

GANPAT UNIVERSITY

Faculty of Science

Teaching Scheme, Examination Scheme

&

Syllabus

M.Sc. Botany

Semester I

(Effective from July 2018)

GANPAT UNIVERSITY

FACULTY OF SCIENCE

TEACHING AND EXAMINATION SCHEME

Programme	Master of Science	Branch/Spec.	Botany																
Semester	I																		
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	TU	Total	P	T W	Total	L	TU	Total	P	TW	Total						
MMBT1BCH	Biochemistry	4	--	4	--	--	--	4	--	4	--	--	--	40	60	100	--	--	--
MBOT1BEB	Basic experimental skill in Biological Science	4	--	4	--	--	--	4	--	4	--	--	--	40	60	100	--	--	--
MMBT1CBG	Cell Biology and Genetics	4	--	4	--	--	--	4	--	4	--	--	--	40	60	100	--	--	--
MMBT1MDP	Bacteriology, Phycology, Mycology And Plant Pathology	4	--	4	--	--	--	4	--	4	--	--	--	40	60	100	--	--	--
MMBT1BRM	Biostatistics and Research Methodology	2	--	2	--	--	--	2	--	2	--	--	--	40	60	100	--	--	--
MMBT1DEB	OR Developmental Biology																		
MMBT1PRA	Practical Module I	--	--	--	6	--	6	--	--	--	12	--	12	--	--	--	--	200	200
Total		18	--	18	6	--	6	18	--	18	12	--	12	200	300	500	--	200	200

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme	Master of Science	Branch/Spec.	Botany						
Semester	I	Version	1.0.0.0						
Effective from Academic Year	2018-2019	Effective for the batch Admitted in	July 2018						
Subject code	MMBT1BCH	Subject Name	Biochemistry						
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: Nil

Learning Outcome: The course will help the student to understand the concept of Biomolecules and its metabolism.

Theory syllabus

Unit	Content	Hrs
1	Carbohydrates: <ul style="list-style-type: none"> - Structure, properties, classification and functions of carbohydrates. - Metabolism of carbohydrates under aerobic, anaerobic and fermentative conditions by different modes; Anaplerotic pathway. - Regulation of Carbohydrate Metabolism. 	15
2	Lipids and Nucleotides: <ul style="list-style-type: none"> - Structure and Chemistry of Lipids. - Biosynthesis and Degradation. - Metabolism of Purine and pyrimidine nucleotides. 	15
3	Amino acids: <ul style="list-style-type: none"> - Classification. - Metabolism of amino acids. - Biosynthesis: Aspartate family, aromatic family, branched chain amino acids, pyruvate family. - Regulation of amino acid biosynthesis. 	15
4	Protein Structure and properties: <ul style="list-style-type: none"> - Peptides and covalent structure of proteins, Elucidation of primary and higher order structures, Evolution of protein structure. - Structure-function relationships in proteins like Membrane protein, nuclear protein and cytoplasmic protein etc. - Tools to characterize expressed proteins. 	15

Reference Books

1	D. Voet and J. G. Voet, Biochemistry, 3 rd edition, John Wiley, New York, 2004.
2	Nelson and Cox, Lehninger - Principles of Biochemistry, 6 th edition, W.H Freeman and Company, 2013.
3	L. Stryer, Biochemistry, 5 th edition, W.H. Freeman and Company, 2002.

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme	Master of Science				Branch/Spec.	Botany			
Semester	I				Version	1.0.0.0			
Effective from Academic Year		2018-19			Effective for the batch Admitted in			July 2018	
Subject code	MBOT1BEB		Subject Name		Basic Experimental Skills in Biological Science				
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: Nil									
Learning Outcome:									
The course will help the students to basic knowledge and application of analytical techniques in life science as well as pharmaceutical sciences.									
Theory syllabus									
Unit	Content								Hrs
1	Basic Techniques: - pH and buffers; Potentiometric and conductometric titration; Ultra filtration and other membrane based filtration techniques; - Microscopy techniques: Phase contrast, fluorescence, confocal and atomic force microscopy, Scanned electron microscopy and Transmission electron microscopy. - Advance techniques in plant : Estimation of chlorophyll, Leaf canopin								20
2	-Centrifugation: Basic principles and applications, Mathematics & theory (RCF, Sedimentation coefficient etc.), Types of centrifuges, Preparative and analytical centrifugation. - Chromatography Techniques: Basic principles and applications, Column, TLC and Paper chromatography, Gel permeation, Ion exchange, Hydrophobic, Reverse-phase and Affinity chromatography, GC, HPLC, HPTLC, GCMS and LCMS. - Electrophoretic techniques: Basic Principles and applications of SDS Polyacrylamide and Agarose gel electrophoresis; Type of electrophoresis: Capillary electrophoresis, 2D Gel Electrophoresis, Pulsed field gel electrophoresis, DGGE and TGGE.								20
3	Advanced techniques: - Basic Principles and applications of - Nucleic acid hybridization techniques; Southern, Northern and Western blotting technique. - Polymerase chain reaction - Biosensors: Types and applications of biosensors.								10
4	Radioactivity: - Basic Principles and applications of tracer technique in biology; Radiation dosimetry; Radioactive isotopes and half-life of isotopes. - Effect of radiation on biological system; Auto radiography; Cerenkov radiation; liquid scintillation counter.								10
Reference Books									
1	Keith Wilson and John Walker, Principles and Techniques of Practical Biochemistry, 5 th Edition, Cambridge, University Press, 2000.								
2	Upadhyay & Nath, Biophysical Chemistry. 4 th edition, Himalaya Publishing House, 2016.								
3	Chatwal and Anand, Instrumental Methods of Chemical Analysis. HPH, 2011.								

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme	Master of Science				Branch/Spec.	Botany			
Semester	I				Version	1.0.0.0			
Effective from Academic Year		2018-19			Effective for the batch Admitted in			July 2018	
Subject code	MMBT1CBG	Subject Name			Cell biology and genetics				
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:									
Nil									
Learning Outcome:									
The course will help the student to understand structural and functional features of the cell, its organelles, cell cycle and signaling. It also includes Mendelian genetics and principles of inheritance.									
Theory syllabus									
Unit	Content								Hrs
1	<ul style="list-style-type: none"> - Origin and evolution of cells: Cell theory, Evolution of first cell and metabolism, Origin of eukaryotes and development of multicellular organisms. - Nucleus: Nuclear envelope and internal organization of the nucleus, Traffic between nucleus and cytoplasm - Protein sorting and transport: Role and organization of Endoplasmic reticulum and Golgi apparatus, Vesicular transport of protein; Lysosomes. 								15
2	<ul style="list-style-type: none"> - Bioenergetics and Metabolism in Mitochondria, Chloroplasts and Peroxisomes: Cytoskeleton Structure and organization of actin filaments, Role of actin and myosin in cell movement, Intermediate filaments and Microtubules. - Extracellular matrix: Extracellular matrix, Cell-matrix interactions, Cell-cell interactions. 								15
3	<ul style="list-style-type: none"> - Biological membranes: Structure of membranes and transport across the membrane; Endocytosis. - Cell cycle: Cell cycle and regulators of cell cycle progression, Mitosis and meiosis. - Cell signaling: Signaling molecules, Cell surface receptors, Intracellular signal transduction. - Programmed cell death. 								10
4	<ul style="list-style-type: none"> - Overview of genetics: Molecular expression of genes, Relationship between genes and traits. - Mendelian inheritance: Mendel's study of pea plants; Law of Independent assortment, Chromosome theory of inheritance; Studying inheritance patterns in humans. - Sex determination: Mechanism of sex determination, Dosage compensation, Properties of X and Y chromosomes in mammals and Transmission patterns for X-linked genes; Genetic linkage and mapping in eukaryotes. 								20
Reference Books									
1	Cooper and Hausman, The cell - A molecular approach. 3 rd edition, ASM Press, 2004.								
2	Alberts <i>et al.</i> , Molecular Biology of the Cell, 4 th edition, Garland, 2002.								
3	Karp <i>et al.</i> , Cell and molecular biology. 8 th edition, Wiley, 2016.								
4	Brooker Robert, Concepts of genetics. 2 nd edition, McGraw-Hill, 2015								
5	Pierce Benjamin, Genetics - A conceptual approach. 5 th edition, WH Freeman, 2013.								

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme		Master of Science				Branch/Spec.		Botany	
Semester		I				Version		1.0.0.0	
Effective from Academic Year			2018-2019			Effective for the batch Admitted in			July 2018
Subject code		MBOT1BPP		Subject Name		Bacteriology, Phycology, Mycology And Plant Pathology (BPP)			
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:									
Learning Outcome:									
The course will help the student to understand structural and functional features of Bacterial cell, Plant cell and fungal cell.									
Theory syllabus									
Unit	Content								Hrs
1	Bacteriology General characters and classification of Bacteria Structure of Bacterial cell. Nutrition and reproduction in Bacteria. Economic importance of Bacteria.								15
2	Phycology General characters, types and classification of different divisions (classes) of Algae: Cyanophyta, Chlorophyta, Charophyta, Phaeophyta, Sargars, fiscus, oeiogonnicae, Ulothix, Rhodophyta, Polysiphomia, Chlamydomonas, Thallus organization (Range of thallus) and reproduction in Algae. Life cycle patterns in Algae. Economic importance of Algae.								15
3	Mycology General characters and classification of different divisions (classes) of Fungi: Phycomycetes, Aspergillus, Penicillium, Claricegras, Ascomycetes, Basidiomycetes, Agaricus, and Deuteromycetes, Alternaria, Cererogora Nutrition in Fungi. Reproduction in Fungi and Heterothallism. Economic importance of Fungi: food and fodder, industry, medicine								15
4	Plant Pathology Introduction, general symptoms and classification of plant diseases. Diseases of plant: Symptoms and types. Defense mechanisms Symptoms, causal organism, disease cycle and control measures of following diseases: <ul style="list-style-type: none"> • Citrus canker • Bacterial blight of Paddy • Downy mildew • Rusts and Smuts 								15
Reference Books									
1	Pelczar M J, Chan E C S and Krieg N R (2004) Microbiology, Tata McGraw-Hall Publishing Company Ltd.,								

	New Delhi (27 th Reprint Edition).
2	Dubey H C (2004), Bacteria, Viruses and Fungi, Vikas Publishing House P Ltd , New delhi.
3	Prescott, Harley and Klein, Microbiology (6th edition).
4	Hait G, Bhattacharya K and Ghosh A K (2008) A Text Book of Botany, Vol-I, New Central Book Agency (P) Ltd., Kolkata (1st Edition's Reprint).
5	Singh V, Pande P C and Jain D K (2008-09) A Text Book of Botany, Rastogi Publications, Meerut (4th Revised Edition's Reprint).
6	Sharma P D (2003) The Fungi, Rastogi Publications, Meerut (2nd Edition's Reprint).
7	Vashishta B R and Sinha A K (2007) Botany for Degree Students –Fungi, S Chand & Company Ltd., New Delhi (1st Edition's Revised and Multicolour-Reprint).
8	Dubey H.C. (2005), An Introduction to Fungi, (3rd edition), Vikas Publishing House P. Ltd.,New Delhi
9	Alexopoulos C.J., Mims C W and Blackwell M (2002)Introductory Mycology (3rd edition), John Wiley & Sons, New York.
10	Pandey B P (2006) Plant Pathology-Pathogen and Plant Diseases, S Chand & Co. Ltd., New Delhi (1st Edition's Reprint).
11	Mehrotra R S (1991) Plant Pathology, Tata McGraw-Hill Publishing Co. Pvt. Ltd., New Delhi (8th Edition's Reprint).
12	Sharma P D (2003) Microbiology and Plant Pathology, Rastogi Publications, Meerut (2nd Edition's Reprint
13	Agrios George N (2004) Plant Pathology, Academic Press, Reed Elsevier India Pvt. Ltd., New Delhi (4th Edition/ 1st Indian Edition's Reprint).

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme		Master of Science				Branch/ Spec.		Botany	
Semester		I				Version		1.0.0.0	
Effective from Academic Year				2018-19		Effective for the batch Admitted in			July 2018
Subject code		MMBT1BRM		Subject Name		Biostatistics and Research Methodology			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	2	--	--	--	2	Theory	40	60	100
Hours	2	--	--	--	2	Practical	--	--	--
Pre-requisites:									
Nil									
Learning Outcome:									
The course will help the student to understand Application of research and statistics in biological sciences.									
Theory syllabus									
Unit	Content								Hrs
1	Introduction to Biostatistics: <ul style="list-style-type: none"> - Descriptive and interference statistics; Sample design and various methods of data collection and analysis. Scope and importance of biostatistics. - Measurement of central tendency; Standard deviation; Hypothetical and non hypothetical testing: standard error and significance; Parametric and non parametric test: Chi-square test for independence; P-value of the statistic; Confidence limits, Probability :Normal, Binomial and Poisson, Probability distribution - Regression and correlation analysis, Introduction to one way and two-way analysis of variance 								15
2	Research <ul style="list-style-type: none"> - characteristic and types of research; Research process: research and experiment design - How to writing research paper, review paper, thesis writing; reference writing and abbreviation, Different funding agency for research grant and how to write research project for various funding agency. 								15
Reference Books									
1	Kothari C.R, "Research Methodology: Methods & Techniques". 2 nd Revised Edition, New Age International Publishers, New Delhi, 2009.								
2	Veer Bala Rastogi Fundamentals of Biostatistics, 2 nd Edition, VB Publisher, 2009.								
3	Day R. A., How to write ad publish a scientific papers. 5 th Edition, ORYX press, 1998.								
4	Arora <i>et al.</i> , Comprehensive Statistical Methods. 2 nd Edition, S. Chand, 2007.								
	Wayne Daniel, Biostatistics: A foundation for Analysis in the Health Sciences, 8 th Edition, Wiley, 2004.								

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	Master of Science					Branch/Spec.	Botany		
Semester	I					Version	1.0.0.0		
Effective from Academic Year			2018-19			Effective for the batch Admitted in		July 2018	
Subject code	MMBT1DEB		Subject Name			Developmental Biology			
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture (DT)		Practical (Lab)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	2	--	--	--	2	Theory	40	60	100
Hours	2	--	--	--	2	Practical	--	--	--
Pre-requisites:									
Nil									
Learning Outcome:									
The course will help the student to understand mechanism and physiology of animals									
Theory syllabus									
Unit	Content								Hrs
1	Basic concept of Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; transition to flowering, floral meristems and floral development								15
2	Production of gametes, cell surface molecules in sperm-egg recognition in animals; embryo sac development and double fertilization in plants; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; embryogenesis, establishment of symmetry in plants; seed formation and germination.								15
Reference Books									
1	Tortora Gerald, Principles of Anatomy and Physiology. Wiley, 2011.								
2	Raven Peter <i>et al.</i> , Biology. 6 th Edition, McGraw Hill, 2007.								

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme	Master of Science				Branch/Spec.	Botany			
Semester	I				Version	1.0.0.0			
Effective from Academic Year		2018-2019			Effective for the batch Admitted in		July 2018		
Subject code	MBOT1PRA		Subject Name		Practical Module I				
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	Use of various instruments in Botany Laboratory.								
2	Estimation of carbohydrates.								
3	Estimation of proteins.								
4	Estimation of and lipids.								
5	Chromatography: carbohydrate, amino acid								
6	Determination of Vmax and Km value of Enzyme								
7	Enzyme Assay: Amylase/Peroxidase								
8	Isolation of Mitochondria								
9	Isolation of Chloroplast								
10	Staining techniques <ul style="list-style-type: none"> • Simple staining • Special staining Bacterial mobility								
11	Study of following Fungi <ul style="list-style-type: none"> • Saprolegnia, Phytophthora, Peziza, Penicillium, Ustilago, Lycoperdon, Cercospora, Fusarium, • Smut of Sugarcane 								
12	Study of following algae Scytonema, Microcystis, Anabaena, Ulva, Coleochaete, Pithophora, Chara, Nitella, Laminaria, Fucus, Ceramium, Polysiphonia								
13	Study of following plant diseases <ul style="list-style-type: none"> • Citrus canker • Bacterial blight of Paddy • Downy mildew of Grapes • Rust of Wheat Smut of Barley								
17	Statistical analysis of data, S.D., significance test of the results obtained in each experiments.								
18	Hypothesis testing : T- test, F- test, Chi-square test								

GANPAT UNIVERSITY

Faculty of Science

Teaching Scheme, Examination Scheme

&

Syllabus

M.Sc. Botany

Semester II

(Effective from July 2018)

GANPAT UNIVERSITY																			
FACULTY OF SCIENCE																			
TEACHING AND EXAMINATION SCHEME																			
Programme	Master of Science				Branch/Spec.	Botany													
Semester	II																		
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	TW	Total						
MBOT2BPG	Bryophytes, Pteridophytes, Gymnosperms And Fossils	4	--	4	--	--	--	4	--	4	--	--	--	40	60	100	--	--	--
MMBT2MOB	Molecular Biology	4	--	4	--	--	--	4	--	4	--	--	--	40	60	100	--	--	--
MBOT2ATR	Angiosperm Taxonomy And Plant Reproduction	4	--	4	--	--	--	4	--	4	--	--	--	40	60	100	--	--	--
MBOT2PAE	Plant Anatomy And Ecology (PAE)	4	--	4	--	--	--	4	--	4	--	--	--	40	60	100	--	--	--
MMBT2BNF MMBT2ECO	Bioinformatics OR Ecology	2	--	2	--	--	--	2	--	2	--	--	--	40	60	100	--	--	--
MBOT2PRA	Practical module II	--	--	--	6	--	6	--	--	--	12	--	12	--	--	--	--	200	200
Total		18	--	18	6	--	6	18	--	18	12	--	12	200	300	500	--	200	200

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	Master of Science				Branch/Spec.	Botany			
Semester	II				Version	1.0.0.0			
Effective from Academic Year			2017-18		Effective for the batch Admitted in			July 2018	
Subject code	MBOT2BPG		Subject Name		Bryophytes, Pteridophytes, Gymnosperms And Fossils				
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									
Learning Outcome: The course will help the student to understand the concept of									
The course will help the student to understand General characters and classification of Bryophytes, Pteridophytes, Gymnosperms, and fossils.									
Theory syllabus									
Unit	Content								Hrs
1	Bryophytes: <ul style="list-style-type: none"> - General characters and classification (Rothmaler and Proskaeur) of Bryophytes. - Study of gametophytes and sporophytes of following groups: Hepaticopsida, Anthocerotopsida and Bryopsida, Plagiocharma, Pellia, Porella. - Anthreros-Notothyhs, Sphagram, Polytrichas - Evolution of sporophytes in Bryophytes. - Economic importance of Bryophytes. 								15
2	Pteridophytes: <ul style="list-style-type: none"> - General characters and classification of Pteridophytes. - Telome theory (evolution of sporophytes), Types of Stele and Stelar evolution. - Soral evolution in ferns, Heterospory and seed habit. - Study of gametophytes and sporophytes of: Psilotales, Lycopodiales, Osmurcda, pteriscaum and Filicales. 								15
3	Gymnosperms: <ul style="list-style-type: none"> - General characters and classification (Bierhorst) of Gymnosperms. - Comparative account of: Cycadales, Coniferels, Ephadrales, Gnetales, Ginkgoales, Zamra, Cypresem, Thuja Podocarpus, Araucana, Ephatra, Gnetuan. - Structure and evolution of male and female gametophytes of Gymnosperms. - Geological rise and fall of Gymnosperms. 								15
4	Fossils: <ul style="list-style-type: none"> - Nomenclature of Fossils. - Geological Time-scale, Fossilization. - Detailed study of following fossils: Rhynia, Asteroxylon, Protolpidodendron. - General account of following fossils: Bennettiales, Pentoxylales, Cordaitales. 								15
Reference Books									
1	Singh V, Pande P C and Jain D K (2008-09) A Text Book of Botany, Rastogi Publications, Meerut (4 th Revised Edition's Reprint).								
2	Vashishta B R and Sinha A K (2007) Botany for Degree Students –Bryophyta, S Chand & Company Ltd., New Delhi (1 st Edition's Revised and Multicolour-Reprint).								
3	A V S S Sambamurty (2005), A text book of Bryophytes, Pteridophytes, Gymnosperms and								

	Paleobotany, Parihar N.S., Pteridophyta
4	Singh V, Pande P C and Jain D K (2008-09) A Text Book of Botany, Rastogi Publications, Meerut (4 th Revised Edition's Reprint).
5	Vashishta B R and Sinha A K (2007) Botany for Degree Students –Pteridophyta, S Chand & Company Ltd., New Delhi (1 st Edition's Revised and Multicolour-Reprint).
6	Hait G, Bhattacharya K and Ghosh A K (2008) A Text Book of Botany, Vol-I, New Central Book Agency (P) Ltd., Kolkata (1 st Edition's Reprint).
7	Biswas C and Johri B M (2004) The Gymnosperms, Narosa Publishing House, New Delhi (2 nd Reprint Edition).
8	Vasishta P C (2005) Botany for Degree Students Gymnosperms, S Chand & Company Ltd., New Delhi (1 st Edition's Reprint)
9	Pandey B P (2003) College Botany –Vol.-II, S Chand & Company Ltd., New Delhi (1 st Edition's Reprint)
10	Pandey S N, Misra S P and Trivedi P S (2003) A Text Book of Botany –Vol.-II, Vikas Publishing House Pvt Ltd., New Delhi (11 th Revised Edition's Reprint).
11	Singh V, Pande P C and Jain D K (2008-09) A Text Book of Botany, Rastogi Publications, Meerut (4 th Revised Edition's Reprint).
12	Pandey B P (2003) Simplified Course in Botany –B Sc-II, S Chand & Company Ltd., New Delhi (1 st Edition's Reprint)
13	Bhatnagar S P and Moitra Alok (2006) Gymnosperms,, New Age International (P) Ltd, Publishers, New Delhi (1 st Edition's Reprint)
14	Hait G, Bhattacharya K and Ghosh A K (2008) A Text Book of Botany, Vol-I, New Central Book Agency (P) Ltd., Kolkata (1 st Edition's Reprint).
15	Biswas C and Johri B M (2004) The Gymnosperms, Narosa Publishing House, New Delhi (2 nd Reprint Edition).
16	Vasishta P C (2005) Botany for Degree Students Gymnosperms, S Chand & Company Ltd., New Delhi (1 st Edition's Reprint)

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme	Master of Science	Branch/Spec.	Botany	
Semester	II	Version	1.0.0.0	
Effective from Academic Year	2018-19	Effective for the batch Admitted in	July-2018	
Subject code	MMBT2MOB	Subject Name	Molecular biology	
Teaching scheme	Examination scheme (Marks)			
(Per week)	Lecture(DT)	Practical(Lab)	Total	
	L	TU	P	TW
Credit	04	--	--	--
Hours	04	--	--	--
			04	04
			Theory	40
			Practical	60
				100
				--

Pre-requisites:

Nil

Learning Outcome:

The course will help the student to understand structural and functional aspects of DNA, DNA replication, transcription, translation, genetic expression and regulation of gene expression.

Theory syllabus

Unit	Content	Hrs
1	<ul style="list-style-type: none"> - Chemical, physical and structural properties of DNA: Structural features of DNA, Forms of DNA, Types of base pairing, Ultraviolet absorption spectra of DNA, Denaturation and renaturation, Cot curves, Chemicals that react with DNA. - DNA topology: Supercoiling, Linking number, Function of topoisomerases. - DNA-protein Interactions: General considerations on protein binding, Specific DNA-protein interactions (Interaction of DNA with different motifs - HTH, HLH, leucine zipper and zinc finger). 	15
2	<ul style="list-style-type: none"> - Organization of DNA into chromosomes: Packaging of DNA in bacterial cells, Role of Hu protein in supercoiling, Structure of nucleosome, Higher order chromatin structure and its regulation, Assembly of nucleosomes after DNA replication. - DNA replication: The chemistry of DNA synthesis, Mechanism and specialization of DNA polymerase, The replication fork and DNA synthesis, Initiation of DNA replication, Mechanism of origin selection and activation by initiator protein, Role of different enzymes in finishing DNA replication. 	10
3	<ul style="list-style-type: none"> - Transcription: Role of RNA polymerase, Transcription in bacteria, Transcription in eukaryotes, Transcription by RNA polymerases I and III. - RNA splicing: Chemistry of RNA splicing, Spliceosome, Splicing pathways and variants of splicing, Alternative splicing, Exon shuffling, RNA editing and mRNA transport. - Translation: Genetic code, mRNA, tRNA and attachment of amino acids to tRNA, Ribosome, Initiation-elongation-termination-regulation of translation, Translation dependent regulation of mRNA and protein stability. 	15
4	<ul style="list-style-type: none"> - Regulation of gene expression in prokaryotes. - Principle of transcriptional regulation; Regulation of Lac, Ara, His and Trp operon. - Regulation of gene expression in eukaryotes: Mechanisms of transcriptional regulation, Role of eukaryotic activators and repressors, Gene silencing, RNAi. - Global regulation: Regulons and stimulons. - DNA Damage and Repair: Types of Mutations and Various repair mechanisms 	20

Reference Books

1	Richard Sinden, DNA structure and function. 1 st Edition, Academic Press, 2012.
2	Snyder <i>et al.</i> , Molecular genetics of bacteria, 4 th Edition, ASM, 2013.
3	Alberts <i>et al.</i> , Molecular Biology of the Cell, 4 th Edition, Garland, 2002.

4	Lodish <i>et al.</i> , Molecular cell Biology, 4 th Edition, W.H. Freeman & Company, 2000.
5	Smith & Wood, Cell Biology. 2 nd Edition, Chapman & Hall, London, 1996.
6	Watson <i>et al.</i> , Molecular Biology of the gene, 5 th Edition, Pearson Prentice Hall, USA, 2003.
7	B. M. Turner, Chromatin & Gene regulation. 1 st Edition, Wiley-Blackwell, 2002.

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme	Master of Science				Branch/Spec.	Botany			
Semester	II				Version	1.0.0.0			
Effective from Academic Year		2018-2019			Effective for the batch Admitted in			July-2018	
Subject code	MBOT2ATR		Subject Name		Angiosperm Taxonomy and Plant Reproduction				
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: Nil									
Learning Outcome:									
The course will help the student to understand various Taxonomy of Plant families and its reproduction.									
Theory syllabus									
Unit	Content								Hrs
1	Taxonomy: <ul style="list-style-type: none"> - Salient features of the International Code of Botanical Nomenclature. - Taxonomic evidence: morphology, anatomy, palynology, embryology, cytology. - Taxonomic tools: Herbarium; floras; histological, cytological, phytochemical, serological, biochemical and molecular techniques; computers and GIS. - Systems of angiosperm classification: Phenetic versus phylogenetic systems; cladistics in Taxonomy; relative merits and demerits of major systems of classification: Takhtajan, Bassaey, Hutchinson. 								15
2	Families: <ul style="list-style-type: none"> - Taxonomical studies of the following families with references to their geographical distribution, systematic position, floral variations and economic importance. <ul style="list-style-type: none"> • DICOTYLEDONS: <ul style="list-style-type: none"> - Polypetalae: Menispermaceae, Capparaceae, Sterculiaceae, Rutaceae, Meliaceae. - Gamopetalae: Oleaceae, Convolvulaceae, Salvadoraceae, Lamiaceae. - Apetalae: Chenopodiaceae, Euphorbiaceae. • MONOCOTYLEDONS: Commelinacead, Typhaceae, Cyperaceae, Poaceae. 								15
3	Plant Reproduction: <ul style="list-style-type: none"> - Microsporangium: Anther wall, Sporogenous tissue, Microsporogenesis - Male gametophyte-morphology: Introduction, pollen wall features, Scope of Palynology, preparation of pollen grains, - Megasporangium: Types of ovules, integuments, megasporogenesis - Male gametophyte-development: Formation of vegetative and generative cells, pollen wall. 								15
4	Plant Reproduction: <ul style="list-style-type: none"> - Female gametophyte: General, types of embryo sacs, Mature embryo sac, Haustorial behaviour of embryo sac, nutrition of embryo sac - Fertilization: pollen germination, pollen tube growth and guidance, in-vitro pollen germination, pollen viability test, double fertilization. - Endosperm development during early, maturation and desiccation stages 								15

	- Embryogenesis, ultra structure and nuclear cytology, polyembryony.	
Reference Books		
1	Singh V and Jain D K (1999) Taxonomy of Angiosperms, Rastogi Publications, Meerut (2 nd Edition's Reprint).	
2	Sambamurty A V S S (2005) Taxonomy of Angiosperms, I K International P Ltd, New Delhi (1 st Edition)	
3	Pandey B P (2004) A Text Book of Botany: Angiosperms, S Chand & Company Ltd., New Delhi (1 st Edition's Reprint)	
4	Reddy S M, Madhusudana Rao M, Reddy S A, Reddy M M and Chary J S (2004) University Botany-3, New Age International (P) Ltd, Publishers, New Delhi (1 st Edition).	
5	Subrahmanyam N S (1999) Modern Plant Taxonomy, Vikas Publishing House Pvt. Ltd., New Delhi (1 st Edition's Reprint).	
6	Lawrence G H M (1967) Taxonomy of Vascular Plants, Oxford & IBH Publishing Co.Pvt Ltd., New Delhi (1 st Indian Edition).	
7	Singh V Pande P C and Jain D K (1995) A Text Book of Botany-Angiosperms, Rastogi Publications, Meerut (1 st Edition's Reprint).	
8	Singh V and Jain D K (1999) Taxonomy of Angiosperms, Rastogi Publications, Meerut (2 nd Edition's Reprint)	
9	Reddy S M, Madhusudana Rao M, Reddy S A, Reddy M M and Chary J S (2004) University Botany-3, New Age International (P) Ltd, Publishers, New Delhi (1 st Edition).	
10	Pandey B P (2003) Simplified Course in Botany –B Sc-II, S Chand & Company Ltd., New Delhi (1 st Edition's Reprint)	
11	Bhojwani S S and Bhatnagar S P (2001) The Embryology of Angiosperms, Vikas Publishing House Pvt Ltd., New Delhi (4 th Revised Edition's Reprint).	
12	Maheshwari P (1989) An Introduction to the Embryology of Angiosperms, Tata McGraw-Hill Publishing Company Ltd., New Delhi (10 th Edition's Reprint).	

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme	Master of Science				Branch/Spec.	Botany			
Semester	II				Version	1.0.0.0			
Effective from Academic Year	2018-19				Effective for the batch Admitted in	July 2018			
Subject code	MBOT2PAE	Subject Name			Plant Anatomy And Ecology				
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: Nil									
Learning Outcome: The course will help the student to understand the concept of Plant Anatomy and Ecology.									
Theory syllabus									
Unit	Content								Hrs
1	Plant Anatomy: <ul style="list-style-type: none"> - Meristems: Classification of Meristems; Apical Meristems: Theories of Shoot Apical Meristems: Apical Cell Theory, Histogenic layer theory, Anneau initial & meristem d'attente theory. - Root Apex: Theories of Root apex organization: Apical Cell Theory, Korper-Kappe theory, Concept of quiescent centre, development of lateral roots and root hairs. - Transition of vegetative shoot apex into reproductive shoot apex. - Development of Plant Tissues: Simple and Complex tissues. - Vascular Elements: Functional Differentiation. - Wood Anatomy: Ontogeny of secondary vascular tissues, Growth rings, Heart wood & Sap wood, Porous & non-porous wood, wood parenchyma. 								15
2	Plant Anatomy: <ul style="list-style-type: none"> - Vascular Cambium: origin, structure, seasonal changes in cambium activity, cambium in wound healing and grafting, cambium in monocotyledons. - Anomalous Secondary Growth in Aristolochia stem, Mirabilis stem, Bougainvillea stem and Chenopodium stem. - Structural variability in Leaves of Helianthus, Aloe, Calotropis, Typha, Nymphaea and Maize. - Systematic Plant Anatomy: with special references to trichomes, stomata, leaf anatomy, nodal anatomy, cellular contents, wood anatomy and flower anatomy. 								15
3	Plant Ecology: <ul style="list-style-type: none"> - Physiological characters and methods of plant community - Ecosystem - Structure and Function, Types-terrestrial (forest and grass land) and aquatic (fresh water, marine and estuarine), Energy flow, Productivity. - Biogeochemical cycle (Carbon and Sulphur), Homeostasis, Optimization and Evolution. - Environmental problems- Biodiversity, Biopiracy, Eco-terrorism, Desertification and Sustainable development. - Environment pollution – Kinds, Sources, Effects on plants and ecosystem. - Conventional and Non-Conventional energy sources. 								15

4	<p>Plant Ecology:</p> <ul style="list-style-type: none"> - Phytogeography – Plant community of the world (terrestrial and aquatic biomes). - Phyto-geographical region of world (vegetation belt), Bio-geographical zones (soil, climate, flora and vegetation) of India. - Bioremediation and Environment clean up-Bioremediation, Need and Scope. - Application, Future outlook and Phyto-remediation. - Conservation - Introduction, Forest conservation (Resources and importance). - National Parks and Biosphere Reserve conservation. 	15
Reference Books		
1	Singh V, Pande P C and Jain D K (1998) Anatomy of Seed Plants, Rastogi Publications, Meerut (1 st Edition's Reprint).	
2	Pandey B P (1997) Plant Anatomy, S Chand & Co. Ltd, New Delhi. (1 st Edition's Reprint).	
3	E John Jothi Prakash (2000) A Text Book of Plant Anatomy, Emkay Publications, Delhi. (2 nd Revised Edition).	
4	Tayal M S (2001) Plant Anatomy, Rastogi Publications, Meerut (5 th Edition's Reprint).	
5	Sharma P D (2003) Ecology and Environment, Rastogi Publications, Meerut. (7 th Edition's Reprint).	
6	Agrawal K C (2001) Fundamentals of Environmental Biology, Nidhi Publishers (India), Bikaner. (1 st Edition).	
7	Subrahmanyam N S and Sambamurty A V S S (2000) Ecology, Narosa Publishing House, New Delhi. (1 st Edition).	
8	Kormondy E J (2002) Concept of Ecology, Prentice-Hall of India Pvt Ltd., New Delhi (12 th Indian Edition Reprint).	

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	Master of Science				Branch/Spec.	Botany			
Semester	II				Version	1.0.0.0			
Effective from Academic Year		2018-19			Effective for the batch Admitted in			July 2018	
Subject code	MMBT2BNF	Subject Name			Bioinformatics				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	02	--	--	--	02	Theory	40	60	100
Hours	02	--	--	--	02	Practical	--	--	--
Pre-requisites:									
Nil									
Learning Outcome:									
The course will help the student to understand Introduction and tools of Bioinformatics and its Applications.									
Theory syllabus									
Unit	Content								Hrs
1	Introduction to Bioinformatics: <ul style="list-style-type: none"> - Overview and applications of bioinformatics. - Database Concepts, public domain databases for nucleotide and protein sequences, Protein structural databases. - Sequence formats, Sequence Submission. - Protein classification and structure visualization, protein structure prediction. 								15
2	Sequence analysis and Phylogeny: <ul style="list-style-type: none"> - Needleman and Wunsch algorithm, Smith-Waterman algorithm. - Pair wise Sequence Alignment, Multiple alignments. - Tools for similarity search and sequence alignment. - Phylogenetic analysis: molecular basis of evolution, Phylogenetic trees & different methods for phylogenetic inference. 								15
Text Books									
1	S. C. Rastogi, Parag Rastogi, Namita Mendiratta, Bioinformatics Methods And Applications: Genomics Proteomics And Drug Discovery.								
2	Dr. Zhumar Ghosh and Dr. Bibekanand Mallick, Bioinformatics: Principles and Applications, Oxford Publication.								
3	Arthur M. Lesk, Introduction to Bioinformatics, Oxford publication.								
4	Westhead and Twyman, Instant notes on Bioinformatics, Viva Publication.								
5	C. Gibas and P. Jambeck, Developing Bioinformatics Computer Skill, 1 st Edition, O'Reilly, 2001.								
Reference Books									
1	David Mount, Bioinformatics: sequence and genome analysis, Cold Springer Harbour press.								
2	Jonattan Pevsner, Bioinformatics and Functional genomics, Wiley liss.								
3	Oren, Jones and Thorntor, Bioinformatics, Gene Proteins and Computers, Advance text, Bios publication.								
4	R.M. Twyman, Principles of Proteomics.								
5	D. Higgins and W. Taylor (Eds), Bioinformatics- Sequence, structure and databanks, Oxford University Press, New Delhi 2000.								
6	R. Durbin, S.R. Eddy, A. Krogh and G. Mitchison, Biological Sequence Analysis, Cambridge Univ. Press, Cambridge, UK 1998.								

7	A. Baxevanis and B.F. Ouellette, Bioinformatics: A practical Guide to the Analysis of Genes and Proteins, Wiley- Interscience, Hoboken, NJ 1998.
8	Michael S. Waterman, Introduction to computational Biology, Chapman & Hall, 1995.
9	Koonin, Eugene V, Sequence-Evolution-Function: Computational Approaches in Compatative Genomics.

GANPAT UNIVERSITY

FACULTY OF SCIENCE

Programme	Master of Science				Branch/Spec.	Botany			
Semester	II				Version	1.0.0.0			
Effective from Academic Year		2018-19			Effective for the batch Admitted in		July 2018		
Subject code	MMBT2ECO		Subject Name		Ecology				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	2	--	--	--	2	Theory	40	60	100
Hours	2	--	--	--	2	Practical	--	--	--
Pre-requisites:									
Nil									
Learning Outcome:									
The course will help the student to understand theory of evolution and concept of ecosystem									
Theory syllabus									
Unit	Content								Hrs
1	Basic introduction to Environment: <ul style="list-style-type: none"> - Physical environment; biotic environment; biotic and abiotic interactions. Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement - Characteristics of a population; population growth curves; population regulation; life history strategies (r and K selection) - Concept of metapopulation – demes and dispersal, interdemec extinctions, age structured populations. - Species Interactions: Types of interactions, interspecific competition, herbivory, carnivory, pollination, symbiosis. 								15
2	Community Ecology: <ul style="list-style-type: none"> - Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones. - Ecological Succession: Types; mechanisms; changes involved in succession; concept of climax. - Ecosystem Ecology: Ecosystem structure; ecosystem function; energy flow and mineral cycling (C, N, P); primary production and decomposition; structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, eustarine). 								15
Reference Books									
1	E. P. Odum, Fundamental of ecology. 5 th Edition, Cengage learning publication.								
2	Environmental Science, S. Chand Publication.								

GANPAT UNIVERSITY									
FACULTY OF SCIENCE									
Programme	Master of Science				Branch/Spec.	Botany			
Semester	II				Version	1.0.0.0			
Effective from Academic Year			2018-19		Effective for the batch Admitted in			July 2018	
Subject code	MBOT2PRA		Subject Name		Practical Module II				
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	Study of genera from listed families as per theory syllabus.								
2	Identify the genus and species of given plant specimen with the help of flora(s).								
3	To study the young and matured anther T.S. in-vitro pollen germination by hanging drop and suspension method.								
4	To dissect out endosperm haustoria with embryo of cucumber seed.								
5	To dissect out Embryo with suspensor and basal cell from Brassica seed.								
6	Study the poly embryo from citrus seeds.								
7	To study the vegetative/reproductive shoot apices of Hydrilla, Ceratophyllum, Grass.								
8	To study the root apices of Eichhornia, Lemna, Allium.								
9	To study the Plant Tissues from fresh material and permanent slides: Parenchyma, Aerenchyma, Chlorenchyma, Collenchyma, Sclerenchyma, Xylem, Phloem, Transfusion tissue.								
10	To study the Wood Anatomy from locally available wood specimens.								
11	To study the Anomalous Secondary Growth from Aristolochia stem, Mirabilis stem, Bougainvillea stem and Chenopodium stem.								
12	To study the Structural variability in the Leaves of Helianthus, Aloe, Calotropis, Typha, Nymphaea and Maize.								
	To study the comparative examples of Systematic Plant Anatomy with special references to trichomes, stomata, leaf anatomy, nodal anatomy, cellular contents, wood anatomy and flower anatomy.								
13	Isolation of DNA from various sources i.e. bacteria, fungi or blood etc.								
14	Preparation of competent cell and Transformation.								
15	Restriction Fragment Length Polymorphism (RFLP).								
16	Amplification of DNA by Polymerase Chain Reaction (PCR). (Demonstration)								
17	Soil analysis (Physical and Chemical characters)								
18	Water analysis (Physical and Chemical characters)								