Kurukshetra University, Kurukshetra

(Established by the State Legislature Act XII of 1956)

('A+' Grade, NAAC Accredited)

Scheme of Examination & Syllabus

of

M.Tech Applied Geology (5-year Integrated Course)

Under CBCS-LOCF For the Session 2023-24

Semester – I to II

Kurukshetra University Kurukshetra
M.Tech Applied Geology (5-year Integrated Course)
Kurukshetra University Kurukshetra
Semester - I

S. No.	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of exam (Hours)
						End semester Exam	Internal Assessment	Practical Exam	Total	
1	B23-HSC-101	English for Technical Writing	2:0:0	2	2	70	30	--	100	3
2	B23-ESC-101	Programming for Problem Solving	3:0:0	3	3	70	30	--	100	3
3	B23-BSC-105	Chemistry	3:1:0	4	4	70	30	--	100	3
4	B23-BSC-109	Applied Mathematics-I	3:1:0	4	4	70	30	--	100	3
5	B23-BSC-106	Biology	3:0:0	3	3	70	30	--	100	3
6	B23-HSC-103	English Language Lab	0:0:2	2	1	--	40	60	100	3
7	B23-ESC-105	Programming for Problem Solving Lab	0:0:2	2	1	--	40	60	100	3
8	B23-ESC-107	Manufacturing Processes Workshop	0:0:4	4	2	--	40	60	100	3
9	B23-BSC-114	Engineering Chemistry Lab	0:0:2	2	1	--	40	60	100	3
10	ATU-202	Environmental Sciences	3:0:0	3	0	75	25	--	100	3
Total				29	21	425	335	240	1000	30

M.Tech Applied Geology (5-year Integrated Course)
Kurukshetra University Kurukshetra
Semester - II

S. No.	Course No./ Code	Subject	L:T:P	Hours/ Week	Credits	Examination Schedule (Marks)				Duration of Exam (Hours)
						End semester Exam	Internal Assessment	Practical Exam	Total	
1	B23-HSM-101	Universal Human Values-II: Understanding Harmony and Ethical Human conduct	3:0:0	3	3	70	30	--	100	3
2	B23-ESC-102	Engineering Graphics and Design	1:0:0	1	1	70	30	--	100	3
3	B23-ESC-103	Basic Electrical and Electronics Engineering	3:1:0	4	4	70	30	--	100	3
4	B23-BSC-103	Applied Physics	3:1:0	4	4	70	30	--	100	3
5	B23-BSC-110	Applied Mathematics-II	3:1:0	4	4	70	30	--	100	3
6	B23-ESC-106	Engineering Graphics & Design Lab	0:0:4	4	2	--	40	60	100	3
7	B23-ESC-108	Basic Electrical and Electronics Engineering lab	0:0:2	2	1	--	40	60	100	3
8	B23-BSC-113	Applied Physics Lab	0:0:2	2	1	--	40	60	100	3
Total				24	20	350	270	180	800	24

B23-HSC-101	English for Technical Writing						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time (hrs.)**
2	-	-	2	70	30	100	3
Purpose	To introduce the basics of communication and technical writing skill for the students of Engineering						
CO1	Building up the vocabulary						
CO2	Students will acquire basic proficiency in English including writing skills						
CO3	Students will be able to select the most appropriate mode of communication for a given situation and will be able to speak assertively and effectively.						
CO4	Students will be able to write effective reports, proposals and papers and present themselves professionally through effective resumes and interviews.						

UNIT- 1

Fundamentals of communication skills

Meaning and types of communication skills, Listening, Speaking, Reading and Writing, Importance of technical communication, Barriers in communication, Tools of effective communication.

UNIT- 2

Vocabulary Building

Word formation &Synonyms and Antonyms, One-word substitution, Abbreviations of scientific and technical words, phrasal verbs and Idioms.

UNIT- 3

Fundamentals of Writing Skills

Job application, CV writing, Business letter, Report writing and E-mail writing, redundancies, precise writing skill, Basics of grammar: uses of tenses, subject verb agreement, narration, active voice.

UNIT- 4

Fundamentals of Speaking skills

Speaking skills, Oral presentation, Body language, Group discussion, Technical Telephonic conversation. Introduction to phonetic sounds, symbol and articulation

Suggested Books:

- Practical English Usage. Michael Swan. OUP. 1995.
- Remedial English Grammar. F.T. Wood. Macmillan.2007
- On Writing Well. William Zinsser. Harper Resource Book. 2001
- Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
- Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.
- Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press

Note: The paper setter will set the paper as per the question paper templates provided.

B23-HSC-103	English Language Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical Exam**	**Internal Assessment**	**Total**	**Time (hrs.)**
-	-	2	1	60	40	100	3

OBJECTIVES

1. Listening comprehension.
2. Pronunciation, intonation, stress and Rhythm.
3. Communication at work place.
4. Group Discussion.
5. Interview.
6. Writing skills: speech writing.

B23-ESC-101	Programming for Problem Solving						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time (hrs.)**
3	-	`-	3	70	30	100	3
CO1	To learn the fundamentals of computers and to understand the various steps in program development.						
CO2	To learn the syntax and semantics of C programming language. To learn the usage of structured programming approach in solving problems.						
CO3	To learn the usage of structured programming approach in solving problems.						
CO4	To analyze the output based on the given input variables.						

UNIT-I

Introduction to Programming; Introduction to components of a computer system (Disks, Memory, Processor, Operating System, Compilers etc.), Algorithm Writing, Flowchart, Pseudocode with examples. From algorithms to programs.

UNIT-II

C language variables and data types, Syntax and Logical Errors in compilation, object and executable code. Operator (arithmetic, relational, logical, bitwise operator) and Precedence, Conditional Branching and Loops.

UNIT-III

Arrays, Arrays (1-D, 2-D), Character arrays and Strings, Structures, defining structures and Array of Structures, Pointers, Idea of pointers, defining pointers, Use of Pointers in self- referential structures, notion of linked list (no implementation), Function, Functions (including using built in libraries), Parameter passing in functions, call by value.

UNIT-IV

Idea of call by reference, Recursion, Recursion as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, File handling in different mode

Suggested Books:

- Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill.
- E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill.
- Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India.

Note: An approved question paper template is to be provided to the paper setter.

B23-ESC-105	Programming for Problem Solving Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Internal Assessment**	**Practical Exam**	**Total**	**Time (hrs.)**
-	-	2	1	40	60	100	3
Purpose	To understand the various steps in program development, syntax of C programming language and usage of structured programming approach in solving problems.						
CO1	To familiarize with programming environment						
CO2	To solve problems involving if-then-else structures						
CO3	To define and declare simple functions to add, multiply etc						
CO4	To call recursive functions and implement factorial, Fibonacci series						

LIST OF EXPERIMENTS

1. To familiarize with programming environment
2. Simple computational problems using arithmetic expressions
3. Problems involving if-then-else structures
4. Iterative problems (e.g., sum of series)
5. 1D Array manipulation
6. Matrix problems (Addition and Multiplication)
7. String operations
8. Simple functions to add, multiply etc...
9. Programming for solving Numerical methods problems
10. Recursive functions factorial, Fibonacci series
11. Pointers and structures
12. File operations (to read from file and write into file)

Note: At least 9 experiments to be performed during the semester.

B23-BSC-114	Engineering Chemistry Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical Exam**	**Internal Assessment**	**Total**	**Time (hrs.)**
-	-	2	1	60	40	100	3
Purpose	To acquaint the students with the knowledge of basic phenomenon/practicals of chemistry						
CO1	To make the students familiar with the titrametric methods for analysing strength of given sample						
CO2	To give exposure and training to handle different instruments used in various experiments of chemistry required in engineering/technological field						

Choice of 10-12 experiments from the following:

1. Determination of surface tension of a given liquid by drop number method using Stalagmometer.
2. Determination of relative viscosity by Ostwald viscometer.
3. Determination of viscosity of lubricating oil by Redwood Viscometer.
4. To synthesise drug molecule (Aspirin/ Paracetamol)
5. Determination of refractive index of given organic liquid by Abbe's refractometer.
6. Determination of flash point and fire point of oil by Pensky Martin appratus.
7. Determination of amount of Na and K in given water sample by Flame photometer.
8. Determination of strength of given Hydrochloric acid solution by titrating it with NaOH solution conduct metrically.
9. Determination of strength of given Hydrochloric acid solution by titrating it with NaOH solution using pH meter.
10. Determination of concentration of given sample of KMnO4 using spectrophotometer.
11. Determination of alkalinity of a given water sample.
12. Determination of Calcium and Magnesium hardness by EDTA method.
13. Determination of Chloride content in given water sample.
14. Determination of amount of dissolved oxygen in given water sample by Winkler'smethod.
15. Determination of total iron content present in a given iron ore solution by using KMnO4 as oxidising agent.
16. Determination of partition co-efficient of Iodine in carbon tetrachloride and water.
17. To check the presence of a given compound in a mixture using thin layer chromatography.

Books:

- Engineering Chemistry with laboratory experiments by M. S. Kaurav, PHI learning Private ltd.
- AICTE's Prescribed Textbook: Chemistry – I with Lab Manual, Khanna Book Publishing

B23-BSC-106	BIOLOGY						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time (hrs.)**
3	-	-	3	70	30	100	3
Purpose	To familiarize the students with the basics of Biology and Biotechnology						
CO1	Introduction to Living world, Cell & Organisms.						
CO2	Introduction to Biomolecules and Biocatalyst						
CO3	Introduction of basic Concept of Genetics.						
CO4	Introduction of basic Concept of Genetic Engineering, & Role of Biology in Different fields						

Unit – I

Introduction to living world: Concept and definition of Biology; Importance of biology in major discoveries of life Characteristic features of living organisms; Cell ultra-structure and functions of cell organelles like nucleus and endoplasmic reticulum. Difference between prokaryotic and eukaryotic cell. Difference between animal and plant cell.

Classification of Organisms: Classification of the organisms on the basis of Energy, Carbon Utilization, Nitrogen Excretion and Habitat.

Unit-II

Introduction to Biomolecules: Definition, general classification and important functions of carbohydrates, lipids, proteins, nucleic acids & Enzymes.

Enzymes as Biocatalysts: General characteristics, nomenclature and classification of Enzymes. Effect of temperature, pH and substrate concentrations on the activity of enzymes. Elementary concept of coenzymes. Mechanism of enzyme action.

Unit-III

Genetics: -Mendel's laws of inheritance, Cell Division- Mitosis & meiosis, Genetic Disorders: Single gene & Multiple genes disorders in human.

Human Traits: Genetics of blood groups, Diabetes Type I & II.

Unit-IV

Concepts of Genetic Engineering: Definition; Tools used in recombinant DNA Technology: Enzymes, Vectors & Passenger DNA.Role of Biology: Role of Biology in Agriculture, Medicine, Forensic science & Bioinformatics.

Suggested Books:

- Introduction to Biotechnology, By Deswal & Deswal, Dhanpat Rai Publications N.A
- Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2014.
- E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.
- D. L. Nelson and M. M. Cox, "Principles of Biochemistry", W.H. Freeman and Company, 2012.
- G. S. Stent and R. Calendar, "Molecular Genetics", Freeman and company, 1978.
- Molecular Biology of cell, 4th ed. Alberts, Bruce et al. Garland Science Publishing, New York.
- Microbiology. Pelczar Jr., M.J.; Chan, E.C.S. and Krieg, N.R. Tata McGraw Hill, New Delhi.
- Lehninger: Principles of Biochemistry, 3rd edition, by David L. Nelson and M.M. Cox. Maxmillan/ Worth publishers.
- Genetics by Snusted& Simmons.
- Molecular Biotechnology: Principles Application of Recombinant DNA. Glick, B. R. and Pasternak, J. J. ASM press Washington DC.

- Kuby's Immunology, Goldsby, R. A. Kindt, T.J, Osborne, B.A. (2003) W. H. Freeman and company, New York.
- Recombinant DNA 2nd Edition. Watson, James D. and Gilman, M. (2001) W.H Freeman and Company, NewYork.

Note: The paper setter will set the paper as per the question paper templates provided

B23-ESC- 107	Manufacturing Processes Workshop						
Lecture	**Tutorial**	**Practical**	**Credit**	**Internal Assessment**	**Practical Exam**	**Total**	**Time (hrs.)**
-	-	4	2	40	60	100	3
Purpose	To make student gain a hands-on work experience in a typical manufacturing industry environment.						
CO1	Students will be explained different manufacturing operations used in industries and work on CNC machine and 3D printer.						
CO2	Students will be able to know operations and working in Fitting shop and Electrical and Electronics shops.						
CO3	Students will be able to perform on Carpentry operations.						
CO4	Students will be able to explain metal casting and welding jobs operations.						

List of Experiments

A) Manufacturing Operations.

1. To study various manufacturing methods.
2. To study different machine tools used in manufacturing industries.
3. To prepare a job on a lathe involving facing, outside turning taper turning, step turning, radius making and parting-off. (Practice)
4. To prepare a job involving side and face milling on a milling machine. (Practice)

B) CNC machining, Additive manufacturing.

1. To study basics of CNC Machine tool.
2. To study the basics of additive manufacturing.
3. To write and simulate CNC Part program for a CNC Milling machine. (Practice)
4. To write and simulate CNC Part program for a CNC Turning machine. (Practice)
5. Modelling and converting CAD models into STL files, and Fabrication of one simple component using 3D printer from CAD models using polymers. (Practice).

C) Fitting operations.

1. To Study various Fitting operations and tools used in Fitting shop.
2. To make a V-groove and V-notch in MS flat. (Practice)

D) Electrical and Electronics operations.

1. To study basics of house wiring
2. To Make an electrical connection to demonstrate domestic voltage and current sharing. (Practice)
3. To perform Soldering of a resistor on a PCB. (Practice)

E) Carpentry operations.

1. To study steps various tools used in Carpentry shop.
2. To make wooden halving joint (or Cross-Joint) of soft wood. (Practice)

F) Metal Casting operations.

1. To study various components of Sand Mould and operations involved in the casting process used in Foundry shop.
2. To test different properties of Sand mould. (Practice)

G) Welding operations.

1. To study various processes and tools used in welding shop.
2. To make a Butt joint using the given two M.S pieces by arc welding. (Practice)
3. To make a Lap joint using the given two M.S pieces by arc welding. (Practice)

Note: At least one experiment may be performed from each of the categories from A to G (Preferably from Practice type). In total at least 8 experiments need to be performed by the students.

Suggested Books:

- Workshop / Manufacturing Practices (with Lab Manual) by Veerana D.K(AICTE Prescribed Text book as per model curriculum)
- Veerana D. K. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology",7th edition, Pearson Education India Edition.
- Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.
- Gowri P. Hariharan and A. Suresh Babu," Manufacturing Technology – I" Pearson Education, 2008.
- Roy A. Lindberg, "Processes and Materials of Manufacture" , 4th edition, Prentice Hall India, 1998
- Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw-Hill House, 2017.

B23-HSM-101	Universal Human Values II: Understanding Harmony and Ethical Human Conduct						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time (hrs.)**
3	-	-	3	70	30	100	3
Purpose	Purpose and motivation for the course, recapitulation from Universal Human Values-I						
CO1	To enable the students, appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings						
CO2	To facilitate the development of a Holistic perspective among students towards life and Profession as well as towards happiness and prosperity based on a correct understanding of the Human reality and the rest of existence						
CO3	To develop understanding Harmony in the Family and Society and the Vision for the Universal Human Order						
CO4	To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behavior and mutually enriching interaction with Nature.						

Unit 1

Course Introduction - Need, Basic Guidelines, Content and Process for Value Education

Right Understanding, Relationship and Physical Facility (Holistic Development and the Role of Education), Understanding Value Education, Self-exploration as the Process for Value Education; Continuous Happiness and Prosperity- A look at Basic Human Aspirations; current scenario, Method to fulfil the Basic Human Aspirations; concept of natural acceptance and ways to explore it.

Unit 2

Understanding Harmony in the Human Being

Understanding human being as a co-existence of the Self and Body;
Understanding, exploring and distinguishing between the needs of Self and Body, Understanding the Body as an instrument of Self; Understanding Harmony in the Self, Exploring Sources of Imagination in the Self, Harmony of the Self with the Body, Program to ensure self- regulation and Health, Exploring Harmony of Self with the Body

Unit 3

Understanding Harmony in the Family and Society

Harmony in the Family – the Basic Unit of Human Interaction, 'Trust' – the Foundational Value in Relationship, Exploring the Feeling of Trust, 'Respect' – as the Right Evaluation, Exploring the Feeling of Respect, Other Feelings, Justice in Human-to- Human Relationship, Understanding Harmony in the Society, Vision for the Universal Human Order, Exploring Systems to fulfill Human Goals.

Unit 4

Understanding Harmony in the Nature and Existence, Implications of the Holistic Understanding – a Look at Professional Ethics:

Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Exploring the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, the Holistic Perception of Harmony in Existence, Exploring Co-existence in Existence. Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, Exploring Ethical Human Conduct, A Basis for

Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Exploring Humanistic Models in Education, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession, Exploring Steps of Transition towards Universal Human Order.

Suggested Books:

- The Textbook - A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93- 87034-47-1
- The Teacher's Manual- Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53.
- Professional Ethics and Human Values, Premvir Kapoor, ISBN: 978-93-86173-652, Khanna Book Publishing Company, New Delhi, 2022.
- JeevanVidya, Ek Parichaya, A Nagaraj, JeevanVidya Prakashan, Amarkantak, 1999.
- Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
- The Story of Stuff (Book).
- The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.
- Small is Beautiful - E. F Schumacher.
- Slow is Beautiful - Cecile Andrews.
- Economy of Permanence - J C Kumarappa.
- Bharat Mein Angreji Raj – Pandit Sunderlal.
- Rediscovering India - by Dharampal
- Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
- India Wins Freedom - Maulana Abdul Kalam Azad
- Vivekananda - Romain Rolland (English)

Note: The paper setter will set the paper as per the question paper templates provided.

B23-ESC- 102	ENGINEERING GRAPHICS AND DESIGN						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time (hrs.)**
1	-	-	1	70	30	100	3
Purpose	To draw and interpret various projections of 1D, 2D and 3D objects. To understand the basics of AUTOCAD and perform exercises.						
CO1	Students will be able to draw the projections of points and straight lines						
CO2	Students will be able to understand and draw the projections of planes and regular solids.						
CO3	Students will be able to understand the sectioning of solids and development of surfaces.						
CO4	Students will be able to draw the isometric projections and know different commands used in AUTOCAD.						

UNIT-I

Introduction, Projection of Points:

Introduction to Engineering Equipment's, Elements of Engineering Drawing, Types of Lines, Various types of projections, First and third angle systems of orthographic projections.

Projections of points in different quadrants.

Projections of straight lines – parallel to one or both reference planes, contained by one or both planes, perpendicular to one of the planes, inclined to one plane but parallel to the other plane, inclined to both the planes, true length of a line and its inclinations with reference planes, traces of a line.

UNIT-II

Projection of planes:

Introduction, types of planes, Projection of planes by change of position method only, projection of plane perpendicular to a plane, with axis parallel to both planes, with axis parallel to one plane and inclined to the other plane.

Projection of Regular Solids:

Types of solids, Projections of Polyhedra Solids and Solids of Revolution – in simple positions with axis perpendicular to a plane, with axis parallel to both planes, with axis parallel to one plane and inclined to the other.

UNIT-III

Sections and Sectional Views of Right Regular Solids:

Sectional views of simple right regular solids like prism, pyramid, Cylinder and Cone.

Development of Surfaces:

Development of surfaces of Right Regular Solids-Prism, Pyramid, Cylinder and Cone;

UNIT-IV

Isometric/Orthographic Projections and CAD commands:

Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions;
Solid works basics; Basic Commands: Line, Point, Rectangle, Polygon, Circle, Arc, Ellipse, Polyline
Basic editing Commands: Extrude Bose, Revolve Bose, Copy, Offset, Fillet, Chamfer, Trim, Extend, Mirror
Display Commands: Zoom, Pan, Redraw, and Regenerate Simple dimensioning and text, simple exercises.

Suggested Books:

- Engineering Graphics using AUTOCAD 2000: T. Jeyapoovan, Vikas Publishing House.
- Machine Drawing: Dr Basudeb Bhattacharyya, Oxford University Press, New Delhi
- Engineering Drawing: Amar Pathak, Dreamtech Press, New Delhi.
- Engineering Drawing: Plane and Solid Geometry: N.D. Bhatt and V.M. Panchal, Charotar Publishing House.
- Thomas E. French, Charles J. Vierck, Robert J. Foster, "Engineering drawing and graphic technology", McGraw Hill International Editions.
- Engineering Graphics and Drafting: P.S. Gill, Millennium Edition, S.K. Katariaand Sons.
- A Primer on Computer aided Engineering Drawing-2006, published by VTU, Belgaum.

B23-ESC-106	Engineering Graphics and Design Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Internal Assessment**	**Practical Exam**	**Total**	**Time (hrs.)**
-	-	4	2	40	60	100	3
Purpose	To make student practice on engineering graphics and design software and provide exposure to the visual aspects of engineering design.						
CO1	Students will be able to understand the user interface and toolboxes in Solidworks software.						
CO2	Students will be able to customize settings of SolidWorks software and produce 2D drawings using SolidWorks.						
CO3	Students will be able to practice & learn performing various operations in SolidWorks and create 3D designs.						
CO4	Students will be able to make assembly and create a simple design project.						

Module 1: Overview of SolidWorks:

Listing the computer technologies that impact on graphical communication, Demonstrating Knowledge of the theory of SolidWorks software: the Menu Bar; the SOLIDWORKS Menus; Quick Access Tools; Command Manager; Feature Manager Design Tree; Heads-Up View Toolbar; Graphics Area; Task Pane; Status Bar; Quick Access Tools; The name of the currently open file; The search prompt (search Commands, Help, Files etc.); User login credentials; SOLIDWORKS Help; Application window options (minimize, maximize, close).

Module 2: Customization & SolidWorks Drawing in 2D:

Setup of the drawing page and the printer, including scale settings, setting up of document units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Trim entities; convert entities.

Sketch; Evaluate; SOLIDWORKS Add-Ins; Producing drawings by using various coordinate input entry methods to draw line, rectangle, circle, slots, arcs, conic sections, spline, polygons etc; smart dimensions; applying annotations to drawings; modifying various entities (viz line, rectangle, circle, slots, arcs, conic sections, spline, polygons etc.); 2D Fillet and chamfer; 2D mirror; linear sketch pattern.

Module 3: Miscellaneous operations and 3D designs:

Drawing; Annotation; Sketch; Markup; Evaluate; SOLIDWORKS Add-Ins; Sheet Format; Features (or Assembly, in an Assembly file); 3D entities (boss and cuts): Extrude boss/base/cut, revolve boss/base/cut, swept boss/base/ cut, Lofted boss/base/cut, Boundary boss/base/cut; 3D Fillet and Chamfer; 3D mirror; 3D linear and circular patterns; reference geometry.

Module4: Assembly & creating a simple design project:

Drawing annotation, Solidworks modeling of parts and assemblies; Geometry and topology of engineered components: creation of engineering models and their presentation in standard 3D; Use of SolidWorks software for creating parts and assemblies: Wheel support assembly, V- Block assembly etc. Applying colour coding to parts and assemblies; meshed topologies for engineering analysis and tool-path generation for component manufacture; geometric dimensioning and tolerancing.

Suggested Books:

- Beginner's Guide to SOLIDWORKS 2021 - Level II: Sheet Metal, Top Down Design, Weldments, Surfacing and Molds 1st Edition - by Alejandro Reyes; SDC Publications; 1st edition (March 4, 2021).
- SOLIDWORKS 2021: A Step-By-Step Tutorial Guide for Beginners (Mixed Units) - by SDCAD Academy.
- SOLIDWORKS 2019: A Power Guide for Beginners and Intermediate User Paperback –
- March 6, 2019 by CADArtifex, John Willis, Sandeep Dogra.
- Solidworks for Beginners: Getting Started with Solidworks Learn by Doing New Edition 2018 Paperback – October 8, 2018 by Arsath Natheem.

B23-ESC-103	Basic Electrical and Electronics Engineering						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time (hrs.)**
3	1	`-	4	70	30	100	3
CO1	Deals with DC networks, AC fundamentals & AC response of RLC circuits.						
CO2	Deals with introductory Balanced Three Phase Power System analysis, magnetic circuits and Single-Phase Transformer.						
CO3	Explains the Basics of Electrical Machines (AC/DC).						
CO4	Study of Introduction to Analog Electronics & Digital Electronics Fundamentals.						

UNIT-I

Review of D.C. circuits: Ohm's Law, junction, node, circuit elements classification: Linear & nonlinear, active & passive, lumped & distributed, unilateral & bilateral with examples. KVL, KCL, Nodal analysis, Star-Delta transformation of set of resistors.

DC Network Theorems: Superposition, Thevenin's, Norton's theorems in DC networks containing both voltage and current sources and Maximum power transfer theorem in a resistive network.

AC Fundamentals & AC Circuit: AC signal, Average and RMS values of sinusoidal AC, polar & rectangular form of representation phasor quantities. Addition & subtraction of two or more phasor sinusoidal quantities using the component resolution method. Steady-state AC response of R/L/C, RL, RC series ckts, P.F., active, reactive & apparent power. Qualitative analysis of Frequency response of series & parallel RLC circuit.

UNIT-II

Balanced 3-Phase AC Circuits: Advantages of 3-phase system, Star and Delta connections and their Line and Phase voltage/current relationships, three-phase power & its measurement using the 2-wattmeter method.

Single phase transformer (only qualitative analysis): MMF, Reluctance and flux flow in a magnetic circuit.

Transformer: Principle – Construction - Emf equation - Phasor diagram and Equivalent Circuit, Losses in a transformer, Maximum efficiency condition, OC/SC Test & direct load test.

UNIT-III (Only Qualitative Analysis)

Principle of Dynamo for generation of AC. Relation between synchronous speed, number of field poles and frequency. Principle of motoring. Torque & Mechanical Power developed at a rotating shaft & B.H.P.

DC Machines: Constructional parts & principles of working of DC Machines, Generated and back EMF, Types of DC machines, Speed Control of DC shunt Motor, applications.

3-Phase Induction Motor: Basic working principle & construction of a 3- phase Induction motor, slip & advantages. Phase sequence and its importance.

Synchronous Machines: Basic principle of working of Alternator and synchronous motor.

UNIT-IV

Analog Electronics Basics (Only Qualitative Analysis): PN junction diode characteristics: forward and reverse bias, breakdown – barrier potential, Zener diode, Basic Rectifier circuits: half wave and full wave, Introduction to BJT: characteristics curve and region of operation.

Digital Fundamentals: Diode as a binary switch, decimal to binary number representation, addition subtraction and basic Boolean algebra, Basic Logic Gates with truth table.

Suggested Books:

1. Basic Electrical Engg: A complete Solution by Vijay Kumar Garg, Wiley India Ltd.
2. Electrical Engg. Fundamentals by Rajendra Prasad, PHI Pub.
3. Basic Electrical and Electronics Engg. by S.K. Sahdev, Dhanpat Rai & Co./Pearson.
4. A.K. Maini, Digital Electronics, Wiley India

Note: An approved question paper template is to be provided to the paper setter.

B23-ESC-108	Basic Electrical and Electronics Engineering Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Internal Assessment**	**Practical Exam**	**Total**	**Time (hrs.)**
-	-	2	1	40	60	100	3
Purpose	To familiarize the students with introductory Electrical & Electronics Engineering practicals.						
CO1	Deals with various DC network theorems to analyse linear circuits. Deals with the steady-state frequency response of RLC circuit parameters solution techniques						
CO2	Deals with introductory Single-Phase Transformer & 3 phase power measurement practicals						
CO3	Deals with the introductory practicals of various types of motors.						
CO4	Deals with various introductory experiments w.r.t Analog & Digital Electronics.						

LIST OF EXPERIMENTS LIST-I

1. To verify KVL and KCL.
2. To verify the Superposition theorem on a linear circuit with at least one voltage & one current source.
3. To verify Thevenin's Theorem on a linear circuit with at least one voltage & one current source.
4. To verify Norton's Theorem on a linear circuit with at least one voltage & one current source.
5. To study frequency response characteristics of a series R-L-C circuit on CRO and determine BW, resonant frequency & maximum current.
6. To study frequency response characteristics of a parallel R-L-C circuit on CRO and determine resonant frequency & minimum current.
7. To perform O.C. and S.C. tests on a single-phase transformer.
8. To perform a direct load test on a single-phase transformer and plot load v/s efficiency characteristics.
9. Measurement of power of a 3-phase balanced load by two-wattmeter method.
10. To perform speed control of the DC shunt motor.
11. To study cut-section models of various generators and motors.
12. To perform starting & reversal of direction of a three-phase induction motor.
13. Starting and running of a 3-phase synchronous motor.
14. To study various Safety measures: Need of Earthing, prevention & precautions against electric shock and electric hazards, shock treatment. General Precautions followed in performing practicals in BEEE Lab.

LIST-II

1. To study the VI characteristics of the p-n diode in forward and reverse bias and find the threshold voltage from the VI curve.
2. To study the operation of half-wave and full-wave rectifiers and observe the output waveform.
3. To experimentally plot the input and output characteristics of a given BJT transistor in CE/CB/CC configuration.
4. Study and realization of Logic gates AND, OR, NOT, NAND, NOR, EX-OR, EX- NOR (any four).

Note: At least 7 experiments from the List - I & 2 experiments from the List -II to be performed during the semester.

B23-BSC-105	Chemistry						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time (hrs.)**
3	1	0	4	70	30	100	3
Purpose	To acquaint the students with the basic phenomenon/concepts of chemistry, the student faces during course of their study in the industry and Engineering field						
CO1	An insight into atomic and molecular orbital and bonding in molecules						
CO2	Knowledge of basic concept of spectroscopic techniques for identification of molecules						
CO3	To understand basics of thermodynamics and periodic properties						
CO4	To understand basics of stereochemistry and various organic reactions						

UNIT -I

Molecular orbitals of diatomic molecules. Equations for atomic and molecular orbitals. Energy level diagrams of diatomic molecules (O2, N2, CO, NO, CN, HCl and HF). Pi-molecular orbitals of butadiene. Concept of aromaticity. Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties. Band structure of solids and the role of doping on band structures.

UNIT -II

Spectroscopic techniques and applications: Principles of spectroscopy and selection rules. Electronic spectroscopy. Fluorescence and its applications in medicine. Vibrational spectroscopy and its applications. Nuclear magnetic resonance and magnetic resonance imaging, surface characterization techniques. Diffraction and scattering.

UNIT -III

Ionic, dipolar and van Der Waals interactions. Equations of state of real gases and critical phenomena. Thermodynamic functions: Internal energy, entropy and free energy. Estimations of entropy and free energies. Free energy and EMF. Cell potentials, the Nernst equation and its applications. Periodic properties - Effective nuclear charge, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries of CCl4, PCl5, H2O, NH3, SF6, IF7 (as per VSEPR theory). Hard soft acids and bases.

UNIT - IV

Stereochemistry: Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis (Ethane, Butane and cyclohexane).

Organic reactions: Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings.

Suggested Books:

- AICTE's Prescribed Textbook: Chemistry – I with Lab Manual, Khanna Book Publishing.
- Engineering Chemistry, by Manisha Agrawal.
- University chemistry, by B. H. Mahan.
- Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane.
- Fundamentals of Molecular Spectroscopy, by C. N. Banwell.
- Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan. AICTE Model Curriculum for UG Degree Course in Computer Science and Engineering 54
- Physical Chemistry, by P. W. Atkins.

B23-BSC-109	APPLIED MATHEMATICS-I						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time (hrs.)**
3	1	-	4	70	30	100	3
Purpose	This course aims to acquaint Biotechnology Engineers with fundamental concepts and tools in Limit, Continuity, Differential & Integral Calculus, and Complex Numbers, enabling them to progressively develop their mathematical proficiency for tackling advanced mathematical principles and applications relevant to their field.						
CO1	To introduce the idea of sets, relations, functions, trigonometric functions, inverse trigonometric functions, these concepts are prerequisite to learn the concepts of differentiation and integration.						
CO2	To introduce the Complex numbers which is fundamental to solve any kind of quadratic equations, Limit is precondition to understand the concept of rate of change and derivative.						
CO3	To develop the essential tool of Continuity and Differentiability needed in evaluating higher order derivatives of functions.						
CO4	To introduce the tools of Indefinite and Definite integrals of functions in a comprehensive manner that are used in various techniques dealing engineering problems.						

UNIT-I

Sets, Relations, Functions

Sets and its types: Operations on sets, complement of a set, Cartesian Product of sets, relations , functions, types of functions, Trigonometric functions: Introduction, Trigonometric functions, Trigonometric functions of sum and difference of two angles, Trigonometric equations, Inverse Trigonometric functions: Introduction, basic concepts and its properties.

UNIT-II

Pre-Calculus

Complex Numbers: Introduction, Algebra of Complex Numbers, Modulus and the conjugate of a complex number, quadratic equations,

Limits and Derivatives: Introduction, Limits, Limits of Trigonometric Functions, Derivatives (single variable).

UNIT-III

Differential Calculus

Continuity and Differentiability: Introduction, Continuity, Differentiability, Exponential and Logarithmic functions, Logarithmic differentiation, Derivatives of functions in parametric forms, second order derivatives, Application of Derivatives (single variable): Increasing and decreasing functions, Maxima and Minima.

UNIT-IV

Integral Calculus

Integrals: Introduction, Integration as an Inverse process of Differentiation, Method of Integration, Integration by Partial Fractions, Integration by Parts, Definite Integrals: Fundamental theorem of Calculus, Evaluation of Definite Integrals by Substitution, properties of Definite Integrals.

Suggested Books:

- G. B. Thomas, R. L. Finney: Calculus and Analytic Geometry, Pearson Education.
- Mathematics Textbook for Class 11th& 12th by NCERT.
- Howard Anton: Calculus, Wiley Publication.
- B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2023

Note: The paper setter will set the paper as per the question paper templates provided.

B23-BSC-103	Applied Physics						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time (hrs.)**
3	1	-	4	70	30	100	3
Purpose	To introduce the basics of physics to the students for applications in Engineering field.						
CO1	Introduce the fundamentals of interference and diffraction and their applications.						
CO2	To make the students aware of the importance of polarization and Ultrasonics.						
CO3	Introduce the basics concepts of laser and its applications.						
CO4	To familiarize with concepts of nuclear radiations and its biological effects.						

Unit I

Interference: Principle of Superposition, Conditions for interference, Division of wave-front: Fresnel's Biprism and Applications, Division of amplitude: Wedge-shaped film, Newton's rings and Applications, Michelson Interferometer and Applications.

Diffraction: Types of diffraction, Fraunhofer diffraction at a single slit, Intensity distributiondue diffraction grating, determination of wavelength; Dispersive power and resolving power of diffraction grating.

Unit II

Polarization: Polarization of transverse waves, Plane of polarization, Polarization by reflection, Double refraction, Nicol Prism, Quarter and half wave plate, Specific Rotation, Laurent 's half shade polarimeter, Biquartz polarimeter.

Ultrasonics: Ultrasonic waves, Properties of ultrasonic waves, Production of ultrasonic waves: Magnetostriction and Piezoelectric methods, Detection of ultrasonic waves, Measurement of velocity of ultrasonic waves, Applications of ultrasonic waves.

Unit III

Laser: 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, CO2), solid-state lasers (ruby, Neodymium), dye lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, applications of lasers in science, engineering and medicine.

Unit IV

Nuclear radiations and its Biological Effects: Classification of nuclear radiations, Interaction of charged particle (light and heavy) and gamma radiations with matter (basic concepts), Dosimetric units, Relative Biological Effectiveness (RBE), Typical doses from commons sources in the environment, Biological Effects, Maximum Permissible Dose, (MPD), Shielding, Radiation safety in the nuclear radiation laboratory. Biomaterials: Introduction, Classification of biomaterials, Applications.

Suggested Books:

- Applied Physics for Engineers, Wiley India Pvt. Ltd.
- Concepts of Modern Physics (5th edition), Tata McGraw-Hill Publishing Company Limited.
- A Textbook of Optics, S. Chand & Company Ltd.
- Techniques for Nuclear and Particle Physics Experiments: A How-to Approach, Springer-Verlag.
- Introduction to Nuclear and Particle Physics, PHI Learning Private Limited.
- Biomaterials: The intersection of Biology and Materials Science, Pearson, New Delhi.

Note: The paper setter will set the paper as per the question paper templates provided.

B23-BSC-113	Applied Physics Lab						
Lecture	**Tutorial**	**Practical**	**Credit**	**Practical Exam**	**Internal Assessment**	**Total**	**Time (hrs.)**
-	-	2	1	60	40	100	3
Purpose	To impart the knowledge of basic concepts of Physics in Engineering.						
CO1	To make the students familiar with the experiments related with interference and diffraction.						
CO2	To understand the basic phenomenon of polarization and ultrasonic						
CO3	To impart the practical knowledge of the experiments related with resistance using different methods						

Note: Student will be required to perform at least 10 experiments out of the following list.

1. To find the wavelength of monochromatic light by Newton's ring experiment.
2. To find the wavelength of sodium light by Michelson's interferometer.
3. To find the resolving power of telescope.
4. To find the wavelength of sodium light using Fresnel bi-prism.
5. To find the wavelength of various colours of white light with the help of plane transmission diffraction grating.
6. To find the specific rotation of sugar solution by using a Polarimeter.
7. To find the frequency of ultrasonic waves by piezoelectric methods
8. To verify Newton's formula and hence to find the focal length of the given convex lens.
9. To find the frequency of A.C. mains by using Sonometer and horse shoe magnet.
10. To find the resistance of a galvanometer by post office box.
11. To find low resistance by Carrey-Foster bridge.
12. To find the value of high resistance by substitution method.
13. To compare the capacitances of two capacitors by De-Sauty's bridge and hence to find the dielectric constantof a medium.
14. To convert a galvanometer into an ammeter of desired range and verify the same.

Suggested Books:

- C.L. Arora, B. Sc. Practical Physics, S. Chand.
- B.L. Worshnop and H, T, Flint, Advanced Practical Physics, KPH.
- S.L. Gupta & V. Kumar, Practical Physics, Pragati Prakashan.

B23-BSC-110	APPLIED MATHEMATICS-II						
Lecture	**Tutorial**	**Practical**	**Credit**	**End Semester Exam**	**Internal Assessment**	**Total**	**Time (hrs.)**
3	1	-	4	70	30	100	3
Purpose	This course aims to equip the students with standard concepts and tools that will serve them well towards tackling more advanced level of mathematics while familiarizing them with essential tool of linear algebra, solution of differential equation, utility of higher order derivatives in engineering domain. More precisely, the objectives are as under:						
CO1	To introduce the essential tool of matrices and linear algebra in a comprehensive manner to solve the large system of linear equations.						
CO2	To introduce effective mathematical tools for the solutions of first order differential equations that model physical processes.						
CO3	To develop the way to solve the ordinary differential equation with higher orders.						
CO4	To extend some concept of differential calculus for more than one variable.						

UNIT-I

Linear Algebra:

Introduction to matrices, its types, algebraic operations, transpose, determinant, minors and adjoint of a matrix. Elementary transformations, Inverse of a square matrix: Cramer's rule, Rank of a matrix, elementary matrices, Gauss Jordon method to find inverse using elementary transformations.

System of Linear equations: General representation, Homogeneous and Non-homogeneous system of linear equations, Consistency of linear system of equations, Gauss Elimination method to solve the system of linear equations.

UNIT-II

First order Ordinary differential equations:

Introduction, order and degree of the differential equation, Formation of differential equation, Solution of the differential equation, Solution of the differential equation with variables separable and differential equations reducible to variable separable form, exact differential equation, and equations reducible to exact differential equations, linear and Bernoulli's equations.

UNIT-III

Ordinary differential equations of higher orders

Introduction, complementary function, particular integrals, solution of second and third order linear differential equations with constant coefficients.

UNIT-IV

Multivariable Calculus:

Partial derivatives, Total differential, Chain rule for differentiation, Partial derivatives of higher orders, Homogeneous functions, Euler's theorem on homogeneous functions, differentiation of an implicit function, Jacobian, Maxima and minima of a function of two variables, Lagrange's method of undetermined multipliers.

Suggested Books:

- G. B. Thomas, R. L. Finney: Calculus and Analytic Geometry, Pearson Education.
- H. Anton, Irl C Bivens, Stephen Davis: Calculus 10th Edition, John Wiley & Sons.
- E. Kreyszig: Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
- E. Kreyszig and S. Ahuja, Applied Mathematics-II, Wiley India Publication, Reprint 2015.
- Srimanta Pal and Subodh C. Bhunia, Engineering Mathematics, Oxford University Press.
- Mathematics Textbook for Class 11th& 12th by NCERT.
- B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 2023

Note: The paper setter will set the paper as per the question paper templates provided.

ATU-202	Environmental Sciences						
Lecture	**Tutorial**	**Practical**	**Credit**	**Major Test**	**Minor Test**	**Total**	**Time (hrs.)**
3	-	-	-	75	25	100	3
Purpose	To learn the multidisciplinary nature, scope and importance of Environmental sciences.						
CO1	Students will be able to learn the importance of natural resources.						
CO2	To learn the of structure and functions of ecosystems.						
CO3	Will be able to understand the biodiversity and its conservation methods.						
CO4	The students will be able to understand the relation between human population and environment.						

UNIT- I

The Multidisciplinary nature of environmental studies: Definition; Scope and Importance, Need for public awareness.

Natural resources and associated problems. Forest resources: Use and Over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests 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

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).

Biodiversity and its 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. India as a mega-diversity nation. Hot-spots 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-III

Environmental Pollution: Definition- Causes, 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.

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-IV

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. Drugs and their effects; Useful and harmful drugs; Use and abuse of drugs; Stimulant and depressant drugs. Concept of drug de-addiction. Legal position on drugs and laws related to drugs. Case Studies.

Field Work (Practical). Visit to a local area to document environmental assets-river/forest/grassland/ hill/mountain. Visit to a local polluted site-Urban/Rural/Industrial/Agricultural. Study of common plants, insects, birds. Study of simple ecosystems-pond, river, hill slopes, etc. (Field work equal to 5 lecture hours).

Suggested Books:

- Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
- BharuchaErach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad -380013, India, Email: mapin@icenet. net (R).
- Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p.
- Clerk B.S., Marine Pollution, Clanderson Pross Oxford (TB).
- Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T.2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p.
- De A.K., Environmental Chemistry, Wiley Eastern Ltd.
- Down to Earth, Centre for Science and Environment (R).

Note: The Examiner will be given the question paper template and will have to set the question paper according to the template provided along with the syllabus.