0	30	20	50	100	150	4
4	BCET-101	ESC	Basic Civil Engineering & Mechanics	3	1	0	30	20	50	100	150	4
B) PRACTICAL / TRAINNG / PROJECT												
5	BASP-104	BSC	Engineering Physics Lab	0	0	2	-	-	25	25	50	1
6	BMEP-102	ESC	Basic Mechanical Engineering Lab	0	0	2	-	-	25	25	50	1
7	BCEP-101	ESC	Basic Civil Engineering & Mechanics Lab	0	0	2	-	-	25	25	50	1
8	BASP-106	HSMC	Technical Communication Lab	1	-	2	-	-	25	25	50	2
9	BMEP-103	ESC	Engineering Graphics	1	-	3	-	-	50	50	100	3
			TOTAL	**14**	**4**	**11**	**-**	**-**	**-**	**-**	**900**	**24**
10	BEST-101	BSC	Environmental Studies	**3**	**-**	-	**-**	**-**	30	70	100*	**-**
11	BASP-102	DLC	Internship-I (60 Hrs Duration)	To be completed at the end of first or second semester during vacation period and its evaluation/ credit to be added in third semester of relevant branch.								

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

New Scheme of Examination as per AICTE Flexible Curricula
Bachelor of Technology (B.Tech.) I Year
W.E.F. Academic session- 2019-20
II Semester – Group B

Sl. No.	Subject code	Category	Subject Name	PERIODS			Evaluation Scheme				Subject Total	Credits
							SESSIONAL EXAM			ESE		
A) THEORY												
				L	T	P	CT	TA	Total	ESE		
1	BAST-101	BSC	Engineering Chemistry	3	1	0	30	20	50	100	150	4
2	BAST-105	BSC	Mathematics-II	3	1	0	30	20	50	100	150	4
3	BAST-103	HSMC	Technical English Communication	3	0	0	30	20	50	100	150	3
4	BEET-101	ESC	Basic Electrical Engineering	3	1	0	30	20	50	100	150	4
5	BCST-101	ESC	Fundamentals of Computers & Programming in C	3	1	0	30	20	50	100	150	4
B) PRACTICAL / TRAINNG / PROJECT												
6	BASP-101	BSC	Engineering Chemistry Lab	0	0	2	-	-	25	25	50	1
7	BEEP-101	ESC	Basic Electrical Engineering Lab	0	0	2	-	-	25	25	50	1
8	BCSP-101	ESC	Fundamentals of Computers & Programming in C Lab	0	0	2	-	-	25	25	50	1
9	BMEP-101	ESC	Manufacturing Practices/Workshop	1	-	3	-	-	50	50	100	3
			TOTAL	**16**	**4**	**13**	-	-	-	-	**1000**	**25**
10	BASP-105	DLC	Swachh Bharat Summer Internship Unnat Bharat Abhiyan (100Hrs)/ Rural Outreach	-	-	4	-	-	25	25	50*	-
11	BASP-102	DLC	Internship-I (60 Hrs Duration)	To be completed at the end of first or second semester during vacation period and its evaluation/ credit to be added in third semester of relevant branch.								

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

Engineering Chemistry

BAST 101/BSCP 101 **3L-1T-2P 5 Credits**

Course Contents:

Unit I: Periodic Properties (4 Lectures)
Effective Nuclear Charge, Atomic & Ionic sizes, Electron affinity, Electro negativity, Ionization Potential, Ploarizability, Oxidation States & Hydrogen Bonding.

Unit II: Phase equilibrium (4 Lectures)
Gibbs Phase Rule, Phase diagram of single component system (Water & Sulphur) Phase diagram of Binary Eutectic System (Cu-Ag)

Unit III: Water Analysis & Corrosion (12 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. Corrosion, Introduction, Dry Corrosion, Wet Corrosion, Mechanism of Corrosion, Factors affecting corrosion and Prevention of corrosion.

Unit IV: Polymers & Lubricants (14 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. Introduction of Lubricants, 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.

Unit V: Spectroscopic techniques and application (6 Lectures)
Basic principle and Applications different spectral method. (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/drug.
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.
7Polymer 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 J B Yadav.

BAST 102	MATHEMATICS-I	3L-1T-0P	4 Credits

COURSE OBJECTIVES: The objective of this course is to familiarize the prospective engineers with techniques in calculus 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. Mainly, the objectives are:

1: 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.
2: To introduce the fallouts of Rolle's Theorem that is fundamental to application of analysis to Engineering problems.
3: To familiarize the student with functions of several variables that is essential in most branches of engineering.
4: To develop the essential tool of vector spaces, matrices and linear algebra in a comprehensive manner.

COURSE OUTCOMES(s):

At the end of this course, the students will be able to:

1. Apply the concept of matrix and apply in solving real life problems.
2. Solve the problems of calculus to evaluate engineering problems.
3. Understand the topic of vector calculus and vector spaces.

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, double integral, Change of the order of integration, triple integral.

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	Technical English Communication	3L-0T-0P	3Credits

COURSE CONTENTS:

Unit-I

Focus on Language: Grammar

Sentence Structure, Articles, Subject-Verb Agreement, Prepositions, Active and Passive Voice, Reported Speech: Direct and Indirect.

Unit-II

Focus on Language: Vocabulary

Prefixes and suffixes, Foreign words and phrases, Synonyms, Antonyms, Homonyms, Homophones, One word substitute.

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, Body language.

Unit-IV

Writing Skills:

Planning, Drafting and Editing, Précis, Technical description. Report Writing: Features of writing a good Report, Structure and Types of Report.

Unit-V

Business Correspondence:

Types and significance of Business Letters, Application, Resume, Email, Inviting Quotations, Tender Notice and Press Note.

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 push Lata, 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 objective: The language laboratory focuses on the practice of English through audiovisual 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.

BASP 106	Technical Communication Lab	1L-0T-2P	02Credits

Technical Communication Lab-- BASP 106

Topics to be covered in the Language laboratory sessions:

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

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

Course Outcomes:

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

1. Students will be enabled to understand the basic objective of the course by being acquainted with specific dimensions of communication skills i.e. Reading, Writing, Listening, Thinking and Speaking.
2. Students would be able to create substantial base by the formation of strong professional vocabulary for its application at different platforms.
3. Students will apply it at their work place for writing purposes such as Presentation/official drafting/administrative communication and use it for document/project/report/research paper writing.
4. Students will be made to evaluate the correct & error-free writing by being well- versed in rules of English grammar & cultivate relevant technical style of communication & presentation at their work place & also for academic uses.

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

Objectives:
To introduce the basic knowledge of Quantum Mechanics, Wave Optics, Solid State Physics, Lasers, Fiber Optics, Electrostatics and their applications in engineering.

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, 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)
Superposition of waves and interference of light by wave front splitting and amplitude splitting; Conditions of maxima and minima, Young's double slit experiment and expression for fringe width, Stoke's treatment, Interference in thin wedge shaped film, Newton's rings.
Difference between interference and diffraction, Fraunhofer diffraction from a single slit and N- slits (Diffraction grating), Rayleigh criterion for limit of resolution and its application to vision; resolving power of diffraction grating.
Module 3: Introduction to solids (8 lectures)
Free electron theory of metals, Fermi level, Fermi energy and Fermi Dirac distribution function, density of states and its expression for one dimensional metallic crystal, Intrinsic and extrinsic semiconductor, 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, B coefficients; amplification of light by population inversion, different types of lasers: solid-state lasers (ruby), gas lasers (He-Ne, CO2), 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 and Poynting theorem.
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. H.C. Verma, Quantum Physics.
7. M.N. Avdhanulu, P.G. Kshirsagar et all, Engineering Physics.
8. S.K. Gupta, Engineering Physics.
9. Satya Prakash, Engineering Physics.

Course Outcomes: The students will be able to:
1. Understand basics of Quantum Mechanics and its application in practical example.
2. Understand wave optics.
3. Understand material properties and the applications of semiconductor.
4. Understand basics and application of Lasers and Fiber Optics.
5. Understand the basic laws and applications of Electrostatics.

BASP 104	Engineering Physics Practical	0L-0T-2P	1 Credits

***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.
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 light 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 of the radius of coil.
17. To determine the resistivity and band gap by four probe method.
18. Use of Michelson-Morley interferometer for determining the wavelength of He-Ne laser.
19. To determine the specific rotation of sugar solution using Lorentz's half shade polarimeter.
20. To calculate the dielectric constant of the given dielectric material.
21. To find the capacitance and permittivity of the given material.
22. Measurement of length (or diameter) using vernier calliper, screw gauge and travelling microscope.
23. To determine g by bar pendulum and Kater's pendulum.
24. To determine g and velocity for a freely falling using digital timing technique.
25. To study the motion of a spring and calculate (a) spring constant (b) value of g
26. To determine the height of an object using a sextant.
27. Determination of the value of e/m of an electron by helical method/ Thomson method.

Code	Subject Name	L	T	P
BEET 101 for 1st sem **& BEET 201** for nd sem	**Basic Electrical Engineering**	**3**	**1**	**0**

Course Outcomes:

At the end of this course, students will demonstrate the ability.
To understand and analyse basic electric and magnetic circuits.
To study the working principles of electrical machines.
To study the measuring instruments to measure electrical quantities.

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 and Norton Theorems, Maximum Power Transfer Theorem.

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.

Unit 3:
Three Phase A.C. Circuits (8 hours) Star-Delta connections and conversion, line and phase voltage/current relations, three phase power and its measurement.
Measuring Instruments:
Construction and principle of operation of voltage and current measuring instruments; introduction to power and energy meters.

Unit 4: Transformers (7 hours)
Magnetic materials, BH characteristics, ideal and practical transformer, equivalent circuit and phasor diagram, open circuit and short circuit test of transformer, losses in transformers, voltage regulation and efficiency. Introduction to Auto-transformer and three-phase transformer.

Unit 5: Electrical Machines (9 hours)
Generation of rotating magnetic fields, Construction and working of induction machine, synchronous machine and DC machine, types of DC machines and E.M.F. equation, Significance of torque-slip characteristic of Induction Machine, Loss components and efficiency, Introduction to Single-phase induction motor.

Text / References:

1. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
3. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
4. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

Code	Subject Name	L	T	P
BEEP 101 for 1st sem **& BEEP 201** for 2nd sem	**Basic Electrical Engineering Lab**	**0**	**0**	**3**

List of Laboratory Experiments/Demonstrations:

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

2. Verification of principle of Thevenin, Norton and Superposition and Maximum Power Transfer Theorems with DC source.

3. Three Phase Power measurement by two wattmeter method and to study Energy meter.

4. To demonstrate the OC and SC test of transformer.

5. Three-phase transformers: Star and Delta connections. Voltage and Current relationships (line-line voltage, phase-to-neutral voltage, line and phase currents). Phase-shifts between the primary and secondary side. Cumulative three-phase power in balanced three-phase circuits.

6. Demonstration of cut-out sections of machines: DC machine (commutator-brush arrangement), Induction Machine (squirrel cage rotor), Synchronous Machine (field winging - slip ring arrangement) and single-phase induction machine.

7. Torque Speed Characteristic of separately excited dc motor.

8. To study the OCC curve of separately excited DC generator.

9. Synchronous Machine operating as a generator: stand-alone operation with a load. Control of voltage through field excitation.

Laboratory Outcomes: The students are expected to

Get an exposure to common electrical components and their ratings.
Make electrical connections by wires of appropriate ratings.
Understand the usage of common electrical measuring instruments.
Understand the basic characteristics of transformers and electrical machines.

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

BMEP 101	ManufacturingPractices/Workshop	1L-0T-3P	3Credits

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 asmetals, 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 alsoincluded.

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 differentapplications.
- Selection of a suitable technique for meeting a specific fabricationneed.
- 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 technicalcompetitions.
- Introduction to different manufacturing methods in different fields ofengineering.
- Practical exposure to different fabricationtechniques.
- Creation of simple components using differentmaterials.
- Exposure to some of the advanced and latest manufacturing techniques being employed in theindustry.

Course Contents:

Lectures & videos: (10 hours)

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

(ii) Workshop Practice:(60 hours)

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

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

Laboratory Outcomes

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

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

Course Contents:

Unit I :

Materials : Classification of engineering material, Composition of Cast iron and Carbon steels, Iron Carbon diagram. Alloy steels their applications. Mechanical properties like strength, hardness, toughness , ductility, brittleness , malleability etc. of materials , Tensile test- Stress-strain diagram of ductile and brittle materials

,Hooks law and modulus of elasticity, Hardness and Impact testing of materials, BHN etc.

Unit II:

Measurement: Concept of measurements, errors in measurement, Temperature, Pressure, Velocity, Flow strain, Force and torque measurement, Vernier caliper, Micrometer, Dial gauge, Slip gauge, Sine-bar and Combination set.

Unit III :

Fluids : Fluid properties pressure, density and viscosity etc. Types of fluids , Newton's law of viscosity , Pascal's law , Bernoulli's equation for incompressible fluids, Only working principle of Hydraulic machines, pumps, turbines, Reciprocating pumps .

Unit IV:

Thermodynamics : Thermodynamic system, properties, state, process, Zeroth, First and second law of thermodynamics, thermodynamic processes at constant pressure, volume, enthalpy & entropy.

Steam Engineering : Classification and working of boilers, mountings and accessories of boilers, steam properties, use of steam tables, p-v,T-S diagram

Unit V:

Reciprocating Machines :

Working principle of steam Engine, Carnot, Otto, Diesel and Dual cycles P-V & T-S diagrams and its efficiency, working of Two stroke & Four stroke Petrol & Diesel engines. Working principle of compressor.

Reference Books:

1- Kothandaraman&Rudramoorthy, Fluid Mechanics & Machinery,New Age .
2- 2- Nakra&Chaudhary , Instrumentation and Measurements,TMH.
3 - Nag P.K, Engineering Thermodynamics , TMH .
4- 4- Ganesan , Internal Combustion Engines, TMH.
5- Agrawal C M, Basic Mechanical Engineering ,Wiley Publication.
6- AchuthanM , , Engineering Thermodynamics,PHI.

List of Suggestive Core Experiments:

Theory related Eight to Ten experiments including core experiments as follows:

1- Study of Universal Testing machines.
2- Linear and Angular measurement using, Micrometer, SlipGauges, Dial Gauge andSine-bar.
3- Hardness Testing.
4- Impact Testing.
5- Verification of Bernoulli's Theorem.
6- 6- Study of various types ofBoilers.
7- Study of different ICEngines.

Study of different types of Boilers Mountings andaccessories

BMET 105	Engineering Graphics	1L-0T-3P	3 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 toaddress:

- 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, andsustainability
- to prepare you to communicateeffectively
- to prepare you to use the techniques, skills, and modern engineering tools necessary for engineeringpractice

Goals & Outcomes:

- Introduction to engineering design and its place insociety
- Exposure to the visual aspects of engineeringdesign
- Exposure to engineering graphicsstandards
- Exposure to solidmodeling
- Exposure to computer-aided geometricdesign
- Exposure to creating workingdrawings
- Exposure to engineeringcommunication

Course Contents:

UNIT 1: Introduction to Engineering Drawing covering, Principles ofEngineering 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 slabonly) . Isometric Projections covering, Principles of Isometric projection – Isometric Scale, Isometric Views, Isometric axes, Conventions; Isometric Views of solids, Box method, coordinate method, Simple and compoundSolids; 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, PearsonEducation
   B. & Agrawal C. M. (2012), Engineering Graphics, TMHPublication
3. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
4. (Corresponding set of) CAD Software Theory and UserManuals

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

COURSE 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.. More precisely, the objectives are:

1: To introduce effective mathematical tools for the solutions of ordinary and partial differential equations that model physical processes.

2: To introduce the tools of differentiation and integration of functions of complex variable that are used in various techniques dealing engineering problems.

3: To acquaint the student with mathematical tools available in vector calculus needed various field of science and engineering.

4: To develop the tool of Series and Fourier series for learning advanced Engineering Mathematics.

COURSE OUTCOMES(s):

At the end of this course, the students will be able to:

1. Remember the concept of ordinary differential equations and apply in solving real life problems.
2. Apply the concept of Partial Differential Equations to evaluate engineering problems
3. Understand to test the convergence of sequence and series.
4. Solve the problems related to complex variable.

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.

BCET 101 BCEP 101	Basic Civil Engineering & Mechanics	3L-1T-2P 5Credit

Course Contents:

Unit I Building Materials & Construction

Stones, bricks, cement, lime, timber-types, properties, test & uses, laboratory tests concrete and mortar Materials: Workability, Strength properties of Concrete, Nominal proportion of Concrete preparation of concrete, compaction, curing.

Unit II Construction Techniques

Elements of Building Construction, Foundations conventional spread footings, RCC footings, brick masonry walls, plastering and pointing, floors, roofs, Doors, windows, lintels, staircases types and their suitability.

Unit III Surveying & Positioning

Introduction to surveying Instruments – levels, theodolites, plane tables and related devices. Electronic surveying instruments etc. Measurement of distances – conventional and EDM methods, measurement of directions by different methods, measurement of elevations by different methods. Reciprocal levelling.

Engineering Mechanics

Unit IV Forces and Equilibrium:

Graphical and Analytical Treatment of Concurrent and non-concurrent Co- planner forces, free Diagram, Force Diagram and Bow's notations, Application of Equilibrium Concepts: Analysis of plane Trusses: Method of joints, Method of Sections. Frictional force in equilibrium problems

Unit – V Centre of Gravity and moment of Inertia

Centroid and Centre of Gravity, Moment Inertia of Area and Mass, Radius of Gyration, Introduction to product of Inertia and Principle Axes. Support Reactions, Shear force and bending moment Diagram for Cantilever & simply supported beam with concentrated, distributed load and Couple.

List of Experiments: Students are expected to perform minimum ten experiments from the list suggested below by preferably selecting experiments from each unit of syllabus.

1. To perform traverse surveying with prismatic compass, check for local attraction and determine corrected bearings and to balance the traverse by Bowditch's rule.
2. To perform levelling exercise by height of instrument of Rise and fall method.
3. To measure horizontal and vertical angles in the field by using Theodolite.
4. To determine (a) normal consistency (b) Initial and Final Setting time of a cement Sample.
5. To determine the workability of fresh concrete of given proportions by slump test or compaction factor test.
6. To determine the Compressive Strength of brick.
7. To determine particle size distribution and fineness modulus of course and fine Aggregate.
8. To verify the law of Triangle of forces and Lami's theorem.
9. To verify the law of parallelogram of forces.
10. To verify law of polygon of forces
11. To find the support reactions of a given truss and verify analytically.
12. To determine support reaction and shear force at a given section of a simply Supported beam and verify in analytically using parallel beam apparatus.
13. To determine the moment of inertia of fly wheel by falling weight method.
14. To verify bending moment at a given section of a simply supported beam

Reference Books:

1. S. Ramamrutam&R.Narayanan; Basic Civil Engineering, Dhanpat Rai Pub.
2. Prasad I.B., Applied Mechanics, Khanna Publication.
3. Punmia, B.C., Surveying, Standard book depot.
4. Shesha Prakash and Mogaveer; Elements of Civil Engg&Engg. Mechanics; PHI
5. S.P,Timoshenko, Mechanics of stricture, East West press Pvt.Ltd.
6. Surveying by Duggal – Tata McGraw Hill New Delhi.
7. Building Construction by S.C. Rangwala- Charotar publications House, Anand.
8. Building Construction by Grucharan Singh- Standard Book House, New Delhi
9. Global Positioning System Principles and application- Gopi, TMH
10.R.C. Hibbler – Engineering Mechanics: Statics & Dynamics.
11.A. Boresi& Schmidt- Engineering Mechines- statics dynamics, Thomson' Books
12.R.K. Rajput, Engineering Mechanics S.Chand& Co.

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
PartA - Short answer pattern - 20 marks
PartB - Essay type with inbuilt choice - 50 marks

Internal Evaluation at Institute Level
PartC - 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.
- Disastermanagement : 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. BalaKrishnamoorthy, Environmental Management, PHI learning PVT Ltd, 2012.