ADDITIONAL OPTIONAL SUBJECTS

1. Textile Craft

Scheme:

			DURATION	MAX.MARK	MIN.MARK
(i)	**Theory:**	One paper	3Hrs	60	22
(ii)	**Practical:**	One	3Hrs	80	28
(iii)	**Submission:**	Two		60	22

(Theory): Introduction to Textile Craft

UNIT-I

1. Introduction to Textiles
2. Definition of fibre, Properties of textile fibres, Primary & Secondary properties.
3. Classification of fibres
4. Production, manufacturing, properties and uses of Natural vegetable fibres- cotton, linen and jute
5. Yarn manufacture by Takli and Charkha

UNIT-II

1. Warp and Weft, Difference between warp and weft
2. Handloom, Parts of Handloom
3. Warp path on Handloom
4. Motion of Handloom(primary & secondary)
5. Elementary Weaves(Basic weaves): Plain, Twill, Satin & Sateen

UNIT-III

1. Concept of colours, Colour Wheel, Colour schemes, Achromatic & Monochromatic colours
2. Dyes and Pigments (colourless dyes)
3. Classification of Dyes
4. Dyeing of cotton fabric by Tie and Dye process
5. Fabric finishes- Introduction and Importance, basic finishes- bleaching, scouring, singeing, mercerising

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(Practical):

Samples preparation

   (i)   Tie and Dye (Marbling, pleating & folding, laheria and bandhej)

   (ii)   Elementary weaves (plain, twill, satin and sateen) on graph paper

   (iii) Primary colour, secondary colour, colour scheme, achromatic & monochromatic colour

   (iv) Hand painting

   (v)   Stencil Preparation and Painting

Submission:

Develop any two products

   (i)   Dupatta / scarf/table cover using tie and dye

   (ii)   Cushion cover or table mats using hand painting or stencil painting

Examination Scheme:

Major Problem: 50 Marks

Tie and dye/ stencil printing / hand painting on a product

Minor Problem: 30 Marks

Preparation of any weave or colour scheme

Reference books :

Dantyagi, S. (2012) Fundamental of Textiles, Orient Blackswan private limited.

Gohl, E. P. G. & Vilensky, L.D. (2005) Textile Science, CBS publishers & distributors PVT.Ltd. New Delhi

Taggart, W. (1920) Cotton Spinning, London; New York: Macmillen. London

Bannergee, N.N. (1986) Weaving Technology, 9th edition, Textile book house

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2. GARMENT PRODUCTION & EXPORT MANAGEMENT

B.Sc. PART – I

PAPER- I: UNDERSTANDING TEXTLES

B.A/B.Com. -M.M. 60   **Hrs.3**
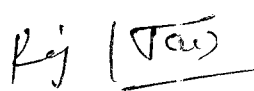
B.Sc. M.M. 50

OBJECTIVES: -

1. To know different textile fibers & their performances.
2. To gain knowledge on different textiles fiber processes and finishes.
3. To become familiar with traditional textiles & embroideries of India.
4. To understand the selection criteria's of clothes

SECTION A: Textile Technology

1. Textile fibers:	:	General properties of Natural Fibers – Cotton, Wool. Silk, Regenerated – Rayon, Acetate Synthetic Fibers – Nylon, Acrylic
2. Fibers to yarn	:	The basic process involved in making yarns including blending, carding, combing, mechanical and chemical spinning
3. Fabric construction	:	Weaving: plain, twill, & satin weave
4. Fabric Finishes	:	Calendering, mercerization and tentering

SECTION B : Traditional Textile

5. Woven fabrics	:	Dacca muslin jamdani, chanderi, brocade baluchari, kashmiri shawls, doria, kanjivaram
6. Dyed Fabrics	:	Bandhej, ikat, patola.
7. Printed Fabrics	:	kalamkari, madhubani

8. Traditional embroideries of India :

   a) Kashida of Kashmir
   b) Kasuti of Karnataka
   c) Manipuri
   d) Chamba rumal of Himachal Pradesh
   e) Kantha of Bengal
   f) Phulkari of Punjab
   g) Chikankari of Uttar Pradesh

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SECTION – C
SELECTION CRITERIA

9. Selection of suitable fabrics for infants, toddlers, pre- school children, school going children, adolescents, adults and special needs

10. Buying criteria for readymade garments, definition, origin & evolution of ready to wear garments

References:

1. Corbman, B. P. (1983). Textiles fibre to fabric. Mc Graw Hill education.
2. Phyllis, G. T., & Billie J. C. (2009). Understanding textile. Pearson publication.
3. Naik, S.D. (1996). Traditional Embroideries of India. APH publishing.
4. Bhatnagar, P. (2009). Traditional Indian costumes and textiles. Abhishek publication.
5. Dhantyagi, S. (2012). Fundamentals of textile and their care. Orient Black swan.
6. Singh, B. Vastra vigyan avam paridhan.
7. Marjory, J. L. (1966). Introductory textile science. Holt McDougal.
8. Marjory, J. L. (1976). Essentials of textiles. Holt McDougal.
9. Jain Ruby and Rathore Girja, Design, Fashion and Garment Production, CBH publication Jaipur 2019.

PAPER – II
BUSINESS AND GARMENTS INDUSTRIES

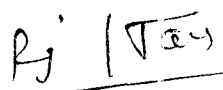B.A/B.Com.-M.M.60   Hrs.- 3
B.Sc.- M.M.50
OBJECTIVES: - To enable students to:-

1. Acquaint with different types of Business ownership.
2. Understand merchandising in Apparel Industries.
3. Understand the garment industry and project planning.

SECTION   A
BASICS OF BUSINESS

1. Meaning and scope of business with special reference to garment export trade in India

2. The important factors to be considered at the same time of commencement of business - legal, economical, and social

3. Different types of business-
   a) individual organization

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b) partnership

c) co-operative

d) public sector

e) company

4. Objectives, importance and utility of book keeping.

SECTION – B
MERCHANDISING THEORY

5. Introduction to fashion merchandising. merchandising planning, scheduling, buying and evaluation

6. Visual merchandising.

7. Careers in Apparel industries.

SECTION –C
GARMENT INDUSTRY

8. Project planning for garment production unit.

9. Production and storage space, laundry area of garment industry.

10. Site selection for unit

11. Budgeting for garment production unit.

References :

1. Kaplan, S. R. & Anthen A. A. (2014). Management. Darling kindesley Pearson education.

2. Frings, G.S. (2007). Fashion from concept to consumer. Pearson G edition.

3. Jindal, R. (1998). Handbook of fashion; best drafting techniques. Mittal publications.

4. A.K. Sharma , S. Sharma, R. Nagar, A. Jain, S. A. Bakshi, 2016, Entrepreneurship and small business management (Hindi) 1st ed. Ajmera Book Company, Jaipur

PRACTICAL – 1
BASICS OF GARMENT CONSTRUCTION
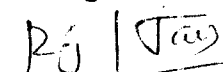
B.A./B.Com.- M.M. 80   **Hrs. 4**

B.Sc. - M.M.   50

OBJECTIVES: - To enable students to:-

Develop skill in understanding all stitching technique.

Develop expertise in basic and traditional embroidery which gives creative, decorative and ornamental effect on dress.

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Contents

1. **Sample making :**

   Basic seams - Basting (even, uneven) back stitch, blanket)

   Hems – visible, invisible

   Lace edging – (machine)

   Gathers - (machine), darts

   Pleats – knife, box, inverted box

   Frills one side, two sided

   Tucks – pin, cross, shell

   Fasteners – hook , press button, shirt button, button hole, loop with button, zip

   Plackets – continuous, two piece

   Pockets – patch, bound, inseam, kurta

   Edge finishing - piping and facings

2. **Basic Embroidery stitches :**

   Chain, stem, running, lazy-dazy, satin, herring- bone, buttonhole, bullion, feather patch and appliqué work.

3. **Make samples of following traditional embroideries :**

   kashida, kantha, kasuti, phulkari, chamba

   Taking body measurements and knowledge of standard measurements from child to adults

Examination Scheme:

B.A.\B.COM:-Max Marks:-80
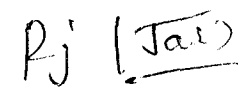1. Major Problems:-40
2. Minor Problems:-25

Internal:-15

B.Sc:-Max Marks:-50
1. Major Problems:-20
2. Minor Problems:-20

Internal:-10

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Scheme:

Theory: Max Marks 100   Minimum Pass Marks 36

Paper I: Physical Geology and Paleontology   3 hrs duration   Max Marks 50

Paper II: Mineralogy and Structural Geology   3 hrs duration   Max Marks 50

Practical (one)   4 hrs duration Max Marks 50

Paper I: Physical Geology and Palaeontology

Section - A

Geology: its definition and scope, sub-disciplines and concept of Earth System Science

Earth: As a part of the Solar System, its origin, composition and structure internal and external forces.

Concept of Plate Tectonics and its application in understanding Earthquakes and volcanoes, Mid Oceanic Ridges and Sea Floor Spreading.

Mountain Building and Isostasy.

Section - B

Weathering and Erosion. Geological work of natural agencies like running water (rivers), wind, glaciers, groundwater and oceans, and development of related landforms.

Fossils: Conditions necessary for fossilization, mode of preservation, their significance in understanding the origin and evolution of life. Outline of Geological Time Scale

Microfossils: definition and significance in geological studies. Skeletal morphology and geological distribution of Foraminifers.

Section - C

Skeletal morphology and geological distribution of the following groups:
Brachiopods, Molluscs, Trilobites and Echinoids.

Brachiopods, Molluscs, Trilobites and Echinoids

Paper II: Mineralogy and Structural Geology

Section A

Crystal: crystalline, cryptocrystalline and amorphous states. Crystals faces, edges, solid angle and elements of crystal symmetry, unit cell, crystal notation and zones.

Mineral: Definition, rock forming minerals and ore minerals. Physical properties of Minerals. Concept of Isomorphism, Polymorphism, Pseudomorphism and Solid Solution

Optical Mineralogy: Construction and use of petrological microscope. Double refraction, Pleochroism, Extinction angle, Interference colours.

Section B

Classification of Silicate Minerals physical, optical and chemical properties of the following mineral groups. Feldspar, pyroxene, amphibole, mica and garnet

Deformation: Elastic, plastic and brittle deformation. Attitude of planar and linear structures, dip, strike, pitch and plunge, concept and use of clinometer compass. Unconformity and its types, criteria for determination of top and bottom of sequences.

Section C

Folds and faults: Definition, ... geometric and genetic classification and recognition in the field

Elementary idea about Cleavage, joints, salt domes, inliers and outliers

Practicals

Study of physiographic features ......geographical maps. Drawing of profiles and geological sections along given direction

Identification, description and drawing of important fossils representing the following groups Brachiopods, Molluscs, Trilobites and Echinoids
Identification and description of common rock forming minerals on the basis of physical properties .... plagioclase, microcline, orthoclase, biotite, hornblende, muscovite ......under microscope

Geology ....samples

4. ENVIRONMENTAL SCIENCE
B.Sc. Part-I

Scheme:

Theory

Max Marks: 100   Min. Marks:36

Paper 1   3 hours duration   Max Marks:50

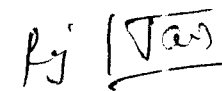Paper 2   3 hours duration   Max Marks:50

Practical   4 hours duration   Min. Marks:18   Max Marks:50

Note:

1. Two types of Question papers for each theory paper will be applicable. Total duration of 3 hours for each paper. One question paper will comprise of the objective questions and the other will be of descriptive type question.
2. Descriptive type question paper (to be given during 1st 2 hours of examination) will have 9 questions,3 from each section out of which a student is supposed to attempt 4 questions selecting at least 1 from each section. This portion of the paper will carry maximum 30 marks. Each descriptive question will be of 7.5 marks.
3. The objective question paper will be given after 2 hours of commencement of descriptive type paper and will have 35 questions of the objective type. This portion of the paper will carry 20 marks. The objective type questions will be of the following types:
   - Multiple choice type questions: 20 questions of ½ marks each.
   - Fill in the blanks/one word/true or false type questions:10 questions of ½ mark each.
   - Very short answer type questions: 5 questions of 1 mark each

Paper I: Fundamentals of Environmental Science

Section-A

1. Ecosystem Concept, Ecosystem structures and function, Components of Ecosystem (Biotic and Abiotic Components).
2. Pyramids of Energy, Biomass and number.
3. Biogeochemical cycling(Nitrogen cycle, Phosphorous cycle, Carbon cycle, oxygen cycle, Sulphur cycle, Water cycle etc.).
4. Concept of energy flow in Ecosystem, Production, Biomass and productivity.
5. Human Ecosystem, Agro- Ecosystem, Rural and Urban Ecosystem.

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Section-B

1. Geographical and Geological aspects of forests, types and distribution of forest, structure and composition of forest, productivity of forest and biodiversity in forest.
2. Geographical and Geological aspects of Grassland Ecosystem, types and Distribution of Grasslands, structures and compositions of Grasslands, Productivity of Grasslands and biodiversity in Grasslands.
3. Geographical and Geological aspects of Desert Ecosystem, types and distribution of Desert Ecosystem at global level.
4. Aquatic Ecosystems; ponds, lakes and marine ecosystems.

Section-C

1. Ecology of Rajasthan with respect to Indira Gandhi Canal.
2. Aravalli's and Thar Desert Ecosystem.
3. Land forms in Rajasthan desert.
4. Adaptation in plants and animals of Rajasthan desert.
5. Types of vegetation's and animals in Rajasthan Desert.
6. Mineral wealth of Rajasthan.

Suggested Readings:

- ❖ Allaby, M, 1986 Ecology Facts. Bridge House London, Kd.
- ❖ Beez, A.V. Knamitter, G.W. and Smith, J.C. 1987. The Environmental Science and Technology Education. Pergmon Press, Oxford.
- ❖ Betaking, D.B. and Killer E.A.F. 1982. Environmental Studies. Charles E. Merril Publishing Co. London.
- ❖ Cassedy, E.S. and Grossman, P.Z. 1990. Introduction to Energy. Cambridge University Press, New York.
- ❖ Colinvanx, P. 1986, Ecology. Jolm Wiley and Sans. New York.
- ❖ Cunnigham, W.P. and Cunnigham M.A. 2003. Principles of Environmental Science. Tata Mc Graw-Hill Publishing Company Ltd. New Delhi.
- ❖ Dicastri, F. Baker, FWG and Hadley M. 1984, Ecology in Practice, Tycooly International Publishing Ltd. Dublin.
- ❖ DiCastri, F. Banker, FWG and Had buy. M. 1984. Ecology in Practice, Tycooly International Publishing Ltd. Dublin.
- ❖ Krebs. C.J. 1985 Ecology. Harper and Row Publishers, New York.
- ❖ Majupuria T.C. 1986. Wildlife Wealth of India. Teq Press service, Bangkok.
- ❖ Odmn, E.P. 1933, Basic Ecology, Harper and Row Publishers, New York.
- ❖ Prakash I. 1988. Desert Ecology, Scientific Publishers.
- ❖ Rana, S.V.S. 2005. Essentials of Ecology and Environmental Science. Prentice Hall of India, Pvt. Ltd. New Delhi.

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❖ Santra, S.C. 2001. Environmental Science. New Central Book Agency Pvt. Ltd. Calcutta.

❖ Shadri, B. 1986, India Wildlife and Wildlife Resources, Sterling Publishers Pvt. Ltd. New Delhi.

❖ Smith, R.L. Elements of Ecology, Harper and Row Publishers, New York.

❖ Tegue, D.D. 1985, A manual of Wildlife Conservation, NatrajPublshers, Dehradun.

❖ Tietenberg, T. 1968. Environmental and National Resources Economics, Scott, Foresmsn, London.

Paper II: Water Resources and Management
Section-A

1. Water Resources; precipitation, infiltration, evaporation, transpiration, runoff and Storm Water.
2. Hydrological cycles mechanism, significance.
3. Surface water resource availability at global, national and regional level.
4. Ground water Resources; Aquifers, ground water collection system, ground water hydraulics.
5. Ground water availability at global, national and regional level.
6. Rain water harvesting its necessity and various methods of collection system and its importance.
7. Water uses; drinking water, use as cooling water in power plants, Irrigation recreational activities. Industrial use with respect to quantum of water use.

Section-B

1. Water quality monitoring; Sampling, Methods of analysis, determination of organic matter, determination of inorganic substances, physical characteristics, Bacteriological measurements.
2. Water processing; Mixing and flocculation, Sedimentation, Filtration, Turbidity removal, Taste and Odour removal, Organic Chemicals removal, Iron and Manganese removal, Water Stabilization, Chlorination, Disinfection, Removal of dissolved salts.

Section-C

1. Secondary (Biological) Treatment; Activated Sludge Process, Trickling Filters, Sludge Treatment and Disposal.
2. Lagoons, Anaerobic digestion, Aerobic Digestion.
3. Advance Waste water treatment, Removal of Suspended Solids, Nitrogen Removal, Advanced Biological System.
4. Recovery of material from process effluent.
5. Removal of Pesticide residues from water.

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Suggested Readings:

- ❖ Alvares, C. and Billorey, R. 1988. Damming the Narmada, Natraj Publishers, Dehradun.
- ❖ Arden, T.V. 1968. Water Purification by Ion Exchange. Butterworths, London, U.K.
- ❖ Botkin, K. 2000. Environmental Science. John Wiley and Sons. New York.
- ❖ Bourne, P.G. 1984. Waste and Sanitation. Academic Press. Inc. New York.
- ❖ Engler, E.D. Kormelink, J.R. Smith, B.F., Smith, R.J. 1986. Environmental Science. W.C. Brown Publishers. Iowa, U.S.A.
- ❖ Gopta, C.P. 1989. Appropriate methodologies for development & management of ground of ground water resources in developing countries. IBH Publishing Co. Pvt. Ltd. New Delhi.
- ❖ Hammer, M.J. and Hammer, M.J. Jr, 2001. Water and Waste water Technology. Prentice-Hall of India, (P) Ltd. New Delhi.
- ❖ Kumar, P. 1988. Ground water and well drilling. CBS Publishers and Distributors, New Delhi.
- ❖ Nazaroff, W.W. and Cohen, L.A. Environmental Engineering Science. John Wiley and Sons. New York.
- ❖ Pillai, K.M. 1987. Water Management and Planning. Himalaya Publishing, New Delhi.
- ❖ Schroeder, E.D. 1977. Water and Waste water treatment. Mc Graw-Hill, New York.
- ❖ Sincero, G.A. and Sincero, A.P. 1999. Environmental Engineering – A Design Approach. Prentice-Hall of India, (P) Ltd. New Delhi.
- ❖ Sinha, U.K. 1986. Ganga: Pollution and Health Hazards, Alka Enterprises, New Delhi.

Suggested Laboratory Exercises (Practicals)

Frequency Determination

Density Determination.

IVI Determination

Study of vegetation types in different forests.

Study of vegetation types in different landforms of Desert.

Study of animals types in different forests. (Knowledge about wildlife)

Study of animals types in different landforms of Desert. (Knowledge about wildlife)

Study of different types of adaptations in plants of Deserts.

Study of different types of adaptations in animals of Deserts.

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Add-on Subjects

1. BIOTECHNOLOGY

Scheme:

Theory

Max. Marks : 100   **Min. Pass Marks : 36**

Paper I   :   Biochemistry & Microbiology   (50 Marks)

Paper II :   Cell Biology & Genetics   (50 Marks)

Paper III :   Bophysics, Bio-Maths

              & Computer Application   (50 Marks)

Practical   (75 Marks)

Paper-1 : Biotechnology and Microbiology

The first question in each paper shall be compulsory and it would be based on the entire syllabus. It will cover 20 per cent marks. It will be of the objective type one word, short answers, etc. which can be done in the same answer book.

Section-A

Nature of biological material. General properties : organic and inorganic compounds. Suitability of organic compounds for generation of structure. storage of energy and information. Hydrophilic and hydrophobic groups in biological molecules.

Classification of biomolecules based on their role in bioprocesses. Molecules involved in generation of mechanical stability— peptidoglycans : polysaccharides and membrane lipids. Analysis of carbohydrates, lipids, proteins and nucleic acid, biosensors and diagnostics

Section-B

Molecules involved in information storage and retireval—the nucleic acids.

Molecules exeecuting mediator and catalytic functions—the proteins.

The sign molecules. Biochemical composition of cell Protein, ds. Carbohydrates. Nuclear acids and metabolic pool. Nature of the material DNA replication

Perspective of biotechnology

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in nucleic acid and proteins. Helicity, bending, looping, pleats, salt bridges etc. and their determinants. The basis for intermolecular interaction e.g., enzyme-substrate and antigen—antibody recognition.

Section-C

Nature of biochemical reactions underlying biosynthesis and degradation. Role of enzymes in such reactions. Protein and non-protein enzymes. Kinetics of enzyme catalyzed reactions. *In vitro* activity of purified enzymes and their applications in industry. Various uses of enzymes—enzymes on food processing, medicine, diagnostics and production of new compounds., Enzymes as research tool—ELISA methods, modification of biological compounds with the help of enzymes

Development of microscopy (optical, TEm and SEM).

Pasteur's experiments disproving spontaneous generation.

The concept of sterilization. Methods of sterilization. (Dry heat wet heat, radiation, chemical and filtration etc.)

Section-D

Concept of microbial species and strains.

The various forms of microorganisms—PPLOS, cocci, bacilli and sprilla.

Genetic homogeneity in clonal populations.

Spontaneous and induced variation arising in microbial population.

Gene transfer in microorganisms.

Nature of the microbial sell surface. Gram positive and gram negative bacteria. Kinds of flagella. Stereotypes.

Prokaryotic and eukaryotic microbial cells.

Nutritional classification of microorganisms.

Microbes in extreme environments—the thermopiles and lkalophiles.

Pathogenic microorganisms Defense mechanism against microorganisms

Symbiosis and antibiosis among microbial populations.

N₂ fixing microbes in agriculture.

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Microbial metabolism fermentation products. A survey of products from microorganisms.

Strains improvement by enrichment, selection and recombinant DNA methods.

Production of heterologous protein in interest in microorganisms.

Paper II : Cell Biology & Genetics

The first question in each paper shall be compulsory and it would be based on the entire syllabus. It will cover 20 per cent marks. It will be of the objective type-one word, short answers etc. which can be done in the same answer book.

Section-A

Cell as a basic unit of living systems. The cell theory. Precellular evolution : artificial creation of "cells". Broad classification of cell types : PPLOS, bacteria, eukaryotic microbes, plant and animal cells. A detailed classification of cell types within an organism. Cell, tissue, organ and organism as different levels of organization of otherwise genetically similar cells. Ecological amplitude of cells in high, altitude, sediments, arctic, hotspring, and brackish and freshwater environments. Ultrastructure of the cell membrane.

Section-B

Structure and function of cell organelles : ultrastructure of cell membrane, cytosol, Golgibodies, endoplasmic reticulum (rough and smooth), ribosomes cytosketal structures (action, microtubles etc.) mitochondria, chloroplasts, lysomes, peroxysomes, nucleus (nuclear membrane, nucleoplasm, nucleolus chromatin,). Cell division and cell cycle (include cell synchrony and its application). Cell-cell inaction.

Cell locomotion (ambeoid, flagellar and ciliary). Muscle and nerve cells.

Cell senescence and depth. Cell differentiation of plants and animals

Section-C

Mendelian laws of inheritance, gene interaction.

Sex determination in plants and animals; sex-linkage; non-disjunction as a proof of chromosomal theory of inheritance. Linkage; mapping genes; interference; coincidence in pro- and eukaryotes. Chromosomes; chemcial composition; structural organization of chromatids, centromeres, telomeres, chromatin, nucleosome organization; eu- and heterochromatin; special chromosomes (e.g. polytene and lampbrush, chromosomes); banding patterns in human chromosomes.

Structural and numerical at aberrations involving chromosomes; evolution of wheat, cotton and rice;

Hereditary effects—Kleinefelter, Turner, Cri-duChat and Down syndromes.

Section—D

Mutations—spontaneous and induced; chemical and physical mutagens; induced mutations in plants, animals and microbes for economics benefit of man.

Basic-microbial genetics conjugation, transduction, transformations; isolation of auxotrophs, replica-plating techniques, analysis of mutations in biochemical pathways, one gene- one enzyme hypothesis.

Extra chromosomal inheritance, mitochondrial and chloroplast genetic systems.

Population genetics : Hardy-Weinberg equilibrium, gene and genotypic frequencies.

B.Sc. Part I
Paper-III Biophysics, Biomaths & Instrumentations and Computer Application

The first question in each paper shall be compulsory and it would be based on the entire syllabus. It will cover 20 per cent marks. It will be of the objective type one word, short answer etc which can be done in the same answer book.

Section - A

Energetics of living body sources of heat limits to temperature heat dissipation and conservation Lambert Beer law pectrophotometry and colorimetry Primary events in photosynthe-

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sis. Strategies of light reception in microbes, plants and animals.

Correction of vision faults. Electrical properties of biological compartments. Electricity as a potential signal

Section—B

The set theory properties of subsets, Linear and geometric functions, Limits of functions, derivatives of functions. The binomial theorem, Logarithm, Differentiation, Integration, Probability calculations, Biostatistics : Methods of sampling, confidence level, Measurements of central tendencies, Measurements of deviations.

Section—C

Computers : General introduction to computers, organization of computer digital and analogue computers algorithm. Use of computers : Common languages of computer, word, excel, power point. Bioinformatics and use of computer in bioinformatics. Computers for online monitoring, computers in co-ordination of solute concentration, pH and temperature etc. of a fermenter in operation.

Section—D

General principles; buffers; electroanalytical methods: potentiometric and conductometric; photometry; chromatographic methods of separation : gel permeation, ion exchange, reverse phase and affinity chromatography, HPLC and

FPLC centrifugation; radiotracer technique; gel electrophoresis techniques : electro blotting and electroelution. capillary electrophoresis. API-electrosprary and MALDI-TOP mass spectrometry.

Practical-Based on Theory syllabus -Max marks 50

2. INDUSTRIAL MICROBIOLOGY

Scheme :

Max. Marks 100

Paper I	3 hrs. duration	Min. Pass Marks : 36
Paper II	3 hrs duration	Marks : 50
Practical	Min. Pass Marks : 18	Marks : 50
		Max. Marks : 50

Note : Each theory paper will contain nine questions, three questions form each section. Candidates are required to attempt five questions in all taking atleast one question from each section.

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Paper-I : Fundamentals of Industrial Microbiology, Biostatistics, Tools and Techniques

Section-A

1. General Introduction history and development of Industrial Microbiology Scope of Industrial Microbiology :
   — Introduction
   — Discovery of Microbial World
   — The experiments of Pasteur
   — The era of the discovery of antibiotic
   — The discovery of the anaerobic life
   — The Physiological significance of Fermentation.

2. Classification isolation, characteristics and ultrastructure of microbes.
   — Bacteria
   — Algae
   — Fungi
   — Actinomycetes
   — Mycoplasma
   — Viruses
   — Procedure of isolation, preservation and identification of micro organisms
   — Methods of staining of different microbes.

3. Biological and Biochemical fundamentals.
   — Introduction
   — The microorganisms and biotechnology
   — Isolation methods for microorganisms
   — Culture preservation and stability
   — Preservation of microbes, serial subculture preservation by over laying culture with mineral oil lyophilisation of freeze drying.
   — Other methods for storage of fungi
   — Over production of microbial metabolizes
   — Preparation of inoculum

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Section-B

4. **Fundamental of Genetics**
   — Introduction
   — Methods for the selection of mutants, direct selection methods for resistant mutants, penillin selection, technique for mutant selection, conditional lethality and use in mutant section.
   — General account about the transfer of genetic information in prokaryotes.
   — Scope of genetic engineering.

5. **Biostatistics**
   — Basic idea of probability distribution patterns, normal binomial and poison distribution, sampling methods, means, mode and median, chi-square statistics. Analysis of variance, transformation.

6. **Microscopy**
   — Simple microscopy; phase contrast microscope, fluorescence and electron microscopy.

Section-C

7. **Chromatography**
   — Paper chromatography, thin layer chromatography, column chromatography, gas chromatography, affinity chromatography, gel filtration, Electrophoresis, moving boundary zone (paper gel etc.)

8. **Instruments : basic principles and usage**
   — pH meter Absorption and Emission spectroscopes. Principle and law of absorption and radiation use densitometry, fluorimetry, calorimetry spectrophotometry (Visible, UV infrared) manometry, polarography, Centrifugalization : principles and application.

   Principle types of Fermentation
   Introduction

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- Factors involved in fermenter design, difference between bio-chemical and chemical processes, classification of bio-chemical reactions, rate process, operational consideration, local conditions within a fermenter.

--- Fermenter configurations, the batch fermenter, continuous stirred tank fermenter the tubular fermenter, the fludidised bed fermenter, solid state fermenters.

- Principal operating characteristics of fermenters.
- Computer control of fermentation process.
- Introduction
- Computer hardware and software, Hardware Graphics, LOTus and DOS, Computer applications in fermentation.
- Justification and planning.

Paper-II : Microbial Genetics, Molecular Biology, Microbial Biochemistry.

Section-A

1. **Nucleic Acids.**

DNA as genetic material structure of DNA, RNA, DNA replication (conservative and semiconservative replication, confirmational flexibility of DNA), replication of Eukaryotes. The genetic code, central dogma, reverse transcriptase, gene transcription, polymerases, transcription, production of DNA, tRNA, mRAN and rRNA, synthesis of RNA in eukaryotes and prokaryotes, catabolite effect operators and repression post transcriptional of RNA.

2. **Molecular Biology of Protein Synthesis.**

Translation and protein synthesis in eukaryotes and prokaryotes, tRNA synthetase activation of amino acid. Inhibitors of protein synthesis. Gene expression catabolite repression regulation of gene expression, peron concept, cAMP. Catabolite Activator Protein (CAP) Positive and negative control and gene expression in prokaryotes the operon. Brittori Davidson model of gene regulation in eukaryotes.

3. **Mutation.**

Molecular mechanism of mutation forward and reveres muta-

transition, transversion, chemical induced mutations, radiations and base analogies, induced mutations, mutation frequency applications of mutations, Mechanism of repair, of radiation induced damage, SOS repair, Post transcriptional repair.

Section-B

4. **Genetic recombinant in bacteria.**

   Transformation, transduction and conjugation. Use of transformation, transduction and conjugative in genetic mapping, preparation of genetic maps.

5. **Extra Chromosome genetic material.**

   Plasmids, cosmids, transposons insertion sequence. Overlapping genes, silent genes, exon and intron evolutionary significance of silent gene, ribonucleo protein. Genetic recombination and it prospects, basics of recombinant RNA, recombinant DNA technology.

6. **Carbohydrates.**

   Classification of carbohydrates, optical property chemical properties of carbohydrates, chemical structure and property of starch, cellulose, glcogen, synthesis of pureness and pyrimidines.

7. **Lipids**

   Saturated and unsaturated fatty acids, biosynthesis of fatty acids, distribution and function of lipids and microorganism. Degradation of lipids by alpha, beta and omega oxidation; lipid peroxidation.

Section-C

8. **Enzymes**

   Classification, coenzyme, cofactor, thermodynamic explanation of enzyme, catalysis reaction orders derivation of Michaelis Menten equation. Transformation of Michaelis menten Kinetics tot Lineweaver Burke and Eadie Hoffstee polite Competitive, uncompetitive and non competitive inhibition kinetics of allosteric regulation of enzyme Isozymes factors contributing to catalytic efficiency of enzymes (Mode of catalysis)

   Amino Acids

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Structure of amino acids, classification of essential aminto acids based on polarity. Hendersen and Hesselbalch equation for ionization of amino acids and Z winter ioni, property. Synthesis of peptizes, properties of proteins (acids base, property and solubility). Amino acid sequencing of proteins—primary secondary and tertiary structures, probes for protein conformation.

10. **Oxidation and Reduction Reactions :**
Standard redox, potentional law of thermodynamics, entropy, enthalpy and free energy of reaction; hydrolysis of energy rich intermediates and ATP. Respiratory electron transport and proton pump. Exudative phosphorylation (ATP synthesis), chemical coupling, copfirmational change and chemismotic; Central dogma of energy transduction role coupling factors and dissipation of proton pump.

Practical on Paper-I

1. Preparation of media, autoculaving and sterilization of glassware, maintenance of culture room.
2. Isolation and minatenance of microbes of different groups.
   (a) Bacteria, (b) Algae, (c) Bacteriophage, (d) Fungi.
3. Single spore drawing.
4. Camera lucida drawing.
5. Standard plate court.
6. Haemocytometer
7. Isolation of Phytoathogens
   . Biostatistics : manual and by computer
   Problem of Chi-square test
   Problem of mean, mode and median
   Protein estimation by calorimeter.
   Carbohydrate estimation by calorimeter.
   Paper Chromatographic separation of amino acid and pigments by one way descending.
   Paper Chromatographic separation by two dimensional Cromatograph
   Paper Chromatographic separation of carbohydrate.

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14. Paper Chromatographic separation of organic acid.
15. Measurement of pH fruit juice.
16. Electrophoretic separation of protein.
17. Centrifugal separation of protein.
18. Absorption spectra of protein nucleic acid and pigments.

Practical On Paper-II

1. Isolation of antibiotic resistant bacteria.
2. Replica plate technique for isolation of mutants.
3. Measurement of mutation frequency in bacteria.
4. Demonstration of lysogeny in Excherichia coli.
5. Mutant isolation by gradient plate technique.
6. Location of site of mutation by using plasmid curing agent acrydine orange.
7. Isolation and purification of DNA.
8. Isolation and purification of RNA.
9. Effect of UV light on mutation frequency in bacteria.
10. Demonstration of photorepair mechanism.
11. Extraction and identification of lipids by thin layer chromatography.
12. Estimation of glycogen in a bacterial cell.
13. Estimation of alkaline phosphates activity.
14. Derivation of Michaelis-Menten constant Vmax of alkaline phosphate.
15. Measurement of competitive inhibition of ammonium uptake using structural analogy methyl I spectra.
16. Change in protein conformation due to pH, Heat, ionic concentration by observing UV spectra.
17. Separation of isozyme by polyacrylamide electrophoresis.
18. Measurement of relative enzyme activity of cellulose.
19. Measurement of cellulose by reducing sugar assay test.

Reference Books :

1 Principles of Biochemistry by Lehninger
2 Microbial Biochemistry by Moat.
3 Outlines of Biochemistry by Cohn and Stumph.

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    4. Microbiology : Fundamentals and Application by R.A. Atlas, macmilan.

5. Microbiology : Fundamentals by A.H. Patel, Macmillan India.

6. Industrial Microbiology by Power and Daginawala, Himalaya Publishing House, Mumbai.

7. General Microbiology by Power and Daginawala, Himalaya Publishing House, Mumbai.

8. Statistics by D.N. Elhance.

9. Statistics by Mishra and Mishra.

10. General Microbiology by R.Y. Stainer.

11. Tools and techniques in biology, by Welson and Gouldin.

12. Laboratory Techniques in Biology by Swaroop, Pathak and Arora.

13. Fermentation Technology by Wihtiaker.

14. Principles of Genetics by E.J. Gander.

3. COMPUTER APPLICATIONS

Scheme :		Min. Pass Marks	Max. Marks
Arts/Commerce		72 (Th. 47 Pr. 25)	200
Science		54 (Th. 36 Pr. 18)	150
Paper-I	3 hours duration	Computer Fundamentals and introduction to IBM PC	Arts/Com. 65 Science 50
Paper-II	3 hours duration	Operating Systems and Business Data Processing	Arts/Com. 65 Science 50
Paper-III		Practical	Arts/Com. 70 Science 50

Paper I : Computer Fundamentals and Introduction to IBM PC

What is Computer? An introduction. Uses of computers in modern society e.g. weather forecasting, census, oil exploration, speech recognition, banking, publishing, accounting, research etc.

Information concepts and processing-hardware, software computer capabilities and limitations. Concept of files and directories.

Hardware features and use-CPU, I/O devices. Storage devices and media

Introduction to networking, multiprocessing, time sharing, multitasking and real time computing.

Variety of hardware systems and features. Various types of comptuers vaailable in market. Micro, Mini and Main Supercomputers.

Evolution of personnel computers, Commodore, Atari, Apple, IBM, PC. Asic block diagram of computer. Difference between personal and main frames-Simple operating system, Easy to use, Less Memory, Dedicated, Normally single user.

Introduction to micro processors and associated computers. Timers, display controllers, DMA controllers.

Block diagram of IBM PC. Introduction to 8086 and 8088. Functional description of various modules and cards.

Boot process in IBM PC. System files. Self-test.

Various types of displays & other peripherals used in IBM PCs.

Disk Operating System—Introduction, Batch files.

Configuration files. COM, EXE, SYS, BIN and TXT files. Introduction to programming in BASIC. Development of programs in Q BASIC. Use of graphics facilitities using Basic.

Diagnostics for IBM PC. Use of Norton Utilities and other packages for undeleting files and other system maintenance jobs.

Advance version of IBM and compatibles.

Paper II : Operating Systems and Business Data Processing

Introduction to various categories of softwares. Operating system and its functions. Interaction of opearting system with hardware and user programs.

Various components of operating system with reference to DOS. Single user operating system. Task loader. Memory management.

File management, Directory structure in DOS. Moving renamng, copying, deleting and undeleting files under DOS.

Practical

Visit to computer Lab Introduction to various components of a ompuater A simple documentation preparation and printing. Usage f printer and other components.

Physical inspection of IBM PC and internal ...... Introduction

...enclature (COM1 COM2, etc.) Writing batch files for various purposes. Modifying config-sys files. Creating RAM Disk. Diagnostics on IBM PC. Controlling PC hardware using BASIC programs.