

GANPAT UNIVERSITY

Faculty of Science

Teaching Scheme, Examination Scheme

&

Syllabus

M.Sc. Biotechnology

Semester III

(Effective from July 2018)

GANPAT UNIVERSITY

FACULTY OF SCIENCE

REVISION OF TECHING & EXAMINATION SCHEME AND SYLLABUS

Programme	M.Sc.	Branch/Spec.	Biotechnology			
Semester	III	Academic Council Approved Syllabus (in which the revision is carried out)			Notification No	
					Date	
Effective from Academic Year	2018-19	Effective for the batch Admitted in	June 2018			
Subject code	Subject Name	Revision in Full Syllabus (Yes/No)	Revision in Teaching Scheme(Yes/No)	Revision in Exam Scheme(Yes/No)	Revision in Content (Yes/No)	Percentage of changes if content revision
MMBT3IMN	Immunology					
MBIT3EBT	Environmental Biotechnology					
MBIT3PAB	Pharmaceutical Biotechnology					
MELE3SSD	Soft skill and Development					
MBIT3PRA	Practical Module III					
MBIT3PRO	Project-I					

NEED OF REVISION:

New syllabus is implemented as per UGC guideline

GANPAT UNIVERSITY

FACULTY OF SCIENCE

TEACHING AND EXAMINATION SCHEME

Programme	Master of Science	Branch/Spec.	Biotechnology																
Semester	III																		
Effective from Academic Year	2018-19	Effective for the batch Admitted in													July 2018				
Subject Code	Subject Name	Teaching scheme												Examination scheme (Marks)					
		Credit						Hours (per week)						Theory			Practical		
		Lecture(DT)			Practical(Lab.)			Lecture(DT)			Practical(Lab.)			CE	SE E	Tot al	C E	SEE	Total
		L	T U	Total	P	T W	Total	L	T U	Total	P	T W	Total						
MMBT3IMN	Immunology	4	--	4	--	--	--	4	--	4	--	-	--	40	60	100	--	--	--
MBIT3EBT	Environmental Biotechnology	4	--	4	--	--	--	4	--	4	--	-	--	40	60	100	--	--	--
MBIT3PAB	Pharmaceutical Biotechnology	4	--	4	--	--	--	4	--	4	--	-	--	40	60	100	--	--	--
MELE3 SSD	Soft skill and Development	2	-	2	--	-	-	2	--	2	--	-	-	40	60	100	--	--	--
MBIT3PRA	Practical Module III	--	--	--	6	--	6	-	--	--	12	-	12	--	--	--	--	200	200
MBIT3PRO	Project-I	8	--	8	--	--	--	8	--	8	-	-	-	--	200	200	--	--	--
Total		20	--	20	6	--	6	20	--	20	12	-	12	160	440	600	--	200	200

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme	Master of Science			Branch/Spec.	Biotechnology				
Semester	III			Version	2.0.0.0				
Effective from Academic Year		2018-2019		Effective for the batch Admitted in			July 2018		
Subjectcode	MMBT3IMN	Subject Name		Immunology					
Teaching scheme				Examination scheme (Marks)					
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	4	--	--	--	4	Theory	40	60	100
Hours	4	--	--	--	4	Practical	--	--	--

Pre-requisites: Students should have basic knowledge of Immunology up to graduation level.

Learning Outcome: The course will help the student to gain the detailed knowledge of Immunology such as types of immunity, detailed description related to life cycle of immune cells and roles of molecules secreted by these cells. In addition, knowledge about various diseased conditions related to immune system will also be well-understood.

Theory syllabus

Unit	Content	Hrs
1	<ul style="list-style-type: none"> - Types of Immunity: Adaptive and Innate, Humoral and cell mediated - Anatomical Barriers to Infection, Phagocytosis, Inflammation, Cytokines and chemokines, Natural Killer Cells, Interactions Between the Innate and Adaptive Immune Systems, Ubiquity of Innate Immunity. - Cells and Organs of the Immune System: Cells of the Immune System, Primary Lymphoid Organs, Secondary Lymphoid Organs. - Complement System: Components, Major pathways, Functions, Regulation and Deficiencies, Microbial Complement Evasion Strategies and significance. - Major Histocompatibility Complex: Types, Structure and function, General organization, Role of the MHC and expression patterns, Endogenous and exogenous pathways, Cross-presentation of exogenous antigens, presentation of nonpeptide antigens. 	15
2	<ul style="list-style-type: none"> - Antigens: Hapten, Epitope, Isoantigen, Heterologous and homologous antigen, Cell-Associated Differentiation Antigens (CD). - Antibodies: Structure of antibody, Classes of immunoglobulins and their role, Abzymes. - Antigen-antibody interactions: Agglutination and precipitation reactions, ELISA, RIA, ELISPOT, Immunoelectron microscopy, Immunofluorescence, Flow cytometry, Magnetic activated cell sorting, Cell cycle analysis, Assays of cell death. - Organization and Expression of Lymphocyte Receptor Genes: Organization of Ig genes, Mechanism of V(D)J recombination, Expression of B-cell receptor, T-cell receptor genes and expression. 	15
3	<ul style="list-style-type: none"> - Development of T-cells: Early thymocyte development, Positive and negative selection, Lineage commitment, Exit from the thymus and final maturation, Other mechanisms that maintain self-tolerance, Apoptosis, - Development of B-cells: Site of hematopoiesis, B-cell development in the bone marrow, Development of B-1 and marginal-zone B-cells, Comparison of B- and T-cell development. - Activation, differentiation and memory generation in T-Cells. - Activation, differentiation and memory generation in B-cells: T-dependent and T- 	15

	independent B-cell responses, Negative regulation of B cells.	
4	<ul style="list-style-type: none"> - Hypersensitivity reactions: Classification and types of hypersensitivity reactions. - Tolerance, Autoimmunity, and Transplantation: Establishment and maintenance of tolerance, Autoimmune diseases, Transplantation immunology, Basis and manifestation of graft rejection, Immunosuppressive therapy, Immune tolerance. - Cancer and immune system: Common types of cancer, Malignant transformation of cells, Tumor antigens, Immune response to cancer, Cancer immunotherapy. - Immunodeficiency disorders: Primary immunodeficiencies, Secondary immunodeficiencies. 	15
Reference Books		
1	Kuby, RA Goldsby, Thomas J. Kindt, Barbara, A. Osborne Immunology, 6th Edition, Freeman, 2002	
2	Brostoff J, Seaddin JK, Male D, Roitt IM., Clinical Immunology, 6th Edition, Gower Medical Publishing, 2002.	
3	Janeway et al., Immunobiology, 4th Edition, Current Biology publications., 1999.	
4	Paul, Fundamental of Immunology, 4th edition, Lippencott Raven, 1999.	
5	Goding, Monoclonal antibodies, Academic Press. 1985	

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme	Master of Science			Branch/Spec.	Biotechnology				
Semester	III			Version	2.0.0.0				
Effective from Academic Year	2018-19			Effective for the batch Admitted in	June 2018				
Subject code	MBIT3EBT	Subject Name		Environmental Biotechnology					
Teaching scheme				Examination scheme (Marks)					
(Per week)	Lecture(DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	4	-	-	-	4	Theory	40	60	100
Hours	4	-	-	-	4	Practical	--	-	--

Pre-requisites: Students should have basic knowledge of Environmental Biotechnology up to graduation level.

Learning Outcome: The course will help the student to gain the detailed knowledge of Environmental Biotechnology such as Techniques use for waste water treatment, Biodegradation of various pollutants, role of microorganisms in nutrient management of plants etc.

Theory syllabus

Unit	Content	Hrs
1	<ul style="list-style-type: none"> - Issues and scopes of environmental biotechnology. - Biotechnology of Waste Management: Principles biological waste treatment; removal of nitrogen, inorganic phosphorous. - Fixed film technologies: Trickle filters, rotation biological contactors, activated bio-filters, fluidized bed reactors. - Suspended growth technologies: activated sludge process; oxidation ditches, aerated lagoons; Stabilization ponds, sludge treatment and disposal; anaerobic treatments; Solid waste management. 	15
2	<ul style="list-style-type: none"> - Biofertilizers: NM (Integrated Nutrient Management in Plants) N₂fixing Microorganisms (Symbiotic, free-living and Associative), Phosphate solubilizing microorganisms. - Bio-control of pathogens: Siderophores, antibiotics enzymes, ice Nucleation and antifreeze Proteins. - Bio-insecticides: <i>Bacillus thuringiensis</i>, Baculovirus and Trichoderma as abiocontrol agent. 	15
3	<ul style="list-style-type: none"> - Biofuels: Gasohol, Bioconversion of agriculture waste by using Hydrogen and electricity. - Biodegradation: Principle and mechanisms, Biodegradation of Xenobiotic compounds (lignin, hydrocarbons, detergents, dyes and pesticides). - Biogeotechnology- Bioleaching of metals: Characteristics of commercially important microbes, mechanisms of bioleaching, factors affecting bioleaching and current biomining processes. Biobeneficiation of gold ores. Microbially enhanced oil recovery. Biodesulfurization of coal: Removal of organic and inorganic sulfur from coal. 	15
4	<ul style="list-style-type: none"> - Bioremediation: Principle and techniques; In situ and Ex situ solid phase treatment, immobilized cells, Biosorption, bioaccumulation and Co-metabolism, Bioremediation of oil spills, hazardous wastes and Metals. - Phyco, Phyto and Zoo remediation - Environmental Sample collection and processing and Indicator microorganisms. - Biopulping and biobleaching 	15

Reference Books

1	Bernard R. Glick and Jack J. Pasternak, Molecular biotechnology : Principles and application
---	--

	of Recombinant DNA, ASM press.
2	Bruce E. Rittmann and Perry L. Mccarty, Environmental Biotechnology: Principles and application, McGraw-Hill International
3	Christson Manual of Environmental Microbiology, ASM press
4	Eugenia J. Olguin, Gloria Sanchez and Elizabeth Hernandez, Environmental Biotechnology and Cleaner Bioprocess, Taylor and Francis
5	Martine Alexander, Biodegradation and Bioremediation
6	Peter Morris (Editor), Riki Therivel, Methods of Environmental Impact Assessment
7	P.D.Sharma, Ecology and Environment
8	P.S.Verma, Principles of Ecology
9	Atlas and Bartha, Microbial Ecology
10	Biotechnology-Rehm and Reid.

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme	Master of Science			Branch/Spec.	Biotechnology				
Semester	III			Version	2.0.0.0				
Effective from Academic Year		2018-19		Effective for the batch Admitted in			July 2018		
Subject code	MBIT3PAB		Subject Name		Pharmaceutical Biotechnology				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total	CE	SEE	Total	
	L	TU	P	TW					
Credit	04	--	--	--	04	Theory	40	60	100
Hours	04	--	--	--	04	Practical	--	--	--

Pre-requisites: Students should have basic knowledge of Pharmaceutical Biotechnology up to graduation level.

Learning Outcome: The course will help the student to gain the detailed knowledge of Pharmaceutical Biotechnology such as Drug discovery, formulations, Bioentrepreneurship, Management etc.

Theory syllabus

Unit	Content	Hrs
1	<ul style="list-style-type: none"> - Role of biotechnology in pharmaceutical industry, Drug Discovery: Strategic Issue of drug target and screening procedure; preclinical and clinical Development of drug - General pharmaceutical formulations. 	15
2	<ul style="list-style-type: none"> - Design and layout of sterile product manufacturing unit, Designing and safety in Microbiology laboratory - Microbial contamination and spoilage of pharmaceutical products and their sterilization. - Microbiology laboratory techniques: Aseptic technique, Pharmacopeia and microbiological tests, Microbiological examination of nonsterile products, Sterility testing, In Vitro and In Vivo testing for pyrogens and endotoxins, Microbiological assay of antibiotics, Environmental monitoring. 	15
3	<ul style="list-style-type: none"> - Biopharmaceutical cGMP product manufacturing process: various recombinant product process: recombinant therapeutic protein, cell therapy, plasma protein, personalized medicine, antibody engineering, plant engineering. - Regulatory practices in pharmaceuticals: Brief introduction to IP, BP and USP, Government regulatory practices and policies, FDA perspective; Quality validation certification from GLP, GMP, ISO, WHO. 	15
4	<ul style="list-style-type: none"> - Quality Assurance and Validation: Regulatory aspects of quality control, sterilization control, Chemical and Biological Indicators. - Bioentrepreneurship: Biomarket space, Biotechnology company fundamentals, funding, research development and marketing; Bio pricing strategies. 	15

Reference Books

1	W.B.Hugo & A.D.Russell, pharmaceutical Microbiology, Blackwell scientific Publications
2	Rajesh Bhatia, Rattan Lalchhpunjani, Quality Assurance in Microbiology, CBS Publishers & Distributors, New Delhi.
3	Pharmaceutical Industrial Management
4	Yali Friedman, Building Biotechnology: Starting, Managing, And Understanding Biotechnology Companies

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	Master of Science				Branch/Spec.	Biotechnology			
Semester	IV				Version	2.0.0.0			
Effective from Academic Year	2018-2019				Effective for the batch Admitted in	July-2018			
Subject code	MELE4SSD	Subject Name			Soft Skills and Development				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	02	00	00	00	02	Theory	40	60	100
Hours	02	00	00	00	02	Practical	00	00	00
Pre-requisites:									
Considerable (Intermediate level) ability to use skills like Listening, Reading, Speaking and Writing									
Learning Outcome:									
This course aims at developing soft skills as well as written and oral Professional Communication skills to enhance the ability to act with confidence, develop the overall personality of the student and its application in professional world.									
Theory syllabus									
Unit	Content								Hrs
1	Technical Writing skills Drafting of Job Application, Resume preparation, Different types of resume, Guidelines for Writing an Impressive Resume, and recommendation letter, Scientific / Technical writing skills; Proposal writing, Report writing, Bibliography writing, Research paper writing: format and rules								07
2	Interpersonal Skills Interviewing: How to face an Interview Board, Proper Body Posture, Group Discussion, Debating Importance of Gestures and Steps to Succeed in Interviews, Self-introduction – highlighting positive and negative traits and Face to Face Communication Leadership: Team building, Strategic Planning, Mentoring, Decision making Delivery of Public Speech, self-confidence and professionalism.								08
3	Communication Skills: Verbal and Nonverbal communication, Public Speaking, Listening, Presentation skill: Planning for effective presentation, Discuss 6 great helpers of effective presentation, How to Make Presentation, Presentation Tools, Boredom Factors in Presentation and How to Overcome them.								08
4	Professional Skills Etiquettes and Manners, Ethics, Telephonic Etiquettes, Expressing thanks and appreciation, greetings, conversation, Time management, SWOT Analysis								07
Reference Books									
1	Technical Communication - Raman, Meenakshi & Sharma Sangeeta, 2006, OUP, New Delhi								
2	Robinson, David; Business Etiquette, Kogan Page.								
3	Kaul, Asha; Business Communication, 1998, Prentice-Hall of India Ltd, New Delhi								
4	Improve Your Communication Skills - Barker, Alan, 2007, Kagan Page (I) Pvt. Ltd.								
5	The Handbook of interviewing - Taylor, Poul J & O'Driscoll Michael P.,2001, Infinity Books.								
6	Business Communication - Lesikar, Raymond V & Pettit John D, 1999, AIIBS Publishers, New Delhi.								

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme		Master of Science				Branch/Spec.		Biotechnology	
Semester		III				Version		2.0.0.0	
Effective from Academic Year			2018-2019			Effective for the batch Admitted in			July 2018
Subjectcode		MBIT3PRA		Subject Name		Practical Module III			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical (Lab)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	--	--	6	--	6	Theory	--	--	--
Hours	--	--	12	--	12	Practical	--	200	200
Sr.No.	Content								
1	Isolation of Xenobiotic (dyes, pesticides) degrading micro organisms								
2	Isolation of hydrocarbon degrading microorganism								
3	Isolation of phosphate solubilizing microorganisms								
4	Isolation of N ₂ fixing microorganisms								
5	Water Analysis: Physicochemical analysis, TS, TDS, TSS, BOD, COD and microbiological analysis of water								
6	Isolation of cellulose degrading microorganism								
7	Microbiological analysis of air								
8	Soil Analysis: Physico-chemical analysis, determination of microbial biomass, determination of soil enzyme activity.								
9	ABO Grouping: Slide technique; Tube technique; Reverse and forward grouping								
10	Cross matching: Major and Minor								
11	Coombs test : Direct coomb's; Indirect coomb's								
12	Widal test								
13	Hemoglobin Estimation								
14	Enzyme Linked Immuno Sorbent assay (ELISA)								
15	Double diffusion, Immuno-electrophoresis and Radial Immuno diffusion								
16	Differential WBC Count								
17	Effectiveness of antimicrobial preservatives								
18	Microbial limit test								
19	Test for sterility								
20	Physicochemical test of extracts								

GANPAT UNIVERSITY

Faculty of Science

Teaching Scheme, Examination Scheme

&

Syllabus

M.Sc. Biotechnology

Semester IV

(Effective from July 2018)

GANPAT UNIVERSITY

FACULTY OF SCIENCE

REVISION OF TECHING & EXAMINATION SCHEME AND SYLLABUS

Programme	M.Sc.	Branch/ Spec.	Biotechnology			
Semester	IV	Academic Council Approved Syllabus (in which the revision is carried out)	Notification No			
			Date			
Effective from Academic Year	2018-19	Effective for the batch Admitted in	June 2018			
Subject code	Subject Name	Revision in Full Syllabus (Yes/No)	Revision in Teaching Scheme(Yes/No)	Revision in Exam Scheme(Yes/No)	Revision in Content (Yes/No)	Percentage of changes if content revision
MBIT4PBT	Plant Biotechnology					
MBIT4ABT	Animal Biotechnology					
MBIT4ABS	Advanced topics in Biological Science					
MBIT4PRA	Practical Module IV					
MBIT4PRO	Project-II					

NEED OF REVISION:

New syllabus is implemented as per UGC guideline

GANPAT UNIVERSITY

FACULTY OF SCIENCE

TEACHING AND EXAMINATION SCHEME

Programme	Master of Science	Branch/Spec.	Biotechnology																
Semester	IV																		
Effective from Academic Year		2018-19	Effective for the batch Admitted in											July 2018					
Subject Code	Subject Name	Teaching scheme												Examination scheme (Marks)					
		Credit						Hours (per week)						Theory			Practical		
		Lecture(DT)			Practical(Lab.)			Lecture(DT)			Practical(Lab.)			CE	SEE	Total	CE	SEE	Total
		L	T U	Total	P	TW	Total	L	TU	Total	P	T W	Total						
MBIT4PBT	Plant Biotechnology	4	-	4	--	-	-	4	--	4	--	-	-	40	60	100	--	--	--
MBIT4ABT	Animal Biotechnology	4	-	4	--	-	-	4	--	4	--	-	-	40	60	100	--	--	--
MBIT4ABS	Advanced topics in Biological Science	4	-	4	--	-	-	4	--	4	--	-	-	40	60	100	--	--	--
MBIT4PRA	Practical Module IV	-	-	-	6	-	6	-	-	-	12	-	12	-	-	--	--	200	200
MBIT4PRO	Project-II	8	-	8	--	-	--	8	-	8	--	-	-	-	200	200	--	--	--
Total		22	-	22	6	-	6	22	-	20	12	-	12	120	380	500	--	200	200

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	Master of Science				Branch/Spec.	Biotechnology			
Semester	IV				Version	2.0.0.0			
Effective from Academic Year		2018-19			Effective for the batch Admitted in			July 2018	
Subject code	MBIT4PBT		Subject Name		Plant Biotechnology				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture (DT)		Practical (Lab)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	4	--	--	--	4	Theory	40	60	100
Hours	4	--	--	--	4	Practical	--	--	--
Pre-requisites: Students should have basic knowledge of Plant Sciences in Undergraduate									
Learning Outcome: The course will help the student to understand Plant biotechnology and its Applications.									
Theory syllabus									
Unit	Content								Hrs
1	<ul style="list-style-type: none"> - Basic concept of conventional plant breeding, Tissue culture, Scope and Importance of plant tissue culture. - Different types of Media composition and concept of optimal media, hormones and growth regulators. - Explants for organogenesis, Somaclonal variation and cell line selection, production of haploid plants and homozygous cell lines. - Micro propagation, somatic embryogenesis, protoplast culture and somatic hybridization and Meristem culture. - Selection and maintainance of cell lines, cryopreservation, germplasm collection and conservation. 								15
2	<ul style="list-style-type: none"> - Plant transformation techniques: Mechanism of DNA transfer – Agro bacterium mediated gene transfer, Ti and Ri plasmids as vectors, role of virulence genes; design of expression vectors; 35S promoter, genetic markers, reporter genes; viral vectors. 								15
3	<ul style="list-style-type: none"> - Direct gene transfer methods-particle bombardment, electroporation and microinjection. Binary vectors, plasmid vectors-pBluescript IIKs, pBin19, pGreen vectors, Transgene stability and gene silencing. - Metabolic engineering of plants: Plant cell culture for the production of useful chemicals and secondary metabolites (Hairy root culture, Biotransformation, Elicitation) - pigments, flavanoids, alkaloids; mechanism and manipulation of shikimate pathway. 								15
4	<ul style="list-style-type: none"> - Production of Industrial enzymes, biodegradable plastics, therapeutic proteins, edible vaccines and antibiotics using transgenic technology and molecular farming. - GM Technology: Crop improvement, productivity, performance and fortification of agricultural products: BT cotton and Golden rice. - Stratagies for stress tolerance in plant, Development of stress resistance in plants : Biotic and Abiotic stress. RNAi and antisense RNA technology for extending shelf life of fruits and flowers (ACC synthase gene and 								15

	<p>polygalacturonase); delay of softening and ripening of flesh fruits. Post-harvest protection of cereals, millets and pulses.</p> <ul style="list-style-type: none"> - Current status of transgenic plants in India and other countries, Ethical issues associated with GM crops and GM food; labeling of GM plants and products. - Importance of integrated pest management and terminator gene technology. 	
Reference Books		
1	J. Hammond et al. Springer Verlag. Plant Biotechnology	
2	T.J. Fu, G.Singh et al. Plant cell and tissue culture for production of food ingredients	
3	H.S. Chawla Biotechnology in crop improvement	
4	R.J. Henry, Chapman & Hall. Practical application of plant molecular biology	
5	P.K. Gupta ,Elements of biotechnology	
6	M.K. Razdan An Introduction to plant tissue culture	
7	M.M. Yeoman Plant cell culture technology	
8	W. Bary et al. Springer, Plant tissue culture and its biotechnology applications	
9	S. H. Mantell et al. Principles of plant biotechnology : An introduction to genetic engineering in plants	

GANPAT UNIVERSITY										
FACULTY OF SCIENCE										
Programme	Master of Science					Branch/Spec.	Biotechnology			
Semester	IV					Version	2.0.0.0			
Effective from Academic Year			2018-19			Effective for the batch Admitted in			July-2018	
Subject code	MBIT4ABT		Subject Name			Animal Biotechnology				
Teaching scheme					Examination scheme (Marks)					
(Per week)	Lecture(DT)		Practical(Lab)		Total		CE	SEE	Total	
	L	TU	P	TW						
Credit	04	--	--	--	04	Theory	40	60	100	
Hours	04	--	--	--	04	Practical	--	--	--	
Pre-requisites:										
Students should have basic knowledge of Animal Biotechnology up to graduation level										
Learning Outcome:										
The course will help the student to understand Animal biotechnology and its Applications.										
Theory syllabus										
Unit	Content								Hrs	
1	<ul style="list-style-type: none"> - Introduction to Animal Cell Culture: Background, Advantages, Limitations and applications. Culture Environment, Cell Adhesion, Cell Proliferation and Cell differentiation. Cell count and Population doubling time - Introduction to Biological Safety Cabinets, Essential Equipments required for animal Cell culture, Aseptic Technique, Risk Assessment and General Safety. - Media: Physicochemical Properties, Balanced Salt Solutions, Complete Media, Serum, Disadvantages of Serum supplemented media, Serum-Free Media, Advantages of Serum-Free media. - Types of cell culture: anchorage dependent and suspension cultures; Primary culture, Secondary culture, Cell lines; 3T3 Cell lines, Cell Clones, Cell Cloning techniques. 								15	
2	<ul style="list-style-type: none"> - Cell Line Characterization: based on Morphology, Chromosome Analysis, DNA, RNA and Protein Content, cell surface markers, DNA finger printing. Transformation of animal cell, Immortalization, Aberrant Growth Control, Cell counting, Plating Efficiency, Labeling Index, Generation Time of established cell line; Recent issues on research in cell lines. - Cryopreservation: Need of Cryopreservation, Preservation, Cell banks, Transporting Cells. - Cytotoxicity: Measurement of Cytotoxicity: cell Viability; Cell Proliferation Assays; Metabolic Cytotoxicity Assays; Microtitration and Clonogenic Survival; Drug Interaction; Apoptosis and its determination; Necrosis; Difference between apoptosis and necrosis. 								15	
3	<ul style="list-style-type: none"> - Transgenic animals: Introducing gene in to animal cells; Transferring genes into animal oocytes, eggs, embryonic and specific animal Cells; In vitro fertilization; embryo transfer; Embryo splitting, Nuclear splitting, transgenic mice, transgenic cattle; transgenic sheep, Goats and pigs; transgenic birds, Transgenic Fishes, Scaling up of animal cells and Large scale culture of animal cells and applications:(Insulin, growth hormone, interferon, tissue plasminogen activator, factor VIII, production of vaccines and monoclonal antibodies. 								15	
4	<ul style="list-style-type: none"> - Introduction to Stem Cells – Definition, Classification, characteristics, 								15	

	<p>Differentiation, dedifferentiation and redifferentiation, Stem cell niche, stem cell Vs Somatic cells; Mechanism of pluripotency in stem cells.</p> <ul style="list-style-type: none"> - Basic culture procedures: Isolation, culture methods, identification, stem cell markers, feeder layer; Different kinds of stem cells – Adult Stem cells, Embryonic stem cells, Embryonic Germ cells, Hematopoietic stem cell, Neural stem cells, muscle and cardiac stem cells, Umbilical cord blood stem cells, cancer stem cells, Mesenchymal stem cells, Induced pluripotent Stem cells. - Therapeutic applications: stem cells and neurodegenerative disorders, stem cells and diabetes, stem cells and cardiac disorders, regeneration of epidermis, Success stories of stem cell therapy. Stem cell banking and ethical approaches on stem cells. 	
--	---	--

Reference Books	
1	L A Babink And J P Phillips Pergamon Press Oxford ,Animal Biotechnology(1989)
2	K A Ward J S F Barrer K Hammond And A E McClintock Academic Press (1992) Future Developments In The Genetic Improvements Of Animals
3	J W Evans And A Hollaender Genetic Engineering Of Animals Vol. 37
4	A Puhler (1993) VCH Publishers, Weinheim Genetic Engineering Of Animals
5	M.Butler,Animal cell culture
6	R.IanFreshney,Culture of Animal Cells
7	R.C.Dubey, Text book of Biotechnology
8	John R. W. Masters, Animal Cell Culture, 3 rd addition

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme	Master of Science				Branch/Spec.	Biotechnology			
Semester	IV				Version	2.0.0.0			
Effective from Academic Year		2018-2019			Effective for the batch Admitted in			July-2018	
Subject code	MBIT4ABS		Subject Name		Advanced topics in Biological Science				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	04	--	--	--	04	Theory	40	60	100
Hours	04	--	--	--	04	Practical	--	--	--
Pre-requisites:									
Students should have basic knowledge of Biological sciences up to graduation level									
Learning Outcome:									
The course will help the student to understand recent topics in Biological sciences and its application.									
Theory syllabus									
Unit	Content								Hrs
1	<ul style="list-style-type: none"> - Nanobiotechnology: Introduction, types, applications, nanobiosensors, drug and gene delivery, risk potential of nanomolecules. - Protein folding, Genome Mapping-Physical and genetic mapping. - Biotechnology of silk worms and Honey bee; Biotechnology of aquaculture. - Synthetic Seed technology 								15
2	<ul style="list-style-type: none"> - Human gene therapy: Viral and nonviral gene delivery system; oligonucleotides as a correction of genetic condition. - Medical virology: Morphology, classification, properties and cultivation of plant and animal viruses, HIV and Oncogenic virus, Pathogenicity and Laboratory diagnosis of Viruses. - Medical Parasitology: Morphology, distribution, classification, Lifecycle,pathogen icity and research application of some protozoans. 								15
3	<ul style="list-style-type: none"> - Nutritional and therapeutic importance of fermented food, Study of fermented foods: Isolation and identification of microbes from yogurt and fermented food. Role of yeast in fermented food. - Production, antimicrobial effect and nutritional value of probiotics and prebiotic, yoghurt.Quality testing for milk and milk products - Food, Milk and sanitation: Good Hygiene Practices, Sanitation in manufacture and retail trade; food control agencies and their regulation, hazard analysis and critical control points (HACCP); GMP, plant sanitation – employees’ health standard, waste treatment, disposal, and quality control. Recent trends and development in food technologies in India. 								15
4	<ul style="list-style-type: none"> - Introduction to Intellectual Property Types of IP: Patents, Trademarks, Copyright & Related Rights, Industrial Design, Traditional Knowledge, Geographical Indications, Protection of New GMOs. - International framework for the protection of IP IP as a factor in R&D; IPs of relevance to Biotechnology and few Case Studies; Introduction to History of GATT, WTO, WIPO and TRIPS Basics of Patents Types of patents; Indian Patent Act 1970; Recent Amendments; Filing of a patent application; Precautions before patenting-disclosure/non- 								15

	disclosure; WIPO Treaties; Budapest Treaty; PCT and Implications; Role of a Country Patent Office; Procedure for filing a PCT application	
Reference Books		
1	Smith D.W. Biocomputing Informatics and the Genome Projects (1st Ed.) Academic Press.USA.1993.	
2	Dubitzky W et al. Fundamentals of data mining in genomics and proteomics (1 st Ed.) Springer publishers.USA.2007	
3	Richard Twyman, Principles of Proteomics (1 st Ed.).Wiley-Blackwell publishers.UK.2004	
4	David M. Knipe and HowleyM.Peter,Field Virology, Williams & Wilkins publishers,4 th edition(2001)	
5	Christof M. Niemeyer and Chad A. Mirkin, NanobiotechnologyConcepts,Application and perspectives,wiley –VCH Verlag GmbH &Co.KGaA Publishers,2 nd edition(2004)	
6	T V R Pillat (1990) Aquaculture: Principles And Practise	