

UNIVERSITY OF MADRAS
M.Sc. DEGREE PROGRAMME IN ZOOLOGY
 SYLLABUS WITH EFFECT FROM 2023-2024

531C3A

Course Objectives:		
The main objectives of this course are:		
1.	To develop an understanding of DNA as genetic material, fine structure of DNA & RNA molecules, karyotyping and variations in chromosome number and structure.	
2.	To gain insight about Genomic Imprinting and to impart knowledge about the significance of Genetic counselling	
3.	To gain knowledge about microbial genetics	
4.	To acquire knowledge and explore the techniques involved in Recombinant DNA Technology and its application	
Course	:	Core VII
Course title	:	Genetics
Credits	:	5
Pre-requisite:		
Basic knowledge on molecular biology and genetics		
Expected Course Outcome:		
On the successful completion of the course, student will be able to		
1.	Explain the organization and functions of genetic material and about variations in chromosome structure and number	K1 & K2
2.	Understand the concept of Genomic Imprinting and Genetic counselling	K1 & K3
3.	Able to distinguish lytic and lysogenic cycle and explain the mechanisms of genetic recombination of the microbes.	K2 & K4
4.	Understand the principle and technique involved in rDNA technology .	K2 & K3

K1- Remember; K2- Understand; K3- Apply; K4-Analyze; K5-Evaluate; K6- Create

Units	
I	Structure, properties and functions of genetic materials: Basic structure of DNA and RNA, alternate and unusual forms of DNA - Physical and Chemical properties of nucleic acid, base properties, denaturation and renaturation , Genetic Code.
II	Genomic Imprinting : Prader-willi and Angelman syndrome, Gene Interactions : Complimentary , Supplementary , Epistasis, Dosage compensation- X inactivation. Human Genetics : Chromosome nomenclature - Karyotyping-idiogram- Chromosomal syndromes, Pedigree analysis, Genetic counseling, Blood grouping in man.
III	Microbial Genetics:Genetics of Virus - Viral chromosome, Lytic cycle, Lysogenic cycle - Bacterial genetics -Bacterial genome - Gene transfer mechanisms in bacteria and virus - conjugation, transduction and

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	transformation. Transposons.
IV	Recombinant DNA technology: Recombinant DNA technology – Overview - Tools for Recombinant DNA Technology – Vectors - types - Techniques used in recombinant DNA technology - generation of DNA fragments - Restriction endonucleases, DNA modifying enzymes, Ligases
V	Introduction of rDNA into host cell - <i>Agrobacterium</i> mediated DNA transfer, electroporation, microinjection, liposome fusion, particle gun bombardment - Selection and screening of transformed cells - Expression of cloned gene; Application of rDNA technology in human welfare - Environment, Medicine and Agriculture

Reading list

1. Gardner, E. J., M. J. Simmons and D.P. Snustad. 2006. Principles of Genetics. 8th Edition, John Wiley & Sons. INC. New York, pp-740.
2. Brooker, R. J. 2014. Genetics: Analysis and Principles. 5th Edition, McGraw Hill Publisher, pp-880.
3. Russell, P.J. 2005. Genetics: A Molecular Approach (2nd Edition). Pearson/Benjamin Cummings, San Francisco, pp-850.
4. https://onlinecourses.swayam2.ac.in/cec21_bt02/preview
5. <https://www.khanacademy.org/science/high-school-biology/hs-molecular-genetics/hs-rna-and-protein-synthesis/a/the-genetic-code>

Recommended texts

1. Griffiths, A. J. F., H. J. Muller, D. T. Suzuki, R. C. Lewontin and W. M. Gelbart. 2012. An Introduction to Genetic Analysis. 11th Edition, W. H. Greeman. New York.
2. Snustad, D.P., Simmons, M.J. 2015. Principles of Genetics, John Wiley Publications, pp-784.
3. Watson, J. D., T. A. Baker, S. P. Bell, Alexander Gann, Michael Levine, Richard Losick. 2003. Molecular Biology of the Gene, (5th Edition). Cold Spring Harbor Laboratory Press, pp-912.
4. Klug, W. S. and M. R. Cummings, C. A. Spencer. 2005. Concepts of Genetics, Benjamin-Cummings Publishing Company.
5. Harti, D. L. 2002. Essential Genetics, A Genomic Perspective, Jones & Bartlet.
6. Krebs, J.E., E.S. Goldstein, S.T. Kilpatrick. 2018. Lewin's Genes XII, Jones & Bartlet Publisher, pp-613.
7. Watson, J. D., T. A. Baker S. P. Bell, A. Cann, M. Levine and R. Losick, 2014. Molecular Biology of Gene 7th Edition, Pearson Education RH Ltd. India.

Mapping with Programme Outcomes*

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	M	L	L	S	S	S	L	M	S
CO2	S	M	M	M	S	M	M	M	L	S
CO3	M	S	L	L	M	S	M	L	S	L
CO4	S	M	S	M	M	S	S	S	S	S
CO5	S	S	S	M	E	S	M	S	M	M

*S - Strong; M - Medium; L – Low