

K.S.Rangasamy College of Arts and Science (Autonomous)

Tiruchengode - 637 215

Department of Biotechnology

New Courses Introduced

- Elective I: Nanobiotechnology
- Core XI: Basics of animal cell culture
- Core V: Developmental Biology
- Elective I: Cell communication and Signaling
- Elective II: Evolution and Biodiversity

Enclosures:

- i. Copy of Scheme of Examination
- ii. Syllabus copy of the courses highlighting the Newly Introduced Courses

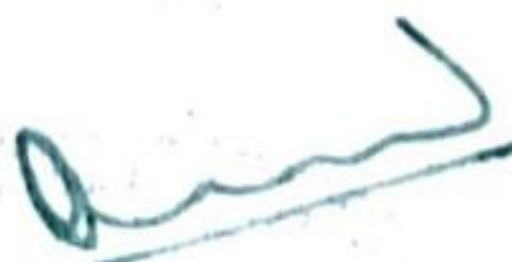

HOD

HEAD, DEPARTMENT OF BIOTECHNOLOGY
K S Rangasamy College of Arts and Science
KSR KalviNagar, Tiruchengode-637 215, India




CoE


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SCHEME OF EXAMINATION


Subject code	Subject	Hours of instruction	Exam duration	Maximum marks			Credit points
				CA	CE	Total	
First semester							
Part I							
18UTALA101/ 18UHILA101/ 18UFRLA101	Tamil I/Hindi I/ French I	5	3	25	75	100	3
Part II							
18UENLA101	Foundation English I	5	3	25	75	100	3
Part III							
18UBTM101	Core I: Concepts of Cell Biology	6	3	25	75	100	5
18UBTMP101	Core Practical - I	4	3	40	60	100	2
18UCSBTA101	Allied I: Computer fundamentals and office automation	5	3	25	75	100	2
18UCSBTAP101	Allied Practical I: Office automation techniques	3	3	40	60	100	2
Part IV							
18UVE101	Value Education I: Yoga	2	3	25	75	100	2
	Total	30				700	19
Second semester							
Part I							
18UTALA201/ 18UHILA201/ 18UFRLA201	Tamil II/Hindi II/ French II	5	3	25	75	100	3


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Part II							
18UENLA201	Foundation English II	5	3	25	75	100	3
Part III							
18UBTM201	Core II : Principles of Genetics	6	3	25	75	100	5
18UBTMP201	Core Practical - II	5	6	40	60	100	2
18UCHBTA201	Allied II: Chemistry	4	3	25	75	100	2
18UCHBTAP201	Allied Practical II: Chemistry	3	3	40	60	100	2
Part IV							
18UVE201	Value Education II: Environmental Studies	2	3	25	75	100	2
	Total	30				700	19
Third Semester							
Part I							
18UTALA301/ 18UHILA301/ 18UFRLA301	Tamil III/Hindi III/ French III	5	3	25	75	100	3
Part II							
18UENLA301	Foundation English III	5	3	25	75	100	3
Part III							
18UBTM301	Core III: Microbiology	5	3	25	75	100	5
18UBTMP301	Core Practical - III	3	6	40	60	100	2
18UBCBTA301	Allied III: Biochemistry (Biomolecules)	3	3	25	75	100	2
18UBCBTAP301	Allied Practical III: Biochemistry (Biomolecules)	3	3	40	60	100	2
Part IV							
18UBTSB301	SBC I: Calculations for Biologist (100% Internal Evaluation)	2	3	100	-	100	2
	NMEC -I	2	3	25	75	100	2


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Non Credit							
18ULS301	Career competency Skills I	1	-	-	-	-	-
	Add on course	1					
	Total	30				800	21
Fourth Semester							
Part I							
18UTALA401/ 18UHILA401/ 18UFRLA401	Tamil IV/ Hindi IV/ French IV	5	3	25	75	100	3
Part II							
18UENLA401	Foundation English IV	5	3	25	75	100	3
Part III							
18UBTM401	Core IV: Biophysics and Bioinstrumentation	5	3	25	75	100	5
18UBTMP401	Core Practical - IV	3	6	40	60	100	3
18UMABTA401	Allied IV: Biostatistics	4	3	25	75	100	2
18UMABTAP401	Allied Practical IV: Statistics (Using MS-Excel)	2	3	40	60	100	2
Part IV							
18UBTSB401	SBC II: Biosafety and Bioethics (100% Internal Evaluation)	2	3	100	-	100	2
	NMEC -II	2	3	25	75	100	2
Non Credit							
18ULS401	Career competency Skills II	1	-	-	-	-	-
	Add on course	1					
	Total	30				800	22
Fifth Semester							
Part III							
18UBTM501	Core V: Molecular Biology	5	3	25	75	100	5
18UBTM502	Core VI: Immunology	5	3	25	75	100	5
18UBTM503	Core VII: Industrial Biotechnology	5	3	25	75	100	5


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18UBTM504	Core VIII: Plant tissue culture	5	3	25	75	100	5
	Elective I	4	3	25	75	100	4
18UBTMP501	Core Practical -V	3	6	40	60	100	3
Part IV							
18UBTSB501	SBC III: IPR for Life science (100% Internal Evaluation)	2	3	100	-	100	2
18ULS501	Career competency skills III	1	-	-	-	-	-
Part V							
18UBTE501	Extension Activity	-	-	-	-	-	2
	Total	30				700	31
Sixth Semester							
Part III							
18UBTM601	Core IX: Recombinant DNA Technology	5	3	25	75	100	5
18UBTM602	Core X : Environmental Biotechnology	5	3	25	75	100	5
18UBTM603	Core XI: Basics of Animal Cell culture	5	3	25	75	100	5
	Elective II	4	3	25	75	100	4
18UBTMP601	Core Practical-VI	3	6	40	60	100	3
18UBTPR601	Internship	5	-	40	60	100	4
Part IV							
18UBTSB601	SBC IV: Basics of Research	2	3	25	75	100	2
18ULS601	Career competency Skills IV	1	-	-	-	-	-
	Total	30				700	28
Grand Total						4400	140



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NON-MAJOR ELECTIVE COURSE (NMEC)

The Department offers the following two subjects during III and I semesters as Non Major Elective Courses for the students of other departments.

S.No	Subject Code	Semester	Subject
1.	18UBTNM301	III	Medicinal herbs
2.	18UBTNM401	IV	Fundamentals of Biotechnology

ELECTIVE COURSES

The Department offers the following subjects during V and VI semesters as Elective Courses. The students can opt any one subject as their Elective course in the respective semester.

S.No	Semester	Elective	Subject code	Subject
1.	V	Elective I	18UBTEL501	Nanobiotechnology
			18UBTEL502	Bioinformatics
2.	VI	Elective II	18UBTEL601	Medical Biotechnology
			18UBTEL602	Food Biotechnology

Add-on Course & Advanced Learners courses: (Career Oriented Courses)

The Department offers the following subjects during III, IV and V semesters as Add-on Course and ALC. The students can opt any one subject in the respective semester.

S.No	Semester	Course	Subject code	Subject
1.	III & IV	Add-on Course	18UBTAC301	Medical transcription
			18UBTAC302	Electrophoresis
			18UBTAC401	Corporate Biotechnology
			18UBTAC402	Animal physiology
2.	IV & V	ALC	18UBTAL401	DNA Science and Drug discovery
			18UBTAL402	Stem cell Biology
			18UBTAL501	Genes and Humans
			18UBTAL502	Omics- Science

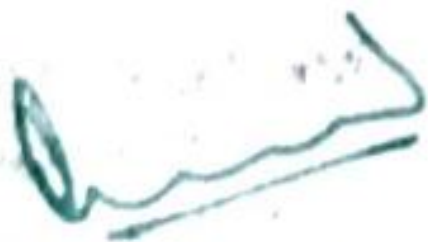
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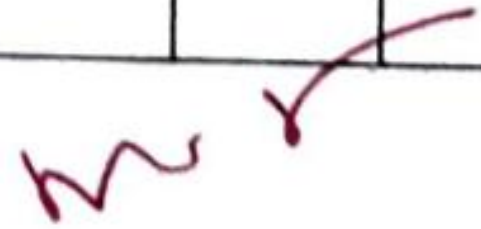
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SCHEME OF EXAMINATION


Subject Code	Subject	Hours of Instruction	Exam Duration (Hours)	Maximum Marks			Credit Points
				CA	CE	Total	
FIRST SEMESTER							
Part-A							
18PBTM101	Core I: Cell Biology	5	3	25	75	100	5
18PBTM102	Core II: Molecular biology	5	3	25	75	100	5
18PBTM103	Core III: Microbiology & Genetics	5	3	25	75	100	5
18PBTM104	Core IV: Biochemistry	5	3	25	75	100	5
18PBTM105	Core V: Developmental Biology	5	3	25	75	100	5
18PBTMP101	Core Practical I: Lab in Cell biology, Molecular biology, Genetics and Biochemistry	4	6	40	60	100	3
Non Credit							
18PLS101	Career competency Skills I	1	-	-	-	-	-
Total		30				600	28
SECOND SEMESTER							
Part-A							
18PBTM201	Core VI: Immunology	5	3	25	75	100	5
18PBTM202	Core VII: Bioprocess Technology	5	3	25	75	100	5
	Elective I	5	3	25	75	100	4
18PBTMP201	Core Practical II: Lab in Bioprocess technology and Immunology	5	6	40	60	100	3


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Optional Subjects							
18PBCBTI201	IDC I: Diagnostic Biochemistry	4	3	25	75	100	2
18PBCBTIP201	IDC Practical I: Diagnostic Biochemistry	3	3	40	60	100	2
18PMBBTI201	IDC I: Clinical Microbiology	4	3	25	75	100	2
18PMBBTIP201	IDC Practical I: Clinical Microbiology	3	3	40	60	100	2
Part- B							
18PVE201	Value Education: Human Rights	2	3	25	75	100	2
Non Credit							
18PLS201	Career competency Skills II	1	-	-	-	-	-
Total		30				700	23
THIRD SEMESTER							
Part -A							
18PBTM301	Core VIII: Plant tissue and Animal cell culture technology	6	3	25	75	100	5
18PBTM302	Core IX: Genetic engineering	6	3	25	75	100	5
18PBTM303	Core X: Biostatistics and Research Methodology	5	3	25	75	100	4
18PBTMP301	Core Practical III: Lab in Plant tissue and Animal cell culture technology and Genetic Engineering	5	6	40	60	100	4


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18PBTMP302	Core Practical IV: Statistical software	2	3	40	60	100	2
Optional Subjects							
18PBCBTI301	IDC II: Pharmaceutical Biochemistry	3	3	25	75	100	2
18PBCBTIP301	IDC Practical II: Pharmaceutical Biochemistry	3	3	40	60	100	2
18PMBBTI301	IDC II: Industrial Microbiology	3	3	25	75	100	2
18PMBBTIP301	IDC Practical II: Industrial Microbiology	3	3	40	60	100	2
	Total	30				700	24
FOURTH SEMESTER							
Part - A							
18PBTM401	Core XI: Food and Pharmaceutical Biotechnology	5	3	25	75	100	5
	Elective II	5	3	25	75	100	4
18PBTPR401	Project & Viva-Voce	4	-	50	150	200	6
	Total	14				400	15
Grand Total						2400	90


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ELECTIVE COURSES

The department offers the following four subjects as Elective courses for second and fourth semesters.

S.No	Subject Code	Semester	Subject
1.	18PBTEL201	II	Cell communication and Signaling
2.	18PBTEL202		Bioinstrumentation and Bioinformatics
3.	18PBTEL401	IV	Environmental Biotechnology
4.	18PBTEL402		Evolution and Biodiversity

TOTAL CREDIT DISTRIBUTION

S.NO	PART	COMPONENTS	TOTAL NUMBER OF SUBJECTS	MAXIMUM MARKS	TOTAL MARKS	CREDIT POINTS
1.	PART - A	Core Subjects	11	100	1100	55
		Core Practical	4	100	400	11
		IDC Paper	2	100	200	04
		IDC Practical	2	100	200	04
		Elective Subject	2	100	200	08
		Project	1	200	200	06
2.	PART - B	Value Education	1	100	100	02
Total					2400	90




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18SUBTEL501	ELECTIVE I: NANOBIO TECHNOLOGY	SEMESTER - V	
Course Objectives: The Course aims <ul style="list-style-type: none"> To know the basis of nanobiotechnology and to obtain knowledge about various applications. 			
Credits: 4		Total Hours: 40	
UNIT	CONTENTS	Hrs	CO
I	Nanobiology - concepts, definitions, prospects; nanoparticles - size, shape, properties. Bionanoparticles - nanostarch, nano composites - dendrimers. Hot - Dot nanoparticles. Types of biomaterials. Biodegradable polymers.	08	CO1
II	Methods of nanobiotechnology - Analysis of bimolecular nanostructures by Atomic Force Microscopy, Scanning Probe Electron Microscopy. Nanofabrication - lithography. Drug nanoparticles - structure and preparation, Liposomes, Cubosomes and hexosomes. Lipid based nanoparticles- liquid nano dispersion, solid liquid nanoparticles	08	CO2
III	Nanotubes, Nanorods, Nanofibers and Fullerenes for nanoscaledrug. Bionanoelectronics. Applications of nanobiotechnology in medicine, drug designing and cancer treatment. Medical, social and ethical considerations of nanobiotechnology.	08	CO3
IV	Nanopores, Applications of NanoMolecules in Biosystems - Nanoscale Elements for Delivery of Materials into Cells. Peptides Coupled Nanoparticles. DNA Based Artificial Nanostructure. Proteins as Components in Nanodevices- Nanoparticle synthesis in plants, bacteria, and yeast.	08	CO4
V	Nanotechnology for Cancer Diagnostics and Treatment: Cancer Biology; Clinical Aspects, Current Approaches and Challenges. Nanotechnology for Cancer Research and Therapy. siRNA. Tumor-targeted Drug Delivery Systems. Nanotechnology for Imaging and Detection	08	CO5
Reference Books			
1	Christof M. Niemayer, Chad A. Mirkin, 2004. Nanobiotechnology: Concepts, applications and perspectives. Wiley VCH publishers		
2	David S. Goodsell., 2006. Bionanotechnology: Lessons from Nature. John Wiley & Sons, New Jersey.		


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3	Jain K.K., 2005. Nanobiotechnology in Molecular Diagnostics: Current Techniques and Applications. Tailor L. Francis Group.
4	Tuan Vo-Dinh, 2007. Nanotechnology in Biology and Medicine: Methods, Devices and Applications. CRC Press, Taylor and Francis Inc., London.
5	Torchilin Vladimir P. 2006. Nanoparticulates as Drug Carriers. World Scientific. Imperial College Press, World Scientific Publishing Co. Pt. Ltd, London.

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Understand the basic concepts and biomaterials
CO2	Gain knowledge about the methods and drug nanoparticles
CO3	Apply the applications of nanoparticles in medicine
CO4	Synthesize nanoparticles using biological materials
CO5	Diagnose and treat cancer and improve their Current Approaches and Challenges in nanotechnology

MAPPING

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	H	H	H
CO2	H	H	H	M	H
CO3	H	H	M	M	H
CO4	H	H	M	M	H
CO5	H	H	M	M	H

H-High; M-Medium; L-Low




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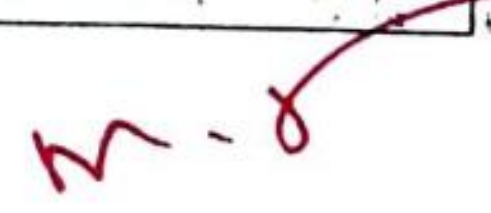


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18UBTM603	CORE XI: BASICS OF ANIMAL CELL CULTURE	SEMESTER -VI	
Course Objectives The course aims <ul style="list-style-type: none"> To learn basic concepts about animal tissue culture. 			
Credits: 5		Total Hours: 50	
UNIT	CONTENTS	Hrs	CO
I	History, Scope and importance of animal cell culture, Types of animal cell culture, Animal cell culture Laboratory-Design and layout, Equipment and materials.	10	CO1
II	Types of culture media, composition, preparation and metabolic functions, Culture vessels and substrate, Serum, supplements, growth factors (EGF, PDGF, NGF, and Gap-43), Serum and protein free defined media, Aseptic practices in animal cell culture.	10	CO2
III	Basic techniques of animal cell culture <i>in vitro</i> , disaggregation of tissue and primary culture, subculture and establishment of cell line, Cloning and selection, Cell separation, Characterization, Differentiation, Transformation and immortalization, Quantification of cell culture. Scale-up and cell synchronization	12	CO3
IV	Cytotoxicity: Viability, toxicity and survival assay, Cryopreservation and cell banks, Organotypic culture and histotypic culture, Stem cells and Tissue Engineering: Scope, embryonic and adult stem cells, properties, identification, stem cells culture, techniques and their applications in modern clinical sciences. Tissue engineering - skin, bone and neuronal tissues.	08	CO4
V	Gametogenesis- Spermatogenesis and Oogenesis, Mechanism of fertilization, <i>In vitro</i> fertilization (IVF), Embryo transfer and test tube babies. Transgenic Animals: Production of fish, cattle, pig and chicken.	10	CO5
Text Book			
1	Brown, T.A. 2010. Gene cloning and DNA analysis an Introduction. [Sixth Edition]. Wiley Blackwell Publication, UK.		


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Reference Books

1	<i>Freshney, R.I., 2005. Culture of animal cells: A Manual of Basic Technique. [5th Edition]. John Wiley and Sons, New Jersey.</i>
2	<i>John R.W. Masters., 2000. Animal cell culture. 3rd Edition, Oxford University Press.</i>
3	<i>Nigel Jenkins, 2005. Animal cell Biotechnology - Methods and Protocols. Humana press.</i>
4	<i>Florence PR. 2006. Animal Biotechnology. Dominant Publishers and Distributors, Delhi.</i>
5	<i>Sandy Primrose, Richard Twyman and Bob Old, 2001. Principles of Gene Manipulation. [Sixth Edition]. Blackwell Science Ltd.</i>

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Explain the history and types of animal tissue culture.
CO2	Describe the preparation of animal tissue culture medium and growth factors.
CO3	Illustrate the basic techniques of animal cell culture.
CO4	Depicts the cytotoxicity, tissue engineering and stem cells.
CO5	Explain about IVF and transgenic animals.

MAPPING

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	H	M	M	H
CO2	H	H	M	H	H
CO3	H	H	H	M	H
CO4	H	M	H	M	H
CO5	H	M	H	H	H


H-High; M-Medium; L-Low



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18PBTM105	CORE V: DEVELOPMENTAL BIOLOGY	SEMESTER - I	
Course Objectives: The Course aims <ul style="list-style-type: none"> To study the basics of Developmental biology. 			
Credits:5		Total Hours:50	
UNIT	CONTENTS	Hrs	CO
I	Foundation of developmental Biology: History of developmental biology, types of development, strategies in developmental biology, phase of animal development. Major molecular and cellular component of development: genes and proteins, and transcription factors and signal molecule.	10	CO1
II	Basic mechanism of development: Cell division - molecular view, Morphogenetic movement - morphogenesis, cellular process, cell - cell adhesion molecules, cell migration. Cell to cell interaction - induction, signal, competency. Growth - mechanism, dynamic and factors. Differentiation: Potency, specification, differentiation.	10	CO2
III	Early embryonic development: Fertilization - structure of gametes - sperm, the egg, - recognition of egg and sperm. External fertilization in sea urchin, internal fertilization in mammals, gastrulation in snails, development of tetrapod.	10	CO3
IV	Organogenesis in plants: Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; transition to flowering, floral meristems and floral development in <i>Arabidopsis</i> and <i>Antirrhinum</i> .	10	CO4
V	Sex determination and development: chromosomal sex determination - sex determination in mammals, sex	10	CO5


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M-8
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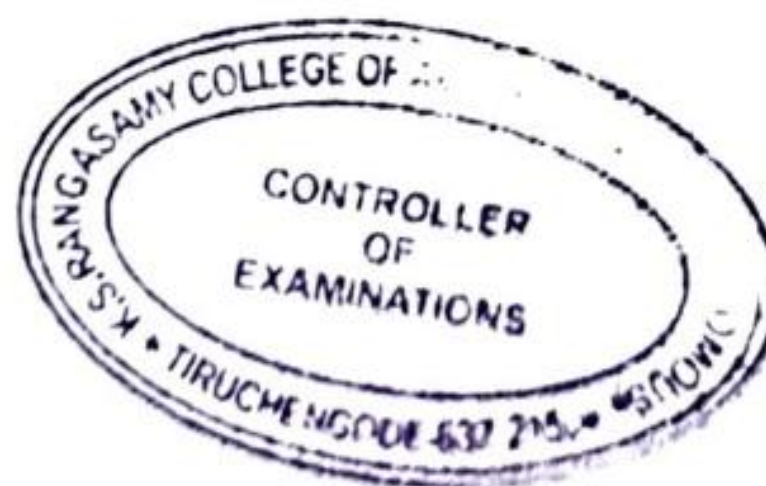
	determination in drosophila. Post embryonic development - metamorphosis - amphibian and insect metamorphosis, regeneration, types of regeneration. Aging and senescence. Evolution - developmental repatterning - heterochrony, heterotopy, heterometry and heterotypy.		
Reference Books			
1	<i>Chattopadhyay S.</i> 2016. An Introduction to Developmental Biology. [First Edition]. Books and Allied (P) Ltd. Kolkata.		
2	<i>Gilbert S.F.</i> 2015. Developmental Biology. [revised edition]. Tata McGraw publishing House.		
3	<i>Lodish Berk, Kaiser Krieger, Scott Bretscher, Ploegh and Matsudair.</i> 2011. Molecular cell Biology. [Fifth Edition]. W. H. Freeman and Company, New York.		
4	<i>Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts and Peter Walter.</i> 2008. Molecular Biology of the Cell. [Fifth Edition]. Garland Science, Taylor and Francis Group.		


COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Explain historical perspective of Developmental biology.
CO2	Demonstrate the fundamentals of Development biology.
CO3	Differentiate gametogenesis, fertilization and early development.
CO4	Illustrate the organogenesis in plants.
CO5	Illustrate the sex determination and evolution.


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 Tiruchengode - 637 215. Tamil Nadu. INDIA

MAPPING

PSO	PSO1	PSO2	PSO3	PSO4	PSO5
CO					
CO1	H	M	M	M	H
CO2	H	H	M	M	H
CO3	H	M	L	M	M
CO4	H	H	M	H	L
CO5	M	H	M	M	M

H-High; M-Medium; L-Low

M.P.


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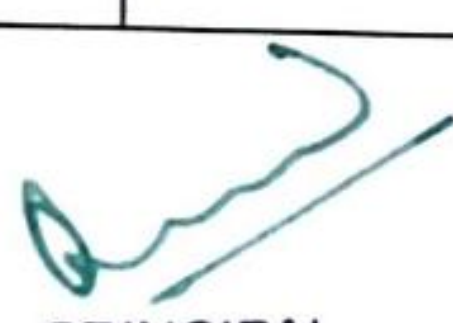


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18PBTEL201	ELECTIVE I: CELL COMMUNICATION AND SIGNALING	SEMESTER - II	
Course Objectives: The Course aims <ul style="list-style-type: none"> To gain knowledge about basics about the Cell signaling and cell communication. To learn about the pharmaceutical biotechnology and cancer immunology. 			
Credits: 4		Total Hours: 50	
UNIT	CONTENTS	Hrs	CO
I	Host parasite interaction: Recognition and entry processes of different pathogens like bacteria, viruses into animal and plant host cells, alteration of host cell behavior by pathogens, virus-induced cell transformation, pathogen-induced diseases in animals and plants, cell-cell fusion in both normal and abnormal cells.	10	CO1
II	Cell signaling: Hormones and their receptors, cell surface receptor, signaling through G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two component systems, light signaling in plants, bacterial chemo taxis and quorum sensing.	10	CO2
III	Cellular communication: Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation.	10	CO3


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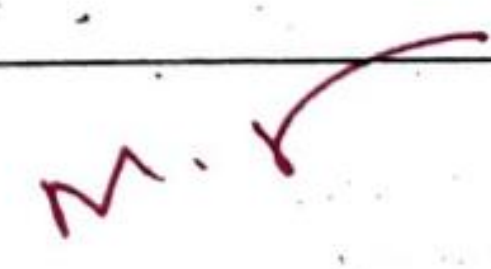
IV	Toll-like receptors, Cytokines receptors, Leukocyte migration - Cell adhesion molecules, Neutrophil extravasation, Lymphocyte extravasation. Cell-mediated effector functions, immune response during bacterial (tuberculosis), parasitic (malaria) and viral (HIV) infections.	10	CO4
V	Cancer: Genetic rearrangements in progenitor cells, oncogenes, tumor suppressor genes, cancer and the cell cycle, virus-induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth.	10	CO5

Reference Books

- 1 *Gerald Karp., 2010. Cell Biology. [Sixth Edition]. John wiley and Sons (Asia) Pvt. Ltd.*
- 2 *Geoffrey M. Cooper and Hausman, R.E., 2007. The Cell - A Molecular Approach. [Fourth Edition]. ASM Press, Washington, D.C.*
- 3 *Lodish Berk, Kaiser Krieger, Scott Bretscher, Ploegh and Matsudair. 2011. Molecular cell Biology. [Fifth Edition]. W. H. Freeman and Company, New York.*
- 4 *Bruce Alberts, Alexander Johnson, Julian Lewis, Martin Raff, Keith Roberts and Peter Walter. 2008. Molecular Biology of the Cell. [Fifth Edition]. Garland Science, Taylor and Francis Group.*
- 5 *Kuby Richard. A. Goldsby, Thomas. J. Kint and Barbara. A. Osborne. 2000. Immunology [Fourth Edition]. W.H. Freeman and Company, New York.*
- 6 *Kalus D. Elgert. 2009. Immunology - Understanding the Immune System. [Second Edition]. Wiley-Blackwell Publication.*
- 7 *Kenneth Murphy, Paul Travers and Mark Walport, 2008. Janeway's Immunobiology. [Seventh Edition]. Garland Science Taylor and Francis Group, New York.*


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COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Apply the basic knowledge of Host parasite interaction.
CO2	Explain about cell signaling.
CO3	Describe about cell communication.
CO4	Demonstrate the types of receptors and immune response during microbial infection.
CO5	Explain about cancer.

MAPPING

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	H	M	M	L	L
CO2	M	H	M	L	L
CO3	H	M	L	M	H
CO4	H	M	H	M	M
CO5	M	L	M	H	H

H-High; M-Medium; L-Low



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18PBTEL402	ELECTIVE II: EVOLUTION AND BIODIVERSITY	SEMESTER - IV	
Course Objectives: The Course aims <ul style="list-style-type: none"> To understand the evolutionary concept and biodiversity. 			
Credits: 4		Total Hours:50	
UNIT	CONTENTS	Hrs	CO
I	Lamarckism; Darwin-concepts of variation, adaptation, Speciation, struggle, fitness and natural selection. Major groups of plants and animals (Evolutionary tree).	08	CO1
II	Origin of cells and unicellular evolution: Origin of basic biological molecules; Abiotic synthesis of organic monomers and polymers; Concept of Oparin and Haldane; Experiment of Miller; The first cell; Evolution of prokaryotes; Origin and evolution of eukaryotic cells, Anaerobic metabolism, photosynthesis and aerobic metabolism.	12	CO2
III	Paleontology and Evolutionary History: The evolutionary time scale - Era, period and epoch; Major events in the evolutionary time scale; Stages in primate evolution including Homo.	10	CO3
IV	Principles & methods of taxonomy: Concepts of species and hierarchical taxa, biological nomenclature, classical & quantitative methods of taxonomy of plants, animals and microorganisms. Levels of structural organization: Unicellular, colonial and multicellular forms. Levels of organization of tissues, organs & systems.	08	CO4


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V	Major habitat types of Indian subcontinent, Common Indian mammals, birds. Organisms of conservation concern: Rare, endangered threatened and endemic species. Red data Book, Conservation strategies. Biodiversity types, Loss of biodiversity, Climate change and its impacts, Kyoto protocol, Geneva convention, Indian Biodiversity Acts.	12	CO5
Text Book			
1	Veer Bala Rastogi. 12 th Edition. Organic evolution. Kedarnat Ramnath, Meerut, Delhi.		
2	Jha AP, 1997. Genes and Evolution. Mac Millan India Limited.		

COURSE OUTCOMES (CO)

After completion of the course, the students will be able to

CO1	Explain about Lamarckism, Darwin concepts and evolutionary tree.
CO2	Attain knowledge about evolution, photosynthesis and metabolism.
CO3	Explain about Paleontology and Evolutionary History.
CO4	Describe about taxonomy.
CO5	Attain knowledge about Conservation strategies and Biodiversity.

MAPPING

PSO CO	PSO1	PSO2	PSO3	PSO4	PSO5
CO1	M	L	L	L	L
CO2	M	L	L	L	M
CO3	M	H	L	M	L
CO4	H	L	L	M	L
CO5	H	H	M	L	M

H-High; M-Medium; L-Low

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