



GOVT. COLLEGE FOR WOMEN PARADE GROUND JAMMU

(*Erstwhile Maharahi Mahila College*) Estd 1944

(NAAC Re-ACCREDITED A GRADE)

Autonomous College under University of Jammu

College for Potential for Excellence (2016)

OVERVIEW OF THE SYLLABUS

❖ Semester I :

- Core Course :- Biochemistry and Metabolism (UBTTC-101)

❖ Semester II :

- Core Course :- General and Applied Microbiology (UBTTC-201)

❖ Semester III :

- Core Course :- Cell and Molecular Biology (UBTTC-301)
- Skill Enhancement course (SEC-I) :- Environmental Biotechnology (UBTTS-301)

❖ Semester IV :

- Core Course :- Enzymology and Bioprocess Technology (UBTTC-401)
- Skill Enhancement course (SEC-II):- Food Biotechnology (UBTTS-401)

❖ Semester V :

- Discipline Specific Elective I (DSE-I):- Plant Biotechnology and Genetic Engineering (UBTTDSE-501)
- Discipline Specific Elective II (DSE-II):- Biotechnology for Human Welfare (UBTTDSE-502)
- Skill Enhancement course (SEC-III) :- Intellectual Property Rights (UBTTS-501)

❖ Semester VI :

- Discipline Specific Elective III (DSE-III):- Immunology and Animal Biotechnology (UBTTDSE-601)
- Discipline Specific Elective IV (DSE-IV) :- Industrial Fermentations (UBTTDSE-602)
- Skill Enhancement course (SEC-IV) :- Clinical Biochemistry (UBTTS-601)



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Pattern for Examination

- Each theory paper /course shall be of 100 marks.
- 20% of which shall be reserved for internal assessment.
- 80% of which shall be reserved for external examinations to be conducted by the University/Colleges.
- The External examination in theory shall consist of the following :
 1. **Five (5) short answers** to the questions representing all units/syllabi i.e. at least one from each unit (without detail explanation having 70 to 80 words in approximately 6 minutes and having **3 marks** for each answer to the question (**All Compulsory**).
 2. **Five (5) medium answers** to the questions representing all units/syllabi i.e. at least one from each unit (with explanation having 250 to 300 words in approximately 12 minutes and having **7 marks** for each answer to the question (**All Compulsory**).
 3. **Five (5) long answers** to the questions (**two to be attempted**) representing whole of the syllabi with detailed analysis/explanation/critical evaluation/solution to the stated problem within 500 to 600 words in approximately 30 minutes and having **15 marks** for each answer to the question.



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SEMESTER-I

Core Course

Course Title : Biochemistry and Metabolism

Course Code : UBTTC-101

Course Credits: 06

Learning outcomes

- The Course aims to make students familiar with the basics of Biochemistry and various biochemical processes with a special emphasis on metabolism of various biomolecules like carbohydrates, Proteins, Lipids and Nucleic acids.
- The students get an overview of various metabolic pathways and cycles involved in cellular metabolism and how an imbalance or anomaly in functioning of these pathways can prove to be of clinical significance.
- The course aims at priming the students towards understanding deeper concepts of cellular functioning in the coming semesters.

UNIT – I

Water : Physicochemical properties, Structure of water molecule; Dissociation and association constants, pH, buffers, pI, pKa, Henderson-Hasselbalch equation ; Solutions, solubility, criteria for solubility, hydrophobicity and hydrophilicity; Dielectric constant; Thermodynamics; free energy, enthalpy, entropy and redox potential.

UNIT – II

Carbohydrates, structure of mono-, di- and polysaccharides, cellulose, glycogen, starch, Glycoproteins, peptidoglycans, lipopolysaccharides; Carbohydrate metabolism- glycolysis, Fate of pyruvate under aerobic and anaerobic conditions, TCA cycle, Amphibolic and anaplerotic nature of TCA cycle, Gluconeogenesis; Electron transport chain, oxidative phosphorylation, Pentose phosphate pathway: Oxidative and non oxidative phase, Glyoxylate cycle.

UNIT – III

Structure of amino acids: Classification of amino acids, Chemical reactions shown by amino acids; Structural organization of proteins, primary, secondary: The alpha- helix, beta-pleated sheet structures, tertiary and quaternary structure of proteins, Forces that stabilize the protein structure, Protein classification, fibrous and globular proteins and functions; Biosynthesis and degradation of amino acids; Reduction and assimilation of atmospheric nitrogen, nitrogen cycle.



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UNIT IV

Lipids and fats, Saturated and unsaturated fatty acids, Classification of lipids, General structure and functions of major subclasses of lipids- acylglycerol, phosphoglycerides, sphingolipids, glycosphingolipids, terpenes, sterols, cholesterol and steroids; prostaglandins; Biosynthesis and degradation of fatty acids.

UNIT V

Nucleic acid, DNA :A, B & Z- DNA, RNA: Structure of m-RNA, r-RNA & t-RNA, Structure and type of nucleosides and nucleotides, biologically important nucleotides and their functions. Biosynthesis and degradation of nucleotides. Vitamins; types of vitamins and their deficiency symptoms; Steroid and peptide hormones.

Books recommended

1. Lehninger, A.L., Nelson, D.L. and Lox, M.M. (2003). Principles of Biochemistry, CBS Publishers and Distributors, New Delhi.
2. Stryer, L. (2001) Biochemistry : 5th Edition, W.H. Freeman and Company, New York.
3. Zubay, G.L., Parson. W.W. and Vance, D.E. (2006). Principles of Biochemistry: Student Study Art Notebook, Wm. C. Brown Publishers.
4. Voet, D. and Voet, J.G. (2004). Biochemistry, 3rd ed., John Wiley and Sons Inc., New York.

Practicals

1. Preparation of Phosphate buffer.
2. Preparation of Acetate buffer.
3. Preparation of Tris-HCL buffer.
4. Demonstration of Principle, Construction and Working of a Spectrophotometer.
5. Verification of Beer Lamberts Law for Copper Sulphate.
6. Verification of Beer Lamberts Law for Cobalt chloride.
7. Determination of pKa value of P-nitrophenol.
8. Determination of pKa value of Copper Sulphate.
9. Estimation of carbohydrate in given solution by anthrone method.
10. Detection of reducing and Non reducing sugars by Fehling's test.
11. Analysis of urine for urea, glucose, uric acid and choride
12. Determination of acid value of a fat.
13. Determination of saponification value of a fat.

Books recommended

1. Plummer, D.T. (1990) An Introduction of Practical Biochemistry. 3rd Ed. Tata McGraw Hill Publishers Co. Ltd., New Delhi.
2. Singh, R. and Sawhney, S.K. (2002) Introduction to Practical Biochemistry. Narosa Publications, New Delhi.



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SEMESTER II

Core Course

Course Title : General and Applied Microbiology

Course Code : UBTTC-201

Course Credits: 06

Learning Outcomes

- General and Applied Microbiology course is designed to provide the student with strong theoretical base of microbiology.
- The course is designed to introduce the student with the principles and practical considerations of microbiology.
- It also includes the concept, principles and methods used in microbial biotechnology and the possibilities of production of various products from microbial source.

UNIT – I

History, development and scope of Microbiology, Principles and applications of microscopy (bright field, darkfield, phase contrast, fluorescence and immunofluorescence, confocal microscopy, electron microscopy), Pure culture techniques : Streaking, serial dilution and plating methods;, microbial culture media, sterilization, culture collection and maintenance of cultures

UNIT – II

Prokaryotic cell structure and function, Flagella and motility, Cell inclusions. Bacterial staining. Microbial growth: batch and continuous culture; Factors affecting growth; Viruses: Discovery, Classification and structure of viruses (Plant, animal and bacterial viruses), Retroviruses. Metabolic diversity among microorganisms.

UNIT – III

Distribution and classification of algae (Fristch) and fungi (Ainsworth). Reproduction and nutrition in algae and fungi. Fungi and ecosystem. Algal ecology and algal biotechnology, Morphology, motility and reproduction in protozoa.

UNIT – IV

Industrial products derived from microbes, industrial enzymes, production of antibiotics, vitamins and vaccines; Single cell proteins, biofertilizers, nitrogen fixation, vermiculture, composting, Biotransformation: Applications of Microbes in Biotransformations, Microorganisms in bioremediation: biodegradation of xenobiotics and bioremediation of contaminated soils, bioplastics and biomining.



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UNIT – V

Air borne disease transmission, respiratory diseases caused by bacteria and viruses, Direct contact disease transmission, tuberculosis, sexually transmitted disease including AIDS, diseases transmitted by animals (rabies, plague), Arthropod transmitted disease (rickettsias, malaria, lyme disease), food and waterborne diseases (Cholera, Giardiasis, Typhoid), pathogenic fungi.

Books recommended

1. Stainer, R.Y., Ingraham, J.L., Wheelis, M. and Painter, P.R. (2003) General Microbiology. The Mac Millan Press Ltd. London.
2. Pelczar, M.J.J., Chan, E.C.S. and Kreig, N.R (2005) Microbiology. Tata McGraw Hill, New Delhi.
3. Prescott, L.M., Harley, J.P. and Klein, D.A. (2005) Microbiology. McGraw Hill, USA.
4. Mackie and McCartney. (1996) Medical Microbiology. Vol. 1. Microbial Infection. Churchill Livingstone.
5. Cappuccino, J.G. and Sherman, N. (1996) Microbiology – A Laboratory Manual.

Practicals

1. To study different components, use and care of the compound bright field microscope.
2. Different sterilization techniques.
3. Preparation of media for cultivation of bacteria and fungi.
4. Isolation of air-borne microorganisms (bacteria and fungi) by Petri plate exposure method.
5. Isolation of microorganisms from soil and water.
6. Study culture characteristics of different microorganisms.
7. Isolation of bacteria [Streak plate, spread plate, serial dilution]
7. Study morphology of molds and yeast by methylene blue staining.
8. Bacterial staining: simple staining ; Gram Staining
9. Biochemical activities of microorganisms.
10. Standard qualitative analysis of water.
11. Antibiotic sensitivity of microbes.

Books recommended

1. Cappuccino, J.G. and Sherman, N. (1996) Microbiology – A Laboratory Manual. Addison – Wesley.
2. Aneja K.R. (2005). Experiments in Microbiology, Plant Pathology and Biotechnology (4th edition). New Age International (P) Limited, New Delhi.