

**Annexure – III**  
**Basket of Open Electives (OE)**

**GE/OE Basket Semester I**  
**Faculty of Science and Technology**

Sem.	Course Category		Name of Course	BoS	Course code
<b>I</b>	<b>GE/OE</b>	1	Bio fertilisers, bio-pesticides and composting	Botany	<b>BGO1T01</b>
		2	Food Biochemistry	Biochemistry	
		3	Biotechnology and Human Welfare	Biotechnology	
		4	Computer fundamentals	Computer Science/Computer Application	
		5	Basic Electronics Components & Instruments	Electronics	
		6	Environmental Conservation Movements	Environmental Science	
		7	A. Introduction to Sports Forensics / B. Toxicology in Everyday Life / C. Optics and Optical Instruments / D. General Instruments in Forensic Biology / E. Psychology of Health & Well Being-I (Psychology)/ F. Computer Fundamentals/ G. Crime and Criminal Behaviour (Law)	Forensic Science	
		8	Topographic Map Reading	Geology	
		9	Quantitative aptitude	Mathematics	
		10	Introduction and scope of Microbiology	Microbiology	
		11	Space Science	Physics	
		12	Elementary Descriptive Statistics	Statistics	
		13	Human anatomy and physiology	Zoology	
			Indian birds	Zoology	
		14	Physical Chemistry	Cosmetic Technology	
		15	Computer Basics	Fashion Design	
		16	Computer Basics	Textile Science	
		17	Food Adulteration	Chemistry	
		18	Mathematics I	Interior Design	
19F	Engineering Mathematics I	Applied Electronics & Software Technology			

<b>B. Sc. Semester-I</b>			
<b>GE / OE-1 Botany (BGO1T01)</b>			
<b>Bio-fertilizers, Bio-pesticides and Composting</b>			
<b>GE/OE-I Theory</b>	<b>Hours: 2 Hours/Week</b>	<b>Marks: 80+20=100</b>	<b>Credit: 2</b>
<b>Unit-I</b>			
1. <b>Biofertilizers:</b> Definition, scope and importance 2. Classification of Biofertilizers on basis of organisms 3. Biological Nitrogen Fixation 4. Plant Growth Promoting Rhizobacteria (PGPR)			7.5 Hrs.
<b>Unit-II</b>			
1. <b>Microbes:</b> Various microbes used as Biofertilizers 2. Commercial production of Biofertilizers: <i>Rhizobium</i> , <i>Azotobactor</i> , <i>Nostoc</i> and, <i>Azolla</i> 3. Phosphate Solubilizer Bacteria (PSB), e.g. <i>Bacillus polymyxa</i> 4. Phosphate Solubilizer Fungi (PSF), e.g. <i>Aspergillus awamori</i>			7.5 Hrs.
<b>Unit-III</b>			
1. <b>Biopesticides:</b> History and concept, Definitions, scope and importance 2. Classification of Biopesticides 3. Role of Biopesticides in Ecofriendly agriculture and Organic farming. 4. Production of Biopesticides (Microorganism and Plant based) 5. Methods of applications of Biopesticides			7.5 Hrs.
<b>Unit-IV</b>			
1. <b>Composting:</b> Definition, scope and importance 2. Science of composting, Classification of composting 3. Methods for composting: Indore method; 4. Methods to improve process of Composting. 5. Vermicomposting 6. Agricultural waste composting 7. Uses of Weed in composting			7.5 Hrs.

**Suggested Readings:**

1. Maheshwari D.K. (2012) Bacteria in Agrobiolgy: Plant Probiotics; Springer Berlin, Heidelberg, New York.
2. Rai M.K. (2006) Handbook of Microbial Biofertilizers; Food Product Press, An Inprint of the Haworth Press, Inc. New York.
3. Reddy Shankara, R. (2012) Biofertilizer Technology; Akhand Publishing House Sadatpur, Dehli.

4. Sharma A.K. (2007) Biofertilizers for Sustainable Agriculture; Agrobios, Jodhpur.
5. Siddiqui, Zaki & Anwar (2012) PGPR: Biocontrol and Biofertilization; Springer Heidelberg, New York.
6. Tivedi P.C. (2008) Biofertilizer; Pointer Publishers Jaipur
7. Leo, M.L. Nollet, Hamirsingh Rathore (2015). Bio Pesticide Handbook. CRC Press Taylor & Francis group, New York. 1-29.
8. Md. Arshad Anwer (2017). Bio Pesticides and Bio Agents e book CRC Press Taylor & Francis group New York. 1-365.
9. Dwijendra Singh. (2014), Advances in Plant Bio Pesticides. Publisher Springer 1-401.
10. Vaishali Kandpal 2014. Bio Pesticides. International Journal of Environmental Research and Development. 4(2), 191-196.
11. Jamie Mc Sweeney (2019), Community Scale Composting systems: A Comprehensive Practical Guide for closing the Food system Loop solving our waste crisis Chelsea Green Publishing, USA.
12. Grace Gershuny (1992), The Rodale Book of Composting, Rodale Press, Pennsylvania.
13. Michelle Balz and Anna Stockton (2017), Composting for a New Generation: Latest Techniques for the Bin and Beyond, Cool Springs Press.

# GE/OE Basket (Biochemistry) Semester-I

## FOOD BIOCHEMISTRY

**Course Objectives:**The specific objectives of the course are:

- This course will help you to enrich your knowledge on how energy generates from foods, namely carbohydrate, proteins and fat molecules, in human body
- How molecules breakdown or rebuild in your body, what other molecules (like, enzymes, minerals, vitamins) needed for the utilization of these molecules.
- You will also be able to get a detail picture of formation DNA, RNA and hormones and their functions in living organisms.
- You will be able to describe methods for food processing and underlying safety aspects.

**PREREQUISITES :** *Basic Training in Chemical and Biological Concepts at the level of Higher Secondary.*

### Unit 1

Biochemical Changes in Carbohydrates in Food Systems, Changes in Carbohydrates during Seed Germination, Basics of Metabolism of Carbohydrates; Biochemical Changes of Proteins and Amino Acids in Foods, Proteolysis in Animal Tissues, Proteolysis in Geminating Seeds;

### Unit 2

Biochemical Changes of Lipids in Foods, Changes in Lipids in Food Systems, Changes in Lipids during Cheese Fermentation, Lipid Degradation in Seed Germination, Biochemical Degradation and Biosynthesis of Plant Pigments, Degradation of Chlorophyll in Fruit Maturation

### Unit 3

Foundations of Food Processing: Transglutaminase Activity in Seafood Processing, Proteolysis during Cheese Fermentation ,Removal of Glucose in Egg Powder Production, Production of Starch Sugars and Syrups; Proteases in Chill-Haze Reduction in Beer Production; Biogenesis of Fresh-Fish Odor, Biochemically Induced Food Flavors

### Unit 4

Selected Biochemical Changes Important in the Handling and Processing of Foods, Production of Ammonia and Formaldehyde from Trimethylamine and Its N-Oxide, Production of Biogenic Amines, Production of Ammonia from Urea, Adenosine Triphosphate Degradation, Polyphenol Oxidase Browning, Ethylene Production in Fruit Ripening, Reduction of Phytate in Cereals.

## Text Books and References:

1. Ashie IA, Lanier TC. 2000. Transglutaminases in seafood processing. In: NF Haard, BK Simpson, editors, *Seafood Enzymes*. New York: Marcel Dekker, Inc. Pp. 147–166.
2. Berger M. 1994. Flour aging. In: B Godon, C Willm, editors. *Primary Cereal Processing*. New York: VCH Publishers, Inc. Pp. 439–452.
3. Bewley JD. 1997. Seed germination and dormancy. *Plant Cell* 9:1055–1066.
4. Bewley JD, Black M. 1994. *Physiology of Development and Germination*, 2nd ed. New York: Plenum Press. Pp. 293–344.
5. Bryce JH, Hill SA. 1999. Energy production and plant cells. In: PJ Lea, RC Leegood, editors, *Plant Biochemistry and Molecular Biology* Chichester: John Wiley and Sons. Pp. 1–28.
6. Cadwallader KR. 2000. Enzymes and flavor biogenesis. In: NF Haard, BK Simpson, editors, *Seafood Enzymes*. New York: Marcel Dekker, Inc. Pp. 365–383.
7. Chin HW, Lindsay RC. 1994. Modulation of volatile sulfur compounds in cruciferous vegetables. In: CJ Mussinan, ME Keelan, editors, *Sulfur Compounds in Foods*. Washington, DC: American Chemical Society. Pp. 90–104.
8. Croteau R, Kutchan TM, Lewis NG. 2000. Natural products (secondary metabolites). In: BB Buchanan, W Grusse, RL Jones, editors, *Biochemistry and Molecular Biology of Plants*. Rockwell, Maryland: American Society of Plant Physiologists. Pp. 1250–1318.
9. Gill T. 2000. Nucleotide-degrading enzymes. In: NF Haard, BK Simpson, editors, *Seafood Enzymes*. New York: Marcel Dekker, Inc. Pp. 37–68.
10. Gopakumar K. 2000. Enzymes and enzyme products as quality indices. In: NF Haard, BK Simpson, editors, *Seafood Enzymes*. New York: Marcel Dekker, Inc. Pp. 337–363.
11. Grappin R, Rank TC, Olson NF. 1985. Primary proteolysis of cheese proteins during ripening. *J. Dairy Science* 68:531–540.
12. Greaser M. 2001. Postmortem muscle Chemistry. In: YH Hui, WK Nip, RW Rogers, OA Young, editors, *Meat Science and Applications*. New York: Marcel Dekker, Inc. Pp. 21–37.
13. Gripon JC. 1987. Mould-ripened cheeses. In: PF Fox, editor, *Cheese: Chemistry, Physics and Microbiology*. London: Elsevier Applied Science. Pp. 121–149.
14. Haard CE, Flick GJ, Martin RE. 1982. Occurrence and significance of trimethylamine oxide and its derivatives in fish and shellfish. In: RE Martin, GJ Flick, CE Haard, DR Ward, editors, *Chemistry and Biochemistry of Marine Food Products*, Westport, Connecticut: AVI Publishing Company. Pp. 149–304.
15. Haard NF. 1990. Biochemical reactions in fish muscle during frozen storage. In: EG Bligh, editor, *Seafood Science and Technology*. London: Fishing News Books (Blackwell Scientific Publications, Ltd.) Pp. 176–209.

## Open Elective Courses

### SEMESTER – I

#### BIOTECHNOLOGY FOR HUMAN WELFARE

**Course Code: BGO1T01**  
**Hours: 30**

**Total Contact**

#### **Course Outcomes:**

After successful completion of this Course, students will be able to:

CO 1. Understand the biotechnological applications in the industry

CO 2. Appreciate application of biotechnology in environmental management

CO 3. Describe application of biotechnology to forensic science

CO 4. Comprehend contributions of biotechnology to biomedical fields, such as diagnostics, genomics and therapeutics

CO 5. Understand the biotechnological applications in the agriculture and livestock management

#### **Unit I**

**8 hrs**

**Environment:** Application of biotechnology in environmental aspects: Degradation of organic pollutants – chlorinated and non-chlorinated compounds; degradation of hydrocarbons and agricultural wastes; Biodegradable plastics & Biofuels- production and its futuristic applications; Bioremediation, Biomining

#### **Unit II**

**7 hrs**

**Industry:** Important enzymes used in Industries, Biotechnological intervention in enzyme engineering; Industrial production of alcoholic beverages (wine), antibiotics (Penicillin), enzymes (lipase), food supplements (Single Cell Protein), Vitamin (B12). Food processing- Production of cheese and yoghurt

#### **Unit III**

**8 hrs**

**Forensic science:** Application of biotechnology in forensic science: Solving crimes of murder and rape; solving claims of paternity and theft by using DNA finger printing techniques

**Health:** Application of biotechnology in health: Genetically engineered insulin, recombinant vaccines, gene therapy, molecular diagnostics using ELISA, PCR; monoclonal antibodies and their use in cancer; human genome project.

#### **Unit IV**

**7 hrs**

**Agriculture:** N<sub>2</sub> fixation: transfer of pest resistance genes to plants; interaction between plants and microbes; biofertilizers & biopesticides.

**Livestock:** Transgenic animals, animal vaccine production, increased milk production, artificial insemination- poultry, fisheries

**References:**

- Bhasin M.K. and Nath, S. (2002). Role of Forensic Science in the New Millennium, University of Delhi, Delhi
- Crueger W. and Crueger A. (2000). Biotechnology: A textbook of Industrial Microbiology. 2nd Ed., Panima Publishing Co. New Delhi.
- Eckert W.G. (1997) Introduction to Forensic Sciences, 2nd Ed., CRC Press, Boca Raton
- James S.H. and Nordby, J.J. (2005). Forensic Science: An Introduction to Scientific and Investigative Techniques, 2nd Edition, CRC Press, Boca Raton
- Mohapatra, P.K. (2006) Textbook of Environmental Biotechnology, I.K. International Publishing House Pvt. Ltd., New Delhi
- Patel A.H. (1996). Industrial Microbiology. 1st edition, Macmillan India Limited.
- Stanbury P.F, Whitaker A and Hall S.J. (2006). Principles of Fermentation Technology. 2nd Ed., Elsevier Science Ltd.
- Nanda B.B. and Tiwari R.K. (2001). Forensic Science in India: A Vision for the Twenty First Century, Select Publishers, New Delhi
- Joerdening H.-J. and Winter J. (2005). Environmental Biotechnology – Concepts and Applications



**B.Sc. Sem-I (Computer Science/ Computer Application)**  
**BGO1T01**  
**COMPUTER FUNDAMENTALS**

**Credits : 2**

**Duration : 30 Hours**

**Course Objectives:**

- 1.To understand the basic digital components of computer.
- 2.To understand the working of peripheral devices.
- 3.To understand the number systems and logical gates.
- 4.To understand the network topologies.

**Course Outcomes :**

After completing this course satisfactorily, a student will be able to:

- 1.Confidently operate computers to carry out computational tasks
- 2.Understand working of Hardware and Software and the importance of operating systems
- 3.Understand number systems, peripheral devices, networking, multimedia and internet concepts

**UNIT I**

**Basic Components of Digital Computers:** Block Diagram.

**CPU:** Functions of Each Unit: Primary Memory, ALU and CU: Fetch and Execution cycle, Execution of Instructions in Single Address CPU.

**Memory:** RAM, ROM, PROM, EPROM, EEPROM and Cache. CISC and RISC Technology

**Bus:** Data, Control and Address Bus, Bus Organization.

**Language Evolution:** Generation of Languages: Machine, Assembly, High Level Languages. Characteristics of Good Language

**Translators:** Compiler, Interpreter and Assembler. Source and Object Program.

**UNIT II**

**Storage Devices:** Hard Disk and Optical Disk. Pen Drive, SD Card, Cloud as storage.

**Input Devices:** Keyboard, Mouse, Light Pen, Touch Screen, Voice Input, MICR, OCR, OMR, Barcode Reader and Flatbed Scanner. **Output Devices:** VDU, Printers: Dot Matrix, Laser and Inkjet. Plotters: Drum, Flat-Bed and Inkjet.

**UNIT III**

**Number Systems:** Binary, Octal, Decimal, Hexa-Decimal, Their Conversions, Binary Arithmetic. ASCII, BCD, EBCDIC.

**Logic Gates:** Truth table, properties and symbolic representation of NOT, AND, OR, NOR, NAND, EXOR, EXNOR gates. NOR and NAND gates as a universal gates.

**Binary Arithmetic:** Binary addition, binary subtraction using 1's and 2's compliment.

**UNIT IV**

**Network:** Network terminology, Topologies: Linear, Circular, Tree and Mesh. Types of Networks: LAN, WAN, MAN. Networking Devices: Repeaters, Bridges, Routers and Gateway. Modem for Communication between pc's, wi-fi network, Introduction of Bluetooth and Infrared devices. Network Architecture: Peer-to-Peer, Client/Server

**Internet Protocols:** TCP/IP, FTP, HTTP, HTTPS, Internet Addressing: IP Address, Domain Name, URL.

## **Books**

1. Information Technology Concepts by Dr. Madhulika Jain, Shashank & Satish Jain, [BPB Publication, New Delhi.]
2. Fundamentals of Information Technology By Alexis And Mathews Leon [Leon Press, Chennai &Vikas Publishing House Pvt. Ltd, New Delhi]
3. Fundamental of Micropocessor by B Ram

## Electronics BoS : Semester - 1: OE1:

### Basic Electronic Components and Instruments (BGO1T01)

#### Course outcome:

At the end of this course students will have ability to

1. Identify various electronic components understand their role
2. Make series and parallel combinations of components.
3. Understand working & replacement

#### Syllabus

1. Electrical Signal and parameters Current Voltage Wattage AC DC Components  
Identification: Resistor, Capacitor, Inductor, Transformer, Switches, Semiconductors
2. Serial and parallel connection of Resistor, capacitor, inductor, Lead & Lag Concepts.
3. Study of Voltmeter & Ammeter, concept of Range, Resolution, Impedance, Loading effect, Multi-meter.
4. Visualization of electrical signal, Introduction to Oscilloscope, Application in general

#### Books:

1. Charles Platt, Make: Electronics, O'Reilly Publications
2. Paul Scherz, Practical Electronics for Inventors, McGraw-Hills Publications
3. J.M. Hughes, Practical Electronics, O'Reilly Publications
4. B. L. Theraja, Basic Electronics (Solid State): S. Chand & Company

## **GE/OE-1: Environmental Conservation Movements (BGO1T01)**

### **Unit-I: Civilization and Environmental Pollution:**

**Environment:** Definition, role of environment in shaping civilizations. Inter-relation between civilization and environment- Ecological economic and socio-cultural.

Industrialization revolution and environmental pollution, Globalization and environmental pollution, Modern agriculture and environmental degradation.

### **Unit-II: Development and Environment:**

**Development:** Definition, population growth and its impact on natural resources, modernization and population, causes for industrialization, impact of industrialization on quality of human life, negative impact of industrialization and urbanization.

**Environmental Management:** Definition, objectives, components, principle and importance of Environmental management; **Development and Environment:** Types of development, sustainable development- need and relevance in contemporary society.

### **Unit-III: Sustainable Development:**

**Sustainable Development:** Definition, concept, principle and planning for sustainable development, Environmental issues and crises, Preventive Environmental Policy (PEP), desertification, invasive species, wildlife depletion and social insecurity.

United Nation Sustainable Development Goals, Strategies for implementing eco-development programmes, sustainable development through- trade, economic growth, carrying capacity and public participation.

### **Unit-IV: Environmental Movements:**

**Environmental Movements:** Concept of environmental movements, the local grassroots movement level, United Nations Conference on Environment, 1972- 'Limits to Growth'. The Brundtland Commission, 1987- 'Our Common Future'. The United Nations Conference on Environment and Development, 1992.

**Environmental Movements in India:** Bishnoi Movements, The Chipko Movements, Appiko Movements, Silent Valley Movements, Narmada Bachao Andolan, Beej Bachao Andolan and Tehri Dam Conflicts,

## References:

1. Bindra, P.S.(2017). The Vanishing: India's Wildlife Crisis. Penguin Random House India.
2. Climate Change: Science and Politics.(2021). Centre Science and Environment, New Delhi.
3. Edwards, Andres R. (2005). The Sustainability Revolution: Portrait of a Paradigm Shift. New Society Publishers.
4. Flanders, L. (1997). The United Nations Department for Policy Co-ordination and Sustainable Development (DPCSD), Global Environmental Change, 7 (4), 391-394.
5. McNeill, John R. (2000). Something New Under the Sun: An Environmental History of the Twentieth Century.
6. Nagendra, H., and Mundoli, S. (2009). Cities and canopies: Trees in Indian cities,Penguin Random House India Private Limited.
7. Nepal, Padam. (2009). Environmental Movements in India: Politics of Dynamism and Transformation, Author Press, Delhi.
8. Rachel Carson. (2002). Silent Spring. Houghton Mifflin Harcourt.
9. Rajit Sengupta and Kiran Pandey. (2021). State of India's Environment 2021: In Figures. Centres Science and Environment.
10. Sustainable Development in India: Stocktaking in the run up to Rio + 20. (2011) TERI for MoEF and CC.

## Semester I

### GE/OE (Forensic Science)

#### GE 1 (BGO1T01): Introduction to Sports Forensics

**Learning Outcomes:** By the end of this Course, the learners will be able to:

1. Recall and identify the concept of sports forensic, sports doping its history n prevalence along with its forensic investigation.
2. Evaluate and analyze different anti-doping organizations and the acts related to it, and also understand the concept of e-doping and e-sporting.
3. Understand the concepts of doping of drugs in sports their classification and effects on human body.
4. Apply the knowledge of analytical chemistry to use preliminary and confirmatory analytical techniques for drug testing in sport.
5. By the end of the course students will have knowledge and understanding about detection of drugs of abuse in sports and its role in forensic science.

#### **Unit-I Basics of Sports Forensics**

Introduction to Sports Forensics, History and Prevalence, Sports doping, why do athletes' resort to doping, investigation of deaths in sports, Forensic investigation in sport malpractices, case studies related to sports forensics.

#### **Unit II Legal Provisions for Drugs Abuse in Sports**

Anti-doping organization; World Anti-Doping Organizations (WADA) and NADA. National Anti-Doping Act 2022. Concept of e-sports and e-doping. Understanding E-doping and need for fair competition in E-Sports.

#### **Unit-III Drug doping in sports**

Drug doping in sports, Classification of prohibited substances in sports: Stimulants, Amphetamines, Cocaine, Sympathomimetic Amines, Narcotic Analgesic, Anabolic steroids. Notable abused drugs in sports-performance enhancing drugs; effects of drugs on the human body;

#### **Unit IV Analytical techniques for drug testing**

Use of preliminary and confirmatory analytical techniques for drug testing in sports: Gas Chromatography- Mass Spectrometry, Liquid Chromatography- Mass Spectrometry, HPLC- UV Immuno- Assays. Detection of drugs of abuse: Steroids, Narcotics, Stimulants, Masking agents, contaminants of other dietary supplements and other substances on WADA prohibited list. Detection of doping in sports and role of forensic science.

## **Semester I**

### **GE/OE (Forensic Chemistry)**

#### **GE 1 (BGO1T01): Toxicology in Everyday Life**

**Course Outcomes:** By the end of this Course, the learners will be able to:

1. Recall and identify the key terms and concepts related to poisons, fatal dose and fatal period, classification of poison, types of poisoning, mode of action, sources of poison, signs and symptoms of poison along with their antidotes.
2. Understand the classification of cosmetic products and certain poisonous substances present in them along with their side effects and precautions.
3. Analyze some common poisonous agents present in household cleaning agents along with their classification, side effects and precautions.
4. Evaluate the effects of some commonly used insecticides and pesticides along with their precautions.

#### **Unit I: Introduction to Toxicology**

Introduction, definition of poison, classification of poisons, modes of action of poisons, types of poisoning, fatal dose and fatal period, signs and symptoms of common poisoning and their antidotes. Sources of poisons in everyday life.

#### **Unit II: Cosmetic Products**

Introduction, Classification, common poisonous substances found in cosmetics products like – lipsticks, fairness creams, facewash, lotions, nail paints, hair colours and hair care products, talcum powders, deodorants, etc. their side effects and precautions related to use of cosmetics.

#### **Unit III: Household Cleaning Agents**

Introduction, Classification, common poisonous substances found in household cleaning agents like – Floor cleaners, toilet and bathroom cleaners, electronic gadgets cleaners, sanitizers, soaps, detergents, etc. their side effects and precautions related to use of cleaning agents.

#### **Unit IV: Pesticides and Insecticides**

Introduction, classification, commonly used pesticides and insecticides in house like – mosquito and cockroach repellents, rat kills, termiticides, fungicides, herbicides, agrochemicals, safety measure and precautions related to use of Pesticides and Insecticides.

## Semester I

### GE/OE (Forensic Physics)

#### GE 1 (BGO1T01): Optics and Optical Instruments

**Course Outcomes:** By the end of this Course, the learners will be able to:

1. Understand the introduction of lenses, equations of lenses, and formulae of optical systems.
2. Understand the types and their reduction of chromatic and achromatic aberration.
3. Analyze the working principles of microscope telescope eyepiece spectrometer interferometer.
4. Remember the working concept of optical and advanced microscope.

#### **Unit I: Geometric Optics**

Introduction, Thin and Thick Lenses, Lens Equation, Lens Maker's Formula, Cardinal Points of an Optical System, Combination of Two Thin Lenses (Equivalent Lenses) (Including Derivation for Focal Length and Cardinal Points).

#### **Unit II: Aberrations**

Achromatic and Chromatic Aberration, Types of Achromatic Aberration and their Reduction: Spherical Aberration, Coma, Astigmatism, Curvature of Field, Distortion, Types of Chromatic Aberration: Achromatism (Lenses in Contact and Separated by Finite Distance).

#### **Unit III: Optical Instruments**

Simple Microscope and Compound Microscope, Telescopes, Reflection and Transmission Type of Telescope, Eyepieces: Huygens's Eyepiece, Ramsden's Eyepiece, Gauss's Eyepiece, Constant Deviation Spectrometer, Michelson Interferometer, Resolving Power and Magnifying Power of Microscope and Telescope.

#### **Unit IV: Microscopes**

Optical Microscopes: Stereomicroscope, Polarizing Microscope, Phase Contrast Microscope and Comparison Microscope.

Advanced Microscopes: Scanning Electron Microscopes (SEM), Transmission Electron Microscope (TEM), X-Ray Diffraction (XRD), X-Ray Fluorescence (XRF).



## Semester I

### GE/OE (Forensic Biology)

#### GE 1 (BGO1T01): General Instrumentation in Forensic Biology

**Course Outcome:** By the end of this Course, the learners will be able to:

1. Analyze the function of pH and buffer along with its mechanism and action relevant to forensic science.
2. Understand and examine the titration curve of weak acids and amino acids.
3. To gain hands-on experience in various laboratory techniques and immunoassay methods.
4. Understand the principles, working mechanism and forensic application of certain techniques and assay related to forensic biology.

#### **Unit-I : pH and Buffer**

pH and Buffer- Biochemical buffers, measurement of pH; Mechanism of buffer action; Henderson-Hasselbalch equation; Isoelectric pH, Titration curve of weak acids; Titration curve of amino acids.

#### **Unit-II: Spectroscopy**

Spectroscopy- Principle of spectroscopy, Concepts of electromagnetic radiation, Concept of chromophores; Beer- Lambert's law and deviations, Extinction coefficient; Principle and working of Spectrophotometer (UV-Visible); Applications of spectrophotometry in forensic biology.

#### **Unit-III: Chromatography**

Chromatography- Types of chromatography, Principle and working of Planar chromatography (Paper and Thin layer); Column chromatography (Preparation of column, Sample loading, Elution, and Detection); Ion exchange chromatography (Principle, working and applications); Applications of chromatography in forensic biology.

#### **Unit-IV: Electrophoresis**

Electrophoresis- Theory of electrophoresis, Methods of electrophoresis; Principle, working and applications of (Agarose gel electrophoresis, Polyacrylamide gel electrophoresis, Immunoelectrophoretic) with reference to forensic biology.

**B.Sc. Sem-I (Forensic Science - Major)**

**Semester I**

**GE/OE (Psychology)**

**GE 1 (BGO1T01): Psychology of Health and Wellbeing-I**

**Course Outcomes:** By the end of this Course, the learners will be able to:

1. Understand the spectrum of health and illness for better health management
2. Identify stresses in one's life and how to manage them
3. Understand a variety of health announcing health protective and health compromising behaviour and to be able to know their application in illness management

**Unit I: Illness, Health, and Wellbeing**

Illness, Health and Wellbeing, Health continuum; models of health and illness: Medical, Bio psychosocial; Holistic Health.

**Unit II: Stress and Coping:**

Nature and Sources of Stress; Personal and Social Mediators of Stress; Effects of Stress on Physical and Mental Health; Coping and Stress management.

**Unit III: Health Management**

Health enhancing behaviours: Exercise, Nutrition, Meditation, Yoga; Health compromising behaviours (alcoholism, smoking, internet addiction); Health Protective behaviours, Illness Management.

**Unit IV: Promoting Human Strengths and Life Enhancing virtues**

Strength: Meaning; Realizing strength; Maximizing Unrealized Strength. Weakness – meaning, measures towards identifying & overcoming weaknesses. Strategies for improving hope and optimism.

## Semester I

### GE/OE (Digital and Cyber Forensics) GE 1 (BGO1T01): Computer Fundamentals

**Course Outcomes:** By the end of this Course, the learners will be able to:

1. Understand the meaning of basic components of digital computers and remembering the different types of storage devices, translators etc used in digital computers.
2. Understand how data is stored and retrieved from different types of storage media.
3. Understand the conversion process between different number systems (e.g., binary to decimal, decimal to hexadecimal, etc.).
4. Remember the basic properties of each number system, including their base values and corresponding digit symbols and the logical operations performed by basic logic gates.
5. Apply knowledge of networking protocols to analyze network traffic and identify potential security threats or anomalies.

#### **Unit I: Basic Components of Digital Computers**

Basic Components of Digital Computers: Block Diagram. CPU: Functions of Each Unit: Primary Memory, ALU and CU: Fetch and Execution cycle, Execution of Instructions in Single Address CPU. Memory: RAM, ROM, PROM, EPROM, EEPROM and Cache. CISC and RISC Technology. Bus: Data, Control and Address Bus, Bus Organization. Language Evolution: Generation of Languages: Machine, Assembly, High Level Languages. Characteristics of Good Language. Translators: Compiler, Interpreter and Assembler, Source and Object Program.

#### **Unit II: Storage, Input and Output Devices**

Storage Devices: Hard Disk, Optical Disk, Pen Drive, SD Card, and Cloud as storage. Input Devices: Keyboard, Mouse, Light Pen, Touch Screen, Voice Input, MICR, OCR, OMR, Barcode Reader and Flatbed Scanner. Output Devices: VDU, Printers: Dot Matrix, Laser and Inkjet, Plotters: Drum, Flat-Bed and Inkjet.

#### **Unit III: Number Systems, Logic Gates and Binary Arithmetic**

Number Systems: Binary, Octal, Decimal, Hexadecimal, Their Conversions, Binary Arithmetic. ASCII, BCD, EBCDIC. Logic Gates: Truth table, properties and symbolic representation of NOT, AND, OR, NOR, NAND, EXOR, EXNOR gates. NOR and NAND gates as a universal gate. Binary Arithmetic: Binary addition, binary subtraction using 1's and 2's compliment.

#### **Unit IV: Network Topology and Internet Protocols**

Network: Network terminology, Topologies: Linear, Circular, Tree and Mesh. Types of Networks: LAN, WAN and MAN, Networking Devices: Repeaters, Bridges, Routers and Gateway. Modem for Communication between PC's, Wi-Fi network, Introduction of Bluetooth and Infrared devices. Network Architecture: Peer-to-Peer, Client/Server. Internet Protocols: TCP/IP, FTP, HTTP, HTTPS, and Internet Addressing: IP Address, Domain Name, URL.

## **B.Sc. Sem-I (Forensic Science - Major)**

### **Semester I**

#### **GE/OE (Law)**

#### **GE 1 (BGO1T01): Crime and Criminal Behaviour**

**Learning Outcomes:** By the end of this Course, the learners will be able to:

1. Demonstrate knowledge and understanding of the basic concepts, theories, and terminology related to crime, criminal behaviour, and the criminal justice system in India.
2. Apply their knowledge and understanding of crime and criminal behaviour to practical scenarios.
3. Develop the ability to analyze crime-related information, including crime scenes, criminal profiles, and legal documents.
4. Develop critical thinking skills to evaluate the effectiveness and fairness of the criminal justice system in India. They will assess the application of forensic techniques, legal procedures, and ethical considerations in the investigation and punishment of crimes.

#### **Unit I: Introduction to Crime**

Nature and Concept of crime, Essential elements of crime, Types of crime, Causes of crime: Social Causes of Crime, Economic Causes of Crime, Physical and Psychological causes of crime, Geographical Causes of Crime. Organized Crimes, Environmental Crimes, Crime and Politics, Economic Crimes, White Collar Crimes, Juvenile Delinquency and Female Delinquency, Terrorism, Cyber Crimes.

#### **Unit II: Crime and Criminal Behaviour**

Definition, Scope and Nature of Criminology. Interrelationship between Criminology, Penology and Criminal Law. Schools of Criminology. Pre-Classical, Classical and Neo-Classical Schools. Lombroso Theory/Positive School. Typological School. Sociological School. Psychological School.

#### **Unit III: Crime and Punishment**

Introduction and History, Theories of Punishment, Kinds of Punishment. Historical development from punishment to Correction and Reformation. Prevention and control mechanism. Prison system: Traditional prison, Open air prison, Pennsylvanian system etc. Prison Reforms in India. Correctional Administration. Probation and Parole.

#### **Unit IV: Criminal Justice System in India**

History and evolution of the criminal justice system. Overview of Indian Criminal Justice System. Wings of Criminal Justice System. Police: History, Structure and Functions. Accountability of Police towards Law Enforcement Agencies and Society. Role of Investigating Officer in crime investigation. Other Specialized Agencies in India: CBI, CID, RAW, ED, NCB etc. Police Reforms in India. International Investigation Agencies: FBI, INTERPOL etc. Introduction of Prison Administration.

# **BACHELOR OF SCIENCE (HONORS/RESEARCH)**

**(Geology - Major)**

## **SYLLABUS (GE/OE)**

### **SEMESTER - I**

#### **Paper I: Topographic Map Reading (BGO1T01)**

##### **Unit I**

History of cartography; modern cartography; introduction to toposheets and aerial photography; maps and globe; map projections - conical, cylindrical, azimuthal; general information on regional maps - (physical, political thematic) - India, Asia, Europe, Africa, North America, South America, Oceans and Antarctica.

##### **Unit II**

Types of geological maps; toposheet numbering- national and international; quadrants in toposheets; scale of toposheet - representative fraction, written statement scale, graphical scale; topographic maps and their numbering by Survey of India; types of maps- large scale map, small scale maps; general purpose maps- physical maps

##### **Unit III**

Objectives of geological mapping - institutional interest, government mandate, academic purpose; precision required in geological mapping; base maps for geological mapping; outcrop maps and sections; geological symbols in maps; contours and landforms - conical hills, plateau, spur and valley, col and pass, gorge, cliff, knoll, convex slope, concave slope.

##### **Unit IV**

General principles of geological mapping; mapping methods in sedimentary, igneous and metamorphic terrains; maps of India - political maps, physical map, rainfall trends, wind maps, drainage maps, soil and land-use maps, mineral deposits, food – crop maps, irrigation maps, agro-climatic zone maps, road and inland maps, railway maps, population maps, natural hazard maps.

**Books Recommended:**

1. Macmillan Publishers India Private Limited (2021)
2. Survey of India toposheets
3. Compton, R.R. (1962) Manual of Field Geology, John Wiley and Sons, Inc.
4. Forrester, J.D. (1957) Principles of Field Geology and Mining Geology, John Wiley.
5. Lahi, F.H. (1987) Field Geology, CBS Publishers.
6. Mathur, S.M. (2001) Guide to Field Geology, Prentice-Hall, New Delhi

## SEMESTER I

### 1. QUANTITATIVE APTITUDE

**Course Outcomes:** This course will enable the students to

1. Have a strong base in the fundamental mathematical concepts.
2. Grasp the approaches and strategies to solve problems with speed and accuracy
3. Gain appropriate skills to succeed in preliminary selection process for recruitment

<b>UNITS</b>	<b>TOPICS</b>	<b>HOURS</b>
<b>Unit 1</b>	Number System • H.C.F. and L.C.M. of Numbers • Decimal Fractions • Simplification • Square Roots and Cube Roots • Average • Problems on Numbers • Problems on Ages • Surds and Indices • Logarithms	<b>8</b>
<b>Unit 2</b>	Percentage • Profit and Loss • Ratio and Proportion • Partnership • Chain Rule • Pipes and Cisterns • Time and Work • Time and Distance • Boats and Streams • Problems on Trains • Alligation or Mixture • Simple Interest • Compound Interest	<b>8</b>
<b>Unit 3</b>	Area • Volume and Surface Area • Races and Games of Skill • Calendar • Clocks • Stocks and Shares • Permutations and Combinations • Heights and Distances	<b>7</b>
<b>Unit 4</b>	<u>Data Interpretation</u> • Tabulation • Bar Graphs • Pie Chart • Line Graphs	<b>7</b>
	<b>TOTAL</b>	<b>30 HRS</b>

**Recommended Books:**

1. R.S. Aggarwal, “Quantitative Aptitude for Competitive Examinations”, Revised Edition, S. Chand and Co. Ltd, New Delhi, 2018.
2. Quantitative Aptitude and Reasoning by R V Praveen, PHI publishers.
3. Quantitative Aptitude : Numerical Ability (Fully Solved) Objective Questions, Kiran Prakashan, Pratogitaprakasan, Kic X, Kiran Prakasan publishers.
4. Quantitative Aptitude for Competitive Examination by Abhijit Guha, Tata Mc Graw hill publications.

**INTRODUCTION AND SCOPE OF MICROBIOLOGY****Course Code: BGO1T01**

<b>GE / OE</b>	<b>Hours: 2 Hours/Week</b>	<b>Marks: 80+20=100</b>	<b>Credit: 2</b>
<b>Unit-I</b>			
<b>Bacteria</b>	Discovery of Microorganism, Differences between prokaryotes and eukaryotes cell Bacteria: General characteristics of different groups. Important archaeal and eubacterial groups. Bacterial Cell size, shape and arrangement, Typical bacterial cell structure & their function		<b>7.5 Hrs</b>
<b>Unit-II</b>			
<b>Fungi</b>	General characteristics of fungi including habit, habitat, nutritional requirements, thallus organization and aggregation, Asexual reproduction, sexual reproduction, heterokaryosis and parasexual mechanism. Slide culture techniques.		<b>7.5 Hrs</b>
<b>Unit III</b>			
<b>Algae</b>	General characters and industrially important algal cells, Asexual & sexual reproduction Cyanobacteria: occurrence and structure of the following: Spirulina and Anabaena. Application of Algae		<b>7.5 Hrs</b>
<b>Unit IV</b>			
<b>Scope of Microbiology</b>	a] Medical microbiology, b] Biotechnology, c] Agriculture microbiology d] Environmental microbiology e] Geomicrobiology,		<b>7.5 Hrs</b>



## Reference books -

1. Atlas RM. (1997). Principles of Microbiology. 2nd edition. W.M.T. Brown Publishers.
2. Black JG. (2008). Microbiology: Principles and Explorations. 7th edition. Prentice Hall
3. Madigan MT, and Martinko JM. (2014). Brock Biology of Micro-organisms. 14th edition. Parker J. Prentice Hall International, Inc.
4. Pelczar Jr MJ, Chan ECS, and Krieg NR. (2004). Microbiology. 5th edition. Tata McGraw Hill.
5. Stanier RY, Ingraham JL, Wheelis ML, and Painter PR. (2005). General Microbiology. 5th edition. McMillan.

## COURSE OUTCOMES

After this course the students will be able to

<b>Sr. No.</b>	<b>Course outcome</b>
1.	Students will be able to understand diversity of microorganisms
2.	Students will be aware of prokaryotic & eukaryotic cellular organization
3.	Justify various scopes of microbiology.

**FYUGP Semester-I**  
**Generic Elective / Open Elective Course (GE/OE-1) (BGO1T01)**  
**(Space Science)**

<b>GE/OE-1 THEORY</b>	<b>Hours: 04 Hours /Week</b>	<b>Marks: 80 + 2- = 100</b>	<b>Credit: 02</b>
<b>Unit-I</b>			
<b>Solar system and measurements</b>	Solar System, Kepler's Laws, Earth-Moon System, Solar and Lunar eclipses, Exploration of Solar System by Telescopes, Rockets and Satellites. Exploration of Mars and Moon. Measurement of terrestrial distances, distance of moon, distance of planets, Astronomical unit, light year and parsec.		<b>7.5 Hrs</b>
<b>Unit-II</b>			
<b>Telescopes and their principles</b>	Optical telescopes, (Refractor, Galilean, Newtonian or Dobsonian, Cassegrainian & Hubble Space Telescope), Magnifying power & Resolving power of telescopes, UV, X-ray, IR, Radio & Gravitational Astronomy, Spectroscope.		<b>7.5 Hrs</b>
<b>Unit III</b>			
<b>Observational and Experimental Tools for Space Science</b>	Rockets and Satellite Payloads. Rocket principle and types. Detectors for optical and infrared regions, Application of CCD's and CMOS to stellar imaging, Techniques of observations of astronomical sources.		<b>7.5 Hrs</b>
<b>Unit IV</b>			
<b>Fundamental Particles and Basic Forces</b>	Particles originated from space, cosmic rays, Protons, Electrons, Neutrons, Neutrinos, Mesons, leptons, and quarks. The concept of Basic forces viz., strong, weak, electromagnetic, and gravitational forces. Basic ideas about galaxy, black hole, neutron star, red giant, black matter and pulsars, nebula, white dwarfs etc.		<b>7.5 Hrs</b>

**Reference Books:**

1. Ionospheric Radio Propagation by Kenneth Davis. National Bureau of Standards Monograph 80 (1965), US Government Printing office, Washington D.C.
2. Physics of the Upper Atmosphere edited by J, A. Ratcliffe, Cavendish Laboratory, University of Cambridge. Academic Press New York and London (1960)
3. Research in Geophysics: Vol.1- Sun, Upper Atmosphere and space edited by Hugh Odishaw, National Academy of Sciences. Washington D.C.
4. Source book on the Space Sciences - Samuel Glasstone, Princeton, New Jersey.
5. The Upper Atmosphere - S K Mitra

**Course outcomes**

After the completion of this course students will be able to

<b>Sr. No.</b>	<b>Course Outcome</b>
1.	Get acquainted with the space related events
2.	Get knowledge about solar system and planets
3.	Determine the average distance and sizes of heavenly bodies
4.	Understand the concept of black hole and other giants
5.	Know the measurement related to large distance
6.	Understand the communication time requirement for longer distances

## Generic Elective Courses/ Open Elective Courses (GE/OE)

### For Statistics major

	<b>Semester I</b>	<b>(GE/OE)</b>
	<b>Name of the Paper - Elementary Descriptive Statistics</b>	
	<b>Paper code – (BGO1T0I)</b>	<b>2 Credits (2 hrs Theory per week )</b>
	<b>Total 30 Hrs</b>	
	<b>OBJECTIVES</b>	
	Students acquire knowledge about how to classify and tabulate data . They also learn various methods of graphical and diagrammatic representations of data.	
	<b>OUTCOMES</b>	
	Students acquire knowledge about: Construction of tables with many factors of classification. They also learn analysis of categorical data.	
	<b>Unit-I (15 Hrs)</b>	
(A)	<b>Types of data:</b> Concepts of a statistical population and sample from a population; qualitative and quantitative data; nominal and ordinal data; cross sectional and time series data; discrete and continuous data; frequency and non-frequency data.	
(B)	<b>Different types of scales</b> — nominal, ordinal, ratio and interval. Primary data and Secondary data, Methods of data collection: Interview method, Questionnaire method, Personal Observation method, designing a questionnaire and a schedule; checking their consistency, Pilot survey Instruction	
( C )	<b>Controlled experiments:</b> Observational studies and Scrutiny of data for internal consistency and detection of errors of recording.	
( D )	<b>Sample surveys and Population Census:</b> methods of conducting population census with special reference to Census in India. Analysis of Categorical data: Consistency of categorical data. Independence and association of attributes. Various measures of association for two- way classification, Odds ratio.	
	<b>Unit-II (15 Hrs)</b>	
(A)	<b>Presentation of data:</b> Construction of tables with one or more factors of classification,	
(B)	<b>Classification:</b> Geographical, chronological, qualitative and quantitative. Formation of frequency distribution of discrete and continuous type, relative frequency, frequency density and cumulative frequencies. Construction of Stem and leaf chart	
( C )	<b>Diagrammatic representation of data:</b> Construction of Simple bar diagram, multiple bar diagram, subdivided bar diagram, percentage bar diagram, pie- diagram and pictogram.	
(D)	<b>Graphical representation of grouped data:</b> Construction of Frequency bar diagram, frequency polygon, histogram, cumulative frequency diagrams and ogives	
	<b>REFERENCES</b>	
1	Bhat B.R,Srivenkataramana T And RaoMadhava K.S(1997): STATISTICS: A BEGINNER’S TEXT,VOL I,NEW AGE INTERNATIONAL (P) LTD.	
2	Goon A. M,Gupta M. K, Das Gupta,B (1999): FUNDAMENTALS OF STATISTICS, VOL I, WORLD PRESS, CALCUTTA.	
3	Croxtone F.E,Cowden D.J And Kelin S(1973): APPLIED GENERAL STATISTICS, PRENTICE HALL OF INDIA	
4	Agrawal B. L: BASIC STATISTICS (New Age International Publishers)	
5	SudhaPurohit, GoreS.D., Deshmukh S. R.: Statistics Using R (Narosa)	
6	Christian S. Albright, Wayne L. Winston, Zappe Christopher J. : Decision Making using Microsoft	

## **General Elective (GE)/ Open Elective (OE) for FYUGP**

### **GE/OE for B.Sc. I Human anatomy and Physiology (BGO1T01)**

**Credit: 2**

**Course outcomes:** After completion of the course, students will able to-

- Learn, describe and explain structure and histology of human digestive system.
- Learn, describe and explain structure and physiology of excretion and muscles.
- Learn, describe and explain structure and physiology of respiration and circulation.
- Learn, describe and explain structure and physiology of nervous system.

#### **UNIT-I**

- 1.1 Digestion – Structure and function of digestive system.
- 1.2 Histology stomach, Intestine, pancreas, liver, large intestine.
- 1.3 Digestion of carbohydrates, proteins and lipids.
- 1.4 Composition and function of Saliva, Gastric juice, Bile juice, Pancreatic juice, Intestinal juice.

#### **UNIT-II**

- 2.1 Excretory system –Excretory organs, structure of kidney.
- 2.2 Juxtaglomerular apparatus, formation of urine.
- 2.3 Muscles – E.M. structure of muscles, contraction of muscle.
- 2.4 Single muscle twitch, tetanus, summation, fatigue, tonus.

#### **UNIT-III**

- 3.1 Respiratory system- Structure of respiratory system, mechanism of respiration (breathing).
- 3.2 Histology of lungs and trachea, Transport of O<sub>2</sub> and CO<sub>2</sub> through alveoli
- 3.3 Circulatory system – Structure of heart, cardiac cycle, Composition of blood
- 3.4 Mechanism of clotting of blood.

#### **UNIT-IV**

- 4.1 Nervous system – structure of brain.
- 4.2 Structure and histology of spinal cord.
- 4.3 Structure and types of neuron.

4.4 Transmission of impulse through neuromuscular junction.

**Suggested reading:**

**Garg K, Joshi M, Kundu S** (2022). Human anatomy and physiology theory and practical 2 edition. CBS Publishers and Distributors Pvt. Ltd. pp. 352.

**Murugesh N.** (2021). Human anatomy and physiology. Sathya publishers, pp. 286.

**GE/OE for B.Sc. I Indian Birds (BGO1T01)**

**Credit: 2**

**Course outcomes:** After completion of the course, students will able to-

- Understand, describe and explain importance of birds.
- Learn how to record and study the birds.
- Identify and recognized certain Indian birds.

**Unit - I**

- 1.1 Methods of identification of birds.
- 1.2 Terms used in the description of birds plumage and body parts.
- 1.3 Bird study techniques: equipments, field data recording, Bird sanctuaries in India.
- 1.4 Role of birds in ecosystem: pollination, seed dispersal, insect control.

**Unit- II**

- 2.1 Morphological features, distribution, feeding habit and habitat of Sarus crane (*Grus antigone*); purple moorhen (*Porphyrio porphyrio*); black Ibis (*Pseudibis papillosa*); Indian coot (*Fulica atra*).
- 2.2 Morphological features, distribution, feeding habit and habitat of Indian spot billed duck (*Anas poecilorhyncha*); Lesser whistling teal (*Dendrocygna javanica*); ruddy shelduck (*Tadorna ferruginea*); bronze-winged jacana (*Metopidius indicus*).
- 2.3 Morphological features, distribution, feeding habit and habitat of black-winged kite or oriental honey buzzard (*Elanus caeruleus*); black kite (*Milvus migrans*); shikra (*Accipiter badius*); Indian white backed vulture (*Gyps bengalensis*).
- 2.4 Morphological features, distribution, feeding habit and habitat of peacock (*Pavo cristatus*); common quail (*Coturnix coturnix*); grey jungle fowl (*Gallus sonneratii*); black partridge (*Francolinus francolinus*).

### Unit- III

- 3.1 Morphological features, distribution, feeding habit and habitat of red-wattled lapwing (*Vanellus indicus*); common sandpiper (*Tringa hypoleucos*); little ringed plover (*Charadrius dubius*); black-winged stilt (*Himantopus himantopus*).
- 3.2 Morphological features, distribution, feeding habit and habitat of common green pigeon (*Treon phoenicoptera*); rock pigeon (*Columbia livia*); spotted dove (*Streptopelia chinensis*); red turtle dove (*Streptopelia tranquebarica*).
- 3.3. Morphological features, distribution, feeding habit and habitat of koyal (*Eudynamys scolopacea*); Coucal (*Centropus sinensis*); spotted owl (*Athene brama*); house swift (*Apus affinis*).
- 3.4 Morphological features, distribution, feeding habit and habitat of little blue kingfisher (*Alcedo atthis*); pied kingfisher (*Ceryle rudis*); green bee eater (*Meropsorientalis*); hopoe (*Upupa epops*).

### Unit- IV

- 4.1 Morphological features, distribution, feeding habit and habitat of roller (*Coracias benghalensis*); Indian grey hornbill (*Ocyeros birostris*); coppersmith barbet (*Psilopogon haemacephalus*); black drongo (*Dicrurus adsimilis*).
- 4.2 Morphological features, distribution, feeding habit and habitat of jungle babber (*Argya striata*); pied bushchat (*Saxicola caprata*); oriental magpie robin (*Copsychus saularis*); scarlet minivet (*Pericrocotus speciosus*).
- 4.3 Morphological features, distribution, feeding habit and habitat of tree pie (*Dendrocitta vagabunda*); redvented bulbul (*Pycnonotus cafer*); paradise flycatcher (*Terpsiphone paradise*); tailor bird (*Orthotomus sutorius*).
- 4.4 Morphological features, distribution, feeding habit and habitat of ashy wren-warbler (*Prinia socialis*); grey wagtail (*Motacilla cinerea*); baya or common weaver bird (*Ploceus philippinus*); purple sunbird (*Nectarinia asiatica*).

### Suggested reading:

**Salim Ali and Futehally L. (1968).** Common Indian Birds: A picture album. National Book Trust, India, pp. 51.

**Salim Ali (2003).** The book of Indian birds. 13<sup>th</sup> edition, Oxford publication, pp. 326.

**Grewal B, Sen S, Singh S, Devasar N and Bhatia G. (2016).** Birds of India - A Pictorial Field Guide. Om Books International, pp. 792.

**Fashion Design/Textile Science**  
**Four Year (Eight Semester Degree Course)**

**Semester – I**  
**Computer Basics**  
**GE/OE (BGO1 TO1)**

<b>Theory Marks : 50</b>	<b>Practical : 50</b>	<b>Total Credits : 2</b>
SEE : 40	SEE : -	Theory : 1
CIE : 10	CIE : 50	Practical : 1

Time Required: 45 Hours

**Theory (15 Hours)**

**Objectives:**

1. Students should understand the significance and utility of computer.
2. To describe basic computer architecture.
3. To understand the working of Networking.
4. To help student to learn basic presentation skills

**Learning outcomes:**

After undergoing the subject, the students will be able to understand the working of computers. The students are expected to know the different parts and flow of data in computer and network. Students are expected to develop their skills in application software.

**Unit I: (3 Hours)**

Computer Fundamentals

- 1.1 Basic component of computer system
- 1.2 Characteristics of computer
- 1.3 Classification of Computers

**Unit II: (4 Hours)**

Computer Memory

- 2.1 Primary Memory
- 2.2 Secondary Memory
- 2.3 Types of Primary Memory
- 2.4 Types of Secondary Memory

**Unit III : (4 Hours)**

Software

- 3.1 System Software
- 3.2 Operating System
- 3.3 Functions of Operating System
- 3.4 Multiprogramming, Multitasking OS

**Unit IV: (4 Hours)**

Networking

- 4.1 Network Types
- 4.2 LAN
- 4.3 WAN
- 4.4 MAN



**Practical****(30 Hours)**

1. Introduction to Ms. Paint, Motif development for specific end use symmetrical/asymmetrical.
2. Introduction to MS Word, Menus, Working with Documents, Formatting, Setting Margins, Editing, Creating Tables, Table settings, Tools, Word Completion, Spell Checks, Drawing and printing Importing and Exporting, Sending files to others, Inserting and Deleting, Find, Search, Replace Commands

**Reference:**

1. Computer Fundamentals -Sinha P.K. -Vol I, II, III, IV
2. Introduction to Computers - Peter Nartons
3. Microsoft Windows 98 - Lery J.O. Linda, Leary
4. Micro soft Office 2000 - Lery J.O. Linda, Leary 10
5. Computer for Beginners - Arora Pawan,
6. Fundamentals of Computer -V.Rajaram.

**B.Sc. Semester – I**  
**BGO1T01: Food Adulteration**  
**Theory: 2 credits**

**Course Outcomes**

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

1. *Understand the adulteration of common foods and their adverse impact on health.*
2. *Comprehend certain basic skills of detecting adulteration in common foods.*
3. *The students are able to understand role and importance of food additives.*
4. *Apply their knowledge of food safety and regulations.*
5. *Prevent food adulteration in the day to day life.*

**Unit I: Introduction and Types of Adulterants (7.5 h)**

Adulteration – Introduction and definition. Types of adulteration- Intentional adulteration, Incidental adulteration, Metallic adulteration and Packaging Hazard.

Methods of food adulteration- Mixing, substituting, using decomposed food, additions of toxic substances and misbranding. Reasons for food adulteration,

Types of Adulterants – Poisonous substances, foreign matter, cheap substitutes, Spoiled parts. General Impact of food adulteration on Human Health.

**Unit II: Adulteration of Common Foods and Methods of Detection (7.5 h)**

Adulteration of Common Foods, Methods of Detection of Adulterants in the following Foods: Milk, Oil, Grain, Sugar, Spices and Condiments, Processed Food, Fruits and Vegetables, Additives and Sweetening agents (at least two methods of detection for each food item).

Quality management system - Quality control, Quality assurance, Quality Improvement and assessment.

**Unit III: Food Additives (7.5 h)**

Introduction, definition, principles categories of food additives on the basis of functional use – Preservatives, Colours, Antioxidants, Anti-caking and anti-foaming agents, Flavouring agent, Buffering agents, raising agents, bulking Nutritive additives, sweetening agents, thickening and jellifying agents, enzymes, firming agents, acidity regulators, leavening agents, emulsifiers and stabilizers. (Role and examples), safe levels of additive uses.

**Unit IV: Laws and Procedures on Adulteration (7.5 h)**

Mitigation measures for addressing food adulteration. Highlights of Food Safety and Standards Act 2006 (FSSAI), Food Safety and Standards (International standards, ISO standards and Indian standards).

Auditing and accreditation (BIS, QCI, AGMARK), Importance and application of food regulation in the Indian and Global context, responsibilities for maintaining and enforcing food safety FSSAI, CODEXALIMENTARIUS, HACCP. ISO 22000 series, TQM and codes of GMP.

## References

1. A first course in Food Analysis, A.Y. Sathe, New Age International (P) Ltd., 1999.
2. Food Safety, case studies – R. V. Bhat, NIN, 1992.
3. DART- Detect adulteration with rapid test. FSSAI, Imprinting Trust, assuring safe and nutritious food, Ministry of Health and Family Welfare, Government of India.
4. Rapid detection of food adulterants and contaminants Theory and Practice, S. N. Jh, 2016, Kindle Edition.
5. Domestic Tests for Food Adulterations, H. G. Christian, Forgotten books.
6. A Laboratory Manual of Food Analysis, S. Sehgal, Wiley Publishers.
7. Food Safety and Standards Act, 2006. Bare ACT, November 2020, Commercial law publishers.
8. Food science and nutrition by Sunetra Roday, Oxford university, 3<sup>rd</sup> addition.
9. Malik R. K. and K. C. Dhigra, Hand book of food industries, Small industry, Research institute.
10. [https://fssai.gov.in/upload/uploadfiles/files/Manual\\_Food\\_Additives\\_25\\_05\\_2016\(1\).pdf](https://fssai.gov.in/upload/uploadfiles/files/Manual_Food_Additives_25_05_2016(1).pdf)
11. Fox B. A. and A. G. Cameron, Food science and chemical approach Hodder and Stoughton educational, 1982.
12. Fitch and Francis, foods and principles of cookery, Prentice-Hall, Inc 1960.

**Bachelor of Science (Honors/Research) 4 yr. 8 Semester Degree Program**  
**B.Sc. Sem I (Interior Design – Major)**

**BGO1T01 MATHEMATICS I**

AIM: To understand elementary principles of mathematics. To apply mathematics in practical problems. To obtain accuracy in calculations and results of various mathematical experiments.

UNIT I : Complex Numbers

Cartesian and polar form of complex numbers, De Moivre's theorem, Exponential function of a complex variable, circular functions of a complex variable, Hyperbolic functions and their inverses

UNIT II : Theory of Equations

General properties of polynomial equations, Relation between roots and coefficients, Transformation of equations, Horner's method of synthetic division, Reciprocal equations

UNIT III : Tangents and Normals

Tangent and Normals, length of the tangent, subtangent, normal and subnormal

UNIT IV : Expansion of functions

Maclaurin's series, Taylor's theorem for functions of one variable

UNIT V : Indeterminate Forms

Indeterminate forms, L' Hospital Rule for evaluating the indeterminate forms.

REFERENCE BOOKS :

1. Higher Engineering Mathematics – Dr.B.S.Grewal
- 2 . A Text Book of Engineering Mathematics – N.P.Bali, Manish Goyal
- 3 . Engineering Mathematics – H.K.Das

S. No	Course Outcomes
CO1	Students will understand the concept of complex numbers.
CO2	Students will learn about theory of equations.
CO3	Students will be able solve problems related to tangents and normal.
CO4	Students will learn about expansion of functions and they will able to solve problems on indeterminate forms of limit

## B. Sc (Applied Electronics & Software Technology) – Semester I (GE/OE)

**BGO1T01**

**ENGINEERING MATHEMATICS I**

Scheme of Examination (Theory)

SEE – 80

CIE - 20

Total - 100

### Course Outcomes:

1. Develop understanding of Sets, Relations and Functions
2. Develop understanding of Logarithms
3. Develop understanding of Trigonometry
4. Develop understanding of Plane Co-ordinate Geometry
5. Develop understanding of Angle between the Lines

### Unit I :

- Sets, Relations and Functions : Definition , Domain , Range
- Cartesian Product
- Even-Odd Functions , Inverse Functions

### Unit II :

- Logarithms
  - Product, Division, Use of Log Tables
  - Simple Calculations using Log Tables

### Unit III :

- Trigonometry
  - Trigonometric Ratios , Ratios of Sum and Differences of Angles
  - Multiple Angles and Half Angles

### Unit IV:

- Plane Co-ordinate Geometry ,Distance Formula
- Equation to a Line , Section Formula and their applications

### Unit V:

- Angle between the Lines
  - Parallel Lines, Perpendicular Lines , Length of Perpendicular

### Reference Books :

1. Algebra by K P Basu
2. Set Theory Schaum Series
3. Trigonometry by S L Loney
4. Plane Co-ordinate Geometry by S L Loney

**GE/OE Basket Semester I**  
**Faculty of Science and Technology**

Sem.	Course Category		Name of Course	BoS	Course code
<b>I</b>	<b>GE/OE</b>	1	Indoor gardening and landscaping	Botany	<b>BGO1T02</b>
		2	Health & Wellness	Biochemistry	
		3	Fermented Foods	Biotechnology	
		4	Office Automation	Computer Science/ Computer Application	
		5	Communication & Broadcasting	Electronics	
		6	Environmental and Public Health	Environmental Science	
		7	A. Introduction to Forensic Journalism/ B. Basic Analytical Chemistry/ C. Basic Analog and Digital Electronics / D. Basics of Enzymology / E. Psychology of Health & Well Being-II (Psychology)/ F. Programming with C /	Forensic Science	
		8	Geo-statistics in Geology	Geology	
		9	Basic Statistics	Mathematics	
		10	Statistics for Competitive examinations	Statistics	
		11	Reproductive biology	Zoology	
			Attractive insects	Zoology	
		12	Organic Chemistry	Cosmetic Technology	
		13	Chemical Processing-I	Fashion Design	
		14	Chemical Processing-I	Textile Science	
		15	Cosmetic Chemistry	Chemistry	
		16	Introduction to Microscopy and staining	Microbiology	
		17	Cultural Anthropology I	Interior Design	
18	Social Science I	Applied Electronics & Software Technology			

<b>B. Sc. Semester-I</b> <b>GE / OE-2 Botany (BGO1T02)</b> <b>Indoor Gardening and Landscaping</b>			
GE/OE-II Theory	Hours: 2 Hours/Week	Marks: 80+20=100	Credit: 2
<b>Unit-I</b>			
1. <b>Indoor Gardening:</b> Introduction, objectives, and scope. 2. Essential Factors to grow indoor plants. 3. Establishment of the indoor garden. 4. Decoration of conference hall, living room & dining hall by indoor plants. 5. Common problems of indoor plants and their management.			7.5 Hrs.
<b>Unit-II</b>			
1. <b>Selection of indoor plants:</b> Potted plants, hanging baskets, bonsai, bromeliad tree terrarium, bottle garden and dish garden. 2. <b>Importance as popular indoor plants:</b> a) <b>Foliage plants:</b> <i>Begonia</i> sp., <i>Coleus</i> sp. b) <b>Ferns:</b> <i>Adiantum</i> sp., <i>Nephrolepis</i> sp. c) <b>Flowering plants:</b> <i>Anthurium</i> sp., <i>Bromeliads</i> d) <b>Orchids:</b> <i>Milioniopsis</i> sp., <i>Dendrobium</i> Sp. e) <b>Palms:</b> <i>Areca palm</i> , <i>Ravenea rivularis</i>			7.5 Hrs.
<b>Unit-III</b>			
3. <b>Landscaping:</b> Introduction, objectives, and scope. a) Landscape architecture b) Tools and equipment used c) Lawn and lawn maintenance d) Fertilizing, weed control, pruning & disease and insect pest control for plants used in landscaping.			7.5 Hrs.
<b>Unit-IV</b>			
4. Landscape management and conservation. a) Heritage and cultural landscape, Urban open space systems, Rural landscape b) Different elements used in construction and designing of landscape c) Landscaping elements in residential, commercial, bungalow, public area, hotel educational institute and religious places. d) Selection of plants for landscaping e) Computer applications in landscaping.			7.5 Hrs.
<b>Note: Field visits are compulsory.</b>			

## **SUGGESTED READINGS**

1. Agarwal, V. K. and Bhargava P. (2017), Home Gardening, Pustak Mahal, Allahabad (India)
2. Bose T. K. and Mukharjee D. (1977) Gardening in India. Oxford & IBH Publishing Co. Pvt. Ltd., Calcutta.
3. Gopal Swamy Iyengar (1990). Complete Gardening in India, IBH, India.
4. Grewall H. S. and Singh P. (2014), Landscape designing and ornamental plants, Kalyani Publication, New Delhi
5. Nambison, K.M.P. (1992). Design elements of landscape gardening. Oxford and IBH Publications, New Delhi.
6. Randhawa G. S. (1973). Ornamental Horticulture in India, Today and Tomorrow's printers and Publishers, New Delhi.
7. Vishnu Swarup (1993), Publication and information-Division ICAR, New Delhi
8. Vishnu Swarup (2002). Indoor Gardening, ICAR, New Delhi.
9. Walker D. T. (1983). Planting Designs, PDA Publishers Corporation, USA.

## **WEBSITES:**

1. [www.dgt.gov.in](http://www.dgt.gov.in)
2. [www.baratskills.gov.in](http://www.baratskills.gov.in)
3. [www.andhrauniversity.edu.in](http://www.andhrauniversity.edu.in)
4. [www.sevenmentor.com](http://www.sevenmentor.com)
5. [www.jsscacs.edu.in](http://www.jsscacs.edu.in)



## **GE/OE Basket (BOS Biochemistry Major)**

### **Health and Wellness (BG01T02)**

#### **Course Outcomes:**

1. Students will know about importance of healthy lifestyle.
2. Students will know about physical and mental health.
3. Students will aware about various lifestyle diseases and how to modulate them.
4. Students will aware about stress management techniques.
5. Students will know about importance of yoga and pranayama.

#### **Unit -I: General awareness.**

Definition of health and wellness. Factors affecting health and wellness (Social, economic, emotional, occupational, intellectual, physical). Types of Physical Fitness and its Health benefits. Sedentary lifestyle and its risk of disease. Modern lifestyle and hypo-kinetic diseases; prevention and management. Benefits of exercise in adulthoods. Use of Health Management Information System (HMIS) in hospitals.

#### **Unit -II: Physiological aspects.**

Brief idea about different parts of kidney, heart, brain. Structure and function of Hemoglobin. LDL in plaque formation. Importance of HDL. International classification of adults underweight, overweight and obesity according to BMI. Parts of respiratory system. Breathing pattern. Stages of breathing in yoga pranayama. Health benefits of Kapalbhathi and Anuloma Viloma pranayama.

#### **Unit -III: Mental aspects.**

What is mental health? Types of mental health disorders. Factors affecting mental health. What is anxiety? Types, causes, symptoms and treatment of anxiety. What is depression? Symptoms, factors affecting, and treatment of depression. Causes and treatment of migraine. Brief idea about stress and it's management. Identification of suicidal tendencies.

#### **Unit- IV: Nutritional aspects.**

Diet and nutrition for health & wellness. Essential components of balanced diet (carbohydrates, proteins, fats, vitamins & minerals) for healthy lifestyle. Malnutrition, under nutrition and over nutrition. Healthy foods for prevention and progression of Obesity, Diabetes, Polycystic Ovarian Syndrome, Cancer, Cardiovascular diseases and Hypertension. WHO recommendations of healthy diet for adults, infants and young children.

### **Reference Books:**

1. Jesse Peoring Williams “The Principles of Physical Education” Published by College Book House, Shivaji Road, Meerut.
2. William D McArdle, Frank I Katch and Vitor I Katch, Essential of Exercise Physiology, Second edition, New York: LipincoffWilliams and wilkins, 2000.
3. Scott K. Powers and Stephen L. Dodd. Total Fitness: Exercise, Nutrition and wellness, Boston: Allyn and Bacon, 1999.
4. P Sembulingam, K Sembulingam. Essentials of medical physiology. 8 th edition. Jaypee Brothers Medical Publishers.
5. Vladimir Gordin. Nutrition and diet The Triangle of health: Chemical components Book 2). Gordin Medical Centre publication.
6. Arvind Upadhyay. Mental health problems. 2<sup>nd</sup> edition. Notion press publication.
7. James Hewitt. The Complete Yoga Book: The Yoga of Breathing, Posture and Meditation. Ebury Publication.

## Open Elective Courses

### SEMESTER – I

#### FERMENTED FOODS

**Course Code: BGO1T02**

**Total Contact Hours: 30**

#### **Course Outcomes:**

After successful completion of this Course, students will be able to:

CO 1. Understand the importance of fermented foods, probiotics, prebiotics and nutraceuticals.

CO 2. Make the students aware of the different types of beverages.

CO 3. Understand the importance of fermented meat and fish products.

CO 4. Understand the importance of fermented dairy and vegetable products.

#### **Unit I**

**7 Hours**

History of food fermentations; Types of fermented foods, Nutritional Values, Advantages and Health Benefits; Prebiotics- Sources of prebiotics, Probiotics- Characteristic features, Sources and Microorganisms used as Probiotics; Synbiotics and Nutraceutical Foods; Oriental fermented foods- Soy sauce, Miso, Tempeh, Tofu, Natto; Traditional fermented foods – Idli, Dosa, Khaman

#### **Unit – II**

**8 Hours**

Beverages- Introduction, Health Importance of Beverages; Ingredients of beverages: Water, fruit pulps, juices, concentrates, sweeteners and preservatives; Alcoholic Beverages- Undistilled Alcoholic Beverages, Beer- commercial production of beer, Elements of brewing process; Types of beer; Wines- commercial production, Types of wine, Distilled alcoholic beverages- Whisky, Rum, Gin, Brandy, Vodka, Non-Alcoholic Beverages- Coffee, Tea, Carbonated beverages, Mocktails, Quality-control in beverage industry

#### **Unit III**

**7 Hours**

Fermented Meat product Sausages- History of fermented meats industry, Meat composition, Fermentation principles, Meat starter cultures, Manufacture of fermented sausage- Cutting and mixing, Stuffing, Casing materials, Fermentation, Cooking, drying, and smoking, Mold-ripening, Flavour of fermented meats, Defects and spoilage of fermented meats. Fermented fish products- Fish sauces, Fish paste- Manufacturing steps, Storage and Shelf-life of products.

#### *Unit IV*

*8 Hours*

Fermented Dairy products- Introduction, Cultured dairy products- Yogurt, Cultured buttermilk, Sour cream, Kefir, Other cultured dairy products. Cheese-Introduction, Manufacturing principles, General steps in cheese making, Types of cheese, Cheese ripening, Recent technological advances in cultured dairy products technology. Fermented Vegetable products- Introduction, Production principles, Manufacture of Sauerkraut, Principles of pickle production, fermented olives, Kimchi and Fermented vegetables.

#### **References:**

- Hutkins, Robert W. *Microbiology and technology of fermented foods*. John Wiley & Sons, 2008.
- Joshi, V. K. "Biotechnology Food Fermentation" Volume 1. Educational Publishers

&Distributors, 2004.

- Hui Y. H “Handbook of Food and Beverage Fermentation Technology”. Marcel Dekker, 2004.
- Wood, Brian J. B. “Microbiology of Fermented Foods” Volume 1 and 2. II Edition. Blackie Academic and Professional, 1998.
- Ramesh C. Ray and Didier Montet, “Fermented Foods, Part- II Technological Interventions”, CRC Press, 2017.
- Kosikowski, F.V. 1997. Cheese and fermented milk foods. Frank Kosikowski and Vikram Mistry, Brooktondale, N. Y.
- Feiner, G. 2006. Meat products handbook. ISBN 978-1-84569-050-2
- Industrial Fermentations- Leland, N. Y. Chemical Publishers.
- Prescott and Dunn’s- Industrial Microbiology, 4 th, ed.
- Bamforth, C.W. 2004. Beer: Health and Nutrition. Blackwell Science Ltd., Oxford, United Kingdom.

**B.Sc. Sem-I (Computer Science/ Computer Application)**

**BGO1T02**

**OFFICE AUTOMATION**

**Credits : 2**

**Duration : 30 Hours**

**Course Objectives:**

- 1.To understand functionality of Operating Systems and its applications.
- 2.To understand the working with the user interface.
- 3.To understand Word Processing, their usage, details of word processing screen, Opening, saving and printing a document
- 4.To understand Worksheet creation, inserting and editing data in cells.

**Course Outcomes :**

After completing this course satisfactorily, a student will be able to:

1. understand functionality of Operating Systems and its applications.
2. Working with the user interface.
3. prepare documents, letters and do necessary formatting of the document.
4. Worksheet creation, inserting and editing data in cells.
5. Opening/saving a presentation and printing of slides and handouts.

**UNIT I**

Introduction to windows Operating System

Advantages of windows operating system, using different windows applications simultaneously, operating with windows, GUI, use of help features, starting an application, essential accessories, creating shortcuts, windows explorer, control panel, my computer, my documents, recycle bin, finding folders and files, changing system settings, system tools, use of run command, setting peripherals, drivers, editing graphics in windows, new features in windows XP/Vista versions.

**UNIT II**

Introduction, basics, starting Word, creating document, parts of Word window, mouse and keyboard operations, designing a document; Formatting- selection, cut, copy, paste; Toolbars, operating on text; Printing, saving, opening, closing of document; Creating a template; Tables, borders, pictures, text box operations; Mail Merge.

**UNIT III**

Introduction to MS EXCEL, navigating, Excel toolbars and operations, Formatting; copying data between worksheets; entering formula, chart creation; data forms, data sort; Functions in Excel ROUND( ), SQRT ( ), MAX( ), MIN( ), AVERAGE( ), COUNT( ), SUMIF( ), SUMIF( ), ABS( ), ROMAN( ), UPPER( ), LOWER( ), CELL( ), TODAY( ), NOW( ).

**UNIT IV**

Introduction to MS POWER POINT Working with Power Point Window, Standard Tool Bar, Formatting tool bar, Drawing tool Bar, Moving the Frame, Inserting Clip Art, Picture, Slide, Text Styling, Send to back, Entering data to graph, Organization Chart, Table, Design template, Master Slide, Animation Setting, Saving and Presentation , auto Content Wizard.

**Books:**

1. MS Office XP for Everyone By Sanjay Saxena (Vikas Publi, Noida)
2. MS-Office 2000(for Windows) By Steve Sagman
3. A First Course in Computers – Sanjay Saxena

## **Semester – 1; OE2: Communication & Broad Casting (BGO1TO2)**

### **Course outcome:**

At the end of this course students will have ability to

- 1 Historical understanding about evolution of Electronics Communication Technology
- 2 Appreciate transformation and Geo-reach concept in Broad casting
- 3 Define purpose of present day communication & Broad Cast Technology, Entertainment, information Education, Alerts, Agricultural
- 4 Conversant with modern digital systems

### **Syllabus**

- 1 Concept of Communication, One-one, One to Many, One way, Two way Distance & media wise, communication applications
- 2 Global & National History about evolution & growth, Akashwani, Vividh Bharti, FM service, HAM radio web based Radio, Doordarshan, Gyan Vani & other.
- 3 Contemporise Communication & Broad Casting system, working features, Sub module of communication system, Regulatory bodies, Law, Standards
- 4 Advances in Communication & Broad Casting Human-Machine communication, Machine-Machine communication, Integration of AI

## GE/OE-2: Environment and Public Health (BGO1TO2)

### Unit-I:

Environment and Public Health: Definition of health and diseases, Perspective on individual health: Nutritional, Socio-cultural and developmental aspects, Dietary diversity for good health; Human developmental indices for public health, Effect of quality of air, water and soil on human health.

Diseases in Contemporary Society: Need for good health – factors affecting health, Types of diseases – deficiency, infection, pollution diseases – allergies, respiratory, cardio-vascular and cancer, Personal hygiene: food- balanced diet, Health effects of smoking, drugs and alcohol consumption.

### Unit-II:

**Malnutrition:** Vitamin deficiency diseases and Mineral deficiency diseases, Folic acid requirement during pregnancy; Food safety- adulterants and preservatives, pesticides toxicity, endosulfan and DDT, genetically modified food.

**Non-communicable diseases and life style diseases:** Diabetes and Hypertension; Communicable diseases: Definition, mode of transmission- pandemic, epidemic and endemic diseases.

### Unit-III:

**Vector Borne Diseases :** Plague and Malaria, emerging diseases: Dengue, Chikungunia. Ebola, Zika, Swine flu, Bird flu, Severe Acute Respiratory Syndrome (SARS), Middle East Respiratory Syndrome (MERS), Zoonosis-Leptospirosis.

**Water and Air Borne Diseases:** Water borne diseases (Cholera, diarrhea. Typhoid, ameobiasis, hepatitis, gastroenteritis and giardiasis. Air borne diseases ( Pneumonia, tuberculosis, Anthrax, COVID-19 and Acute Flaccid Myelitis (AFM).

### Unit-IV:

**Occupational Health:** Sick building Syndrome, Noise and Radiation; Ergonomoics – Stress and fatigue, Carpal Tunnel Syndrome (CTS), Methyl mercury and cerebral palsy, Synergistic effect, Irritable bowel syndrome, Crohn's diseases.

**Environmental Sanitation and Hygiene :** Safe disposal of human excreta, solid waste disposal, sanitation value chain. Drug safeties – Thalidomide Tragedy, Antibiotic stewardship, New Delhi Antibiotic – Resistant superbug.

## References:

1. Aktar, R. (Ed.). (2019). Extreme weather events and human health: International casestudies. Springer Nature.
2. Bedi and Yashpal. (1971). Handbook of Hygienic and Public Health. Atma Ram & Sons, Delhi.
3. Kessel, A. (2006). Air, the environment and public health. Cambridge University Press.
4. Lopez, R.P. (2012). The built environment and public health (Vol.16). John Wiley & Sons.
5. Nandini N. (2018). Environment and public Health. Sapna Book House, Bengaluru,
6. Q'Carroll, P.W., Yansnoff, W.A., Ward, M.E., Ripp, L.H., & Martin E.L. (Eds.). (2003). Public health informatics and information systems.
7. Park, K (2009). Park's Textbook and Preventive and Social Medicine, 20<sup>th</sup> Edition. Misc Publication
8. Rajit Sengupta and Kiran Pandey. (2021). State of India's Environment 2021: In Figures. Centre Science and Environment, New Delhi.
9. Van den Bosch, M., & Bird, W. (Eds.). (2018). Oxford textbook of nature and public health: The role of nature in improving the health of a population. Oxford University Press.
10. Walton, M (2017). One planet, One Health. Sydney University Press.



## **GE/OE (Forensic Science)**

### **GE 2(BGO1T02): Introduction to Forensic Journalism**

**Course Outcome:** By the end of this Course, the learners will be able to:

1. Recall and identify the key terms and concepts related to forensic journalism, including investigative reporting, forensic journalist, types of news reporting, news editing, and ethical practices.
2. Understand the principles, practices, and challenges of forensic journalism in contemporary society.
3. Apply the techniques, methods, and skills required for effective forensic journalism, including researching, reporting, writing, and editing.
4. Analyze the role and impact of forensic journalism in uncovering the truth, promoting justice, and addressing social issues, as well as the challenges and limitations of forensic journalism.
5. Evaluate the effectiveness and ethics of forensic journalism in different contexts, including reporting on crime, human rights abuses, disasters, and crises, as well as assessing the future directions and innovations in forensic journalism.

#### **Unit-I Writing and Editing of News**

Introduction to News, Types of News, Sources of News, Writing News, The Leads, Types of Leads, Method of Writing Leads, Tips for Writing News, Function of News, News Editing, Nature and Need for Editing, Editors, Method of Editing, Proof Reading, Preparation of Copy for Press.

#### **Unit-II: Introduction to Forensic Journalism**

Definition of forensic journalism and its importance: What is forensic journalism and how is it different from regular journalism? The importance of forensic journalism in uncovering the truth and promoting justice, The origins of forensic journalism in investigative reporting. Ethics and best practices in forensic journalism: The importance of accuracy, fairness, and balance in forensic journalism

#### **Unit-III: Basics of Forensic Journalism**

Forensic Journalism, Investigative Journalism, Forensic Journalist, Scope and Need of Forensic Journalist. 5W1H, Reporting, Reporter, Type of News Reporting such as Straight News Report, Beat Reporting, Investigative News Reports, Role and Responsibilities of Forensic Journalist, Research methods and tools for investigative reporting, Ten Golden Rules for Forensic Journalist, Qualities of Good Forensic Journalist.

#### **Unit IV: Applications of Forensic Journalism**

Covering crime and courts. Investigating human rights abuses and social justice issues. Reporting on disasters and crises. The challenges and limitations of reporting on disasters and crises. Challenges and limitations of forensic journalism. The potential future directions and innovations in forensic journalism.

## **GE/OE (Forensic Chemistry)**

### **GE 2(BGO1T02): Basic Analytical Chemistry**

**Learning Outcomes:** By the end of this Course, the learners will be able to:

1. Recall and identify the key terms and concepts related to SI units, methods of expressing concentrations, calculations, solutions and their concentration.
2. Understand the principles, descriptions, handling, calibration and use common laboratory apparatus.
3. Apply the knowledge and skills of volumetric analysis to classify different volumetric methods and understand the concept of different types of titrations.
4. Analyze the principles, theory, types of gravimetric analysis their application and limitations.

#### **Unit I: SI Units**

Definitions of the Seven Basic Units (Mass, Length, Time, Temperature, Amount of substance, Electrical current and Luminous intensity). Methods of expressing concentrations - Mole, molar mass, Molarity, Calculations in grams and moles, Solutions and their concentrations, Molar concentration b) Percent concentration, Parts per million/billion (ppm, ppb)

#### **Unit II: Description and use of common laboratory apparatus**

Volumetric flasks, burettes, pipettes, meniscus readers, weighing bottles, different types of funnels chromatographic columns, chromatographic jars, desiccators, drying ovens, filter crucibles, rubber policeman. Calibration and use of volumetric glassware.

#### **Unit III: Volumetric Analysis A**

Definitions: Volumetric Titration, Gravimetric Titration, Coulometric Titration. B. The equivalence point, the end point; Classification of volumetric methods, theory of indicators and buffers Equilibria Principles-Aqueous and non-aqueous acid-base titration- Redox titrations- Complexometric titrations – Precipitation titrations

#### **Unit IV: Volumetric Analysis B**

Principle, theory and types of Gravimetric analysis, properties of precipitates and precipitating agents, application and limitations of gravimetric methods

## **GE/OE (Forensic Physics)**

### **GE 2(BGO1T02): Basic Analog and Digital Electronics**

**Course Outcome:** By the end of this Course, the learners will be able to:

1. Recall and identify the key terms and concepts related to basic electronics, including active and passive components, identification techniques of components, and rectifier circuits.
2. Understand the principles, practices, and challenges of analog and digital electronics, including the working principle of oscillators and waveform generators, and the applications of logic gates, flip-flops, and shift registers.
3. Apply the knowledge and skills required to properly design and analyze analog and digital electronic circuits, including the use of filters, waveform generators, and signal converters.
4. Analyze the characteristics and properties of electronic components, including resistors, capacitors, inductors, diodes, and transistors, and their applications in electronic circuits.
5. Evaluate the performance and limitations of electronic circuits, including waveform shaping circuits and signal processing techniques, and the ethical considerations surrounding the use of electronic devices.

#### **Unit I: Basic Electronics**

Active and Passive Components (Resistors, Capacitors, Inductors, Diodes, Transistors), Field Effect Transistors, IC's and IC packages, Identification Techniques of Components, Rectifier Circuits, Introduction to OPAMP (Inverting & Non-inverting Amplifier) and Applications.

#### **Unit II: Analog Electronics**

LR, CR, LCR Circuits, Timer Circuits (using IC 555 &UJT). Active Filters: Low Pass, High Pass, Band Pass. Waveform Generators: Working Principle of Oscillators, Waveform Generators; Sine (Phase-shift, Wien Bridge, Colpitts and Hartley), Square, Triangular, Sawtooth.

#### **Unit III: Digital Electronics**

Logic Gates and Their Applications, Flip Flops, Shift Registers and Counters (Asynchronous, Synchronous and Decade).

#### **Unit IV: Signal Processing**

Signal Converters: Analog to Digital Converters (Dual Slope &Successive Approximation), Digital to Analog Converters (Weighted Resistors &R-2R Ladder). Wave Shaping Circuits: Wave Clipping, Clamping Circuits.

## **GE/OE (Forensic Biology)**

### **GE 2(BGO1T02): Basics of Enzymology**

**Course Outcome:** By the end of this Course, the learners will be able to:

1. Recall and identify key terms, historical developments, and classification of enzymes.
2. Understand the specificity of enzyme action, mechanisms of enzyme catalysis, and the role of regulatory enzymes.
3. Apply knowledge of enzyme mechanisms to predict and explain enzyme-substrate interactions.
4. Analyze enzyme kinetics, including the measurement of initial velocities and interpretation of graphs.
5. Evaluate the effects of enzyme concentration, temperature, and pH on enzyme activity.

#### **Unit-I: Fundamentals of Enzymology and Enzyme Catalysis**

History and Terminology; Classification & nomenclature of enzymes; Specificity of enzyme action (Lock & key model & Induced fit model); Introduction to Enzyme catalysis: Proximity and Orientation effect; covalent catalysis; acid-base catalysis; metal ion catalysis; Introduction to regulatory enzymes.

#### **Unit-II: Enzyme Mechanisms, Coenzymes, and Factors Affecting Enzyme Activity**

Mechanism of action of Chymotrypsin; Role of vitamins as coenzyme precursors (Niacin, Biotin); Effect of enzyme concentration; Effect of temperature on enzyme activity & temperature quotient.

#### **Unit-III: Enzyme Kinetics**

Enzyme kinetics: Importance of measuring initial velocities; Michaelis-Menten equation; Single & double reciprocal plots; Graphical representation of various inhibitors (Competitive, Non-competitive & Uncompetitive) on Lineweaver-Burke plots.

#### **Unit-IV: Advanced Enzyme Kinetics and Assay Techniques**

Definition and importance of  $K_{cat} / K_m$ ; Introduction to Bisubstrate reactions, sequential and ping-pong mechanisms with examples; Effect of pH, General pH profile diagram; Concept of enzyme assay & its importance, Enzyme activity units (Katal & Specific activity).

## **GE/OE (Psychology)**

### **GE 2(BGO1T02): Psychology of Health and Wellbeing-II**

**Learning Outcomes:** By the end of this Course, the learners will be able to:

1. Understand the spectrum of health and illness for better health management
2. Identify stresses in one's life and how to manage them
3. Understand a variety of health announcing health protective and health compromising behaviours and to be able to know their application in illness management.

#### **Unit I: Aptitude**

Concept of Aptitude, Aptitude Tests: DAT, GATB. Concept of Interest; Interest Tests: The strong Campbell Interest Inventories, Kuder preference Record. Application: Use of Psychological tests in career selection.

#### **Unit II: Emotions**

Theories of emotions: James-Lange's theory, Cannon-Bard's theory, Schachter-Singer's theory, cognitive appraisal theory. Application to everyday life: use of incentives to motivate the employees to work hard.

#### **Unit III: Personality**

Assessment of Personality- Behavioural assessment (Observation, Rating scales), Personality inventories (16 PF, MMPI, NEO-PI). Projective techniques: TAT, Rorschach Ink Blot Test, Sentence Completion Test. Applying psychology to everyday life: Parents as a role model for children and film stars as role models for adolescents.

#### **Unit IV: Intelligence**

Theories of Intelligence: Spearman, Gardner, and Sternberg. Individual Differences in Intelligence: mental retardation, and giftedness. Application: Early childhood intervention: towards boosting intelligence.

## **GE/OE (Digital and Cyber Forensics)**

### **GE 2(BGO1T02): Programming with C**

**Course Outcomes:** By the end of this Course, the learners will be able to:

1. Understand programming structures like Sequence, Selection, Iteration and Modular.
2. Understand development tools such as algorithm, flowchart and pseudo code for any problem to solve them programmatically.
3. Understand basic concepts of programming in C such as character set, Operators, Functions, arrays, strings, functions, structures, unions and pointers.
4. Understand the file handling, sequential access and random access programmatically.
5. Apply their knowledge to solve programming problems using C language.

#### **Unit I: Programming Fundamentals**

Programming Structure: Sequence, Selection, Iteration and Modular, Problem-Solving Techniques and Development Tools: Algorithm, Flowcharts and Pseudo code (Definition and its characteristics), Developing Algorithm and Drawing flowcharts

#### **Unit II: Introduction to C Programming**

C Character set, Tokens, Identifier, Keywords, Variables, Data types, Qualifiers. Operators and Expressions: Arithmetic, Relational, Logical, Bit-Wise, Increment, Decrement, Conditional and Special operators. typedef, Type Conversion, Constants, Declaring Symbolic Constants, Character Strings, Enumerated Data Types, Operator Precedence and Associativity. Library functions: Maths, string handling Functions. Control Structure: Compound Statement, Selection Statement: if, if-else, Nested if, switch. Iteration statement: for, while, do...while, Nested loops, jump statements: break, continue, goto (Special emphasis on problem solving)

#### **Unit III: Arrays, Strings, and Functions in C Programming**

Arrays: Need, Types: Single and Two-Dimensional Array. Strings: Strings Manipulation, Arrays of Strings, Evaluation order. Function: Function Components, Return Data type, Parameter Passing, Return by Reference, Default Arguments, Recursive Functions, Arrays with Functions, Storage Classes. (Special emphasis on problem Solving)

#### **Unit IV: Structures, Unions, Pointers, and File Handling in C Programming**

Structure: Declaration, Definition, Accessing structure members, Initialization, Nesting of Structures. Union: Unions, Differences between Structure and Union. Pointer: Introduction, Address Operator (&), Pointer variables, void pointers, Pointer Arithmetic, Pointers to Pointers. File handling: Hierarchy of File Stream Classes, Opening & closing a file, Testing for errors, File Modes, File pointers and their manipulations, Sequential Access, Random Access, Command Line arguments.

## **Paper II: Grain Size and Geostatistics in Geology** (BGO1T02)

### **Unit I**

Concept of grain size of minerals-grains; very coarse-grained, medium-grained, fine-grained, glassy material; grain-size distribution of acidic, intermediate, basic and ultrabasic igneous rocks with textures of rocks; glassy acidic and basic igneous rock types.

### **Unit II**

Surface processes leading to rock breakdown- physical, chemical and biological; weathering; resistance of rocks to weathering; factors influencing weathering; Processes of sediment transport; grain size variation from river, marine, deltaic and glacial sediments.

### **Unit III**

Wentworth's scale of grain sizes of sediments; grain sizes of sediments and sedimentary rock types; grain angularity and roundness, conversion of millimeter to phi scale of grain size.

### **Unit IV**

Arithmetic mean, mode, median, range, variance, frequency, skewness, kurtosis, standard deviation of grain sizes; identification of depositional environment based on grain size distribution; CM plot, depositional environment based on grain size distribution from probability ordinate paper.

### **Books Recommended:**

1. Blatt, H., Middleton, G.V. and Murray, R.C. (1980) Origin of Sedimentary Rocks, Prentice-Hall Inc.
2. Hota, R.N. (2011) Practical Approach to Petrology, CBS Publisher and Distributors Pvt Ltd., New Delhi
3. Reineck, H.E. and Singh, I.B. (1973) Depositional Sedimentary Environments, Springer-Verlag.
4. Isaaks, E.A. and Srivastava, R.M. (1990) An Introduction to Geostatistics, Oxford University Press.
5. Morrison, D.F. (1967) Multivariate statistical methods, McGraw-Hill.
6. Tucker, M.E. (1981) Sedimentary Petrology: An Introduction, Wiley and Sons, New York.

## SEMESTER 1: BASIC STATISTICS

### Course Outcomes:

1. To discuss the interpretations of Statistics in numerical data.
2. To give overview of Statistics in various sectors & disciplines
3. To apply & use of Statistics Methods in various diverse fields

<b>UNITS</b>	<b>TOPICS</b>	<b>HOURS</b>
<b>Unit 1</b>	Concept of Sample Space - Events - Definition of Probability - Addition and Multiplication laws of Probability - Conditional Probability - Baye's Theorem - Simple Problems.	<b>8</b>
<b>Unit 2</b>	Random Variables - Distribution Function - Expectation and Moments - Moment Generating Function - Probability Generating Function - Simple Problems.	<b>8</b>
<b>Unit 3</b>	Concept of Bivariate Distribution - Correlation - Karl Pearson's Coefficient of Correlation - Rank Correlation - Linear Regression.	<b>7</b>
<b>Unit 4</b>	Standard distributions: Discrete distributions - Binomial, Poisson, Hyper Geometric and Negative Binomial Distributions - Continuous Distributions Normal, Uniform, Exponential.	<b>7</b>
	<b>TOTAL</b>	<b>30 HRS</b>

### **Recommended books:**

1. S.C. Gupta & V.K. Kapoor : Fundamentals of Mathematical Statistics, Sultan & sons
2. Hoel, P.G (1971): Introduction to Mathematical Statistics, Wiley.
3. Wilks S.S. Elementary Statistical Analysis, Oxford and IBH
4. Hogg, R.V. & Craig.A.T.(1998) : Introduction to Mathematical Statistics, Macmillan
5. Statistical Methods, Gupta S. P.: Sultan Chand and Sons, New Delhi.



	<b>Semester I (GE/OE)</b>
	<b>Name of the Paper - Statistics for Competitive examinations</b>
	<b>Paper code – (BGO1T02) 2 Credits (2 hrs Theory per week )</b>
	<b>Course Objectives</b>
	To train the students to solve the problems of statistics that appear in most of the competitive exams conducted by Banking, State and Central Governments and other agencies.
	<b>Course Outcomes (CO)</b>
	After the successful completion of the course, the students will be able to develop the data analysis skills required for Competitive Examinations.
	<b>CONTENTS</b>
	<b>Unit 1 (15 Hrs)</b>
( A )	<b>Collection Classification and Presentation of Statistical Data</b> Primary and Secondary data, Methods of data collection; Tabulation of data; Graphs and charts; Frequency distributions; Diagrammatic presentation of frequency distributions.
( B )	<b>Measures of Central Tendency</b> Meaning of central tendency and essentials of a good measure of central tendency. Types of measures of central tendency, Arithmetic mean, Median, Mode, Geometric mean and Harmonic mean - definition, merits and demerits. Properties of arithmetic mean. Empirical relation between mean median and mode. Problems on both grouped and ungrouped data for all the measures. Partition values-definition and types of partition values: quartiles, deciles and percentiles. Problems on Quartiles for grouped ungrouped data only
	<b>Unit 2 (15 Hrs)</b>
( A )	<b>Measures of Dispersion</b> Meaning and objectives of measures of dispersion. Essentials of a good measure of dispersion, absolute and relative measures of dispersion. Types of measures of dispersion- Range, Quartile deviation, Mean deviation and standard deviation with relative measures – definition, merits and demerits. Properties of Standard deviation, simple problems on ungrouped and grouped data.
( B )	<b>Introduction to Probability</b> Introduction to probability, Basic concepts: Random experiment, Sample space, Mutually exclusive, exhaustive, equally likely events, complimentary events, classical, statistical and axiomatic definition of probability, properties, Addition theorem of Probability and Definition of independent, dependent events, Conditional probability, Multiplication theorem of Probability without proof. Simple numerical problems.
	<b>References</b>
1	Freedman, D., Pisani, R. and Purves, R. (2014), Statistics, 4th Edition, W. W. Norton & Company.
2	Gupta S. C. Fundamentals of Statistics, Himalaya Publishing House, Bombay.
3	Gani S. G., Sankhyashastra and Ganakayantra. Udaya Ravi Publications, Bijapur

## GE/OE for B.Sc. I Reproductive Biology (BGO1T02)

**Credit: 2**

**Course outcomes:** After completion of the course, students will able to-

- Understand, describe and explain the male reproductive system.
- Understand, describe and explain the female reproductive system.
- Understand, describe and explain menstrual cycle.
- Understand, describe and explain spermatogenesis, oogenesis and fertilization.

### **Unit- I**

1. Male reproductive organs.
2. Function of Sertoli cells and Leydig cells.
3. Structure of Sperm.
4. Sperm transportation in male tract.

### **Unit -II**

1. Female reproductive organs.
2. The anatomy, histology and function of uterus, cervix, vagina, fallopian tubes and mammary gland.
3. Structure of Ovary.
4. Sperm transport in female tract.

### **Unit- III**

1. Menstrual cycle- different phases of menstrual cycle, menarche and menopause.
2. Hormonal control of menstrual cycle.
3. Male reproductive hormone and their function.
4. Female reproductive hormone and their function.

### **Unit- IV**

1. Spermatogenesis, spermiogenesis and spermiation
2. Oogenesis, Folliculogenesis, Ovogenesis, Ovulation
3. Oocyte maturation – Primary follicle to Graffian follicle
4. Fertilization- Sperm egg recognition, Acrosome reaction and species barriers

### **Suggested Reading:**

**Tortora GJ and Derrickson BH (2009).** Principles of Anatomy and Physiology, XII Edition, John Wiley and Sons, Inc., pp. 1281.

**Widmaier EP, Raff H and Strang KT (2008).** Vander's Human physiology. 11<sup>th</sup> Edition. McGraw Hill, pp. 770.

**Khurana I (2018).** Medical Physiology for undergraduate students. 2<sup>nd</sup> edition, Elsevier, pp. 938.

## GE/OE for B.Sc. I Attractive Insects BGO1T02

**Credit: 2**

**Course outcomes:** After completion of the course, students will able to-

- Understand, describe and explain the general characters of insects.
- Understand, describe and explain suborders of Odonata .
- Identify, recognized, describe and explain certain damselflies.
- Understand, describe and explain ecological significance of dragonflies.
- Identify, recognized, describe and explain certain dragonflies.
- Identify, recognized, describe and explain certain butterflies.
- Identify, recognized, describe and explain certain beetles.

### Unit -I

- 1.1 Introduction to class Insecta: Systematic position of class Insecta, General Characters of class Insecta .
- 1.2 Introduction to order Odonata: General characters of Odonata, suborders and families of order Odonata.
- 1.3 General characters of suborder Zygoptera, morphological difference between dragonflies and damselflies.
- 1.4 General characters, distribution of Coromandel marsh dart, *Ceragrion coromandelianum* (Fabricius, 1798) and golden dartlet, *Ischnura aurora* (Brauer, 1865)

### Unit- II

- 2.1 General characters of suborder Anisoptera, Ecological importance of dragonflies.
- 2.2 General Characters of Family Libellulidae; general characters, morphological features and distribution of green marsh hawk, *Orthetrum sabina* (Drury, 1770); ground skimmer, *Diplocodes trivalis* (Rambur, 1842).
- 2.3 General characters, morphological features and distribution of the granite ghost, *Bradinopyga geminata* (Rambur, 1842), ditch jewel, *Brachythemis contaminata* (Fabricius, 1793).
- 2.4 General characters, morphological features and distribution of the scarlet skimmer, *Crocothemis servilia* (Drury, 1770); pied paddy skimmer, *Neurothemis tullia* (Drury, 1773).

### Unit- III

- 3.1 General characters of family Aeshnidae; Morphological features, distribution of pale spotted emperor, *Anax guttatus* (Burmeister, 1839).
- 3.2 General characters of family Gomphidae; Morphological features, distribution of common clubtail, *Ictinogomphus rapax* (Rambur, 1842).
- 3.3 Introduction to Coleoptera: General characters, distribution and habitat of beetles.
- 3.4 Morphological features, distribution and habitat of Indian glow worm, *Lamprophorus tenebrosus* (Walker, 1858); seven spotted ladybird beetle, *Coccinella septempunctata* (Linnaeus, 1758); six-spotted zigzag ladybird, *Cheilomenes sexmaculata* ((Fabricius, 1781).

### Unit- IV

- 4.1 General characters, distribution and habitat of butterflies; morphological features of Nymphalidae, Papilionidae and Pieridae.

- 4.2. Morphological features, distribution and habitat of the common core, *Euploea core* (Cramer, 1780); the blue pansy, *Junonia orithya* (Linnaeus, 1758); *Danaus chrysippus* (Linnaeus, 1758)
- 4.3 Morphological features, distribution and habitat of lemon butterfly, *Papilio demoleus* (Linnaeus, 1758); the crimson rose, *Pachliopta hector* (Linnaeus, 1758); the tailed jay, *Graphium agamemnon* (Linnaeus, 1758).
- 4.4 Morphological features, distribution and habitat of common jezebel, *Delias eucharis* (Drury, 1773); common grass yellow, *Eurema hecabe* (Linnaeus, 1758); common emigrant, *Catopsilia pomona* (Fabricius, 1775).

### **Suggested Reading**

**Marshal SA (2018).** Beetles: The natural history and diversity of Coleoptera. Boston Mills Press, pp. 800.

**Smetacek P (2016).** A naturalists guide to the butterflies of India. Prakash Books India Private Limited, pp. 176.

**Andrew R.J., Subramanian K.A., Tiple A.D. (2008).** Common odonates of Central India. e-book for “ the 18<sup>th</sup> International Symposium of Odonatology, Hislop College, Nagpur”, pp. 56.

**Subramanian K.A. (2005).** Dragonflies and damselflies of peninsular India: A field guide. Project report of Centre for Ecological Science, Indian Institute of Science, Bangalore and Indian Academy of Science, Bangalore, pp. 35.

**Fashion Design/Textile Science**  
**Four Year (Eight Semester Degree Course)**  
**Semester - I**  
**Chemical Processing – I**  
**GE/OE (BGO1 TO2)**

**Theory Marks : 100**

SEE : 80

CIE : 20

**Total Credits : 2**

Theory : 2

Time Required: 30 Hours

**Theory (30 Hours)**

**Objectives**

1. To study the chemical processing of textile Material.
2. To become aware about Textile Chemistry.

**Unit I: (8 Hours)**

1.1 Comparison of organic & Inorganic compounds

1.2 Water (Required for Textile Industry)

- Impurities in water
- Purification softening of water by using
- Lime soda Treatment
- Zeolite or Base Exchange plant.

**Unit II: (7 Hours)**

2.1 Fiber Classification according to Chemical group

2.2 Textile fibres: Physical and Chemical properties of following fibres-

- |           |              |                     |             |              |
|-----------|--------------|---------------------|-------------|--------------|
| i. Cotton | ii. wool     | iii. Silk           | iv. Viscose | v. polyester |
| vi. Nylon | vii. Acrylic | viii. polypropylene |             |              |

**Unit III: (8 Hours)**

1.1 Cotton Fabric processing sequence

1.2 Shearing & cropping

1.3 Singeing & Designing

1.4 Scouring

**Unit IV: (7 Hours)**

1.1 Souring

1.2 Bleaching: (i) Hypochlorite (ii) Peroxide

1.3 Mercerizing – Fabric & Yarn & Barium number test

**References:**

- 1 Technology of Textile Processing - Vol 1(Textile Fiber) - Dr. V.A. Shenoi
- 2 Technology of Textile Processing - Vol III (Technology of Bleaching) - V.A. Shenoi
- 3 Technology of Textile Processing - Vol IX (Fundamental Principal of Textile Processing) - V.A. Shenoi
- 4 Chemical technology of Fibre materials - F. Sadav
- 5 Textile scouring & Bleaching - E.R. Trotman

**B.Sc. Semester – I**  
**BGO1T02: Cosmetic Chemistry**  
**Theory: 2 credits**

*Course Outcomes: By the end of this course, students will be able to:*

- *Understand the basic principles of cosmetic chemistry.*
- *Identify and describe the function of various cosmetic ingredients.*
- *Formulate and evaluate different types of cosmetic products.*
- *Apply knowledge of skin and hair biology to cosmetic product development.*
- *Understand the regulatory and safety considerations in the cosmetic industry.*

**Unit I: Introduction to Cosmetic Chemistry (7.5h)**

- (A) **Overview of the cosmetic industry:** Historical development of cosmetics, Basic principles of cosmetic formulation, Types of cosmetics (skincare, haircare, color cosmetics, etc.).
- (B) **Cosmetic Ingredients:** Categories of cosmetic ingredients: Emollients, Humectants, Surfactants, Preservatives, Colorants, Fragrances, Natural vs. synthetic ingredients. Functions and mechanisms of action of key ingredients.

**Unit II: Skin-Hair Biology and Products (7.5h)**

- (A) **Structure and function of the skin:** Skin types and conditions, Structure and function of hair, Hair types and conditions.
- (B) **Skincare Products:** Formulation of cleansers, moisturizers, sunscreens, and anti-aging products. Key ingredients and their roles in skincare products. Evaluation and testing of skincare products (e.g., stability, efficacy, safety).
- (C) **Haircare Products:** Formulation of shampoos, conditioners, hair dyes, and styling products. Key ingredients and their roles in haircare products. Evaluation and testing of haircare products (e.g., performance, safety).

**Unit III: Colour and Fragrances in Cosmetics (7.5h)**

- (A) **Colour:** Formulation of makeup products (foundations, lipsticks, eye shadows, etc.). Pigments and colorants used in cosmetics. Safety and stability of color cosmetics. Trends and innovations in color cosmetics.
- (B) **Fragrances:** Basics of fragrance chemistry. Types of fragrances (natural and synthetic). Role of fragrances in cosmetics and personal care products. Regulatory considerations for fragrances.

**Unit IV: Regulatory Safety Considerations, Sustainability and Ethics (7.5 h)**

- (A) **Regulatory and Safety Considerations:** Cosmetic regulations and standards (FDA, EU, etc.). Safety assessment of cosmetic ingredients. Good Manufacturing Practices (GMP) in the cosmetic industry. Labeling and claims in cosmetics.
- (B) **Sustainability and Ethics:** Sustainable sourcing of ingredients. Green chemistry principles in cosmetic formulation. Ethical considerations in the cosmetic industry (e.g., animal testing, fair trade).

## References

1. "Introduction to Cosmetic Formulation and Technology" by Gabriella Baki and Kenneth S. Alexander
2. "Harry's Cosmeticology" by Ralph Gordon Harry, Martin M. Rieger, and Edward Sagarin
3. Baki, G., & Alexander, K. S. (2015). 'Introduction to cosmetic formulation and technology'. Wiley.
4. Harry, R. G., Rieger, M. M., & Sagarin, E. (2000). 'Harry's cosmeticology' (8th ed.). Chemical Publishing Co.
5. Sakamoto, K., Lochhead, R., Maibach, H., & Yamashita, Y. (Eds.). (2017). 'Cosmetic science and technology: Theoretical principles and applications'. Elsevier.
6. "Cosmetic Science and Technology: Theoretical Principles and Applications" edited by Kazutami Sakamoto, Robert Lochhead, Howard Maibach, and Yuji Yamashita

## Weblinks

<https://onlinelibrary.wiley.com/journal/14682494>

<https://www.scconline.org/journal-of-cosmetic-science>

<https://www.cosmeticsandtoiletries.com/>

<https://onlinelibrary.wiley.com/journal/16000846>

<https://www.scconline.org/journal-of-cosmetic-science>

**B.Sc. Semester-I**  
**Subject: Microbiology**  
**Course Code: BGO1T02**  
**INTRODUCTION TO MICROSCOPY & STAINING**

<b>GE/OE</b>	<b>Hours: 2 Hours/Week</b>	<b>Marks: 80+20=100</b>	<b>Credit: 2</b>
<b>Unit-I</b>			
<b>Microscopy I</b>	<ol style="list-style-type: none"> <li>1. Discovery of Microscope</li> <li>2. Properties of Light</li> <li>3. Simple Microscope</li> <li>4. Compound microscope—Bright field Microscopy,</li> <li>5. Principle, applications and ray diagram Dark field Microscopy,</li> </ol>		<b>7.5 Hrs</b>
<b>Unit-II</b>			
<b>Microscopy II</b>	<b>Principle, applications and ray diagram:</b> <ol style="list-style-type: none"> <li>1. Transmission Electron microscopy</li> <li>2. Scanning Electron microscopy</li> <li>3. Phase-contrast microscopy,</li> <li>4. Fluorescent microscopy</li> </ol>		<b>7.5 Hrs</b>
<b>Unit III</b>			
<b>Staining Techniques I</b>	<ol style="list-style-type: none"> <li>1. Stains &amp; dyes, chromophore, auxochrome &amp; chromogenes</li> <li>2. Types of stains</li> <li>2. Theories of staining</li> <li>3. Staining techniques : Simple, negative staining,</li> <li>4. Differential staining- Gram staining</li> </ol>		<b>7.5 Hrs</b>
<b>Unit IV</b>			
<b>Staining Techniques II</b>	<b>Special staining Technique</b> <ol style="list-style-type: none"> <li>1. Acid-fast staining</li> <li>2. Flagella staining</li> <li>3. Endospores staining</li> <li>4. capsule staining</li> <li>5. Inclusion bodies staining</li> </ol>		<b>7.5 Hrs</b>



## Reference books -

1. Introduction to Microbial Techniques by Gunasekaran
2. Microbiology: Fundamentals and Applications by Ronald M. Atlas, New York: Macmillan Publication
3. Powar C. B. and Daginawala H. I. (2005). General microbiology Volume I. Himalaya Publishing House Private Limited, Pune, India.
4. Powar C. B. and Daginawala H. I. (2005). General microbiology Volume II. Himalaya Publishing House, Private Limited, Pune, India
5. Debnath M., Prasad G. B. and Bisen P. S. (2012). Microbes: Concepts and Applications. Germany: Wiley.
6. Pelczar M. J. Jr., Chan E.C.S. and Krieg N. R. (2010). Microbiology: An Application based Approach. McGraw-Hill Education (India) Private Limited, New Delhi, India.
7. Pierce B. E. and Leboffe M. J. (2019). Microbiology: Laboratory Theory and Application: Essentials. United States: Morton Publishing

## COURSE OUTCOMES

<b>Sr. No.</b>	<b>Course outcome</b>
1.	Students will be able to understand the needs and basics of techniques used in observing microbes.
2.	Students will be aware of applications of basic techniques.
3.	Handling and use of microscopes for the study of microorganisms which are among the basic knowledge expected from a practicing microbiologist.

**Bachelor of Science (Honors / Research) 4 yr. 8 Semester Degree Program**  
**B.Sc. Sem I (Interior Design – Major)**

**BGO1T02 CULTURAL ANTHROPOLOGY I**

**AIM: Students** of design have to be sensitized to various cultural aspects such as traditions , fine arts and the performing arts of a particular country and have to understand the symbolism, patterns and forms that manifest themselves in the architecture of that place.

UNIT I : Industrial Psychology

i) Meaning and Definition

ii) Scope

UNIT II : Fatigue in Industry

i.)Meaning and Definition of Fatigue

ii) Internal environment

iii) Factors creating fatigue

iv) Techniques of lessening physical fatigue, Other Techniques

v)External environment

vi) boredom and monotony

UNIT III : Recruitment , Selection and training

i) Recruitment: sources of Recruitment

ii) Selection: steps in selection process

iii) Training: methods of training, Advantages of Training

UNIT IV : Indian Constitution and Federal System

i) Remarkable features

ii) Federal System

iii) A Quasifederal constitution

UNIT V : Fundamental Rights and Directive Principles of state policy

i) Fundamental rights

ii) Characteristics

iii) Fundamental Right enshrined in the constitution

iv) The directive principles of state policy

#### REFERENCE BOOKS

1) A new Outlook into Social Science – S. Shabbir, A. M. Sheikh, Jaya Dwadashiwar, S.

Chand, Delhi

2) T. Ramasamy, 2012, Principles of Management, Himalaya Publishing House,

Mumbai.

3) Dr. Pratibha M. Siriya, 2011, Principles of Business Management, Sai Jyoti

Publication, Nagpur.

4) King's, Personnel management & Industrial Relations, Harsha Rastogi, Delhi.

S. No	Course Outcomes
	The students will gain knowledge regarding
CO1	Indian Constitution
CO2	Fundamental Rights & Duties
CO3	Federal System
CO4	Fatigue in Industry
CO5	Indian Constitution

## **B. Sc ( Applied Electronics & Software Technology ) – Semester I (GE/OE)**

### **BGO1T02 SOCIAL SCIENCE I**

Scheme of Examination (Theory)

SEE – 80

CIE - 20

Total - 100

**Course Outcome :** The students will gain knowledge regarding

1. Types of Society
2. Culture – types & characteristics
3. Importance of anthropology
4. Importance of Ethnography
5. Types of Communication

**UNIT I: Society** – i) Meaning and Definition ii) Characteristics of Society iii) Types of Society iv) Factors Bringing Changes in Society v) Impact of Modernization on Society and Study of Society

**UNIT II: Culture** – Meaning and Definition ,Characteristics of Culture ,Types of Culture in India ,Factors bringing changes in Culture – Modernization, Urbanization, Technology ,Tradition and Rituals of any one State Art form and Craft form in Indian States

**UNIT III: Anthropology** - Meaning and Definition of Cultural Anthropology ,Importance of Anthropology

**UNIT IV: Ethnography** : Meaning and Definition , History of Ethnography , Significance of Ethnography

**UNIT V: Communication** : Meaning and Definition , Types and Channels of Communication , Significance of Communication in Interior Design.

#### **Reference Books**

- Nadeem Hasnain, 2011, Indian Anthropology
- Mohd. Irfan, 2012 , Social Exclusion And Muslim Ethnograph, Neha Publishers & Distributors

**GE/OE Basket Semester II**  
**Faculty of Science and Technology**

Sem.	Course Category		Name of Course	BoS	Course code
<b>II</b>	<b>GE/OE</b>	1	Sustainable agriculture	Botany	<b>BGO2T03</b>
		2	Bioethics	Biochemistry	
		3	Applications of Biotechnology in Agriculture	Biotechnology	
		4	Programming in C	Computer Science/ Computer Application	
		5	PC Assembly & Maintenance	Electronics	
		6	Introduction to Climate Crises	Environmental Science	
		7	A. Introduction to Forensic Auditing & Fraud Assessment / B. Chemistry of Natural & Synthetic Molecules / C. Instrumentation Aids/ D. Basics of Microbial Forensics/ E. Basics of Clinical Psychology (Psychology)/ F. Office Automation/ G. Criminal Law-I (Law)	Forensic Science	
		8	Introduction to Landforms	Geology	
		9	Business statistics I	Mathematics	
		10	Microbial world	Microbiology	
		11	Energy sources	Physics	
		12	Statistical methods and psychological testing	Statistics	
		13	Industrial entomology	Zoology	
		14	Physical Chemistry	Cosmetic Technology	
		15	Computer Application in Design	Fashion Design	
		16	Computer Application in Designing	Textile Science	
		17	Kitchen and Nutrition Chemistry	Chemistry	
		18	Mathematics II	Interior Design	
		19	Engineering Mathematics II	Applied Electronics & Software Technology	

<b>B. Sc. Semester-II</b>			
<b>GE / OE-3 Botany (BGO2T03)</b>			
<b>Sustainable Agriculture</b>			
<b>GE/OE-III Theory</b>	<b>Hours: 2 Hours/Week</b>	<b>Marks: 80+20=100</b>	<b>Credit: 2</b>
<b>Unit-I</b>			
<b>Introduction</b>			7.5 Hrs.
<ol style="list-style-type: none"> <li>1. Concept and importance of sustainable agriculture</li> <li>2. General principles and goals of sustainable agriculture</li> <li>3. History and policy for sustainable agriculture in India</li> <li>4. Barriers or problems in adoption of sustainable agriculture</li> <li>5. Farming system: Scope and types</li> </ol>			
<b>Unit-II</b>			
<b>Sustainable agriculture system: Objectives, Characteristics and advantages of following practices</b>			7.5 Hrs.
<ol style="list-style-type: none"> <li>1. Organic farming.</li> <li>2. Natural farming.</li> <li>3. Biodynamic of agriculture.</li> <li>4. Conservation agriculture.</li> <li>5. Integrated farming system.</li> <li>6. Precision farming.</li> <li>7. Crop rotation and inter cropping</li> <li>8. Vertical farming</li> </ol>			
<b>Unit-III</b>			
<b>Sustainable agriculture system: Objectives, Characteristics and advantages of following practices</b>			7.5 Hrs.
<ol style="list-style-type: none"> <li>1. Permaculture.</li> <li>2. Agroforestry.</li> <li>3. Integrated pest management</li> <li>4. Rain water harvesting- artificial ground water recharge.</li> <li>5. Floating farming.</li> <li>6. Mulching.</li> <li>7. Vermi-composting.</li> <li>8. Soil solarization.</li> </ol>			
<b>Unit-IV</b>			
<b>Factors affecting: sustainability of agricultural resources and control measures</b>			7.5 Hrs.
<ol style="list-style-type: none"> <li>1. Land or soil related problems.</li> <li>2. Irrigation related problems.</li> <li>3. Indiscriminate use of agrochemicals.</li> <li>4. Environmental pollution.</li> <li>5. Erosion of genetic biodiversity.</li> </ol>			
<b>Note: Field visits are compulsory.</b>			

## Suggested readings

1. Gopal Chandra De. 1980., Fundamentals of Agronomy. Oxford and IBH Publishing Co. Ltd., Bangalore. 3) Hand book of Agriculture, ICAR Publication.
2. Panda, S.C., 2006. Agronomy Agribios Publication, New Delhi.
3. Reddy, S.R. Principles of Agronomy Kalyani Publishers, Ludhiana, India.
4. Sankaran, S and Subbiah Mudliyar, V.T., 1991. Principles of Agronomy. The Bangalore Printing and Publishing Co. Ltd., Bangalore.
5. Lampkin, N (1990) Organic Farming. Farming Press, Ipswich (ISBN 0 85236 191 2)
6. Kristensen, P., Taji, A. and Reganold, J. (2006). Organic Agriculture: A Global Perspective. CSIRO Press, Victoria, Australia.
7. Palsnipsn S. P., Cropping systems in tropics- Principles and practices
8. Altieri, M. A. 1995, Agroecology: The Science and Sustainable Agriculture. 2<sup>nd</sup> Edn Westview Press, Colorado.
9. A. Zaman. 2002 Watershed Management for Sustainable Agriculture in Indian Perspectives. 12<sup>th</sup> ISCO Conference
10. Chadha G. K. Sen S. and Sharma H. R. 2004. State of Indian Farmer: A Millenium Study, Vol.2: Land resources, Ministry of Agriculture, Govt of India.
11. Niti Gupta, Shanal Pradhan, Abhishek Jain and Nahya Patel (2021); Sustainable Agriculture in India: What we know and how to scale up. New Delhi. CEEW Report April 2021
12. Deb, D. L. 1994. Natural Resources Management for Sustainable Agriculture and Environment. Angkor Publishers Ltd., New Delhi.
13. Saroja Raman. 2006. Agricultural Sustainability- Principles, Processes and Prospects. Food products Press, New York.
14. Subramaniyan, S. 2004. Globalization of Sustainable Agriculture. Kalyani Publishers, Ludhiana.

# **General Elective Paper (Biochemistry-Major)**

## **Semester 2 : BIOETHICS (BGO2T03)**

### **COURSE OUTCOMES:**

This course is designed to provide:

1. To Understand the terms 'ethics' and 'bioethics';
2. To Demonstrate understanding of the biosciences and ethical considerations associated with a current advance in biotechnology, modern biomedicine, agriculture and in the utilization of natural resources.
3. Integrate the use of scientific facts and ethical principles and argumentation in discussing cases involving moral dilemmas;
4. Use and critically evaluate information gathered from a variety of sources; a Recognize the diversity of informed ethical opinions regarding the development of current advancements in biology and biomedicine;
5. Develop scientific attitudes, reflective processes and decision making skills; a Develop a sense of moral obligation and responsibility both in their relationship with nature and in their future professional activity.

### **UNIT I: Theoretical background to bioethics**

The nature of bioethics (defining bioethics, history and philosophy, modern science, a new history of biology, the scientific method, bioscience and biotechnology, importance of bioethics for the biosciences); theories of ethics (introduction to ethics, ethics and morality, moral reasoning and major ethical theories)

### **UNIT: II. Environmental ethics**

Interactions of humans with the natural world (the place of humans in nature, environmental values, origin and emergence of environmental ethics, ideas of stewardship and Gaia); current themes in environmental ethics (anthropogenic impact on the biosphere and precautionary principles, environmental sustainability); current issues in environmental ethics (terrestrial and aquatic pollution, global climate change, environmental degradation and loss of biodiversity, ecotourism and ethics); humans and non-humans animals (animal welfare and animal rights, human use of nonhuman animals, ethics of animal research, legislation for, and alternatives to animal experimentation).

### **UNIT: III Ethics of biotechnology**

Genetic modification (general ethical issues related to genetic modification, application of genetic modification – pharmaceuticals, GM food and crops, genetic modification of animals, research use of genetic modification, GM and less-developed countries; GM microorganisms as bacteriological warfare; conception of risk, assessment, management, communication and standards of risk; interpreting the precautionary principles); Introduction to the Human Genome Project.

### **UNIT: IV Biomedical ethics**

Cloning and stem cells (ethics of human cloning, reproductive cloning and therapeutic cloning, embryonic stem cells and the status of the early human embryo, experiments on embryonic stem cells, legislation and therapeutic cloning); ethical aspects of the assisted reproductive technologies (artificial insemination and donor insemination, in vitro fertilization, surrogate mothering, designer babies etc. in brief)



**References:**

1. Bryant J., Baggott la Velle L., Searle S. (2006) Introduction to Bioethics, John Wiley & Sons, Chichester.
2. Downie R., Clarkeburn H. (2005) Bioscience Education,
3. Encyclopedia of Bioethics (2004) 3rd Edition (Stephen G. Post, Ed.), Thomson Gale, p. xi.
4. Greenwell P. and McCulley M. (2007) Molecular therapeutics: 21st Century Medicine. John Wiley & Sons, Chichester.
5. Hristova S. (2009). Ethics in the world of biotechnology, Faber, Sofia. (in Bulgarian);.
6. Jonsen A. (1998) The Birth of Bioethics, Oxford University Press, Oxford.

## SEMESTER – II

### APPLICATIONS OF BIOTECHNOLOGY IN AGRICULTURE

**Course Code: BGO2T03**

**Total Contact Hours: 30**

#### **Course Outcomes:**

After successful completion of this Course, students will be able to:

- CO 1. Understand the biotechnological applications in agriculture
- CO 2. Comprehend the pros and cons of GM crops and their plant products
- CO 3. Appreciate the biotechnological applications for effective pest control and crop improvements
- CO 4. Understand the importance of molecular markers in agriculture

#### **Unit I**

**8 hours**

**Agricultural Biotechnology:** Concept and scope of biotechnology in Agriculture; Plant tissue culture, micro propagation; entrepreneurship in commercial plant tissue culture; Banana tissue culture – primary and secondary commercial setups, Small scale bio enterprises: Mushroom cultivation

#### **Unit II**

**7 hours**

**Transgenic plants:** The GM crop debate – safety, ethics, perception and acceptance of GM crops; GM crops case study: Bt cotton, Bt brinjal; Plants as biofactories for molecular pharming; edible vaccines, plantibodies, nutraceuticals.

#### **Unit III**

**8 hours**

**Pest control and crop improvement:** Baculovirus pesticides, Mycopesticides; Post-harvest Protection: Antisense RNA technology for extending shelf life of fruits and shelf life of flowers; Genetic engineering for quality improvement: Golden rice, Seed storage proteins, Flavours– capsaicin, vanillin

#### **Unit IV**

**7 hours**

**Molecular marker aided breeding:** RFLP maps, linkage analysis, RAPD markers, STS, microsatellite, SCAR (sequence characterized amplified regions), SSCP (single strand conformational polymorphism), QTL, map based cloning, molecular marker assisted selection

**References:**

- Chrispeels M.J. and Sadava D.E. (1994) *Plants, Genes and Crop Biotechnology*, 2nd Ed., Jones and Bartlett Publishers, Boston.
- Gamborg O.L. and Philips G.C. (1998) *Plant cell, tissue and organ culture*, 2nd Ed., Narosa Publishing House. New Delhi.
- Gistou, P. and Klu, H. (2004). *Handbook of Plant Biotechnology (Vol. I & II)*. John Publication.
- Hammond J., McGarvy P. and Yusibov.V. (2000). *Plant Biotechnology*, Springer Publ.
- Heldt. H.-W. (1997). *Plant Biochemistry and Molecular Biology*. Oxford and IBH Publishing Co. Pvt. Ltd. Delhi.
- Kyte, L., Kleyn, J., Scoggins, H., and Bridgen M. (2003) *Plants from test tubes. An introduction to micropropagation*, 4th Ed., Timber Press, Portland.
- Murray D.R. (1996) *Advanced methods in plant breeding and biotechnology*. Panima Publishing Corporation.
- Nickoloff, J.A. (1995). *Methods in molecular biology, Plant cell electroporation and electrofusion protocols*-Humana Press Incorp, USA.
- Sawahel, W.A. (1997). *Plant genetic transformation technology*. Daya Publishing House, Delhi.

**B.Sc. Sem-II (Computer Science/ Computer Application)**  
**BGO2T03**

**PROGRAMMING IN 'C'**

**Credits : 2**

**Duration : 30 Hours**

**Course Objectives:**

- 1.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 implement operations on arrays, strings , structures, unions , functions and file handling.

**Course Outcomes :**

After completing this course satisfactorily, a student will be able to:

1. Write simple algorithms for arithmetic and logical problems.
2. Write the C code for a given problem
3. Perform input and output operations using programs in C
4. Write programs that perform operations on arrays, strings , structures, unions , functions and file handling.

**UNIT I**

Programming Structure: Sequence, Selection, Iteration and Modular. Problem Solving techniques: Development Tools: Algorithm, Flowcharts and Pseudo code (Definition and its characteristics) Developing Algorithm and Drawing flowcharts

**UNIT II**

C Character set, Tokens, Identifier, Keywords, Variables, Data types, Qualifiers. Operators and Expressions: Arithmetic, Relational, Logical, Bit-Wise, Increment, Decrement, Conditional and Special operators. typedef, Type Conversion, Constants, Declaring Symbolic Constants, Character Strings, Enumerated Data Types, Operator Precedence and Associativity. Library functions: Maths, string handling Functions. Control Structure: Compound Statement, Selection Statement: if, if-else, Nested if, switch. Iteration statement: for, while, do...while, Nested loops, Jump statements: break, continue, goto (Special emphasis on problem solving)

**UNIT III**

Arrays: Need, Types: Single and Two Dimensional Array.  
Strings: Strings Manipulation, Arrays of Strings, Evaluation order  
Function: Function Components, Return Data type, Parameter Passing, Return by Reference, Default Arguments, Recursive Functions, Arrays with Functions, Storage Classes. (Special emphasis on problem Solving)

**UNIT IV**

Structure: Declaration, Definition, Accessing structure members, Initialization, Nesting of Structures.  
Union: Unions, Differences between Structure and Union  
Pointer: Introduction, Address Operator (&), Pointer variables, void pointers, Pointer Arithmetic, Pointers to Pointers.  
File handling: Hierarchy of File Stream Classes, Opening & closing a file, Testing for errors, File Modes, File pointers and their manipulations, Sequential Access, Random Access, Command Line arguments.

**Books**

1. The Art of programming through flowcharts & algorithm by Anil B. Chaudhari Firewall Media, Laxmi publication, New Publication.
2. Programming in C by E. Balagurusamy TMH Publications.
3. C Programming – KernighenRitche
4. Programming with C – Y. Kanetkar.
5. C Programming – Holzner, PHI Publication.
6. Programming in C – Ravichandran.

**Course outcome:**

At the end of this course students will have ability to

1. Identify basic terms, concepts, functions, and operations of personal computer (PC) system components.
2. Complete installations of memory modules, system boards, processors, power supplies, adapter boards, storage devices, and multimedia devices.
3. Analyse common symptoms and problems associated with PC components and provide solutions to troubleshoot and isolate the problems. Identify the purpose of various types of preventive maintenance products and procedures.

**Syllabus :**

1. Introduction to PC Hardware: Study of basic I/O systems, Types of Memories- Static RAM and Dynamic RAM, ROM, PROM, EPROM, EEPROM, CPU (Central Processing Unit)- ALU and control unit.
2. Motherboard and Processor: Study of different types of Motherboards, Motherboard Configuration, Identifying Internal and External connectors, Types of data cables, Types of Processors- Intel Celeron, P4 family, Xeon dual core, quad core, core2 duo, i3, i5, i7 and AMD.
3. BIOS Configuration: Study of BIOS Set-up- Advance set-up, Boot configuration, Boot Menu. Installation of OS (Operating Software) Windows installation. Hard Disk: Formatting of Hard disk, Partitioning of Hard disk in different logical drives, Disk defragmentation, Disk clean up, Scan disk etc.
4. Troubleshooting: Motherboard drivers, LAN, Audio, and Video. Configuration of External devices: Printers, Scanner set-up, Webcam, Bluetooth device, Memory card reader etc. Diagnostic and troubleshooting of PC: POST (Power on Self-Test), identifying problems by Beep codes errors, checking power supply using Multi-meter, Replacement of components etc. Antivirus and Application Software

**Books:**

1. Troubleshooting, Maintaining and Repairing PCs by Stephen J. Bigelow
2. The Complete PC Upgrade and Maintenance Guide by Mark Minasi.

**Unit-I:**

**Climate Change:** Definition, scope and facts of climate change, Composition and thermal structure of atmosphere, weather and climate. Meteorological parameters – temperature, pressure, precipitation, humidity, wind speed and direction.

**Monsoons:** Definition, Indian monsoons – seasons: cold weather season (winter), the hot weather season (summer), season of advancing monsoon (rainy season) and season of retreating monsoon (the transition season), cyclones of the Indian region; El-Nino and La-Nina and their impacts.

**Unit-II:**

**Air Pollution:** types of air pollution. Air pollutants, Co-relation between air pollution and climate crisis. Impact of air pollution, Mitigation methods. Case studies of air pollution disasters. **Acid rain:** chemistry of acid rain, impacts of acid rain, mitigation measures of acid rain.

**Greenhouse effect and global warming:** Definition, impacts, major greenhouse gases, sources and sinks of greenhouse gases, global dimming and global warming potential, black carbon and carbon footprint.

**Unit-III:**

**Impact of climate change:** Influence on agriculture, climate change and food security, water stress and water insecurity, rise in sea levels, loss of biodiversity and extinction of species, vectorborne/zoonotic diseases, increase in floods and drought incidences.

**Mitigation strategies of climate change:** Carbon sequestration, carbon sink, carbon credit, carbon offsetting, carbon tax, geo-engineering.

Unit-IV:

**Climate change and policy frameworks:** United Nation Framework Convention on Climate Change (UNFCCC), The United Nation Conference on Environment and Development, Inter- governmental Panel on Climate Change (IPCC), The Kyoto Protocol, Paris Agreement.

**India and Climate Change:** Ministry of Environment, Forest and Climate Change (MoEF andCC), India's National Plan on Climate Change, The National Mission on Strategic Knowledge for Climate Change (NMSKCC), National Mission for Sustainable Agriculture (NMSA), National Bio-Energy Mission.

**References :**

1. Abhishek Tiwary and Jerem Colls.(2020). Air Pollution: Measurement, Modelling and Mitigation.III Edition, Routledge Publication.
2. Agarwal.K.M, Sikdar P.K and Deb S.C. (2002). A Text book of Environment MacMillerIndia Ltd., Culcutta.
3. Climate Change: Science and Politics. (2021). Centre Science and Environment, NewDelhi.
4. Donald Ahrens. C. (2008). Essential of Meteorology: An Invitation to the Atmosphere.Cengage Learning Publication.
5. Howard J. Critchfield.(1983). General Climatology (4<sup>th</sup> Edition), Phi Learning Pvt Ltd.

6. IPCC. (2006). Guidelines for National Green house gas Inventories. Published by the Institute for Global Environmental Strategies (IGES), Hayama, Japan on Behalf of the IPC.
7. John E. Oliver, John J Hidore. (2002). Climatology: An Atmosphere Science, Second Edition. Printice Hall Publication.
8. John T. Hardy. (2003). Climate Change: Causes, Effects and Solution. John Wiley andSons Publication.
9. Mann, M.E. (2021 The New Climate War: The Fight to take back our planet, HachetteUK.
10. Nicholas Stern.(2008). The Economics of Climate Change: The Stern Review.Cambridge University Press, Great Britain.
11. Rajit Sengupta and Kiran Pandey, (2021). State of India's Enironment 2021: In Figures.Centre Science and Environment, New Delhi.
12. Roger G. Barry and Richard J. Chorley. (2007). Atmosphere, Weather and Climate, 8<sup>th</sup> Edition, Routledge Publication.
13. Shankar IAS Academy (2016).Environment 4<sup>th</sup> Edition. Chennai (India).



## Semester II

### GE/OE (Forensic Science)

#### GE 1 (BGO2T03): Introduction to Forensic Auditing, Forensic Accounting and Fraud Assessment

**Learning Outcomes:** By the end of this Course, the learners will be able to:

1. Apply the principles of forensic auditing and understand the fundamental concepts of forensic auditing and its role in investigating financial irregularities.
2. Understand the different types of fraud, including financial statement fraud, employee embezzlement, and corruption schemes.
3. Utilize forensic accounting techniques, including data analysis, financial statement reconstruction, asset tracing, and forensic interviews.
4. Develop strong written and verbal communication skills to present their forensic audit findings and fraud assessment reports.
5. Collaborate effectively with other professionals, to gather evidence, analyze complex financial transactions, and build strong legal cases.

#### **Unit-I: Basics of Forensic Auditing**

Introduction to Forensic Auditing, the difference between a general audit and Forensic Audit, Legal and Regulatory Framework, Understanding the legal and ethical considerations in forensic auditing, Fraud Examination Techniques, Introduction to data analytics in forensic auditing, Investigative Procedures and Evidence Gathering, Fraudulent Financial Reporting, Case Studies and Real-World Applications, Ethical Considerations in Forensic Auditing

#### **Unit-II: Basic of Forensic Accounting**

Forensic Accounting, basics of Forensic Accounting, the difference between general and Forensic accounting, principles of Forensic Accounting and fraud examination, Roles of a forensic accountant, forensic accounting services, forensic accounting skills; critical thinking, reasoning and communication.

#### **Unit-III: Fraud Assessment I**

Introduction to fraud; definition of fraud, Role of fraud assessment in forensic auditing, Importance of proactive fraud risk management different types of frauds such as insurance frauds, management fraud, financial statement fraud (revenue and inventory related frauds), disclosure frauds (consumer fraud, identity theft, scams, money laundering), tax fraud, fraud in e-commerce.

#### **Unit-IV: Fraud Assessment II**

Nature of fraud, fraud cycle, fraud schemes and red flags. Fraud prevention and fraud detection, recognizing symptoms of fraud, fraud investigation, fraud risk assessment. Emerging Trends and Technologies in Fraud Assessment, Introduction to technological advancements in fraud assessment, Use of artificial intelligence, machine learning, and data mining in fraud detection Future challenges and opportunities in fraud assessment

## GE/OE (Forensic Chemistry)

### GE 1 (BGO2T03): Chemistry of Natural and Synthetic Molecules

**Course Outcomes:** By the end of this Course, the learners will be able to:

1. Examine the classification, structure, properties and biological importance of synthetic sugar and natural sugars and its significance in forensic science.
2. Recall and understand the fundamentals of dyes and paints along with their nature, classification, composition use and significance in forensic science.
3. Understand the nature, structure and physical properties of fats and oils.
4. Understand the structure, types, properties, preparation, and application of polymers and its significance in forensic science.

#### **Unit I: Sugars**

Introduction, Classification, Properties and Biological importance. Natural and synthetic sugars, structures of glucose, reducing and non-reducing sugars, significance in forensic science

#### **Unit II: Dyes and Paints**

Dyes & Paints: Introduction, Nature, classification, composition, uses. Paints. Components of paint: binders, pigments, solvents, additives; Role and properties of each component in paint formulation; Common types of paints and their distinguishing features. Forensic significance of Dyes and Paints.

#### **Unit III: Oils and fats**

Introduction, Structures of Fats and Oils, Physical Properties of Fats and Oils, Physical Properties of Fats and Oils, Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils. Analytical constants: Acid value, Saponification value, Iodine value, significance and principle involved in their determination.

#### **Unit IV: Polymers**

Introduction, General idea of structures, types of polymerization processes, properties of polymers, Structure, preparation and applications of Polyethylene, Teflon, PVC, Polystyrene, etc. Significance in Forensic Science

## **GE/OE (Forensic Physics)**

### **GE 1 (BGO2T03): Instrumentation Aids**

**Course Outcomes:** By the end of this Course, the learners will be able to:

1. Remember the basic principles of electromagnetic radiation and its properties.
2. Apply the appropriate electromagnetic radiation sources such as UV, visible and IR rays etc. for specific forensic analysis.
3. Understand the basic structure and basic concept of optical fiber and remembering different types of optical fibers used in forensic physics.
4. Understanding the working mechanisms of various transducers and their applications.
5. Understand the principles of detection and signal processing and the working mechanisms of different detectors and their applications.

#### **Unit I: Electromagnetic Radiation Sources**

Conventional Sources for UV, Visible and Infrared Rays, Sources of Radiations for X-Rays, Laser (Ruby, He-Ne, CO<sub>2</sub>, Dye Laser, Semi-Conductor Laser).

#### **Unit II: Optical Fibres**

Importance of Optical Fiber, Propagation of Light Waves in Optical Fiber, Basic Structure, Stepped Index Monomode Fiber, Graded Index Fiber, Acceptance Angle and Acceptance Cone, Numerical Aperture, Fiber Losses and their Units (Basic Concept), Electrical and Optical Band Width, Bandwidth Length Product, Dispersion in Optical Fiber.

#### **Unit III: Transducers**

Strain Gauge, Resistance Thermometer, Thermocouple, Thermistors and its Applications, Microphone & Loudspeaker, Photo-Electric Transducers, LVDT

#### **Unit IV: Detectors**

Photographic Detectors, Thermal Detectors, Photoelectric Detectors, PMT and Semiconductor Detectors. Construction and Working Principle of Ionization Chamber, Proportional Counter, Geiger Muller Counter, Scintillation Counter, Solid State Detectors.

## **GE/OE (Forensic Biology)**

### **GE 1 (BGO2T03): Basics in Microbial Forensics**

**Course Outcomes:** By the end of this Course, the learners will be able to:

1. Understand the concept of microbiology, bioterrorism, bio-surveillance, biodefence, biotoxin and their aspect in forensic science.
2. Recall and understand the structure of bacteria and viruses along with their different culturing techniques.
3. Gain a comprehensive understanding of the functioning of Recombinant DNA technology and its significance in forensic science, Polymerase Chain Reaction, its history and development, different types of vectors and restriction enzymes.
4. Examine the growth curve of bacteria and analyze concepts such as reproduction of bacteria, control of bacteria and different staining technique.

#### **Unit-I: Introduction to Microbiology**

Introduction of Microbiology, History, and Development of Microbiology; Whittaker Classification system; General structure of Bacteria and Viruses; Types of culture media (basal, selective, differential, enriched, enrichment); Culturing techniques of microorganisms (Streak plate and pour plate method).

#### **Unit-II: Bacterial Reproduction, Control, and Culture Techniques**

Reproduction of bacteria; Control of microorganisms (Chemical and Physical); Growth curve of bacteria; continuous culture and synchronous culture of bacteria; Staining of bacterial cells (Simple and differential).

#### **Unit-III: Recombinant DNA Technology and Forensic Applications**

Introduction to Recombinant DNA technology (RDT): History and development; Types of vectors (Plasmid, Cosmid, YAC, BAC); Restriction enzymes; Joining of DNA molecules; Introduction to PCR; Forensic significance of RDT.

#### **Unit-IV: Microbial Forensics, Bioterrorism, and Biological Toxins**

Introduction to microbial forensics, the critical elements, the sample collection methods and guidelines, the various detection methods and the result interpretation. Bioterrorism; Types of biological agents (Category-A, B, C); Bio surveillance; Biodefence; Forensic aspects of biological toxins (Ricin, Botulin).

## **B.Sc. Sem-II (Forensic Science - Major)**

### **GE/OE (Psychology)**

#### **GE 1 (BGO2T03): Basics of Clinical Psychology**

**Course Outcomes:** By the end of this Course, the learners will be able to:

1. Understand the fundamentals and characteristics of clinical psychology
2. Explore the activities of clinical psychologists, such as assessment, treatment, research, teaching, consultation, and administration.
3. Evaluate the scope and advancements in clinical psychology, including evidence-based practice, training, and different models of treatment delivery in the healthcare environment.
4. Analyze the ethical standards in clinical psychology, including principles of honesty, lack of bias, responsible caring, professional competence, and integrity in professional relationships.

#### **Unit-I Basics of Clinical Psychology**

Introduction and definition of clinical psychology, Historical overview of clinical psychology, characteristics of clinical psychology, Role of clinical psychologist, Legal, Educational, and Ethical Requirements to Be a Clinical Psychologist, Clinical Psychology and the Related Mental Health Professions. Qualification for clinical psychologist.

#### **Unit-II: Clinical Psychologists at Work**

Activities of Clinical Psychologists (Assessment, Treatment, Research, Teaching, Consultation, Administration, Employment Settings of Clinical Psychologists. Working with children and Family, working with adult, Working with people having disability and serious health issues and working with person of dementia.

#### **Unit-III: Clinical Psychology in the 21st Century**

Scope of clinical psychology, Evidence based practice, Clinical Psychology Training, Eclecticism and Integration, The Health Care Environment, Managed Care, Managed Care, Models of Treatment Delivery.

#### **Unit-IV: Ethics in Clinical psychology**

Ethical standards in clinical psychology, General principle, Value statement, honesty, lack of Bias, Responsible caring, professional competence and responsibility/ honesty and integrity in professional relationships.

## GE/OE (Digital & Cyber Forensics)

### GE 1 (BGO2T03): Office Automation

**Course Outcomes:** By the end of this Course, the learners will be able to:

1. Remember the basic functions of word processing software, such as creating, editing, and formatting documents.
2. Understand the basic features of MS Word, MS office, MS excel, MS power point and Open Office Writer, calc., base, and impress respectively. for collaboration and version control.
3. Apply the MS PowerPoint and OpenOffice Impress to create visually engaging presentations of forensic findings.
4. Evaluate the effectiveness of different document formats for preserving metadata and maintaining data integrity in forensic analysis.
5. Create the design and templates for forensic reports, data analysis, or presentation purposes using MS Word, MS Excel, MS PowerPoint, or OpenOffice applications.

#### Unit I: Introduction to MS Office - MS Word and Open Office – Writer

**MS Word - Working with Documents** -Opening & Saving files, Editing text documents, Inserting, Deleting, Cut, Copy, Paste, Undo, Redo, Find, Search, Replace, Formatting page & setting Margins, Converting files to different formats, Importing & Exporting documents, Sending files to others, Using Tool bars, Ruler, Using Icons, using help, **Formatting Documents** - Setting Font styles, Font selection-style, size, colour etc, Type face - Bold, Italic, Underline, Case settings, Highlighting, Special symbols, Setting Paragraph style, Alignments, Indents, Line Space, Margins, Bullets & Numbering. **Setting Page style** - Formatting Page, Page tab, Margins, Layout settings, Paper tray, Border & Shading, Columns, Header & footer, Setting Footnotes & end notes – Shortcut Keys; Inserting manual page break, Column break and line break, Creating sections & frames, Anchoring & Wrapping, Setting Document styles, Table of Contents, Index, Page Numbering, date & Time, Author etc., Creating Master Documents, Web page. **Creating Tables**- Table settings, Borders, Alignments, Insertion, deletion, Merging, Splitting, Sorting, and Formula, **Drawing** - Inserting Clip Arts, Pictures/Files etc., **Tools** – Word Completion, Spell Checks, Mail merge, Templates, Creating contents for books, Creating Letter/Faxes, Creating Web pages, Using Wizards, Tracking Changes, Security, Digital Signature. **Printing Documents**– Shortcut keys.

**Free Open Source Software: OPEN OFFICE - WRITER: Introduction to Open Office Suite** - Selecting the application package, working with Documents- Formatting Documents - Setting Page style- Creating Tables - Drawing- Tools - Printing Documents - Operating with MS Word documents.

#### Unit II: Introduction to MS Office – MS Excel and Open Office – Calc

**MS Excel:** Spread Sheet & its Applications, Opening Spreadsheet, Menus - main menu, Formula Editing, Formatting, Toolbars, Using Icons, Using help, Shortcuts, Spreadsheet types. Working with Spreadsheets- opening, Saving files, setting Margins, Converting files to different formats (importing, exporting, sending files to others), Spread sheet addressing - Rows, Columns & Cells, Referring Cells & Selecting Cells – Shortcut Keys. **Entering & Deleting Data**- Entering data, Cut, Copy, Paste, Undo, Redo, Filling Continuous rows, columns, Highlighting values, Find, Search & replace, Inserting Data, Insert Cells, Column, rows & sheets, Symbols, Data from external files, Frames, Clipart, Pictures, Files etc, Inserting Functions, Manual breaks, **Setting Formula** - finding total in a column or row, Mathematical operations (Addition, Subtraction, Multiplication, Division, Exponentiation), Using other Formulae. **Formatting Spreadsheets**- Labelling columns & rows, Formatting- Cell, row, column & Sheet, Category - Alignment, Font, Border & Shading, Hiding/ Locking Cells, Anchoring objects, Formatting layout for Graphics, Clipart etc., Worksheet Row & Column Headers, Sheet Name, Row height & Column width, Visibility - Row, Column, Sheet, Security, Sheet Formatting & style, Sheet background, Colour etc, Borders &

Shading – Shortcut keys. **Working with sheets** – Sorting, Filtering, Validation, Consolidation, and Subtotal. **Creating Charts** - Drawing. **Printing. Using Tools** – Error checking, Spell Checks, Formula Auditing, Creating & Using Templates, Pivot Tables, Tracking Changes, Security, Customization.

**OpenOffice-Calc - Introduction** – Introduction to Spreadsheets, Overview of a Worksheet, Creating Worksheet & Workbooks, Organizing files, Managing files & workbooks, Functions & Formulas, Working with Multiple sheets, Creating Charts & Printing Charts – Operating with MS Excel documents, which are already created and saved in MS Excel.

### **Unit III: Introduction to MS Office-MS Access and Open Office-Base**

**MS Access:** Introduction, Planning a Database, Starting Access, Access Screen, Creating a New Database, Creating Tables, Working with Forms, Creating queries, Finding Information in Databases, Creating Reports, Types of Reports, Printing & Print Preview – Importing data from other databases viz. MS Excel etc.

**OpenOffice-Base – Introduction-** Database Concepts – Creating a New Database, Creating Tables, Working with Forms, creating queries, Finding Information in Databases, Creating Reports, Types of Reports, Printing and Printing preview – Operating with other databases i.e. MS Access etc.

### **Unit IV: Introduction to MS Office-MS Power Point and Open Office-Impress**

**MS Power point:** Introduction to presentation – Opening new presentation, Different presentation templates, setting backgrounds, selecting presentation layouts. **Creating a presentation** – Setting Presentation style, Adding text to the Presentation. **Formatting a Presentation** - Adding style, Colour, gradient fills, arranging objects, Adding Header & Footer, Slide Background, Slide layout. Adding Graphics to the Presentation- Inserting pictures, movies, tables etc into presentation, Drawing Pictures using Draw. **Adding Effects to the Presentation-** Setting Animation & transition effect. **Printing Handouts**, Generating Standalone Presentation viewer.

**OpenOffice-Impress - Introduction** – Creating Presentation, Saving Presentation Files, Master Templates & Re-usability, Slide Transition, Making Presentation CDs, Printing Handouts – Operating with MS Power Point files / slides.

## **B.Sc. Sem-II (Forensic Science - Major)**

### **GE/OE (Law)**

#### **GE 1 (BGO2T03): Criminal Law I**

**Learning Outcomes:** By the end of this Course, the learners will be able to:

1. Understand the criminal law by interpreting and explaining the provisions of IPC 1860 related to offenses affecting the human body, offenses against property, and offenses relating to coins and government stamps.
2. Apply their knowledge of criminal law to practical scenarios.
3. Analyze legal provisions and case laws related to offenses affecting the human body, offenses against property, and offenses relating to coins and government stamps.
4. Synthesize their knowledge and skills to propose legal strategies and solutions in criminal law cases.
5. Evaluate the ethical considerations, legal principles, and forensic evidence in the investigation, prosecution, and adjudication of these offenses.

#### **Unit I: Introduction to Indian Penal Code, 1860**

Historical background, Jurisdiction under the Code, Definitions, Punishments, General Exceptions.

#### **Unit II: Offences affecting the Human Body**

Culpable homicide and Punishment for culpable homicide not amounting to murder. Murder and Punishment for murder. When culpable homicide is not murder. Punishment for murder by life-convict. Causing death by negligence. Dowry death. Abetment of suicide. Attempt to murder. Hurt and Grievous hurt. Sexual offences, Unnatural Sexual offences.

#### **Unit III: Offences against Property**

Theft, Extortion, Robbery and Dacoity. Criminal Misappropriation of Property. Criminal Breach of Trust. Receiving of Stolen Property. Cheating. Fraudulent Deeds and Dispositions of Property.

#### **Unit IV: Offences relating to Coins, Government Stamps, etc.**

Counterfeiting of coin, Government Stamps. Offences relating to Weights And Measures. Offences relating to Documents. Offences relating to Property Marks and other marks. Offences relating to Currency-Notes and Bank-Notes.



## **SEMESTER - II**

### **Paper I: Introduction to Landforms** (BGO2T03)

#### **Unit I**

From of Earth; atmosphere; hydrosphere; biosphere; weathering and erosion; differential weathering; products of weathering

#### **Unit II**

Concept of diastrophism; types of diastrophism – epeirogenic movements (continental building movements), orogenic movements (mountain building movements); sudden movements, slow and secular movements; evidences for upliftment of land; evidences for subsidence of land

#### **Unit III**

Development of (drainage) rivers system; identification and naming of streams; concept of drainage area, altitude, volume, slope, profiles of the land and drainage basin characteristics; stream order, stream length, mean stream length, stream length ratio.

#### **Unit IV**

River profiles; sea profiles; types of coast lines; coral reefs; ice sheets; glaciers; desertic lands.

#### **Recommended Books**

1. Arthur Holmes (1978) Principles of Physical Geology
2. Emmons, Thiel, Staffer and Allison: Geology principles and Processes.
3. Hamblin, Kenneth: The Earths' Dynamic System.
4. Sawkins, Chase, Darby and Rapp: The Evolving Earth: A Text Book in Physical Geology.
5. Mallory and Cargo: Physical Geology.
6. Judson Kauffman and Leet: Physical Geology.
7. Skinner and Porter: The Dynamic Earth: An introduction to Physical Geology.
8. Tarbuck and Lutgens: The Earth: An introduction to Physical Geology.
9. Manroe and Wicander: Physical Geology: Exploring the Earth

## SEMESTER II

### 2. BUSINESS STATISTICS –I

**Course Outcomes:** This course will enable the students to

1. Translate the real word problems through appropriate statistical modelling.
2. Explain the concepts and use equations, formulae and statistical expression and relationship in a variety of context.
3. Analyze and demonstrate the statistical skill require in intensive areas in economics and business.

<b>UNITS</b>	<b>TOPICS</b>	<b>HOURS</b>
<b>Unit 1</b>	Permutations and combinations, Set theory, Logarithm, Binomial theorem, Compound interest, Annuities	<b>8</b>
<b>Unit 2</b>	Charts & Diagrams, Collection, Classification & Presentation of business statistical data	<b>8</b>
<b>Unit 3</b>	Frequency Distribution, Frequency Curve and Analysis of data	<b>7</b>
<b>Unit 4</b>	Measure of central tendency and Measure of dispersion	<b>7</b>
	<b>TOTAL</b>	<b>30 HRS</b>

**Recommended Books:**

1. Fundamental of Mathematical Statistics, B L Agarwal, S. Chand
2. Business mathematics of Statistics., N.G. Das, J. K. Das, Mc Graw Hill
3. Statistical Methods, Gupta S. P.: Sultan Chand and Sons, New Delhi.
4. Fundamental of Mathematical Statistics, S.C. Gupta, V. K. Kapoor, Sultan Chand & Sons

<b>B.Sc. Semester-II</b> <b>Subject: MICROBIOLOGY</b> <b>Course Code: BGO2T03</b> <b>MICROBIAL WORLD</b>			
GE/OE	Hours: 2Hours/Week	Marks:80+20= 100	Credit: 2
<b>Unit-I</b>			
<b>Prokaryotic microbes</b>	1. General characters of a) Proteobacteria, b) Mycoplasma 2. Cyanobacteria: Characteristics of anabena and applications of cyanobacteria 3. Actinomycetes: Characteristics of Streptomyces and their applications 4. Archae bacteria:Types of archaeobacteria (Brief description), Methanogenic bacteria and their importance	<b>7.5 Hrs</b>	
<b>Unit-II</b>			
<b>Eukaryotic microbes</b>	1. Fungi and yeast:General characters, Asexual and sexual mode of reproduction, 2. Algae:-General characters and industrially important algal cells 3. Protozoans: General characters and life cycle of <i>Entamoeba histolytica</i>	<b>7.5 Hrs</b>	
<b>UnitIII</b>			
<b>Acellular microbes: Viruses.</b>	1. Discovery of viruses, General structure, symmetry and classification 2. Cultivation: Animal inoculation, chick embryo & tissue culture method 3. Detection of viral growth 4. T4-Bacteriophages-lyticcycle, 5. Lambdaphage-Lysogenic cycle.	<b>7.5 Hrs</b>	
<b>UnitIV</b>			
<b>Microbial interaction</b>	1. Positive and negative interaction:Commensalism, synergism, syntropism, mutualism, parasitism, predation, antagonism, competition 2. Protist-Plant interaction:Root nodule bacteria 3. Protist-Animal interaction: Rumen bacteria, insect midgut bacteria, luminescent bacteria	<b>7.5 Hrs</b>	

**Reference Books:**

1. Prescott,Hurley. Klein-Microbiology, 7<sup>th</sup> edition, International edition, McGraw Hill.
2. Stanier. Ingrahametal, General Microbiology 4<sup>th</sup> & 5<sup>th</sup> Ed. 1987, Macmillan Education Ltd
3. Microbiology An Introduction .6<sup>th</sup> Edition. Tortora, Funke and Case.Adisson Wesley LongmanInc. 1998.
4. Powar C .B. and Daginawala H. I.(2005). General microbiology Volume I .Himalaya Publishing House Private Limited, Pune, India.

5. Powar C. B. and Dagainawala H. I. (2005). General microbiology Volume II. Himalaya Publishing House, Private Limited, Pune, India
6. Madigan M. T, Martinko J M, Dunlap P V and Clark. D P. 2008. Brock Biology of Microorganisms. 12th Ed. Pearson/ Prentice Hall
7. Arora B. and Arora D. R. (2020). Practical Microbiology. CBS Publishers and Distributors, New Delhi, India.
8. Tortora G. J., Funke B. R. and Case C. L. (2016). Microbiology: an Introduction. Twelfth edition. Pearson, London

Sr.No.	Course outcome
1.	After completing this course students will be able to acquire basic knowledge about the importance of Microbiology
2.	Students will learn about basic characteristics features of microorganisms
3.	Students will be able to study the classification of bacteria
4.	Students will gain insights into the important characters, classification & life cycle of viruses.

**FYUGP Semester-II**  
**Generic Elective / Open Elective Course (GE/OE-2) (BGO2T03)**  
**(Energy Sources)**

<b>GE/OE-2 THEORY</b>	<b>Hours: 04 Hours /Week</b>	<b>Marks: 80 + 20 = 100</b>	<b>Credit: 02</b>
<b>Unit-I</b>			
<b>Conventional and Non-conventional energy Sources, Solar Energy</b>	Conventional and Non-conventional energy Sources: Fossil fuels and Nuclear Energy, their limitation, need of renewable energy, Solar Energy: Solar energy, its importance, storage of solar energy, solar pond, non-convective solar pond, applications of solar pond and solar energy, solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell, absorption air conditioning. Need and characteristics of photovoltaic (PV) systems, PV models and equivalent circuits, and sun tracking systems. Solar energy utilization by Solar roof panels.		<b>7.5 Hrs</b>
<b>Unit-II</b>			
<b>Ocean Energy, Tidal energy, Geothermal Energy</b>	Ocean Energy: Ocean Energy Potential against Wind and Solar, Wave Characteristics and Statistics, Wave Energy Devices. Tidal energy, Tide characteristics and Statistics, Tide Energy Technologies, Ocean Thermal Energy, Osmotic Power. Geothermal Energy: Geothermal Resources, Geothermal Technologies. (02 L)		<b>7.5 Hrs</b>
<b>Unit -III</b>			
<b>Hydro Energy, Biomass energy, Wind Energy</b>	Hydropower resources, hydropower technologies, environmental impact of hydro power sources. Biomass, biochemical conversion, biogas generation, Ocean biomass Fundamentals of Wind energy, Wind Turbines and different electrical machines in wind turbines, Power electronic interfaces, and grid interconnection topologies		<b>7.5 Hrs</b>
<b>Unit -IV</b>			
<b>Piezoelectric Energy, Electromagnetic Energy</b>	Physics and characteristics of piezoelectric effect, materials and mathematical description of piezoelectricity, Piezoelectric parameters and modeling piezoelectric generators, Piezoelectric energy harvesting applications, Human power Linear generators, physics mathematical models, recent applications, Carbon captured technologies, cell, batteries, power consumption Environmental issues and sustainability of renewable energy sources.		<b>7.5 Hrs</b>

**Reference Books:**

1. Non-conventional energy sources - G.D Rai - Khanna Publishers, New Delhi
2. Solar energy - M P Agarwal - S Chand and Co. Ltd.
3. Solar energy - Suhas P Sukhatme Tata McGraw - Hill Publishing Company Ltd.
4. Godfrey Boyle, "Renewable Energy, Power for a sustainable future", 2004, Oxford University Press, in association with The Open University.
5. Solar Energy: Dr. P Jayakumar, Resource Assesment Handbook, 2009
6. Photovoltaics, J.Balfour, M.Shaw and S. Jarosek, Lawrence J Goodrich (USA).

**Course outcomes**

After the completion of this course students will be able

<b>Sr. No</b>	<b>Course outcome</b>
1.	To impart knowledge of basic concepts of Conventional and Non-conventional Energy Sources.
2.	To get the knowledge and methodology necessary for Solar, Ocean, geothermal, Hydro and Biomass energy resources.
3.	To learn the efficiency of the technology available for using source of energy and the environmental impact of using that source.
4.	To apply the knowledge of Energy Sources to real life problems.
5.	To create scientific temperament related to Energy Sources.

	<b>Semester II (GE/OE)</b>
	<b>Name of the Paper - Statistical Methods And Psychological Testing</b>
	<b>Paper code – (BGO2T03) 2 Credits (2 hrs Theory per week )</b>
	<b>Course Objectives</b>
	To introduce basic statistical methods, psychological testing and qualitative methods and their uses.
	<b>Course Outcomes (CO)</b>
	Statistical methods play a critical role in the field of psychology by helping researchers to draw meaningful conclusions from their data. It is important for psychologists to have a solid understanding of statistical methods so that they can design effective studies and accurately interpret their findings. After the successful completion of the course, the students will have knowledge of different psychological testing and qualitative methods and their uses.
	<b>CONTENTS</b>
	<b>Unit 1 (15 Hrs)</b>
(A)	<b>Data:</b> Ungrouped and grouped, frequency distribution. Graphical representation of data: Histogram and Frequency Polygon. Primary and Secondary data,; Tabulation of data; Graphs and charts; Frequency distributions;
(B)	<b>Application:</b> Diagrammatic presentation of data ,Graphical representation
(C)	<b>Data analysis</b> <b>Measures of central tendency:</b> Mean, Median, Mode (Properties and Computation of grouped & ungrouped data) <b>Application:</b> Computation of statistical problems.
(D)	<b>Measures of Dispersion</b> Meaning and objectives of measures of dispersion. Essentials of a good measure of dispersion, absolute and relative measures of dispersion. Types of measures of dispersion- Range, Quartile deviation, Mean deviation and standard deviation with relative measures – definition, merits and demerits. Properties of Standard deviation, simple problems on ungrouped and grouped data. Computation of standard deviation
(E)	<b>Correlation:</b> Meaning & types: Spearman’s Rank Correlation Pearson’s Product Moment correlation , Normal Probability Curve (NPC): Properties
	<b>Unit II (15 Hrs)</b>
(A)	<b>Test of Significance:</b> All applications of Chi Square test , All applications of ‘t’ test.
(B)	<b>Psychological Testing:</b> Introduction to psychological testing, characteristics of Psychological test, Reliability, Validity, Norms and standardization. Types of tests.
(C)	<b>Qualitative methods:</b> Methods of data collection - Interview, observation, case study.
(D)	<b>Application:</b> Use of psychological test in day to day life
	<b>References</b>
1	Chadha, N. K. (1991): Statistics for Behavioral and Social Sciences. Reliance Pub. House: New Delhi.
2	Garrett, H. E. & Woodworth, R. S. (1987): Statistics in Psychology and Education. Mumbai, Vakils, Feffer & Simons Pvt. Ltd.
3	Gregory, R. J. (2006): Psychological Testing: History, Principles, and Applications (4th Ed.) New Delhi: Pearson Education
4	King, B. M. & Minium, E. W, (2007): Statistical Reasoning in the behavioral Sciences USA: John Wiley & Sons

Credit: 2

**Course outcomes:** After completion of the course, students will able to-

- Understand, describe and explain the Mulberry sericulture
- Understand, describe and explain Tasar sericulture.
- Understand, describe and explain Eri sericulture
- Understand, describe and explain lac culture.
- Understand, describe and explain agricultural and medical pests.
- Understand, describe and explain apiculture.

### **Unit 1- Mulberry sericulture**

- 1.1 Mulberry sericulture:- life history and rearing.
- 1.2 Silk gland of mulberry silkworm:- structure and silk synthesis.
- 1.3 Cocoon formation, cocoon harvesting and reeling.
- 1.4 Mulberry plantation and silkworm rearing house.

### **Unit 2- Tasar sericulture**

- 2.1 Tasar silkworm biology and life cycle.
- 2.2 Mature tasar larvae, silk gland and silk proteins.
- 2.3 Hammock and cocoon formation, cocoon harvesting.
- 2.4 Natural host plants and predators of tasar silkworm.

### **Unit 3- Eri, lac culture , agricultural and medical pests**

- 3.1 Eri silkworm biology and life cycle.
- 3.2 Lac insect- biology, lac cultivation and economic importance.
- 3.3 Agricultural pest: pest of paddy, pest of vegetables, pest of stored grain
- 3.4 Insect vectors spreading diseases in human (Malaria, Filarial, Kala- Azar).

### **Unit 4- Apiculture**

- 4.1 Types of honey bees, *Apis dorsata*, *A. indica* and *A. mellifera*.
- 4.2 Colony formation and Apiary products.
- 4.3 Beekeeping techniques: moveable frame hive and bee rearing management.
- 4.4 Economic importance honey, wax and other apiary products.



**Suggested reading:**

**K.K. Nayar, T. N. Ananthkrishan and B.V. Davis.** General and Applied Entomology, Tata McGraw - Hill Co.Ltd., pp. 589.

**D. B. Tembhare.** Modern Entomology(Second edition):, Himalaya Publication House.

**C. L. Metcalf, W. P. Flint and R. I. Metcalf .** Destruction and Useful Insect, Their Hanits and Control, , Mc Grow I Ill Co. New York.

**H. S. Dennis.** Agriculture Entomology, , Timber Press Inc.

**Alford V. David.** Text Book of Agriculture Entomology, Blackwell Science.

**Fashion Design/Textile Science**  
**Four Year (Eight Semester Degree Course)**  
**Semester - II**  
**Computer Application in Design**  
**GE/OE (BGO2 TO3)**

<b>Theory Marks</b> :50	<b>Practical</b> : 50	<b>Total Credits</b> : 2
SEE :40	SEE : 25	Theory : 1
CIE :10	CIE : 25	Practical : 1

Time Required: 45 Hours

**Theory** (15 Hours)

**Objectives**

1. To help student to understand the fundamentals and principle of CAD
2. To explain the structure, features and concept of Hardware and software.
3. To help student to learn basic presentation skill
4. To help students to learn basic e mail and web use

**Learning outcomes:** Students will be able to understand the basic uses of MS Office and develop assignments by using the software effectively. Students will be able to understand the concept of E mail basics and handling.

Unit I: (3 Hours)

In Put Device

- 1.1 CAD – Definition
- 1.2 Digitizers
- 1.3 Image Scanners
- 1.4 Bar Code Reader, OMR & OCR,

Unit II : (4 Hours)

Out Put Device

- 2.1 Printers
- 2.2 Classification of Printers
- 2.3 Plotters

Unit III: (4 Hours)

Communication System

- 3.1 Basic elements of a communication system, Simplex
- 3.2 Half Duplex
- 3.3 Full Duplex
- 3.4 Types of communication Channels

Unit IV: (4 Hours)

Internet

- 4.1 Internet working tools: Bridge
- 4.2 Routers
- 4.3 Gateways
- 4.4 Introduction to 2G, 3G, 4G, Technology
- 4.4 Search Engines

**Practical:****(30 Hours)**

1. Introduction to Excel, Spreadsheet & its Applications, Menus, Toolbars, Working with Spreadsheets, Converting files to different formats, Computing data, Formatting spreadsheets, Working with sheets, Sorting, Filtering, Validation, Consolidation, Subtotal

2. Introduction to presentation, Formatting a presentation, Adding style, Color, gradient fills, Arranging objects, Slide Background, Slide layout, Adding Graphics to the presentation, Inserting pictures, movies, tables, etc into the presentation, Drawing Pictures using Draw, Adding effects to the presentation, Setting Animation & transition effect, Adding audio and Video.

Internet and web use, E-mail basics,

**Reference:**

1. Computer fundamentals-Sinha P.K.
2. Introduction to Computers-Peter Nartons
3. Computer for Beginners-Arora Pawan
4. Computer Network-Andrew Tanenbaum,
5. Fundamentals of Computer-V.rajaram

**B.Sc. Semester – II**  
**BGO2T03: Kitchen and Nutrition Chemistry**  
**Theory: 2 credits**

**Course Outcomes**

*After the completion of this course, student will be able to*

- 1. Understand the chemical composition of food, including macromolecules, nutrients, and additives, and their significance in cooking, nutrition, and medical applications*
- 2. Apply knowledge of macromolecules, cooking chemistry, and food additives to analyse and optimize cooking processes, ensuring the preservation of nutritional value and sensory quality in prepared foods.*
- 3. Evaluate the classification and sources of nutrients in food, considering macronutrients, micronutrients, and additives, to make informed dietary choices that support overall health and well-being.*
- 4. Critically analyse the role of food additives in food preservation and flavour enhancement, considering their chemical composition and potential impacts on human health and food quality.*

**Unit - I: Nutrition in Food (7.5h)**

Introduction to nutrition, definition of food, nutrients and nutrition, Relation of food and health, Balance diet, Food and its functions (Physiological, psychological and social function), Classification of nutrients (Micronutrients and macronutrients), Understanding the role of carbohydrates, proteins, fats and oils in food systems, Chemical structures and functions of macromolecules (carbohydrates, proteins, fats and oils).

**Unit - II: Chemistry of Cooking (7.5 h)**

Introduction and definition of cooking, Objective of cooking food, Methods of cooking- Dry heat method of cooking, moist heat method of cooking, cooking under pressure, microwave cooking, solar cooking and infrared cooking. Physical and Chemical changes during cooking (Caramelisation, crystallization, gelatinization, emulsification, coagulation and pyrolysis), Stability of nutrients during cooking. Food sterilization - pasteurization of milk, Safety protocols and best practices in kitchen chemistry.

**Unit - III: Classification and sources of nutrients (7.5h)**

Chemistry of spices and condiments- Definition, classification on the basis of active principles present in spices (Pungent spices, aromatic seeds and fruits, aromatic barks, phenolic spices and colour spices), function of spices and condiments in the cookery.

Carbohydrate- Definition, occurrence, sources and classification with examples.

Protein- Definition, occurrence, sources and classification with examples

Fat-Oil - Definition, occurrence, sources and classification of fatty acid with examples

Vitamins - Definition, occurrence, sources and classification(water soluble and fat soluble)

**Unit – IV: Water and beverages (7.5h)**

Water – Water contents of common foods (free water and bound water), Function of water in cookery, effect water content of food on the nutritive value, types of water (hard water and soft water), disadvantages of hard water.

Beverages – Introduction and definition, functions of beverages, classification of beverages with examples – cold and hot, alcoholic and non-alcoholic, Types of Tea (green tea, black tea and oolong tea), Cold beverages (carbonate drinks and alcoholic drinks), effect of beverages on human body.

## References

1. The Science of Cooking: Understanding the Biology and Chemistry behind Food and Cooking; Joseph J. Provost, Keri L. Colabroy, Brenda S. Kelly, Mark A. Wallert.
  2. Dairy Chemistry and Animal Nutrition – M.M. Roy.
  3. Fundamentals of Dairy Chemistry -B.H. Webb, A.H. Hooson, J.A. Alford, CBB Publishers
  4. Milk and Milk Products-C.H. Eckles, H. Macy, Tata McGraw Hill Publishing Company
  5. Essential Guide To Food Additives by Victoria Emerton and Eugenia Choi <https://books.rsc.org/books/edited-volume/21/Essential-Guide-to-Food-Additives>
  6. Food Additives Data Book by Jim Smith and Lily Hong-Shum.
  6. Food Additives by A. Larry Branen, P. Michael Davidson, Seppo Salminen and John H. Thorngate III
  7. Food and Nutrition Handbook for Extension Workers by Ministry of Agriculture, Animal Industry and Fisheries.
  8. Textbook on Nutrition & Dietetics for Post Basic BSc Nursing Students by I. Clement.
  9. Food science and nutrition by Sunetra Roday, Oxford university, 3<sup>rd</sup> addition.
  10. Malik R. K. and K. C. Dhigra, Hand book of food industries, Small industry, Research institute.
  11. Fox B. A. and A. G. Cameron, Food science and chemical approach Hodder and Stoughton educational, 1982.
- Fitch and Francis, foods and principles of cookery, Prentice-Hall, Inc 1960.

**Bachelor of Science (Honors / Research) 4 yr. 8 Semester Degree Program**  
**B.Sc. Sem II (Interior Design – Major)**  
**BGO2T03 MATHEMATICS II**

AIM : To understand elementary principles of mathematics. To apply mathematics in practical problems. To obtain accuracy in calculations and results of various mathematical experiments.

UNIT I : Matrices

Addition, scalar multiplication and product of matrices, Elementary row operations, Rank and inverse of a matrix, Consistency and solution of a system of linear equations, Eigen values and eigen vectors

UNIT II : Curvature and radius of curvature ( cartesian, parametric and polar form), centre of curvature and circle of curvature (cartesian form only)

UNIT III : Partial differentiation

Functions of several variables of first and higher order, Homogeneous functions, Euler's theorem on homogeneous functions

UNIT IV : Differential equations of first order and first degree

Variable separable form, homogeneous equations, linear equations and exact equations

UNIT V : Linear Differential Equations

Linear differential equations with constant coefficient, method of variation of parameters

REFERENCE BOOKS :

1. Higher Engineering Mathematics – Dr.B.S.Grewal
2. A Text Book of Engineering Mathematics – N.P.Bali, Manish Goyal
3. Engineering Mathematics – H.K.Das

S. No	Course Outcomes
CO1	Students will understand the concept of matrices.
CO2	Students will learn about Curvature and radius of curvature.
CO3	Students will learn about major concept of mathematics that is Partial Differential Equation.
CO4	Students will be able to solve problems related to Differential Equation Of 1 st order and 1 st degree and understand the concept of Linear Differential Equations.
CO5	Understand Definite Integrals

## B. Sc (Applied Electronics & Software Technology ) – Semester II (GE/OE)

BGO2T03

ENGINEERING MATHEMATICS II

Scheme of Examination (Theory)

SEE – 80

CIE - 20

Total - 100

### Course Outcomes:

- 1) Understand Limits
- 2) Understand first order Derivatives
- 3) Understand second order Derivatives
- 4) Understand Integration by parts and Partial fractions
- 5) Understand Definite Integrals.

### Unit I :

- Limits
  - Definition , Standard forms
  - Special Cases as : Limit tends to Infinity

### Unit II :

- Derivatives (I)
  - Derivatives from definition , Standard forms , Product rule, Quotient rule , Parameter form, Logarithmic derivatives , Implicit functions

### Unit III :

- Derivatives (II)
  - Rate measuring , Maxima-minima

### Unit IV :

- Integration (I)
  - Standard forms , Substitution Method, Integration by parts
  - Algebraic forms, Partial fractions

### Unit V :

- Integration (II)
  - Definite Integrals , Area by definite integration

### Reference Books :

1. Differential Calculus by Gorakh Prasad
2. Integral Calculus by Gorakh Prasad

**GE/OE Basket Semester II**  
**Faculty of Science and Technology**

Semester	Course Category		Name of Course	BoS	Course code
<b>II</b>	<b>GE/OE</b>	1	Hydroponics and Plant Growth Regulators	Botany	<b>BGO2T04</b>
		2	Antimicrobial Resistance	Biochemistry	
		3	Bioethics and Biosafety in Biotechnology	Biotechnology	
		4	Web Technologies	Computer Science/ Computer Application	
		5	Home Automation	Electronics	
		6	Environmental Disaster and Management	Environmental Science	
		7	A. Forensic Gemology / B. Chemistry of Drugs / C. Introduction to Forensic Ballistics / D. Basics of Biostatistics and Bioinformatics/ E. Basics of Psychology (Psychology)/ F. Internet & Web Development/	Forensic Science	
		8	Tools and Techniques in Geology	Geology	
		9	Business statistics II	Mathematics	
		10	Statistics for Economics	Statistics	
		11	Fish farming	Zoology	
		12	Organic Chemistry	Cosmetic Technology	
		13	Chemical Processing-II	Fashion Design	
		14	Chemical Processing-II	Textile Science	
		15	Basics of Environmental Pollution	Chemistry	
		16	Biomolecules	Microbiology	
		17	Cultural Anthropology II	Interior Design	
		18	Social Science II	Applied Electronics & Software Technology	



<b>B. Sc. Semester-II</b>			
<b>GE / OE-4 Botany (BGO2T04)</b>			
<b>Hydroponics &amp; Plant Growth regulators.</b>			
<b>GE/OE-IV Theory</b>	<b>Hours: 2 Hours/Week</b>	<b>Marks: 80+20=100</b>	<b>Credit: 2</b>
<b>Unit-I</b>			
1. <b>Hydroponics:</b> Introduction, Scope and Importance of Hydroponics, Different types of hydroponic systems, NFT and DWC 2. Methods of hydroponic farming in tomato, spinach and cucumber. 3. Commercial Aspects of Hydroponics- Concept and importance of post-harvest management including cooling, cleaning, sorting, grading and packaging 4. Advantages and disadvantages of Hydroponics.			7.5 Hrs.
<b>Unit-II</b>			
1. Mineral nutrition –sources and types (Macro and Micronutrients) 2. Role and deficiency symptoms of Macronutrients – Nitrogen, Phosphorus, Potassium and Calcium. 3. Role and deficiency symptoms of Micro nutrients – Iron, Manganese, Boron and Zinc. 4. Government Schemes for hydroponics			7.5 Hrs.
<b>Unit-III</b>			
1. Plant growth regulators (Phyto-hormones) – i. Definition, Natural and synthetic, Auxins- Discovery, occurrence, Distribution, Structure. ii. Synthetic auxins – IPA, IBA, NAA, 2,4-D, 2,4,5-T iii. Effect of auxins on plant growth and development. (cell elongation and cell division, apical dominance, phototropism, geotropism and sex expression) iv. Uses of auxin in rooting, seedless production, promotion of flowering and tissue culture. 2. Gibberellins – History, types, structure, GAs, regulation by environment and its role in seed development and other physiological functions.			7.5 Hrs.
<b>Unit-IV</b>			
1. <b>Cytokinins</b> - History, structure, function, mode of action and uses. 2. <b>Ethylene</b> - History, structure, properties, function, properties and production. 3. <b>Abscisic acid (ABA)</b> – Discovery, structure, function, location and timing of biosynthesis, effect.			7.5 Hrs.

## Suggested Readings:

1. How to Hydroponics 4th Edition by Keith Roberto
2. Hydroponic Grower Books Varieties
3. Hydroponics for the Home Grower by Howard M. Resh
4. Hydroponic Tomatoes by Howard M. Resh
5. Commercial Hydroponics by John Mason
6. Plant Factory: An Indoor Vertical Farming System for Efficient Quality Food Production by OyokiKozai
7. The Hydroponics Gardening Guide to Growing Your Own Vegetables, Fruits and HerbsRiley Brown
8. The Ultimate Beginner's Guide to Container Gardening in Urban Settings. Roger Grant
9. Plant Growth Regulators Signaling Under Stress Conditions (Hb 2021) by Aftab T , Springer
10. Plant Growth Regulators Bio-stimulants and Chemicals on Horticultural Crops by Rajangam, J, A Subbiah, C Rajamanickam, K S Vijai Selvaraj, P Balasubramanian, T Sivakumar & K Balakrishnan, Satish Serial Publishing House
11. Plant Growth Regulators in Fruit Science by J.S. BAL
12. Plant Physiology by Ross, Salisbury (1999) CBS
13. Biochemistry- Plummer (1989) Mc Graw hills Publication
14. Plant Biochemistry - Day and Harborne (2000)
15. Introductory Plant Physiology Glenn Ray Noggle, George John Fritz

## **GE / OE- 4 - (Biochemistry)**

### **Semester 2**

#### **ANTIMICROBIAL RESISTANCE (AMR) – (BGO2T04)**

##### **COURSE OBJECTIVES**

After completion of the course students will be able to:

1. Learn about the global health challenge called Antimicrobial resistance(AMR)
2. Describe the role and importance of antibiotics, their sources and learn to categorize them on the basis of mechanism of action.
3. Enumerate and describe how bacteria can become resistant and the mechanisms that may be involved in that process
4. Describe how antimicrobial resistance emerges and spreads around the world
5. Understand the need for alternative therapeutics and global scenario on AMR.

##### **UNIT 1**

Antimicrobials and their action: Definition, natural sources, Antibiotics and antibiotic resistance in the pre-antibiotic era, Modern antibiotic era, classes of antibiotics, Antibiotic resistance(AMR): origin and current status. AMR in Agriculture, AMR in animals

##### **UNIT 2**

Mechanism of action of antibiotics: Inhibition of cell wall synthesis, Inhibitors of protein synthesis, Inhibitors of membrane function, Inhibitors of nucleic acid synthesis, antimetabolites

##### **UNIT 3**

Mechanism of resistance development: Drug resistant mutations in bacteria, antibiotic target modification, modifying cell wall permeability, Acquired resistance from gene transfer, antimicrobial efflux pumps, Bacterial biofilms, metabolic modifications, ESKAPE pathogens, Concept of MDR.

##### **UNIT 4**

AMR Challenges and threat, Sources of Antibiotic Resistance: Zoonotic, Human and Environment, causes of the antibiotic resistance crisis ( drug related, patient related, environment related etc.), Strategies to overcome AMR, New approaches for alternatives to antibiotics, Role of WHO in AMR awareness.

##### **List of Books:**

1. Antimicrobial Resistance-Underlying Mechanisms and Therapeutic Approaches by Vinay Kumar, Varsha Shriram, Atish Paul, Mansee Thakur, Springer Singapore, Published: 03 January 2022
2. Antibiotics: Targets, Mechanisms and Resistance, Editor(s):Claudio O. Gualerzi, Letizia Brandi, Attilio Fabbretti, Cynthia L. Pon, Wiley-VCH Verlag GmbH & Co. KGaA, First published:4 October 2013
3. The End of an Antibiotic Era,Bacteria's Triumph Over a Universal Remedy By Rinke van den Brink · 2021 3 April 2019,
4. Antimicrobials, Antibiotic Resistance, Antibiofilm Strategies and Activity Methods; Publisher: IntechOpen, Editor:Sahra Kırmusaoğlu
5. Antimicrobial Stewardship: Principles and Practice 1st Edition,by K. LaPlante (Editor), Cheston Cunha (Editor), H. Morrill (Editor), Louis Rice (Editor), Eleftherios Mylonakis (Editor)

## Open Elective Courses

### SEMESTER – II

#### BIOETHICS AND BIOSAFETY IN BIOTECHNOLOGY

Course Code: BGO2T04

Total Contact Hours: 30

#### Course Outcomes:

After successful completion of this Course, students will be able to:

CO 1. Give an insight about the morals and principles while working in the field of biology.

CO 2. Make the students aware of the issues arising per while handling and developing genetically engineered organisms and laboratory animals.

CO 3. Understand the risks involved and the regulations to be followed when experimenting with biological samples.

CO 4. Develop a perception about the practices to be followed in a biotechnology laboratory and the management of the laboratory waste.

#### UNIT I

7 hours

An introduction to Bioethics; Medical ethics and environmental ethics; Concepts of Bioethics: Autonomy, Justice, Beneficence, Non-Maleficence; Control, resolution, and enforcement of regulations; Ethical committees and constitution

#### UNIT II

8 hours

Bioethics in health care: patient confidentiality, informed consent, euthanasia, artificial reproductive technologies, prenatal diagnosis, genetic screening, gene therapy, transplantation; Bioethics in research: cloning and stem cell research, Human and animal experimentation, animal rights/welfare; Genetically engineered food, environmental risk, labelling and public opinion

#### UNIT III

7 hours

Introduction to biosafety and biosecurity; Biological hazards: types; primary containment for biohazards; introduction to biological safety cabinets; Risk assessment: HACCP and management (Assessment, Mitigation and Performance), International Guidelines regarding Biosafety and Biosecurity: OIE, WHO, NIH, CDC

#### UNIT IV

8 hours

Biosafety Levels: High risk micro-organisms and their management; Good Laboratory Practices (GLPs) and Good Manufacturing Practices (GMPs); Bio-waste Management; Plant biosafety, Principles of safety assessment of transgenic plants – sequential steps in risk assessment

#### References:

- Kuhse, H. (2010). *Bioethics: an Anthology*. Malden, MA: Blackwell
- Karen F. Greif, Jon F. Merz - Current Controversies in the Biological Sciences\_ Case Studies of Policy Challenges from New Technologies (Basic Bioethics)-The MIT Press (2007)

- V. Sreekrishna - Bioethics and Biosafety in Biotechnology-to New Age International Pvt Ltd Publishers (2007)
- Padma Nambisan (Auth.) - An Introduction to Ethical, Safety and Intellectual Property Rights Issues in Biotechnology- Academic Press (2017)
- Kshitij Kumar Singh (auth.) - Biotechnology and Intellectual Property Rights\_ Legal and Social Implications-Springer India (2015)
- David Castle - The Role of Intellectual Property Rights in Biotechnology Innovation (2011)
- Goel, D., & Parashar, S. (2013). *IPR, Biosafety and Bioethics*. Pearson Education India.15. Guidelines for Safety Assessment of Foods Derived from Genetically Engineered Plants. 2008.
- Alonso, G. M. (2013). *Safety Assessment of Food and Feed Derived from GM Crops: Using Problem Formulation to Ensure "Fit for Purpose" Risk assessments*

**B.Sc. Sem-II (Computer Science/ Computer Application)**  
**BGO2T04**

**WEB TECHNOLOGIES**

**Credits : 2**

**Duration : 30 Hours**

Course Objectives:

1. To comprehend and analyse the basic concepts of web programming and internet protocols.
2. To describe how the client-server model of Internet programming works.
3. To demonstrate the uses of HTML and DHTML.

Course Outcome:

After completing this course satisfactorily, a student will be able to:

1. Differentiate web protocols and web architecture.
2. Apply HTML and DHTML effectively to create websites.

**UNIT I :**

Introduction to Internet, History of Internet, Internet users, Internet working, Information on Internet, Requirements for connecting to Internet, Basic Internet Terms, Introduction to world wide web, Evaluation of world wide web, basic features, web browsers, popular web browsers, web servers, HTTP, URL, Search Engines, Search Engines categories, how to use Search Engines, Searching criterion.

**UNIT II :**

HTML: Introduction, Objective, HTML Browsers, Windows Switching, HTML Command Tags, URLs, links, new web page creation, main body of the text, putting headers, adding paragraph, formatting text in HTML and font mechanism, Color settings, superscripts and subscripts and other manipulations on text and paragraphs, using directory and menu lists, creation of links, inserting graphics, using images, all manipulations on tables and its display, Detailed working with forms, allowing visitors to upload files, active images, working with frames & framesets, Frames handling, scroll bars, alternatives to frames,

**UNIT III :**

Introduction to browsers, Working with e-mail, Parts of e-mail text, working with messages.  
DHTML: using DHTML in internet explorer, heading and horizontal line, hidden message, the message at the center of the page, moving boxes, changeable box.

**UNIT IV :**

Cascading style sheets

Introduction to css, creating style sheets, common tasks with CSS, Colors, the font -family, font metrics, length units, absolute units, relative units, the pixel unit, percentages as values, keywords as values, various properties such as the font -size property, font -size property etc, Assigning classes, tags and attributes for applying classes, applying classes to an HTML tag, applying classes to other document parts, the layer tag, CSS Tags

**Books**

1. Internet and web design by R Bangia, Second edition, Firewall Media
2. Multimedia and Web technology by R Bangia
3. Internet and web designing by ITELS (Macmillan)
4. Web Enabled Commercial Application Development Using HTML, DHTML, JS, Perl by Ivan Bayross
5. Deitel, Deitel & Nieto, Internet and Worldwide Web how to Program, Pearson Education, PHI.
6. Internet Programming with VBScript and Java Script. Kathleen Kalata, (Thomson Publication)
7. Programming the World Wide Web By. Robert W. Sebesta. (Pearson)
8. Web Technology Theory and Practice By: M Srinivasan (Pearson Publication)

## Semester – 2; OE2: Home Automation

### Course outcome:

At the end of this course students will have ability to

1. Understand concept of Home automation
2. Able to deploy modules of Home Automation
3. Explain the connectivity issue associated with home automation
4. Describe the tools and products used in home automation

### Syllabus:

1. Concept & Need of Home automation, Historical Review of development, Current concepts in home automation, Basics of IoT, Sectors & types of control, Surveillance
2. Home automation & connectivity, WiFi, Cloud/ Bluetooth/ Cellular, Alexa ecosystem, Lights/appliances/climate control,
3. Video, cameras, Security/locks, entry system, fluid & Gas control, Sensors
4. Development Boards, Modules, Cyber/security, Designing of typical systems.

### Books :

The Smarthome Book: Simple ideas to assist with your smarthome renovation by Andrew Howe

Smart Smart Home Handbook: Connect, control and secure your home the easy way: Control Your Home With Your Voice by Adam Juniper

The Smart Home Manual: How To Automate Your Home To Keep Your Family Entertained, Comfortable, And Safe by Marlon Buchanan

Alexa User Manual: The Illustrated Alexa User Guide - Hacks, Tips & Skills for All Amazon Alexa Devices, Including Other Smart Home Integrations by Gregory McGuire

## GE/OE -4: Environmental Disaster and Management

### Unit: I:

**Natural Disasters:** Meaning and nature of natural disaster, their types, causes and effects, Hydrological disasters (Flood, Flash flood, Drought and Cloud burst), Geological disasters (Earthquake, Volcanic eruption, Landslides, Avalanches, Tsunami and Mud flow).

**Man-made Disaster: Man-made Disaster:** Meaning and nature of man-made disaster, their types, causes and effects, Chemical, Biological, Radiological and Nuclear disaster, Fire (Building fire, coal fire, forest fire and oil fire), Accidents (Road, rail, air and sea accidents).

### Unit: II:

**Risk Assessment:** Risk concept, Elements of risk, Role of Science and Technology in Disaster Risk Reduction, Strategies of risk reduction, Decision making for risk reduction, Problems in risk assessment.

**Vulnerability:** Observation and perception, vulnerability identification, vulnerability types and dimensions, Vulnerability (social & economic factor). Physical and social infrastructure for vulnerability reduction, Hazard resistant design and construction, systematic management and strategic planning for vulnerability reduction.

### Unit: III

**Disaster preparedness:** Concept and significance, Disaster preparedness measures, Institutional mechanism for disaster preparedness, Policy and programme of disaster preparedness. Role of Government, NGOs and Information technology in Disaster preparedness.

**Disaster Response:** Essential components of disaster response, Disaster Response Plan (Communication, Participation and Activation of Emergency preparedness Plan), Search, Rescue, Evacuation and Logistic management, Relief and Recovery, Rehabilitation and Reconstruction.

### Unit: IV

**Mitigation and Management Techniques:** Mitigation and Management techniques of Disaster, Training, awareness program and project on disaster management Training and drills for disaster preparedness, Awareness generation program, Usages of GIS and Remote sensing techniques in disaster management, National and State Bodies for Disaster Management.

**Global Initiatives for Disaster management :** GDPDRR- Global platform for Disaster Risk Reduction, , AMCDRR – Asian Ministerial Conference on Disaster Risk Reduction, SENDAI Framework, SDG 11.5 – Reduce the adverse Effects of Natural Disasters, CDRI – Coalition for Disaster Resilient Infrastructure.

### Reference Books:

1. Textbook of Environmental studies by Benny Joseph , *McGraw-Hill Publishing Company Limited.*
2. Disaster Management by Mukesh Dhunna, *Vayu Education of India, New Delhi, 2009 First edition.*
3. Introduction to Environmental Science by G. Tyler Miller, Jr. Scott Spoolman, *Cengage Learning Publication.*
4. Environmental Science by S.C. Santra, *New Central Book agency Pvt. Ltd. Kolkata ,India.*
5. Environmental Management by H.P. Behera and M.S. Khan, *Himalaya Publication.*
6. Disaster Management Programmes And Policies by Siddhartha Gautam K Leelakrishna Rao, *Publication - Vista International.*
7. Introduction To Disaster Management ,by B.C. Bose 46 ,*Rajat Publishers.*
8. Global Disaster Management ,by Arun Kumar, *SBS Publishers.*
9. Handbook Of Disaster Management (2 Vol.set) , Author : Reepunjaya Singh ,*ABD Publishers.*



10. Handbook of Disaster Management *William L. Waugh 2005.*
11. Disaster Management : Text and Case Studies *D.B.N. Murthy Jain Book Agency 2000.*
12. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)
13. Damon, P. Copola, (2006) Introduction to International Disaster Management, Butterworth Heineman.
14. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.
15. Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New Delhi.  
Modh S. (2010) Managing Natural Disasters, Mac Millan Publications

## **GE/OE (Forensic Science)**

### **GE 2/A (BGO2T04): Forensic Gemology**

**Learning Outcomes:** By the end of this Course, the learners will be able to:

1. Recall and recognize the fundamental concepts and terminology of gemology, including gemstone types, properties, and classification.
2. Demonstrate comprehension of the various techniques and instruments used in gemstone analysis, such as microscopic examination, spectroscopy, and X-ray techniques.
3. Apply analytical skills to identify and differentiate gemstones, including natural gems, synthetic gems, and treated gemstones, using appropriate laboratory techniques and instruments.
4. Analyze and evaluate gemstone origin through the interpretation of geological processes, gemstone deposits, and advanced techniques like elemental analysis, stable isotope analysis, and inclusion analysis.
5. Evaluate the forensic applications of gemology in real-world scenarios, including the identification of stolen jewellery, gemstone fraud, smuggling cases, and the role of gemstone analysis in trace evidence analysis and expert testimony.

#### **Unit 1: Introduction to Forensic Gemology**

Introduction to forensic science and its application in gemstone investigations. Basics of gemology: gemstone types, properties, and classification. Legal and ethical considerations in forensic gemology. Introduction to gemstone identification methods and instruments.

#### **Unit 2: Gemstone Analysis Techniques**

Microscopic examination: magnification, gemstone inclusions, and identifying synthetic gems  
Spectroscopy techniques: absorption, emission, and Raman spectroscopy. X-ray techniques: XRD (X-ray diffraction) and XRF (X-ray fluorescence). Advanced analytical techniques: FTIR (Fourier Transform Infrared Spectroscopy), UV-Vis (Ultraviolet-Visible Spectroscopy), and LIBS (Laser-Induced Breakdown Spectroscopy)

#### **Unit 3: Gemstone Origin Determination**

Geological processes and gemstone formation. Gemstone deposits and their characteristics. Geographic origin determination techniques: elemental analysis, stable isotope analysis, and inclusion analysis. Synthetic gemstone identification and differentiation.

#### **Unit 4: Forensic Applications of Gemmology**

Gemstone identification in forensic investigations: stolen jewellery, gemstone fraud, and smuggling cases. Trace evidence analysis using gemstones. Expert testimony and legal considerations. Case studies and real-world examples of forensic gemology.

## **GE/OE (Forensic Chemistry)**

### **GE 2/B (BGO2T04): Chemistry of Drugs**

**Course Outcome:** By the end of this Course, the learners will be able to:

1. Recall and identify the key terms and concepts related to pharmaceutical drugs, including drug classification, drug dependence, and examples of common drugs.
2. Understand the principles, practices, and challenges of pharmaceutical drugs in contemporary society, including the differences between narcotic drugs, psychotropic substances, and plant drugs.
3. Apply the knowledge and skills required to properly classify and identify different types of pharmaceutical drugs, including understanding the chemical composition, characteristics, and therapeutic applications of specific plant drugs.
4. Analyze the mode of action of antibiotics, including the chemistry and classification of penicillin, chloramphenicol, streptomycin, and tetracyclines, and their importance.
5. Evaluate the risks and benefits of using pharmaceutical drugs, including the potential for drug dependence and the ethical considerations surrounding the use of certain types of drugs.

#### **Unit I: Pharmaceutical Drugs**

Introduction, Classification, Origin of Drugs, Natural Drugs, Synthetic Drugs, Drug Dependence - Physical Dependence, Psychological Dependence, Analgesic, Antipyretic, Antibiotics and anti-histamines (examples of common drugs).

#### **Unit II: Narcotic drugs and Psychotropic Substances**

Introduction, Classification, Sign and Symptoms, Tolerance, Drug Dependence - Physical Dependence, Psychological Dependence, depressants, stimulants, hallucinogens and sedatives.

#### **Unit III: Plant drugs**

Introduction to Plant Drugs: Definition and significance, Historical background and cultural uses, Importance in traditional medicine systems. Overview of medicinal plants and their classification, Characteristics and therapeutic applications of the following plant drugs – Tulsi, Turmeric, ginger, Giloy, Garlic, Aloe vera, etc.

#### **Unit IV: Antibiotics**

Definition, Introduction and significance of antibiotics, Historical background and discovery of antibiotics, Importance in medicine and healthcare, Classification of antibiotics based on chemical structure and mechanism of action. Chemistry and mode of action of penicillin, chloramphenicol, streptomycin and tetracyclines etc.

## **GE/OE (Forensic Physics)**

### **GE 2/C (BGO2T04): Introduction Forensic Ballistics**

**Course Outcomes:** By the end of this Course, the learners will be able to:

1. Remember the various types of firearms commonly used in forensic investigations.
2. Understand the principles of ballistics and firearm identification, including the concepts of rifling, bullet trajectories, and gunshot residue analysis.
3. Analyze ammunition-related evidence, such as cartridge cases, bullet fragments, and firearm markings, to determine the type of firearm used, the sequence of shots, propellants and potential links between firearms and crime scenes.
4. Recall the fundamental concepts and principles of internal ballistics, including the ignition of propellant, pressure development, and projectile acceleration inside a firearm barrel.
5. Understand the factors influencing terminal ballistics, such as bullet design, velocity, target composition, and angle of impact, and how they affect the behaviour of projectiles during a shooting incident.

#### **Unit I: Firearms**

Early Fire Arms, Hand Cannons, Matchlock, Wheel Lock, Snaphaunce, Flintlock, Percussion System, Cartridge System, Centre Fire System, Dreyse Needle, Smooth Bore Firearms, Rifling, Revolver, Pistols, Actions of Firearms, Shotgun, Sub Machine Gun, Machine Gun, Improvised Firearms.

#### **Unit II: Ammunition**

Propellants- Black Powder, Smokeless Powders, Primers- Berdan Primer, Boxer Primer, Primer Cap Types- Rim Fire, Centre Fire, Pin Fire. Caseless, Blank Ammunition, Tear Gas, Grenade Launcher, Dummy, Cartridge Cases - Rimless, Semi Rimmed, Rimmed, Belted. Bullets and Its Types, Components of Shotgun Ammunition.

#### **Unit III: Internal Ballistics**

Energy Considerations, Initiation, Combustion of Propellants, Density of Loading, Atmospheric Temperature, Shape of the Cartridge Case. Heat Problems, Barrel Pressure and Its Determination, Recoil, Measurement of Recoil, Vibration and Jump, Barrel Fouling.

#### **Unit IV: Terminal Ballistics**

Introduction, Stopping Power of Bullet, Shockwave and Cavitation Effect, Wounding Mechanism, Elements of Wound Ballistics; Nature of Target, Velocity of Projectile, Constructional Features of Projectile. Range.

## **GE/OE (Forensic Biology)**

### **GE 2/D (BGO2T04): Basics of Biostatistics and Bioinformatics**

**Course Outcomes:** By the end of this Course, the learners will be able to:

1. Gain a solid understanding of different types of sampling, data collection techniques and statistical techniques in reference with biostatistics.
2. Develop the understanding of concepts such as mean, median, mode, range, standard deviation, variance, probability, correlation and regression and distribution curves along with their significance.
3. Learn techniques to retrieve database and methods of deposition of database using different tools by understanding the formats and contents of data entries.
4. Gain a comprehensive understanding of Entrez, PubMed, DDBJ, DMBL.
5. Examine the properties of protein and nucleic acid sequence and understand the concept of comparative genomics along with their application.

#### **Unit-I: Introduction to Biostatistics**

Sampling techniques; Data collection; tabular and graphical representation of Data; Analysis of Mean, mode, median, range, variance, standard deviation and standard error (with examples).

#### **Unit-II: Test of significance**

Z-test, T-test and Chi-square test; Probability Distribution: Binomial Poisson and Normal distribution; Correlation and linear regression; Analysis of variance; ANOVA; One-way and two-way classification.

#### **Unit-III: Databases**

Introduction to databases with respect to organization of data; contents and formats of database entries; retrieval of data using text-based search tools; sources of data; method for deposition of data to databases; Introduction to Entrez, PubMed, DDBJ, EMBL.

#### **Unit-IV: Proteomics and Genomics**

Protein and nucleic acid sequences properties: Proteomics tools at the ExPASy server and GCG utilities and EMBOSS; Comparative genomics: Basic concepts and applications.

## **B.Sc. Sem-II (Forensic Science - Major)**

### **GE/OE (Psychology)**

#### **GE 2/E (BGO2T04): Basics of Psychology**

**Learning Outcomes:** By the end of this Course, the learners will be able to:

1. Define the fundamental concept of psychology, goals, types of psychological profession including its historical and modern perspective.
2. Analyse the structure and functioning of neurons, neurotransmitters, brain, central nervous system, peripheral nervous system etc.
3. Understanding the concept of learning, its definitions, and apply its knowledge to operant and classical conditioning along with their application and explanation with experiments.
4. Develop and implement the concept of memory and forgetting, types of memory, levels of processing theory and their physical aspects.

#### **Unit I: The Science of Psychology**

What is Psychology? definitions, goals, types of psychological professions, Historical perspectives in psychology: Structuralism, Functionalism, Gestalt, and Psychoanalysis. Modern perspectives in psychology: Behaviouristic, Humanistic, Bio-psychological, and Cognitive.

#### **Unit II: Biological Foundation of Behaviour**

Neuron: Structure, function, synapse, and neurotransmitters, Central Nervous System - Brain: Structure and function of brain; (ii) Cerebral hemispheres, Spinal cord- (i) Structure and function of brain, Peripheral Nervous System: Structure and function, Autonomic Nervous System, Somatic Nervous system, Glandular system.

#### **Unit III: Learning**

Learning: Definition, Classical Conditioning: Pavlov's experiment, extinction, spontaneous recovery, generalization, discrimination, higher-order conditioning. Operant Conditioning: Thorndike's Laws of learning, Skinner's experiment, positive reinforcer, negative-reinforcer, schedules of reinforcement, shaping. Cognitive Learning Theories Tolman's Latent Learning, Kohler's Insight Learning, Bandura's Observation Learning Theory., Application of classical and operant and classical conditioning to everyday life.

#### **Unit IV: Memory**

Memory: definition and Process, The information-processing model: Three stages of memory Sensory, Short-term, Long term. Types of long-term memory- Procedural, Declarative (episodic, semantic), Explicit and implicit. Levels of processing theory. Forgetting: Course of forgetting (Ebbinghaus' forgetting curve) Causes of forgetting (encoding failure, decay of memory traces, interference, motivated forgetting). Physical aspects of memory.

## **GE/OE (Digital & Cyber Forensics)**

### **GE 2/F (BGO2T04): Internet and Web Development**

**Course Outcomes:** By the end of this Course, the learners will be able to:

1. Demonstrate knowledge and understanding of the fundamental concepts, principles, and protocols of the internet, World Wide Web, HTML, and JavaScript.
2. Demonstrate a deeper understanding of the internet, World Wide Web, HTML, and JavaScript by interpreting and explaining concepts, protocols, and standards.
3. Apply their knowledge and skills in practical scenarios.
4. Develop the ability to analyze internet-based artifacts and web applications.

#### **Unit I: Internet**

History of internet, the early years, The global Internet, A global information infrastructure, Review of packet switching and its relevance to the internet, topologies, Routers, Dial-up access, IP address. Transmission Control Protocol (TCP), Domain names, Names and IP address, TCP/IP, Flexibility, Reliability and efficiency.

#### **Unit II: World Wide Web (WWW)**

Browsing the World Wide Web (WWW), HTML, Web page design with HTML, Features and importance of HTML, Advanced WEB technologies.

#### **Unit III: HTML**

General Introduction to Internet and WWW, Text tags, Graphics, Video and Sound Tags, Link and Anchor Tags, Table Tags, Frame Tags, Miscellaneous tags (layers, image maps etc), CSS, DHTML, HTML Forms and Fields.

#### **Unit IV: JavaScript**

Basic data types; control structures; standard functions; arrays and objects, event driven programming in Javascript; Example Applications.

## **Paper II: Tools and Techniques in Geology (BGO2T04)**

### **Unit I**

Thin section and polished section making; Sample etching, staining and model count techniques; heavy mineral analysis and paleocurrent interpretation; principle and geological application of X ray diffractometry.

### **Unit II**

Use of MS WORD in writing geological texts for fields; use of MS Excel in computing mineral variations, mean, average, standard deviation, covariance; use of MS Power Point in preparing geological texts for presentation.

### **Unit III**

Use of computers in inserting geological pictures in geological reports; use of computers in inserting clip arts in geological reports; use of computers for illustrations by shapes – lines, basic shapes, block arrows, basic charts, callouts and stars and banners; use of computers in inserting symbols, equations.

### **Unit IV**

Use of computers in insertion of columns, line charts, pie charts, bar charts, area charts, scatter diagrams in geological reports; addition of page numbers in WORD file; word counts; setting of margins, page orientation, page-size selection; addition of line numbers.

### **Books Recommended:**

No Textbook - only handouts and web pages



## SEMESTER II

### 5. BUSINESS STATISTICS –II

**Course Outcomes:** This course will enable the students to

1. Integrate concept in international & national business concept with functioning of global trade.
2. Evaluate the legal, social and economic environment of business.
3. Apply decision-support tools to business decision making.
4. Will be able to apply knowledge of business concepts and functions in an integrated manner.

<b>UNITS</b>	<b>TOPICS</b>	<b>HOURS</b>
<b>Unit 1</b>	Moments- Central & Non-Central Moments, Beta & Gamma Coefficients, Skewness, Kurtosis.	<b>8</b>
<b>Unit 2</b>	Correlation and Regression, Bivariate Data, Covariance, Correlation Data, Rank Correlation.	<b>8</b>
<b>Unit 3</b>	Probability and Probability Distribution, Attributes	<b>7</b>
<b>Unit 4</b>	Interpolation, Finite Differences, Newton's Forward & Backward Interpolation Formulae, Index Numbers, Time series Analysis.	<b>7</b>
	<b>TOTAL</b>	<b>30 HRS</b>

**Recommended Books:**

1. Business mathematical Statistics., N.G. Das, J. K. Das
2. Business Mathematics and Statistics, N.G. Das &Dr. J.K. Das McGraw Hill, New Delhi.
3. Fundamentals of Business Mathematics, M. K. Bhowal, Asian Books Pvt. Ltd New Delhi
4. Fundamentals of Mathematical Statistics, Gupta S. C. and Kapoor V. K.:, Sultan Chand and Sons, New Delhi.
5. Statistical Methods, Gupta S. P.: Sultan Chand and Sons, New Delhi.
6. Applied Statistics, Mukhopadhyaya Parimal New Central Book Agency Pvt. Ltd., Calcutta.
7. Fundamentals of Statistics, Goon A. M., Gupta, M. K. and Dasgupta, B. World Press, Calcutta.
8. Fundamentals of Applied Statistics, S. C . Gupta and V. K. Kapoor, Sultan Chand and Sons, New Delhi.

	<b>Semester II (GE/OE)</b>
	<b>Name of the Paper - Statistics for Economics</b>
	<b>Paper code – (BGO2T04) 2 Credits (2 hrs Theory per week)</b>
	<b>Course Objectives</b>
	The objectives of this paper are to acquaint the students of economics with basic methods of data analysis in Economics using statistical tools/models. The paper aids the students of economics in understanding the importance of decision in determining the choice
	<b>Course Outcomes (CO)</b>
	After the successful completion of the course, the students will have knowledge of basic statistical tools required in Economics.
	<b>CONTENTS</b>
	<b>Unit 1 (15 Hrs)</b>
	Introduction to Statistics <b>Statistics-</b> Meaning, Scope, Importance and Limitations; Sources of Data-Primary and Secondary;
	<b>Classification of Data</b> Qualitative and Quantitative; Geographical ,cross sectional and time series data; discrete and continuous data; frequency and non-frequency data
	<b>Scales of measurement</b> - Nominal, Ordinal, Interval and Ratio;
	<b>Frequency and Tabulation of Data.</b> Ungrouped and grouped, frequency distribution. Graphical representation of data: Histogram and Frequency Polygon. Primary and Secondary data,; Tabulation of data; Graphs and charts; Frequency distributions; Diagrammatic presentation of data
	<b>Measures of Central Tendency:</b> Mean-Arithmetic, Harmonic and Geometric, Median and Mode;
	<b>Unit 2 (15 Hrs)</b>
	<b>Measures of Dispersion:</b> Range, Inter-quartile Range, Mean Deviation, Standard Deviation and Co-efficient of Variation
	<b>Correlation-</b> Meaning and Types-Simple, Partial and Multiple Correlation; . Measures of Correlation-Karl Pearson and Spearman’s Rank Correlation; <b>Regression-</b> Meaning and Types Simple Regression and Multiple Regression Analysis and its Applications
	<b>References</b>
1)	Gupta, S. P. (2012): Statistical Methods, S. Chand and Sons, Educational Publishers, New Delhi.
2)	2) Gupta, S.C. and Kapoor, V. K. (2016): Fundamentals of Applied Statistics, 3rd Edition, Sultan Chand & Sons, New Delhi.
3)	3) Monga, G. S. (2015): Mathematics and Statistics for Economics, Second Revised Edition, Vikas Publishing House, Pvt. Ltd. New Delhi.
4)	4) Salvatore, D. (2015): Mathematics and Statistics, Schaum’s Series, Tata McGraw Hill

## **GE/OE for B.Sc. II Fish Farming BGO2T04**

**Credit: 2**

**Course outcomes:** After completion of the course, students will able to-

- Understand, describe and explain suitable aquaculture fish on specific criteria.
- Understand, describe and explain construction and management of fish pond.
- Understand, describe and explain breeding techniques.
- Comprehend the status of freshwater resources.
- Evaluate economically important freshwater biological resources for their commercial utilization.
- Adjudge different types of rearing process and steps along with procedure involve in preparation and management of nursery and rearing pond of fish culture.
- Understand, describe and explain the marketing of fish.
- Understand, describe and explain various diseases in fishes.

### **UNIT- I**

- 1.1 Cultivable species of fish (Indian carps, exotic carps and other economic important fishes), Growth and fecundity.
- 1.2 Construction of fish farm: Selection of site, topography, layout of fish farm, Types of fish ponds (Nursery, rearing and stocking ponds), Construction of various ponds.
- 1.3 Management of fish pond: Pre-stocking management, fertilization of ponds, lining, liming, eradication of predatory and weed fishes, and control of aquatic insects.
- 1.4 Methods of fish cultivation: pond culture , cage culture, pen culture, Raceway culture, culture in recirculatory water system, monoculture and polyculture.

### **UNIT – II**

- 2.1 Post stocking management of fish pond- Feeding, Thining, Harvesting.
- 2.2 Methods of collections of fish seed, resources (natural water bodies and hatcheries), Transport of fish seed
- 2.3. Induced breeding: Induced breeding of carps and other cultivable fishes.
- 2.4 Bundh breeding: dry and wet bundh breeding.

### **UNIT – III**

- 3.1 Physical and chemical factors affecting fish culture.
- 3.2 Rearing of spawn, fry and fingerling.
- 3.3 Fishing crafts and gears- Spear, Harpon, Hooks and Lines, Types of fishing nets.
- 3.4 Preservation and processing of fish.

### **UNIT – IV**

- 4.1 Fish marketing: Marketing practices, information, marketing channels and systems.
- 4.2 Fish diseases and its control: Biotic (Viral diseases, Bacterial diseases, Fungal, Protozoan, Helminthes, copepod) diseases and abiotic diseases (Air embolism, gas bubble diseases, acidosis, alkalosis)
- 4.3. Fishery Survey: Methods and techniques, Fish breeding centres of Maharashtra.

4.4. Fish products and by-products: i. Fish body oil, ii. Fish liver oil, iii. Fish meal, iv. Isinglass, v. Fish protein concentrate, vi. Fish glue, vii. Fish manure.

**Suggested reading:**

**Pandey K and J.P. Shukla JP (2018).** A Textbook of fish and fisheries Rastogi Publication, Meerut, pp. 588.

**Khanna SS and Singh HR (2014).** A text book of fish biology and fisheries. 3<sup>rd</sup> edition, Narendra Publishing House.

**Gupta SK and Gupta PC (2006).** General and applied Ichthyology (Fish and Fisheries). S. Chand and Company, pp. 1160.

**Fashion Design/Textile Science**  
**Four Year (Eight Semester Degree Course)**  
**Semester - II**  
**Chemical Processing – II**  
**GE/OE (BGO2 TO4)**

**Theory Marks : 100**

80

CIE : 20

Theory

**Total Credits : 2 SEE**

: 2

Time Required: 30Hours

**Theory**

**(30 Hours)**

**Objectives**

1. To study the chemical processing of
2. To make students aware about Textile Chemistry

**Unit I:**

**(8 Hours)**

- 1.1 Flow chart for manufacturing process of manmade fibre by
- Dry spinning – Acrylic
  - Wet spinning – Viscose
  - Melt spinning – Polyester and polypropylene
  - Introduction and terms used in the POY, FDY and Texturing process

**Unit II :**

**(7 Hours)**

Introduction to finishing of Fabric & Garment

- 2.1 Object of Finishing
- 2.2 Classification of Finishing
- 2.3 Mechanical Finishing
- Calendar Finishing
  - Dimensional Stability Finishing

**Unit III:**

**(7 Hours)**

- 3.1 Hot Air Starter Finishing
- 3.2 Chemical Finishing
- Resin Finishing
  - Water Repellent Finishing

**Unit IV:**

**(8 Hours)**

Chemical Finishing

- 4.1 Fire Retardant Finishing
- 4.2 Enzyme Finishing
- 4.3 Back filling
- 4.4 Types of softner used in Finishing

**References:**

1. Technology of Textile Processing -Vol 1(Textile Fiber)-Dr. V.A. Shenoi
2. Technology of Textile Processing -Vol III (Technology of Bleaching)-V.A. Shenoi
3. Technology of Textile Processing -Vol IX ( Fundamental Principal of Textile Processing) - V.A. Shenoi
4. Chemical technology of Fibre materials - F. Sadav
5. Textile scouring & Bleaching-E.R. Trotman

**B.Sc. Semester – II**  
**BGO2T04: Basics of Environmental Pollution**  
**Theory: 2 credits**

**Course Outcomes:-**

1. Evaluate the classification of pollutants and understand the sources and effects of noise pollution.
2. Explicate the importance of water and thermal pollution.
3. Learn the basics of solid waste management and soil pollution.
4. Understand the effects of air and radioactive pollutions.

**Unit-I: Environmental Pollution (7.5h)**

**Environmental Pollution:** Definition, types, Classification of Pollutants- on the basis of physical properties and forms of their existence, Primary and secondary pollutants, degradable and non-degradable pollutants.

**Noise Pollution:** Sources and effects, Decibel scale, control measures of noise pollution. Ambient noise level of monitoring.

**Unit-II: Water Pollution (7.5h)**

**Water Pollution:** sources, effect of water pollution on flora and fauna, human beings and materials, Eutrophication, Heavy metal pollution- Minamata episode, water, pollution control measures, water quality indices.

**Thermal Pollution:** Causes, effects and control measures.

**Marine Pollution:** sources, causes and mitigation of marine pollution.

**Unit-III-Soil and Solid Pollution (7.5h)**

**Soil Pollution:** Sources and types, soil pollutants- metals, inorganic ion and salts, organic substances, effects of soil pollution on soil health and productivity, effects of pesticides, soil pollution control measures,

**Solid Waste Pollution:** sources, Classification and characteristics of solid waste, segregation, collection and transportation and disposal of solid waste, Solid Waste management, **Biomedical Waste:** Categories of biomedical waste, types of container used for the disposal of biomedical waste, biomedical waste management.

**Unit-IV: Air and Radiation Pollution (7.5h)**

**Air Pollution:** Sources, Effects (Human health, vegetation and animals, Building material and structures), Indoor pollution, vehicular pollution, Bhopal gas tragedy, Air Quality Standards-

**Radioactive Pollution:** Types and sources of radiations, biological effects and control measures. of radiations, E-waste (sources and its health effect), recycling and disposal methods.

**References**

1. Text Book of Environment: K M Agrawal, P.K.Sikdar, and S.C.Deb, Mc'Millan Publication, Mumbai.
2. Man and Environment: M.C.Dash and P.C.Mishra, Mc'Millan Publication, Mumbai.
3. Environmental Science: S.C.Santra, New Central Book Pvt.Ltd, Kolkatta.
4. Environmental Problems and Solution: D.K.Asthana, S.Chand Publication, New Delhi.

5. A Text book of Environmental Chemistry and Pollution Control: S.S.Dara, S.Chand and Company Ltd,New Delhi.
6. Environmental Chemistry: B.K.Sharma, Goel Publication,Meerut.
7. Environmental Chemistry: A.K.Dey,New Age International Publishers,2001.
8. Man and Environment: P.R.Trivedi and Gurdeep Raj,Akashdeep Publishing House,New Delhi.
9. Fundamentals Concepts in Environmental Studies: Dr.D.D.Mishra, S.Chand Publication,New Delhi.
10. Environmental Pollution: Khitoliya,R.K. S.Chand Publication,New Delhi.
11. Air pollution and it's Control: Rao,M.N and Rao, H.V.N., Tata McGraw-Hill Publishing Company ,New Delhi.
12. Principles of Environmental Chemistry,3rd edition, J.E.Girard, Jones and Bartlett Learning Company, Burlington
13. The Science of Environmental Pollution,3rd edition, Frank.R.Spellman, CRC Press, Taylor and Francis Group.

<b>B.Sc. Semester-II</b> <b>Subject: MICROBIOLOGY</b> <b>Course Code: BGO2T04</b> <b>BIOMOLECULES</b>			
GE/OE	Hours: 2 Hours/Week	Marks: 80 +20 = 100	Credit: 2
<b>Unit-I</b>			
<b>Carbohydrates and Lipids</b>	<ol style="list-style-type: none"> <li>1. Definition and Classification of carbohydrates,</li> <li>2. Structure of glucose, fructose, maltose, lactose, sucrose, starch, hyaluronic acid, glycogen, cellulose,</li> <li>3. Classification of lipids, structure of triglyceride, compound lipids.</li> </ol>		<b>7.5 Hrs</b>
<b>Unit-II</b>			
<b>Amino acids and proteins</b>	<ol style="list-style-type: none"> <li>1. Classification of amino acids,</li> <li>2. Acidic ,basic and neutral amino acids,</li> <li>3. Peptide bond theory,</li> <li>4. Primary, secondary and tertiary structure of proteins.</li> </ol>		<b>7.5 Hrs</b>
<b>Unit-III</b>			
<b>Enzymology</b>	<ol style="list-style-type: none"> <li>1. Definitions and nature of enzymes, classification, nomenclature,</li> <li>2. Activation energy, transition state, ES complex, enzyme activity, katal, specific activity ,turnover number</li> <li>3. Functional diversity such as holo enzyme, apoenzyme, coenzyme, cofactor, prosthetic group, isoenzymes,</li> <li>4. Membrane bound enzymes, multi enzyme complex, zymogens</li> </ol>		<b>7.5 Hrs</b>
<b>Unit-IV</b>			
<b>Nucleic acid and Vitamins</b>	<ol style="list-style-type: none"> <li>1. Structure of purines, pyrimidines, nucleosides, nucleotides,</li> <li>2. Structure of DNA and RNA</li> <li>3. Types of vitamins, Classification on the basis of solubility, functions of vitamins,</li> <li>4. Hypervitaminosis–Definition, causes, symptoms, treatment of Vit. A and D</li> </ol>		<b>7.5 Hrs</b>



**ReferenceBooks:**

1. Lehninger.Principles of Biochemistry. 4<sup>th</sup> Edition. D. Nelson and M .Cox. W .H. Freeman and Company. New York2005
2. Microbiology an Introduction .6<sup>th</sup> Edition. Tortora, Funke and Case. Adisson Wesley Longman Inc. 1998.
3. Prescott, Hurley. Klein-Microbiology 5<sup>th</sup> & 6<sup>th</sup> edition, International edition 2002 & 2006, McGraw Hill.
4. Garrett, R. H. and Grisham, C. M .(2004) Biochemistry .3<sup>rd</sup> Ed .Brooks /Cole Publishing Company, California.
5. ConnEric, Stumpf Paul K., Bruuening George, Doi Roy H. ,(1987) Outlines of Biochemistry 5<sup>th</sup> Ed , John Wiley and Sons, New Delhi.
6. Miller A. D. and TannerJ .(2013). Essentials of Chemical Biology: Structure and Dynamics of Biological Macromolecules. Germany: Wiley.
7. Powar C. B. and Daginawala H. I. (2005). General microbiology Volumel. Himalaya Publishing House Private Limited, Pune, India.

Sr.No.	Course outcome
1.	Students will learn about different types of biomolecules and their functions.
2.	Students will learn about the various disease s due to deficiency of vitamins.

**Bachelor of Science (Honors / Research) 4 yr. 8 Semester Degree Program**

**B.Sc. Sem II (Interior Design – Major)**

**BGO2T04 CULTURAL ANTHROPOLOGY II**

Students of design have to be sensitized to various cultural aspects such as traditions, fine arts and the performing arts of a particular country and have to understand the symbolism, patterns and forms that manifest themselves in the architecture of that place

UNIT I : Communication

- i) Meaning and Definition
- ii) Importance of Communication
- iii) Objectives of Communication
- iv) Principles of Effective communication
- v) Media of Communication

UNIT II : Industrial Sociology

- i) Meaning and Definition
- ii) Scope Industrial Sociology
- iii) Nature of Industrial Sociology

UNIT III : Work Organisation

- i) Meaning and Definition
- ii) Importance
- iii) Forms of industrial organization: Line Organization, Line and Staff Organization, Functional Organization

- iv) Authority – Meaning and definition

- v) Delegation of authority

- vi) Process of delegation

UNIT IV : Industrial culture in India

- i) Modernization : impact on Indian society
- ii) Industrialisation: impact on Indian society
- iii) Urbanization : impact on Indian society

## UNIT V : Leadership in Industry

- i) Meaning and Definition
- ii) Characteristics of Leadership
- iii) Importance of Leadership
- iv) Leadership Styles

### Reference Books

- 1) A new Outlook into Social Science – S. Shabbir, A. M. Sheikh, Jaya Dwadashiwar, S. Chand, Delhi
- 2) T. Ramasamy, 2012, Principles of Management, Himalaya Publishing House, Mumbai.
- 3) Dr. Pratibha M. Siriya, 2011, Principles of Business Management, Sai Jyoti Publication, Nagpur.
- 4) King's, Personnel management & Industrial Relations, Harsha Rastogi, Delhi.

### Cultural Anthropology II

S. No	Course Outcomes
	The students will gain knowledge regarding
CO1	Industrial Sociology
CO2	Work organization
CO3	Industrial Culture & Leadership
CO4	Leadership Styles
CO5	Communication Skills

## **B. Sc (Applied Electronics & Software Technology) – Semester II (GE/OE)**

**BGO2T04**

**SOCIAL SCIENCE II**

Scheme of Examination (Theory)

SEE – 80

CIE - 20

Total - 100

**Course Outcome :** The students will gain knowledge regarding

- Vastu Shastra
- Traditions in Arts & Crafts
- Evolution of forms and spaces
- Significance of cultural traditions

**Unit I:**

**Vastu Shastra** : History of Vastu Shastra , Scientificness of Vastu Shastra, Use of Vastu Shastra in Interior Design.

**Unit II :**

Traditions in arts & crafts – space, function and climate responsiveness

**Unit III :**

Evolution of forms and spaces during various eras and regions , influences etc.

**Unit IV :**

Symbolism, patterns and forms that manifest themselves in the architecture of that place

**Unit V :**

Significance of cultural aspects and traditions

**Reference Books :**

1.Nadeem Hasnain, 2011, Indian Anthropology

2. Mohd. Irfan, 2012 , Social Exclusion And Muslim Ethnograph, Neha Publishers & Distributors

**GE/OE Basket Semester III**  
**Faculty of Science and Technology**

Semester	Course Category		Name of Course	BoS	Course code
III	GE/OE	1	Nutraceuticals	Botany	BGO3T05
		2	Sports Biochemistry	Biochemistry	
		3	Biotechnology in Forensic Science	Biotechnology	
		4	Chemistry in everyday life	Chemistry	
		5	Data Base Management System	Computer Science	
		6	Data Base Management System	Computer Application	
		7	Data Base Management System	Data Science	
		8	Basic Electronics for Life Science	Electronics	
		9	Modern Technologies for Environmental Management	Environmental Science	
		10	A. Forensic Meteorology/ B. Forensic Chemistry/ C. Forensic Physics/ D. Forensic Biology/ E. (Psychology)/ F. Digital & Cyber Forensic/ G. Criminal Law-II (Law)	Forensic Science	
		11	Paedology and Soil Testing	Geology	
		12	Data Base Management System	Information Technology	
		13	Financial mathematics	Mathematics	
		14	Digital systems	Physics	
		15	Animal husbandry	Zoology	
		16	Introductory Pharmacology & Toxicology	Cosmetic Technology	
		17	Hand Printing	Fashion Design	
		18	Textile Testing-I	Textile Science	
		19	Metabolism of Biomolecules	Microbiology	
		20	Environmental Psychology	Interior Design	
		21	Engineering Mechanics I	Applied Electronics & Software Technology	

**GE/OE Basket Semester IV**  
**Faculty of Science and Technology**

Semester	Course Category		Name of Course	BoS	Course code
IV	GE/OE	1	Biofuels technology	Botany	BGO4T06
		2	Pharmacogenomics	Biochemistry	
		3	Biotechnology & Law	Biotechnology	
		4	Molecules of Life	Chemistry	
		5	Cyber security	Computer Science	
		6	Cyber security	Computer Application	
		7	Cyber security	Data Science	
		8	Mobile App development	Electronics	
		9	Biodiversity and Wildlife Conservation	Environmental Science	
		10	A. Forensic Photography/ B. Forensic Chemistry/ C. Forensic Physics/ D. Forensic Biology/ E. (Psychology)/ F. Digital & Cyber Forensic/ G. Criminal Law-III (Law)	Forensic Science	
		11	Engineering Properties of Rocks and Soil	Geology	
		12	Cyber security	Information Technology	
		13	Mathematics for Competitive Examinations	Mathematics	
		14	Applied Microbiology	Microbiology	
		15	Communication Systems	Physics	
		16	Bio-statistics	Zoology	
			Communicable diseases	Zoology	
		17	Introductory Pharmacology & Toxicology	Cosmetic Technology	
		18	Home Linen Designing	Fashion Design	
		19	Textile Testing-II	Textile Science	
		20	Green Building Technology	Interior Design	
21	Green Building Technology	Applied Electronics & Software Technology			