

(For The Candidates Admitted From 2016 Onwards)
HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPALLI – 2
COURSE CONTENT AND SCHEME OF EXAMINATIONS
PG AND RESEARCH DEPARTMENT OF BIOTECHNOLOGY AND BIOINFORMATICS
M.Phil BIOTECHNOLOGY
COURSE CONTENT AND SCHEME OF EXAMINATIONS

Semester	Course	Title of the Paper	Code	Hrs/Week	Credit	Marks
I	Major Core 1	Research Methodology- techniques and their application	MPH15BT1C01	6	4	100
I	Major Core 2	Applied Biotechnology	MPH16BT1C02	6	4	100
I	Major Core 3	Principles and Practice of Te Biotechnology	MPH15BT1C03	6	4	100
I	Major Core 4	Molecular Modeling and Compu Aided Drug Designing	MPH15BT1E04	6	4	100
II		Project Dissertation and Viva	MPH15BT2D01	-	8	200
			Total		24	600

HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPALLI – 2
M.Phil . BIOTECHNOLOGY - SEMESTER – I
MAJOR CORE: 1 - RESEARCH METHODOLOGY – TECHNIQUES & THEIR
APPLICATION

Hours/Week: 6
Credit: 4

Code: MPH15BT1CO1
Marks: 100

UNIT-I

Colorimetry-Principle, working and applications of redox and pH -meter, buffers, estimation of macro molecules (protein, carbohydrate and nucleic acids), enzyme kinetics.

Spectrophotometry- ultraviolet and visible - principle, instrumentation and application of spectrophotometers.

X-ray Diffraction:-Structure factor expression, electron density equation, phase problems, Patterson function, molecular replacement method, heavy atom method, isomorphous replacement method, refinement procedure and interpretation of results.Fiber X-ray diffraction studies, single crystal X-ray diffraction studies and NMR studies on mono and oligo-nucleotides. Methods of data collection of crystal containing small molecule and large molecule, factors affecting the measurement of integrated intensities, photographic methods, diffractometers, area detectors and image plates.

UNIT -II

Different types of microscopic techniques- selection of suitable samples, and observation in different systems, study of living cells (light microscope, compound microscope, dark field microscope, phase contrast microscope, Normaski microscope, confocal microscopy, transmission electron microscopy (TEM) and scanning electron microscopy (SEM), atomic force microscopy (AFM), Cell sorting-flow cytometry

UNIT -III

Centrifugation- Types of rotors. Principles, instrumentation and applications of types of centrifugation techniques

Chromatography- techniques and principles and different types (Affinity chromatography, ion exchange chromatography, Gel exclusion chromatography, Gas chromatography, HPLC, TLC, paper chromatography). Isolation of natural products (extraction, purification and separation).

UNIT- IV

Electrophoresis- Principle and instrumentation of Agarose and Polyacrylamide Gel Electrophoresis (Native & SDS-PAGE). 2D gel electrophoresis.

Methods in Molecular Biology- Isolation, purification and separation of nucleic acids., DNA sequencing methods. DNA fragmentation analysis. Hybridization techniques. PCR and its applications. Micro array & RTPCR. COMET assay, cell viability assay, karyotyping.

Immunological Methods- Production of antibodies from laboratory animals, monoclonal antibodies. Routes of immunization, types of adjuvant and their importance, antigen antibody interaction, monoclonal and polyclonal antibodies. RIA & ELISA techniques-principle and applications, Immuno-radiometric assay- Principles and applications, Hybridoma.

UNIT-V

Statistics in biomedical research- Experimental design, Various sampling methods, Probability, frequency distribution average (arithmetic, geometric, means, mode and median) Standard Deviation, Standard Error of Mean, Degree of Freedom, Significance, ttest, Correlation, null hypothesis, distribution. Use of computers in data analysis.

REFERENCE BOOKS:

- 1.Keith Wilson and Jhon Walker, (2010). Principles and Techniques of Biochemistry and Molecular Biology- seventh Edition. Cambridge University Press, Cambridge
- 2.Walker, John M. Rapley, Ralph (Eds.), (2008). Molecular Biomethods Handbook, 2nd ed., Humana Press
- 3.Prescott LM., Harley JP., Klein DA., (2006). Microbiology sixth edition. McGraw –Hill, New York.
- 4.Upadhyay, A., Upadhyay, K. and Nath, N, (2002). Biophysical Chemistry, Himalayan Publication House, New Delhi.
- 5.Tai Te Wu., (2001). Analytical Molecular Biology. Springer
- 6.Boyer, R.F., (2000). Modern Experimental Biochemistry, third edition, Addison, Wesley Massachusetts.
- 7.Wilson K., Walker., (2000). Practical Biochemistry– Principles and Techniques, fifth edition, Cambridge University Press, Cambridge.
- 8.Holme, J.D. and Peck, H., (1998). Analytical Biochemistry, third edition, Wesley Longman, New York.
- 9.Colin Banwell, Elaine McCash, (1994). Fundamentals of Molecular Spectroscopy, IV edition,

McGraw-Hill Higher Education.

10. Plummer D., (1987). Introduction to Practical Biochemistry third edition. McGraw –Hill, New York.
11. Robert L. Miler John Maltby and co., (2002). SPSS for Social Scientists. Palcrave Macmillan, New York.
12. Bailey, NTJ. (1959). Statistical methods in biology. The English language book society and English university press Ltd.

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HOLY CROSS COLLEGE (AUTONOMOUS), TIRUCHIRAPALLI – 2
M.Phil . BIOTECHNOLOGY- SEMESTER – I
MAJOR CORE: 2- APPLIED BIOTECHNOLOGY

Hours/Week: 6
Credit: 4

Code: MPH16BT1CO2
Marks: 100

UNIT I

Microbiology - Microbial growth Physiology- Overview of Basic Metabolism & Microbial Nutrition- reproduction in microbes- Applications of microbes- Biodegradation. Microbial Diseases & Chemotherapy/ Antibiotics.

Immunology- Organs and cells of the immune system. Types of immunity. Antigen and antibody interactions. Role of MHCs and Complements. Auto immunity. Vaccines- Types and production. Experimental models of human disease. Induction of nude mice. Experimental autoimmunity- Inoculation of mice with antigen. Types of immunization.

UNIT II

Animal Biotechnology- Parameters in Animal Cell cultures. Biotechnology in anticoagulant & thrombocytic agent. Cloning techniques-Invitro fertilization- gamete selection, embryonic sex selection, embryo manipulation , embryo transfer. Transgenic live stock production. Gene knockout techniques – Strategies of gene delivery Targeted gene replacement , Gene correction, chromosome engineering and gene silencing – Future prospects . Diagnosis of genetic disorders - Use of RAPD, RFLP, DNA probes in detection of thalassemias, sickle cell anaemia, PKU. Gene therapy – types, site of gene therapy against cancer and other genetic disorders.

Plant Biotechnology- Techniques in Plant tissue Culture - Tools in producing Transgenic plants and their preservation Gene Cloning -Transgenic plants in Agriculture & Industry- Plant Breeder's Right(PBR) and Farmer's Rights. Gene transfer techniques.

UNIT III

Recombinant DNA Technology- Molecular tools and their application- Gene amplification and its application. Construction of c-DNA and genomic DNA libraries, expression of cloned gene,

DNA labeling by radioactive and non radioactive methods. Gene cloning vectors- properties of ideal vector. Plasmids-structure, different types. Isolation and purification of plasmids. Cosmids - Construction and its use in gene cloning. Gene transfer techniques. Reporter genes-GUS, Luciferase, GFP.

Bioprocess technology -Introduction to Bioprocess Engineering. Bioreactors. Isolation, Preservation and Maintenance of Industrial Microorganisms. Kinetics of microbial growth and death. Media for Industrial Fermentation. Air and Media Sterilization. Types of fermentation processes. Measurement and control of bioprocess parameters. Downstream Processing. Whole cell Immobilization and their Industrial Applications.

UNIT VI

Nanotechnology-The hydrogen atom ,Spectroscopic series. The helium atom and the exchange interaction. Many electron atoms, spin-orbit coupling, Spectroscopic notation. Lasers. NMR and ESR. Molecular Spectra – electronic , vibration and rotation. Bonding and anti-bonding orbitals- Artificial intelligence-super-high density data storage and super-high speed microprocessors, memory chips and novel nanodevices. Drug delivery systems. Nano particle synthesis.

UNIT V

Patenting and IPR in Biotechnology -IPR in the global economy , in international trade; Biodiversity related global IPR regime , TRIPS agreement, objectives and general principles, patents, trade secrets, UPOV convention; IPR and Biodiversity , sustainable use, Plant variety rights, Rights of traditional knowledge holders, the CBD, WTO, UNCTAD biotrade initiatives, government and regional initiatives, non-governmental initiated community intellectual rights, SRISTIs local innovations databases, peoples biodiversity register; Unsolved questions

REFERENCE BOOK

1. Jeffrey, C., Pommerville Jones., Bartlett., (2006). Fundamentals of Microbiology, Seventh Edition.
2. Gerard, J. Tortora., Bert Funke., Christian L.Care., (2004). Microbiology: An Introduction
3. Bergey's Manual of Systematic Bacteriology, September (2004).Vol. 2 set, II Edition.
4. William E. Paul., (2008). Fundamental Immunology. Lippincott Williams & Wilkins.
5. Roitt, I., (2002). Essentials Immunology. VI ED., Elsevier Science Publishing Company,

New York.

6. Kuby, J . (1994). Immunology. W.H. freeman & Company, New York.
7. Adrian Slater, Nigel Scott., Mark Fowler (2003). Plant Biotechnology-The genetic manipulation of plants, Oxford University Press.
8. Glick, B. R., Pasternak Jack. J.,(2001). Molecular Biotechnology ASM press London.
9. Adrian Slater, Nigel Scott., Mark Fowler, (2003).Plant Biotechnology-The genetic manipulation of plants, Oxford University Press.
10. Stanbury, P.F., Whitaker, A., (1984). Principles of Fermentation Technology, Aditya Books Pvt., Ltd ., New Delhi.
11. Wastson, H.D., Micheal Gilman, Jan Withowski, Mark Zoller., (1999) . Recombinant DNA – Scientific American Books. W.H. Freeman and company, New York.

HOLY CROSS COLLEGE (AUTONOMOUS)TIRUCHIRAPPALLI-2.
M.Phil . BIOTECHNOLOGY - SEMESTER I
MAJOR CORE: 3 - PRINCIPLES AND PRACTICE OF TEACHING
BIOTECHNOLOGY

Hours/Week: 6
Credit: 4

Code: MPH15BT1CO3
Marks: 100

UNIT I : Communication skills

Type of communication

- a. verbal-characteristics – Principle, structure and method of verbal communication – speaking skills - Organizing a talk – Delivering a presentation – interaction.
- b. Non-verbal communication - Mannerisms - attitude and outlook – Body language.
- c. Life Science communication: approaches – delivery – content

UNIT II: Reaching Skills

- a) Teaching objectives: Taxonomy of education objectives – Writing teaching objectives – importance of objectives.
- b) Planning teaching: Content analysis – identification of appropriate subject materials – organization.
- c) Teaching methods: appropriate teaching strategies – teaching aids.
- d) Motivation: Need for motivation – Herzberg’s theory – Maslow’s theory.

UNIT III : Computer application skills (Lab Work)

- a) MS Word: Preparation of word document.
- b) MS Excel: Data entry, basic calculations and chart preparation.
- c) MS Power Point: Preparation and presentation.
- d) MS Paint: Drawing and editing a picture.
- e) Photoshop (Adobe)

UNIT IV: Data Banks and Retrieval of information (Lab Work)

- a) Internet: Browsing and saving web content
- b) Protein-SWISS-PROT, PIR
- c) Genome-EMBL, Genbank information resources

- d) Structural databases and sequence alignment
- e) e- Journal

UNIT V: Analysis of data with SPSS (Lab. Work)

- a) Data entry and computation of descriptive and dispersion, correlation and regression co-efficient
- b) Hypothesis testing with 't' test and ANOVA, Interpretation and presentation of data.
- c) Comparison of mean-single and paired 't' test.

REFERENCE BOOKS:

1. Rawat, S .C., (2004). Essentials of Educational Technology R.Lall Book Depot, Meerut.
2. Attwood T.K., Parry Smith D.J.,(2004). Introduction to Bioinformatics Published by Pearson Education Ltd., New Delhi .
3. Arthur, M. Lesk., (2003). Introduction to Bioinformatics, Oxford University Press, New Delhi.

HOLY CROSS COLLEGE (AUTONOMOUS)TIRUCHIRAPPALLI-2.
M.Phil . BIOTECHNOLOGY - SEMESTER – I
MAJOR CORE: 4- MOLECULAR MODELING & COMPUTER AIDED DRUG
DESIGN

Hours/Week: 6
Credit: 4

Code: MPH15BT1E04
Marks: 100

OBJECTIVES

Provide a broad and thorough background in modeling tools and docking program. To understand the theories used to build tools and their relationship and basic concepts involved in drug designing.

UNIT I

Introduction to Useful Concepts in Molecular Modeling – Co-ordinate systems, Potential Energy surface, molecular graphics, surfaces, computer hardware and software and recent advances in drug design methodologies. Steps in drug designing – molecular modeling in drug designing – Pharmacophores – Design of pharmacophores – various methods to design a pharmacophore – constrained systematic search, ensemble distance geometry – clique detection methods.

UNIT II

Molecular Mechanics – definition – applications - calculation of bonded and non-bonded interactions. Energy Minimization using Discovery studio-Molecular Dynamics and its applications.

UNIT III

Molecular Docking – principle – Types of docking – Ligand design – structure based ligand design – 3D database searching and de nova ligand design (outside in and inside out methods) using Discovery studio.

UNIT IV

Structure Based Design Methods-Structure based design methods to design novel inhibitors – QSAR using TSAR and its importance –Virtual Screening and ADMET properties using ACCORD Excel. Software tools for modeling bio-molecules.

UNIT V:

Immunoinformatics

Basics of Immunoinformatics- Databases in Immunology- Immunogenetics Information System. (IMGT), Role of Immunoinformatics in Personalized Medicine. B-Cell epitope prediction Methods, T-Cell Epitope Prediction Methods.

REFERENCES

1. Andrew Leach.,(1996). Molecular Modelling: Principles and Applications (2ndEdition), Addison Wesley Longman, Essex, England.
2. Alan Hinchliffe., (2000). Modelling Molecular Structures , 2nd Edition, John-Wile.
3. Alan Hinchliffe.,(2003). Molecular Modelling for Beginners, John-Wiley.
4. Rauter, C., Horn, K., (1984). X-ray crystallography and drug design, Elsevier.
5. Rapaport, D.C., (1995). The Art of Molecular Dynamics Simulation. Cambridge University Press, Cambridge, England.
6. Frenkel, D., Smit, B., (1996). Understanding Molecular Simulations. From Algorithms to Applications. Academic Press, San Diego, California.
7. McCammon,J.A.,Harvey,S.C.,(1987). Dynamics of Proteins and Nucleic Acids. Cambridge University Press, Cambridge.
8. M. Kalos,M., Whitlock, P.A.,(1986). Monte Carlo Methods. John Wiley & Sons, New York.
9. Cohen,N., (Ed.), (1996). Guide Book on Molecular Modeling in Drug Design,Academic Press, San Diego.
10. Jizhong Zhou., DK Thompron,D.K., Ying Xu., JM Tiedje., (2000). Microbial Functional genomics. Wiley Liss Publications
11. Immunoinforamtics by Novartis Foundation-Wiley Publication

Holy Cross College (Autonomous) Tiruchirappalli is a highly reputed Arts and Science College for Women in the state of Tamil Nadu. Situated at the heart of "The Rock City"™ on the banks of the River Cauvery, Holy Cross College has a unique history of academic excellence. It is a Catholic Institution established in 1923 when higher education for women was considered almost a transgression. It has been in the fore front of women's education for 97 years and is marching towards the centenary. In keeping with its mission, the college admits a number of students from the socially and economically we Capability Enhancement Schemes. HRD. EDC(E-Cell). Examination Pattern. The UG Programme is for a period of three years and PG Programme for a period of two years. Each year will consist of two semesters viz. Odd and Even semesters. Odd semesters shall be from to June to October/November and Even semesters shall be from November / December to April / May. Credit refers to the weightage given to a course, usually in relation to the instructional hours and content of the course assigned to it. The total minimum credits, required for completing a UG Programme is 141 and PG Programme is 90. The details of credits for individual components and individual courses shall be obtained from the course structure of the syllabus provided to the students. Holy Cross College is situated in Tiruchirappalli in Tamil Nadu state of India. Established in 1923, it is accredited from NAAC and it is affiliated to Bharathidasan University. HCC, Tiruchirappalli offers 51 courses across 10 streams namely Science, Paramedical, Arts, Commerce and Banking, IT, Medical, Media and Mass Communication, Management, Law, Education and across 14 degrees like BSc, BA, BBA, BCA, B.Com. Hostel facility is available for its students. Additional campus facilities such as Auditorium are also there. HCC Top Courses & Fees Holy Cross College Courses. BSc 10 Courses Offer Get detailed information about Holy Cross Home Science College Courses, Fees, Faculty, Infrastructure & Contact Details. Looking for a Specific Course? Select Course Bachelor of Commerce(B.Com.) Bachelor of Arts (BA) Bachelor of Science (B.Sc) Master of Science(M.Sc.) Popular Courses B.Com BA B.Sc M.Sc M.Sc View All. Courses Offered. 4.