जम्मू केंद्रीय विश्वविद्यालय

Central University of Jammu

राया–सूचानी; बागला, जिला सांबा–181143 जम्मू; जम्मू एवं कश्मीर
Rahya- Suchani (Bagla), District **Samba-181143, Jammu (J&K)**

No. CUJ/Acad/II-15/11/2020/110

12th March, 2020

NOTIFICATION No. 21 /2020

Sub: Course Scheme and Syllabus for Interdisciplinary and Foundation Courses offered by Centre for Molecular Biology w.e.f. Academic Session **2019 -20** – Reg.

Ref: Notification No. 75/2018 dated 30.11.2018

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It is hereby notified for the information of all concerned that on the recommendation of the Board of Studies of Centre for Molecular Biology and Dean, School of Life Sciences, the Academic Council has approved the following **Course Scheme** and **Syllabus** for Interdisciplinary and Foundation Courses offered by Centre for Molecular Biology w.e.f. Academic Session **2019-20.** The approved course scheme and syllabus are as follows:

Course Code	Course Title	Credit	CIA	MSE	ESE	Max Marks
Interdisciplinary Courses						
PGMOL**0**I004T	Biomolecules	4	25	25	50	100
PGMOL**0**I005T	Introduction to Biochemistry	4	25	25	50	100
PGMOL**0**I006T	Experimental Techniques	4	25	25	50	100
Foundation Course						
PGMOL**0**F002T	Molecules of Life	2	12.5	12.5	25	50
PGMOL**0**F003T	Nanobiotechnology	2	12.5	12.5	25	50

- **0** represents semester code since these courses may be offered during all semesters.

Deputy Registrar 12/3/2020
(Admin – HR)

Encl: Syllabus for Foundation Course and IDC

To:

Head, Centre for Molecular Biology

Copy to:

Controller of Examinations

PGMOL01004T

Interdisciplinary Elective Course-I

Course Title: Biomolecules **Credits:** 4

Course objective: The objective of this course is to augment the understanding of fundamental biomolecules among the students. This course will expose the students to elementary knowledge of basic and applied sciences.

Unit I:Cell Biology

1.1.Introduction to cell biology and cell architecture: Structure and function of prokaryotic and eukaryotic cells.

1.2.Structural organization and function of cell organelles; Plasma membrane; Cell wall; Cell-Cell Interactions; Cell division; Cell differentiation; Cell movement; Cell death.

Unit II: Nucleic acids

2.1.Discovery and importance of nucleic acids; DNA and RNA as the genetic material; Structure and composition of DNA and RNA; Different forms of DNA and RNA and their importance.

2.2.Structure and organization of bacterial and eukaryotic genomes. DNA Replication in prokaryotic and eukaryotes, DNA damage and repair.

Unit III: Proteins

3.1.General Introduction; structure, classification and biological function of amino acids; amino acids as ampholytes, zwitterion structure of amino acids, Isoelectric pH, Essential and non essential amino acids.

3.2.Classification of proteins; structural organisations of proteins-primary, secondary, tertiary and quaternary, Ramachandran plot, helical structure, beta structure; Tertiary structure-fibrous and globular structure, Quaternary structure of protein.

Unit IV: Carbohydrates

4.1.General properties and biological importance of carbohydrates; Types of carbohydrates; Monosaccharides- structure, properties, and classification with examples; Disaccharides: structure, properties, and classification with examples.

4.2.Polysacchraides: structure, properties, and classification with examples.

Unit V: Lipids

5.1.General introduction and biological importance of lipids; Fatty acids: definition, classification, structures and properties of fatty acids; Acid hydrolysis of triglycerides, unsaturation in acylglycerols and iodine number.

5.2.Structure and properties of phosphoglycerides, sphinogolipids, glycosphingolipids, prostaglandins, waxes, lipoproteins.

Suggested reading

1. Cooper and Hausman; The Cell: A molecular approach; Sinauer Associates Press; 8th edition
2. Behlke MA, Berghof-Jäger K, Brown T, et al.; Polymerase Chain Reaction: Theory and Technology, 2019; Caister Academic Press.
3. Karp G, Iwasa J, and Marshall W; Karp's Cell Biology, 2018; Wiley-Blackwell Press.
4. Krebs JE, Goldstein ES, Kilpatrick ST; Lewin's Genes XII, 2017. Jones & Bartlett Learning.
5. Lodish H, Berk A, et al.; Molecular Cell Biology; WH Freeman Press; 8th edition.
6. T. A. Brown; Genome 3, 2007; Garland Science Press; 3rd Edition.
7. Campbell MA; Discovering genomics, proteomics and bioinformatics, 2006; Pearson Education Limited. 2nd Edition.
8. Green MR, Sambrook J; Molecular Cloning: A Laboratory Manual, 2012; Cold Spring Harbor Laboratory Press.
9. Bruce Alberts, J.D. Watson. Molecular Biology of the cell (2008) Garland publishing Inc., N.Y. 5th edition
10. David L Nelson, Michael M. Cox. Lehninger Principles of Biochemistry (2017). W H Freeman & Co; 7th edition.

Suggested reading

1. Cooper and Hausman; The Cell: A molecular approach; Sinauer Associates Press; 8th edition
2. Behlke MA, Berghof-Jäger K, Brown T, et al.; Polymerase Chain Reaction: Theory and Technology, 2019; Caister Academic Press.
3. Karp G, Iwasa J, and Marshall W; Karp's Cell Biology, 2018; Wiley-Blackwell Press.
4. Krebs JE, Goldstein ES, Kilpatrick ST; Lewin's Genes XII, 2017. Jones & Bartlett Learning.
5. Lodish H, Berk A, et al.; Molecular Cell Biology; WH Freeman Press; 8th edition.
6. T. A. Brown; Genome 3, 2007; Garland Science Press; 3rd Edition.
7. Campbell MA; Discovering genomics, proteomics and bioinformatics, 2006; Pearson Education Limited. 2nd Edition.
8. Green MR, Sambrook J; Molecular Cloning: A Laboratory Manual, 2012; Cold Spring Harbor Laboratory Press.
9. Bruce Alberts, J.D. Watson. Molecular Biology of the cell (2008) Garland publishing Inc., N.Y. 5th edition.
10. David L Nelson, Michael M. Cox. Lehninger Principles of Biochemistry (2017). W H Freeman & Co; 7th edition.

PGMOL010057

Interdisciplinary Elective Course-II

Course Title: Introduction to Biochemistry **Credits:** 4

Course objective: The objective of this course is to supplement the underlying knowledge of biochemistry among the students. This course will apprise the students about the essential biochemical components and their pivotal roles.

Unit I: History of Biochemistry

1.1. Historical account and landmark developments; Contributions of Emil Fisher, Louis Pasteur, Eduard Buchner, Gustav Embden, Otto Fritz Meyerhof, Hans Kreb, Leonor Michaelis, Maud Menten, Watson & Crick, Chargaff and H. G. Khorana.

1.2. Biochemical composition of living organism; Properties of water as a solvent of life.

Unit II: Nucleic Acids

2.1. Discovery and importance; Structure and composition of DNA and RNA; Nucleosides and nucleotides; different forms of DNA and RNA and their importance; DNA and RNA as the genetic material.

2.2. DNA Replication- Initiation, elongation and termination; Transcription.

Unit III: Amino acids and proteins

3.1. General Introduction; Structure and classification of amino acids; Properties of amino acids; ampholytes, zwitterions, Isoelectric pH, titration curve of amino acids, peptide linkage.

3.2. Classification of proteins; Structural organisations of proteins-primary, secondary, tertiary and quaternary, Ramachandran plot, helical structure, beta structure; Tertiary structure-fibrous and globular structure, Quaternary structure (Haemoglobin).

Unit IV: Carbohydrates

4.1. General properties and biological importance of carbohydrates; Types of carbohydrates; Monosaccharides- structure, properties, and classification with examples; Disaccharides: structure, properties, and classification with examples.

4.2. Polysacchraides: structure, properties and classification with examples.

Unit V: Lipids

5.1. General introduction and biological importance of lipids; Fatty acids: definition, classification, structures and properties of fatty acids; Acid hydrolysis of triglycerides, unsaturation in acylglycerols and iodine number.

5.2. Structure and properties of phosphoglycerides, sphinogolipids, glycosphingolipids, prostaglandins, waxes, lipoproteins.

Suggested reading

1. Cooper and Hausman; The Cell: A molecular approach; Sinauer Associates Press; 8th edition
2. Behlke MA, Berghof-Jäger K, Brown T, et al.; Polymerase Chain Reaction: Theory and Technology, 2019; Caister Academic Press.
3. Karp G, Iwasa J, and Marshall W; Karp's Cell Biology, 2018; Wiley-Blackwell Press.
4. Krebs JE, Goldstein ES, Kilpatrick ST; Lewin's Genes XII, 2017. Jones & Bartlett Learning.
5. Lodish H, Berk A, et al.; Molecular Cell Biology; WH Freeman Press; 8th edition.
6. T. A. Brown; Genome 3, 2007; Garland Science Press; 3rd Edition.
7. Campbell MA; Discovering genomics, proteomics and bioinformatics, 2006; Pearson Education Limited. 2nd Edition.
8. Green MR, Sambrook J; Molecular Cloning: A Laboratory Manual, 2012; Cold Spring Harbor Laboratory Press.
9. Bruce Alberts, J.D. Watson. Molecular Biology of the cell (2008) Garland publishing Inc., N.Y. 5th edition
10. David L Nelson, Michael M. Cox. Lehninger Principles of Biochemistry (2017). W H Freeman & Co; 7th edition.

PGMOL01006T

Interdisciplinary Elective Course-III

Course Title: Experimental Techniques **Credits:** 4

Course objective: The objective of this course is to impart skills and knowledge in basic and advance scientific techniques needed to become a successful academician, scientist or an entrepreneur.

Unit I: Electrophoresis

1.1. Principle and applications of electrophoresis; Agarose gel electrophoresis; Polyacrylamide gel electrophoresis.

1.2. SDS-Polyacrylamide gel electrophoresis; Native gel electrophoresis, Capillary electrophoresis.

Unit II: Blotting

2.1. Principle and applications of blotting. Historical background and applications.

2.2. Types of blotting techniques: Northern blotting, Southern blotting, Western blotting, Eastern blotting; Northwestern blotting; Southwestern blotting

Unit III: Chromatography

3.1 Principle and applications of Chromatography; Introduction of different types of chromatographic techniques.

3.2 Thin Layer Chromatography, Paper chromatography, Column chromatography; Ion-exchange chromatography; Molecular exclusion chromatography; Affinity chromqtography, High pressure liquid chromatography (HPLC).

Unit IV: Microscopy

4.1. Histroy of microscopy, Principle and applications of Light microscopy- Brightfield, Darkfield, Phase Contrast, Fluorescence microscopy;

4.2. Electron microscopy- Transmission Electron Microscopy (TEM); Scanning Electron Microscopy (SEM).

Unit V: Centrifugation

5.1. Basic principles and applications of centrifugation, Types of centrifuges; Micro centrifuge, High speed and Ultracentrifuges,

5.2. Types of rotors; fixed-angle rotors, vertical tube rotors and swinging-bucket rotors; Care and mentainace of rotors; Preparative centrifugation; Differential and density gradient centrifugation.

Suggested reading

1. Wilson K and Walker J. Principles and Techniques of Biochemistry and Molecular Biology. (2018). Cambridge University Press. 8th edition.
2. Bisen PS & Sharma A. Introduction to Instrumentation in Life Sciences. (2012). CRC Press. 1st edition.
3. Freifelder DM. Physical Biochemistry: Applications to Biochemistry and Molecular Biology (1983). W. H. Freeman. 1st edition.
4. David S. Physical Biochemistry: Principles and Applications. (2009). Wiley-Blackwell. 2nd edition.
5. Bruce Alberts, J.D. Watson. Molecular Biology of the cell (2008) Garland publishing Inc., N.Y. 5th edition
6. Cooper and Hausman; The Cell: A molecular approach; Sinauer Associates Press; 8th edition
7. Behlke MA, Berghof-Jäger K, Brown T, et al.; Polymerase Chain Reaction: Theory and Technology, 2019; Caister Academic Press.
8. Bruce Alberts, J.D. Watson. Molecular Biology of the cell (2008) Garland publishing Inc., N.Y. 5th edition
9. David L Nelson, Michael M. Cox. Lehninger Principles of Biochemistry (2017). W H Freeman & Co; 7th edition.
10. Green MR, Sambrook J; Molecular Cloning: A Laboratory Manual, 2012; Cold Spring Harbor Laboratory Press.

PGMOLOF002T

Foundation courses- I

Course Title: Molecules of life **Credits: 2**

Course objective: The objective of this course is to augment the understanding of fundamental biomolecules among the students. This course will expose the students to elementary knowledge of biological sciences.

Unit I: Nucleic Acids

1.1. Introduction, types and importance, Nucleic acids as genetic material, Structure of nucleosides and nucleotide, deoxynucleotides, cyclic nucleotides and polynucleotides.

1.2. Different forms of DNA and RNA and their importance.

Unit II: Amino acids and proteins

2.1. Amino acid as building blocks-classification, structure and physical properties of the standard amino acids. Proteinaceous and non-proteinaceous, essential and non-essential amino acids.

2.2. Primary, secondary, tertiary and qua ternary structure of proteins. Biological function of proteins.

Unit III: Carbohydrates

3.1. General properties and biological importance of carbohydrates; Structure and function of monosaccharides- hexoses and pentoses; disacharides-sucrose, lactose, maltose.

3.2. Storage and structural polysaccharides- Glycogen, starch and cellulose. Biological importance and applications of carbohydrates

Suggested readings:

1. Bruce Alberts, J.D. Watson. Molecular Biology of the cell (2008) Garland publishing Inc., N.Y. 5th edition
2. David L Nelson, Michael M. Cox. Lehninger Principles of Biochemistry (2017). W H Freeman & Co; 7th edition.
3. Gero D & Joseph B. Schlenoff. Multilayer Thin Films: Sequential Assembly of Nanocomposite Materials, (2012). 7th edition
4. David SG. Bionanotechnology: Lessons from Nature. (2004). Wiley-Liss. 1st edition.
5. Logothetidis & Stergios. Springer-Verlag Berlin Heidelberg. (2012). Springer-Verlag Berlin Heidelberg. 1st edition.
6. Sharon. Bio-Nanotechnology: Concepts And Applications. (2012). Ane book publoshers Pvt Ltd.
7. Neelina H & Malsch. Biomedical Nanotechnology. (2012). CRC Press. 1st edition.

PGMOLOF003T

Foundation courses- II

Course Title: Nanobiotechnology **Credits: 2**

Course objective: The objective of this course is generate independent researchers who are capable of translating the research developed at laboratory scale to the industrial level.

Unit I: Introduction to Nanobiotechnology

1.1. Introduction, Definition, history, background and concept of Nanotechnology. Properties at nanoscale; overview of nanodevices and techniques, Basic biology principles and practice of micro fabrication techniques, Atomic force microscopy

1.2. Cellular Nanostructures; Nanopores; Biomolecular motors; Criteria for suitability of nanostructures for biological applications

Unit II: Biomolecules

1.1. Biomolecules in nanoscience: General introduction of nucleic acid. Structure and composition of DNA and RNA.

1.2. Classification and General characteristics of amino acids, Proteins primary, secondary and tertiary structure of proteins and their significance

UNIT III: Applications of nanobiotechnology

3.1. Synthesis and bio-functionalization of Nanoparticles: MEMS/NEMS based on Nanomaterials, Nanobiotechnology in healthcare, nutraceuticals, pharmaceuticals.

3.2. Biosensors and their applications, Nanoparticles for targeted drug delivery system; Nanobiotechnology in molecular therapy.

Suggested readings:

1. Bruce Alberts, J.D. Watson. Molecular Biology of the cell (2008) Garland publishing Inc., N.Y. 5th edition
2. David L Nelson, Michael M. Cox. Lehninger Principles of Biochemistry (2017). W H Freeman & Co; 7th edition.
3. Gero D & Joseph B. Schlenoff. Multilayer Thin Films: Sequential Assembly of Nanocomposite Materials, (2012). 7th edition
4. David SG. Bionanotechnology: Lessons from Nature. (2004). Wiley-Liss. 1st edition.
5. Logothetidis & Stergios. Springer-Verlag Berlin Heidelberg. (2012). Springer-Verlag Berlin Heidelberg. 1st edition.
6. Sharon. Bio-Nanotechnology: Concepts And Applications. (2012). Ane book publoshers Pvt Ltd.
7. Neelina H & Malsch. Biomedical Nanotechnology. (2012). CRC Press. 1st edition.