

**KADI SARVA
VISHWAVIDYALAYA,
GANDHINAGAR**



**M.Sc. BOTANY
CBCS SYLLABUS
W.E.F. 2017**

Kadi Sarva Vishwavidyalaya, Gandhinagar
CBCS Syllabus of M.Sc. Botany

Course Structure for M.Sc. Botany

SEMESTER- 1

Sem.	Paper	Title	Hours/ week	Credits	Exam hours	Mid Term marks	External marks	Total marks
1	BCT 101	Cell and Molecular Biology	4	4	3	Max.:30 Min: 12	Max.:70 Min: 28	100
1	BCT 102	Bio- instrumentation	4	4	3	Max.:30 Min: 12	Max.:70 Min: 28	100
1	BCT 103	Genetics and Plant breeding	4	4	3	Max.:30 Min: 12	Max.:70 Min: 28	100
1	BCT 104	Plant Ecology and Phytogeography	4	4	3	Max.:30 Min: 12	Max.:70 Min: 28	100
1	BCP 105	Practicals related to theory papers in the semester	8	8	12	----	Max.: 200 Min: 80	Max.:200 Min: 80
Total credits				24				

SEMESTER- 2

2	BCT 201	Biology and Diversity of Algae, Bryophytes and Pteridophytes	4	4	3	Max.:30 Min: 12	Max.:70 Min: 28	100
2	BCT 202	Taxonomy and Diversity of seed plants	4	4	3	Max.:30 Min: 12	Max.:70 Min: 28	100
2	BCT 203	Mycology and Plant pathology	4	4	3	Max.:30 Min: 12	Max.:70 Min: 28	100
2	BCT 204	Horticulture	4	4	3	Max.:30 Min: 12	Max.:70 Min: 28	100
2	BCP 205	Practicals related to core theory papers in the semester	8	8	12	----	Max.: 200 Min: 80	Max.: 200 Min: 80
Total credits				24				

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SEMESTER- 3

Sem	Paper	Title	Hours/ week	Credits	Exam hours	Mid Term marks	External marks	Total marks
3	BCT 301	Plant tissue culture	4	4	3	Max.:30 Min: 12	Max.:70 Min: 28	100
3	BCT 302	Evolutionary and stress Biology	4	4	3	Max.:30 Min: 12	Max.:70 Min: 28	100
3	BCT 303	Advance Plant Physiology and Biochemistry	4	4	3	Max.:30 Min: 12	Max.:70 Min: 28	100
3	BCT 304	Biostatistics and Scientific Communication.	4	4	3	Max.:30 Min: 12	Max.:70 Min: 28	100
3	BCP 305	Practicals related to theory papers in the semester	16	8	12	----	Max.: 200 Min: 80	Max: 200 Min: 80
3	BET 306A	Research Methodology I	2	2	2	Max.:15 Min: 6	Max.:35 Min: 14	50
Or								
3	BET 306B	Genomics	2	2	2	Max.:15 Min: 6	Max.:35 Min: 14	50
		Total credits		26				

SEMESTER- 4

Sem	Paper	Title	Hours/ week	Credits	Exam hours	Mid Term marks	External marks	Total marks
4	BDI 401	Dissertation/ Industrial Training	---	24	---	---	Max.: 600 Min: 240	Max.: 600 Min: 240
4	BET 402A	Research Methodology II	2	2	2	Max.: 15 Min: 6	Max.:35 Min: 14	Max.: 50 Min: 20
Or								
	BET 402B	Proteomics	2	2	2	Max.: 15 Min: 6	Max.:35 Min: 14	Max.: 50 Min: 20
		Total credits		26				

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General instructions

1. The medium of instruction will be English for theory and practical courses.
2. There will be 4 lectures, each of 55 min duration / week / theory paper / semester.
3. There will be “*four*” units in each core theory paper. There will be 48 hrs. of theory teaching / paper / semester. Each theory paper / semester will be of 100 marks. There will be 30 marks for midterm evaluation and 70 marks for external evaluation.
4. There will be “*two*” units in each elective theory paper. There will be 24 hrs. of theory teaching / paper / semester. Each theory paper / semester will be of 50 marks. There will be 15 marks for midterm evaluation and 35 marks for external evaluation.
5. In semesters 1, 2, and 3 there will be 16 practical hours/ week / paper / batch. Each practical paper / semester will be of 200 marks. There is no midterm evaluation for practical work.
6. In semester 4, there will be 8 practical hours/ week / paper / batch. Each practical paper / semester will be of 100 marks. There is no midterm evaluation for practical work.
7. Dissertation and Industrial Training in semester 4 shall be evaluated for 600 marks. Work carried out and written report each carry 200 marks, presentation carries 100 marks and viva carries 100 marks.

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M.Sc. Botany I Year Course Description:

Paper	Title of Paper	Credits
Core	SEMESTER-1	
BCT 101	Cell and Molecular Biology	4
BCT 102	Bioinstrumentation	4
BCT 103	Genetics and Plant breeding	4
BCT 104	Plant Ecology and Phytogeography	4
BCP 105	Practicals related to theory papers in the semester	8
	SEMESTER-2	
Core		
BCT 201	Biology and Diversity of Algae, Bryophytes & Pteridophytes	4
BCT 202	Taxonomy and Diversity of seed plants	4
BCT 203	Mycology and Plant pathology	4
BCT 204	Horticulture	4
BCP 205	Practicals related to core theory papers in the semester	8
	SEMESTER-3	
BCT 301	Plant tissue culture	4
BCT 302	Evolutionary and stress Biology	4
BCT 303	Advance Plant Physiology and Biochemistry	4
BCT 304	Biostatistics and Scientific Communication	4
BCP 305	Practical related to theory papers in the semester	8
BET 306A	Research Methodology-I	2
	Or	
BET 306B	Genomics	2
	Total	26
	SEMESTER-4	
BD/BIT 401	Dissertation/ Industrial Training	24
BET 402 A	Research Methodology-II	2
	Or	
BET 402 B	Proteomics	2
	Total	26

BCT- Botany Core Theory, BCP- Botany Core Practical.

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Semester-1

BCT101 CELL AND MOLECULAR BIOLOGY

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
BCT 101	Cell and Molecular Biology	4	48	30	70	100

COURSE CONTENT

Section A		
Unit1	No. of Lectures:12	% Weightage:25
An overview of cell organization: Structure of prokaryote and eukaryote cell. Cell organization: Structure and functions of membranes, nucleus, Chloroplast, Mitochondria, Endoplasmic reticulum, Golgi complex, ribosomes, lysosomes, peroxisomes and glyoxysomes.		
Unit 2	No. of Lectures:12	% Weightage:25
The cytoskeleton and cell motility – Microtubules, microfilaments and intermediate filaments. Cell cycle and cell division. Nucleic acids as carries of genetic information; Physical properties and structure of DNA and RNA. Replication of DNA: Enzyme and proteins involved in replication.		
Section B		
Unit 3	No. of Lectures:12	% Weightage:25
Transcription of DNA, post transcriptional modifications of RNA and control of transcription. Genetic code and its properties. Translation of RNA. Significant differences between prokaryote and eukaryote translation.		
Unit 4	No. of Lectures:12	% Weightage:25
DNA damage and repair- Pyrimidine dimer formation, Photoreactivation, Excision Repair, Mismatch Repair, Recombination Repair, SOS repair.		

REFERENCES:

Sr. No.	Name of Book	Authors
1	Instant notes on Molecular Biology- 4 Ed.	Turner
2	Cytology	Verma and Agrawal
3	Molecular Biology of cell	B. Albertet <i>al.</i>

Suggested reading:

1. Bonifacino JS, Dasso M, Harford JB, Liipincott-Schwartz J and Yamada KM. (2004) Short Protocols in Cell Biology. John Wiley & Sons, New Jersey.
2. Hawes C and Satiat-Jeuemaitre B (2001) Plant Cell Biology: Practical Approach. Oxford University Press, Oxford.
3. Hartk D.L and Jones, E.W 1998 Genetics: Principles and Analysis (Fourth Edition). Jones and Bartlett Publishers, Massachusetts, USA.
4. Karp, G. 1999. Cell and Molecular Biology: Concept and Experiments. John Wiley and Sons, Inc., USA.
5. Molecular biology of the cell, 1994: By Bruce Alberts et al; Garland publishing New York.
6. Cell and molecular biology, 1999 : By Gerald Karp, John Wiley, London.
7. Cell and molecular biology, 1987 : By DeRobertis and DeRobertis, Lee and Febiger, Washington.
8. Molecular cell biology, 2000 : By Lodish et al; W. H. Freeman & Company, Newyork.

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Semester -I

BCT102 BIO-INSTRUMENTATION

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory		Total Marks	
			Hrs.	Max Marks		
				Mid Term		End Term
BCT102	Bio-Instrumentation	4	48	30	70	100

COURSE CONTENT

Section A		
Unit1	No. of Lectures:12	% Weightage:25
Experimental approaches for studying cells: Various types of light microscopy, Electron microscopy, fixation and staining. Principle and application of light, phase contrast, fluorescence, scanning and transmission electron microscopy, scanning tunneling electron microscopy. Preparation of microbial, animal and plant samples for microscopy.		
Unit 2	No. of Lectures:12	% Weightage:25
Principle methodology and applications of Paper chromatography, Thin layer chromatography, gel filtration, ion –exchange and affinity chromatography; High Performance Liquid Chromatography and gas chromatography.		
Section B		
Unit 3	No. of Lectures:12	% Weightage:25
Visible, UV, IR Spectroscopy. Radioactive Isotopes and half-life of isotopes; Effect of radiation on biological system; Autoradiography.		
Unit 4	No. of Lectures:12	% Weightage:25
Centrifugation: Basic principle, types and applications; density gradient and Ultracentrifugation. Overview of pH meter, buffers and Electrophoresis.		

REFERENCES:

SN	Title	Author
1.	Biophysical chemistry: Principle and techniques.	Upadhyay & Nath
2.	Instrumental analysis	D.A.Skoog, Holler & Crouch

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Semester -I

BCT 103 GENETICS AND PLANT BREEDING

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
BCT 103	Genetics and Plant Breeding	4	48	30	70	100

COURSE CONTENT

Section A

Unit 1 **No. of Lectures:12** **% Weightage:25**
 Fundamentals of Genetics: Mendelian analysis, The Law of segregation, The law of Independent assortment. Test cross and back cross; Interaction of genes: Incomplete dominance, co-dominance, lethal genes, epistasis, pleiotropy polygenic traits and quantitative inheritance;

Unit 2 **No. of Lectures:12** **% Weightage:25**
 Sex chromosomes and sex-linked inheritance: Transmission of sex- linked traits, sex determination; Chromosome structure and function. Chromosome mapping and its significance: Linkage, Crossing over- two point crosses, three–point crosses, tetrad analysis, chromosome maps.

Section B

Unit 3 **No. of Lectures:12** **% Weightage:25**
 Alterations in chromosome number and structure: Aneuploidy & euploidy, polyploidy and its significance. Deletions, duplications, inversions and translocations; Mutations: Types of mutations, mutagens, molecular basis of mutations; transposable elements; Reverse mutations & suppressor mutations.

Unit 4 **No. of Lectures:12** **% Weightage:25**
 Male sterility in plants. Objectives and Methods of plant breeding, Origin, domestication and introduction of crop plants; Modes of reproduction – asexual and sexual reproduction, determination of mode of reproduction in a species, modes of pollination, mechanism of pollination control, self-incompatibility, Hybridization: History, objectives and procedures in hybridization, consequences of hybridization

REFERENCES

SN	Title	Author
1.	Principles of Plant Genetics and Breeding, Blackwell Publishing Ltd.USA.	Acquaah G (2007).
2.	Genetics, 3rd Edition, Pearson (Prentic Hall).	Strickberger MW (2008).

Suggested reading:

1. Snustad, D.P and Simmons, M.J 2000. Principles of Genetics (Second Edition). John Wiley and Sons Inc., USA.
2. Gardner and Simmons Snustad 2005 (Eighth Edition). Principles of Genetics, John Wiley and Sons, Singapore.3.
3. Allard R.W 1995. Principles of Plant Breeding. John Wiley and Sons, Ice., Singapore.
4. Sharma J.R 1994 Principles and practices of Plant Breeding. Tata McGraw-Hill Publishers Company Ltd., New Delhi.
5. Singh B.D 1996 Plant Breeding – Principles and methods. Kalyani Publications, Ludhiana.
6. Chahal G.S and Gosal S.S 2002. Principles and procedures of Plant Breeding, Narosa Publishing House, New Delhi.
7. Hartl DL and Jones EW (2007). Genetics – Analysis of Genes and Genomes, 7th edition, Jones and Barlett publishers..
8. Allard RW (1999). Principles of Plant Breeding (2nd Edition), John Wiley and Sons.

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Semester-1

BCT 104 PLANT ECOLOGY AND PHYTOGEOGRAPHY

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
BCT-104	Plant Ecology and Phytogeography	4	48	30	70	100

COURSE CONTENT

Section A

Unit1

No. of Lectures:12

% Weightage:25

Plant relation with the environment:

1. Plant relation with the climatic factors: water, precipitation, temperature, light and radiation. 2. Plant relation with the edaphic factors: types of soil, soil moisture and water holding capacity of the soil, soil nutrients, soil microbes. 3. Plant distribution with respect to topographic and climatic factors, centres of origin, migration. 4. Environmental pollution and its impact – Air, water, soil and noise.

Unit 2

No. of Lectures:12

% Weightage:25

Population Ecology:

1. Ecological limits and the size of population, factors affecting population size, demes. 2. Life history strategies, r and k selection, C-S-R triangle. 3. Concept of metapopulation, extinction events, population viability analysis. 4. Community structure and species diversity. 5. Diversity types and levels (alpha, beta, gamma), ecotone and edge effect.

Section B

Unit 3

No. of Lectures:12

% Weightage: 25

Ecosystems: 1. Ecosystem: Components and organization. 2. Energy flow and mineral cycling, carbon sequestration. 3. Ecosystem types Terrestrial: Forests, grasslands and deserts. Aquatic: Fresh water and marine. Artificial: Agricultural. 4. Eco-physiology: Adaptive responses of plants to variation in: Light: Photoinhibition, protection against light-induced damage. Temperature: Winter hardiness, vernalization, adaptation to high temperature. Water availability: Adaptation to light drought and flooding. Plant succession: Autogenic and allogenic, mechanism and phases. 5. Cerial communities and climax communities: Hydroseres, lithoseres, xeroseres, haloseres.

Unit 4

No. of Lectures:12

% Weightage:25

Phytogeography:

1. Introduction, major plant communities of world, phytogeographic regions of world (vegetation of belts), soil, climate, flora and vegetation of India, floristic (Botanical) regions of India. 2. Biomes: Classification and components. 3. Habitat ecology: Fresh water, Marine water, Estuarine ecology, Terrestrial ecology, Dessert ecology. 4. Endemism and EIA

REFERENCES:

SN	Title	Author
1.	Plant Ecology	P.D. Sharma
2.	Environment. 6th edition. John Wiley & Sons, Inc., New York.	Raven PH, Begr LR, Hassenzahl DM (2008)

Suggested reading:

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1. Ambhast, R. S. (1998). A Text Book of Plant Ecology, 9th edition, Friend and Co.
2. Barbour, M. G., Pits, W. D. and Burk, J. H. (1967). Terrestrial Plant Ecology, Addison-Wesley Publisher.
3. Begon, M., Townsend, C. R., Harper, J. L. (2005). Ecology: From Individuals to Ecosystems, 4th edition, Wiley Blackwell.
4. Canter, L. (1996). Environmental Impact Assessment, 2nd edition, McGraw Hill Publishing Company.
5. Coleman, D. C., Crossley, D. A., Handrix, P. F. (2004). Fundamentals of Soil Ecology, 2nd edition, Elsevier academic press.
6. Coller, B. D., Cox, G. W. and Miller, P. C. (1973). Dynamic Ecology, Prentice-Hall, Inc. Englewood Cliffs, New Jersey.
7. Crawley, M., Crawley, J. And Crawley, M. (1997). Plant Ecology, 2nd edition, Wiley Blackwell.
8. De, A. K. (1994). Environmental Chemistry, Wiley Eastern publication.
9. Gurevitch, J., Scheiner, S. M., Fox, G. A. (2006). The Ecology of Plants, Sinauer Associates.

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Semester-1

BCP 105 Practical work

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Practical		Total Marks
			Hrs	Max Marks	
BCP 205	Practical work	8	48	200	200

Practicals related to core theory papers of Semester1 shall be conducted.

LIST OF EXPERIMENTS

- 1) Micrographs of Prokaryotic and Eukaryotic cell structure
- 2) Micrographs of different cell organelles
- 3) Study of Mitosis and Meiosis through *Allium cepa*, *Lilium*.
- 4) Cytochemical / Histochemical studies of special cell types: Guard cell, senescent cells, bundle sheath cells, meristematic cells, laticiferous cells, glandular cells, pollen grains.
- 5) Microscopy
- 6) pH meter and determination of pH using standard buffers.
- 7) To solve the Genetic Back Cross and Test Cross using genetics problems.
- 8) Study of pollen Viability, in vitro germination and tube growth.
- 9) Study of morphological and anatomical characteristics plants under stress (salt and temperature).
- 10) Determination of frequency, density, abundance of the species among the plant communities. (Quadrat method)
- 11) Interpretation of satellite imageries and aerial photographs with respective major vegetation/ land use patterns/ landforms etc.
- 12) Physiochemical analysis of soil like Color, Water holding capacity (physical properties).
- 13) Physiochemical analysis of water like Hardness, Calcium contents (chemical properties).

Instruction Strategies

1. Explanation of Principles, protocols, expected result trends, handling of instruments and equipment, precautions and safety measures in the class and demonstration of important steps.
2. Monitoring of the students performing the experiments in the practical hall.
3. Evaluation of results of each experiment.

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Semester-2

BCT 201 BIOLOGY AND DIVERSITY OF ALGAE, BRYOPHYTA AND PTERIDOPHYTA

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory		Total Marks	
			Hrs.	Max Marks		
				Mid Term		End Term
BCT201	Biology and Diversity of Algae, Bryophytes and Pteridophytes	4	48	30	70	100

COURSE CONTENT

Section A		
Unit1	No. of Lectures:12	% Weightage:25
Archebacteria and eubacteria: General account; ultra-structure, nutrition and reproduction biology and economic importance; cyanobacteria – salient features and biological importance. Viruses: general account, morphology and reproduction, classification, economical importance		
Unit 2	No. of Lectures:12	% Weightage:25
Algae: general account, morphology and reproduction, classification, economical importance		
Section B		
Unit 3	No. of Lectures:12	% Weightage:25
Bryophyta: general account, morphology and reproduction, classification, economical importance		
Unit 4	No. of Lectures:12	% Weightage:25
Pteridophyta: general account, morphology and reproduction, classification, economical importance		

REFERENCES:

SN	Title	Authors
1	The Structure and Reproduction of Algae. Vol. II. Cambridge Univ. Press. Cambridge, London.	Fritsch FE (1945).
2	Biology of Bryophytes. John Wiley & Sons, New York, NY.	Chopra R.N. & Kumar P.K. (1988)
3	Botany for degree students, Bryophyta, S. Chand Publication.	Vashista B.R., Sinha A.K., Kumar A. (2008)
4	Textbook of Pteridophyta. MacMillan India Ltd. Delhi.	Sharma O.P. (1990).

Suggested reading:

1. Brodie J. and Lewis J. (2007). (Ed.) Unravelling the algae: the past, present and future of algal systematics. CRC press, New York, pp 335.
2. Bellinger E.G. and Sigeo D.C. (2010). Freshwater algae: Identification and use as bioindicators, Willey-Blackwell, UK, pp. 271..
3. Cole K.M. and Sheath R.G. (1990). Biology of the red algae. Cambridge University Press.USA. pp. 503.
4. Desikachary T.V. (1959). Cyanophyta. ICAR, New Delhi
5. Krishnamurthy V. (2000). Algae of India and neighboring countries I. Chlorophycota, Oxford & IBH, New Delhi.
6. Prescott G.W. (1969). The algae.
7. Kumar, H. D. Introductory Phycology. Affiliated East-West Press Ltd., New Delhi.
8. Parihar, N. S. Bryophyta. Central Book Depot, Allahabad.
9. Round, F. E. The Biology of Algae. Cambridge University Press, Cambridge.
10. Sporne, K. K. The Morphology of Pteridophytes. B. I. Publishing Pvt. Ltd., Bombay.
11. Stewart, W. N. and Rathwell, G. W. Paleobotany and the Evolution of Plants. Cambridge University Press.

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Semester-2

BCT 202- TAXONOMY AND DIVERSITY OF SEED PLANTS

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
BCT 202	Taxonomy and Diversity of seed plants	4	48	30	70	100

COURSE CONTENT

Section A

Unit1

No. of Lectures:12

% Weightage:25

Taxonomy- Definition. The species concept: taxonomic hierarchy, species, genus, family and other categories; Salient features of the International Code of Botanical Nomenclature (ICBN). Systems of classification: Bentham and Hooker, Hutchinson, Takhtajan. Merits and demerits of classification systems

Unit 2

No. of Lectures:12

% Weightage:25

Taxonomic evidence: morphology, anatomy, palynology, embryology, cytology; phytochemistry; and genetics. Taxonomic tools: Herbarium; floras; histological, cytological, phytochemical, serological, biochemical and molecular techniques; computers and GIS. Plant explorations; invasions and introductions; local plant diversity and its socio-economic importance.

Section B

Unit 3

No. of Lectures:12

% Weightage:25

Introduction to Gymnosperms, structure and reproductive organs, male and female gametophytes. Comparative account of Cycadales, Ginkgoales, Coniferales, Ephedrales, and Gnetales. Geological rise and fall of gymnosperms.

Unit 4

No. of Lectures:12

% Weightage:25

General characters, classification of angiosperms.
Study of dicot families: Polypetale – menispermaceae, anaciadace, molgenaceae, Gemopetale – olicaceae, *Convolvulaceae*, *salvadoraceae*, *lamiaceae*, Apetale – nectagenaceae, chinopodiaceae, euphorbeaceae, Axlapidaceae. Study of monocot families: *Poaceae*, *Liliaceae*, *Commelianaceae*, *laminaceae*. Explanation of floral diagram.

REFERENCES:

SN	Title	Author
1.	An integrated system of classification of flowering plants. Columbia University Press, New York.	Cronquist, A. 1981.

Suggested reading:

1. Bhatnagar, S.P. and Moitra, A. 1996. Gymnosperms.
2. Gurcharan Singh. Plant systematics: Theory and Practice
3. Heywood (ed.) Modern Methods in Plant Taxonomy
4. Jeffery, C. An Introduction to Plant Taxonomy
5. Jones, S.B., Luchsinger, A.L. 1987. Plant Systematics
6. Judd, W.S; Campbell, C.S., Kellogg, E.A; Stevens, P.F. 1999. Plant Systematics: A phylogenetic approach
7. Lawrence, G.H.M. Vascular Plant Systematics
8. Nordenstam, B., El Gazaly, G. and Kassas, M. 2000. Plant systematics for 21st century.
9. Radford, A. 1986. Fundamentals of Plant Systematics
10. Solbrig, O.T. 1970. Principles and Methods of Plant Biosystematics

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11. Sporne, K. Morphology of gymnosperms
12. Stace, C. A. 1980. Plant Taxonomy and Biosystematics
13. Stebins, G.L. Variation and Evolution in Plants.
14. Turrill, W.B. Vistas in Botany vol. IV (Recent Researches in Plant Taxonomy)
15. Woodland, D.W. Contemporary plant systematics.

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Semester-2

BCT 203 - MYCOLOGY AND PLANT PATHOLOGY

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
BCT 203	Mycology and Plant pathology	4	48	30	70	100

COURSE CONTENT

Section A

Unit 1 **No. of Lectures:12** **% Weightage:25**
 Introduction to fungi: general account, morphology and reproduction, classification, economical importance; Lichens: growth forms and reproductive structures.

Unit 2 **No. of Lectures:12** **% Weightage:25**
 Techniques for mushroom cultivation: Schedule and systems of cultivation; composting; peak heating; spawn preparation and mushroom strains; spawning and mycelial growth; supplementation; cultivation techniques from casing to ruffling and recovery growth to harvesting; pests and diseases, its protection.

Section B

Unit 3 **No. of Lectures:12** **% Weightage:25**
 Introduction to plant pathogens: Viruses, bacteria, fungi, nematodes and insect pests.
 Introduction to plant pathology. Detailed study on symptoms, etiology, epidemiology and control of the following fungal diseases of plants. Late blight; powdery mildew; smuts, Citrus canker, red dot.

Unit 4 **No. of Lectures:12** **% Weightage:25**
 Symptoms, etiology, epidemiology and control of bacterial and viral diseases with reference to leaf blight, leaf spot, citrus canker, brown rot, mosaic diseases in plants.
 Host-pathogen interactions: Pathogen attack strategies; plant defense mechanisms; HR and SAR in plant defense.

REFERENCES:

SN	Title	Author
1.	Plant Pathology, 5th Edition.	Agrios GN (2005)
2.	Introductory Mycology	Alexopoulos, C. J., Mims, C. W. and Blackwell

Suggested reading:

1. Mandahar, C. L. Introduction to Plant Viruses. Chand & Co. Ltd., Delhi.
2. Mehrotra, R. S. and Aneja, R. S. An Introduction to Mycology. New Age Intermediate Press.
3. Rangaswamy, G. and Mahadevan, A. 1999. Diseases of Crop Plants in India. Prentice Hall of India Pvt. Ltd., New Delhi.
4. Singh R S. Plant diseases. 6th edition. Oxford and IBH, New Delhi
5. Singh R.S. Principles of plant pathology. 3rd edition. Oxford and IBH, New Delhi

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Semester-2

BCT204- HORTICULTURE

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
BCT 204	Horticulture	4	48	30	70	100

COURSE CONTENT

Section A

Unit1 **No. of Lectures:12** **% Weightage:25**

1. Importance of Horticultural crops.
2. Principles of Horticulture crop production technology.
3. Principles of plant propagation, methods of propagation for horticultural crops.
4. Essential of plant nutrients, their deficiency symptoms and toxicities in Horticultural crops.

Unit 2 **No. of Lectures:12** **% Weightage:25**

1. Organic and inorganic manures and their methods of application in Horticultural crops.
2. Principles of weed control, crop rotation, cropping system, methods of irrigation and drainage.
3. Major pest and diseases management in horticultural crops.
4. Harvesting, handling, storage.
5. Traits and quality standards of horticultural products.

Section B

Unit 3 **No. of Lectures:12** **% Weightage:25**

1. Important vegetable crops - present status and future prospects.
2. Selection of site and soil for growing vegetables.
3. Role of environment and soil factors in vegetable production.
4. Essential plant nutrients and their deficiency symptoms.
5. Vegetable crops management.
6. Classification of vegetable crops.

Unit 4 **No. of Lectures:12** **% Weightage:25**

1. Importance and scope of Floriculture and Landscaping: Present status and future prospects.
2. History of gardening in India.
3. Types and styles of gardens.
4. Principle and elements of landscaping.
5. Important annual and perennial flower crops.
6. Principles and methods of propagation of ornamental crops.
7. Commercial seed production in Flower Crops.
8. Application of biotechnology in flower crops.

REFERENCES:

SN	Name of Book	Authors
1	Post harvest technologies for commercial Floriculture	Verma and Anil
2	Horticulture Glance-3Floriculture, Landscaping and Gardening, Medicinal & Aromatic plants.	Dr. Ajeet Singh, Salaria and Dr. Babita Singh Salaria

Suggested reading:

1. Objective Horticulture knowledge, Salaria.
2. Advance in Horticulture Strategies, production, plant protection, value addition, Dr.V.K.Sharma

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Semester-2

BCP 205 PRACTICALS

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Practical		Total Marks
			Hrs	Max Marks	
BCP 205	Practical work	8	48	200	200

Practicals related to core theory papers of Semester2 shall be conducted.

LIST OF EXPERIMENTS

Semester-II

1. Study of morphological, anatomical and reproductive structures of:
 - a. Chlorophyta (Chara, Odogonium,)
 - b. Pheophyta (Sargasum, Ectocarpus)
 - c. Rhodophyta (Polysiphonia, Gellidiella,)
 - d. Cyanophyta (Nostoc, Oscillaria)
2. Study of morphological, anatomical and reproductive structures of:
 - a. Hepaticopsida (Porella, Riccardia)
 - b. Anthocerotopsida (Anthoceros, Notothylus)
 - c. Musci (Polytrichum, Pogonatum)
3. Study of morphological, anatomical and reproductive structures of:
 - a. Psilopsida (Psilotum)
 - b. Lycopsidea and Sphenopsida (Lycopodium, Selaginella, Equisetum, Isoetes)
 - c. Pteropsida (Angiopteris, Marsilea)
4. Taxonomy and Diversity of Seed Plants:
 - a. Preparing herbarium sheet (20 Sheets) / Digital Sheets
5. Study of Morphological and reproductive structure of:
 - a. Cycas
 - b. Ephedra
 - c. Thuja
6. Study of Morphological and reproductive structure of:
 - a. Monocot: Commelinaceae, Poaceae, Liliaceae
 - b. Dicot: Asteraceae, Bignoniaceae, Convolvulaceae
7. Study of phyllotaxy
8. Study of local floral study and submission of report
9. Study of :
 - a. Fungi (Polysephalum, Rhizopus)
10. Study of plant pathogens
 - a. Powdery mildew
 - b. Smut
 - c. Rust
11. Process of emasculation, bagging, tagging
12. Study of methods of vegetative propagation (cutting, layering, grafting, budding)
13. Study of gardening and landscaping and report preparation
14. Study of seed dormancy.

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Semester-3

BCT 301 PLANT TISSUE CULTURE

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
BCT 301	Plant Tissue Culture	4	48	30	70	100

COURSE CONTENT

Section A		
Unit1	No. of Lectures:12	% Weightage:25
Plant tissue culture: Objective and goals of Plant tissue culture, laboratory design and development, operation and management, Plant Tissue Nutrition: Basic principles of in vitro culture, factors influencing morphogenesis, Physiological significance of tissue nutrition, Media preparation: Media preparation and handling, sterilization technique, equipment and apparatus, procedure of media preparation and stock solution.		
Unit 2	No. of Lectures:12	% Weightage:25
Plant Growth Regulators, Types of Culture: Explant culture, Callus formation and its culture, Callus desiccation, organogenesis, meristem culture, axillary bud culture – protocols and schedules of observation		
Section B		
Unit 3	No. of Lectures:12	% Weightage:25
Organ culture anther/ovary culture, Hairy root culture, Cell suspension culture, cell line isolation, Somaclonal variation; selection embryo rescuing, synthetic seed, Hardening of tissue cultured plants		
Unit 4	No. of Lectures:12	% Weightage:25
Green house technology; types of green house, operation, maintenance, management Cryopreservation, its importance and future prospects, conservation of Plant Germplasm.		

REFERENCES:

S. N.	Name of Book	Authors
1	Biotechnology in Crop Improvement	H.S.Chawla.
2	An Introduction to Plant Tissue Culture	M.K.Razdan.
3	Handbook of Plant Cell Culture (Vols. 1 to 4)	Evans <i>et. al.</i>
4	Plant Tissue and Cell Culture	H.E.Street
5	Applied and Fundamental Aspects of Plant Cell Tissue and Organ Culture	J.Reinert&Y.P.S.Bajaj (Eds)
6	Principles of Plant Biotechnology: An Introduction to Genetic Engineering in Plants	S.H.Mantellet. <i>al.</i>
7	Plant Propagation by Tissue Culture	E.F.George, M.A.Hall& G-J de Klerk (Eds.)
8	Cell Culture and Somatic Cell Genetics of Plants	A.K.Vasil
9	Genetic Engineering	Smita Rastogi
10	Culture of Animal Cells	R. I. Freshney

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Semester -3

BCT- 302 EVOLUTIONARY AND STRESS BIOLOGY

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory		Total Marks	
			Hrs.	Max Marks		
				Mid Term		End Term
BCT 102	Evolutionary Biology	4	48	30	70	100

COURSE CONTENT

Section A		
Unit1	No. of Lectures:12	% Weightage:2
Evolutionary Biology before Darwin, Darwin, after Darwin. Biological diversity, Species and classification, Phylogenetic trees. Phylogeny and fossil record, Major patterns of distribution..		
Unit 2	No. of Lectures: 12	% Weightage:2
Microevolution: Genetic drift, sampling, coalescence. Founder effects. Natural theory of molecular evolution. Natural selection. Adaptation in action. Levels of selection. Patterns of evolutionary change. Adaptive radiation. Evolution and development.		
Section B		
Unit 3	No. of Lectures:12	% Weightage:25
Abiotic stress: effect of temperature, effect of pH, effect of higher concentration and deficiency of macronutrients and micronutrients.		
Unit 4	No. of Lectures:12	% Weightage:25
Biotic stress: positive biotic reaction, negative biotic reaction, genetic changes on physiology and biochemistry of plants.		

REFERENCES:

1. David Briggs, Stuart Max Walters (1997). Plant Variation and Evolution, Cambridge University Press.
2. Douglas J. Futuyma (1998). Evolutionary Biology (3rd Edition), Sinauer Associates.
3. Mark Ridley (2003) Evolution (3rd edition), Blackwell.
4. Roderic D. M. Page, Edward C. Holmes (1998). Molecular Evolution: A Phylogenetic Approach, Blackwell.
5. Scott R, Freeman and Jon C. Herron (2003). Evolutionary Analysis, Prentice Hall.
6. Plants under stress vol:1 by Erik T. Nilsen ,David M. Orcutt.
7. Abiotic Stress and Plant Physiology: Volume 01: Metabolic Activities by Amitav Bhattacharyya.

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Semester -3

BCT- 303 ADVANCE PLANT PHYSIOLOGY AND PLANT BIOCHEMISTRY

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
BCT- 303	Plant Physiology and Biochemistry	4	48	30	70	100

COURSE CONTENT

Section A

Unit –I	No. of Lectures: 12	% Weightage:25
Respiration – whole plant respiration. Glycolysis in plants and its regulation, Regulation of Pentose Phosphate Pathway and TCA Cycle. Regulation of electron transport chain and role of alternate oxidase.		
Unit –II	No. of Lectures: 12	% Weightage:25
Photosynthesis-A brief outline of chlorophyll biosynthesis and the pigment organization in thylakoid membrane. Regulation of Calvin Cycle and C4 Pathway, RUBISCO and PEP Case, C3 – C4 intermediates. CAM plants		
Section B		
Unit –III	No. of Lectures:12	% Weightage:25
Carbohydrate Metabolism – Regulation of starch and sucrose biosynthesis, Synthesis and degradation of cellulose, A brief idea of protein biosynthesis and enzymes involved in protein degradation.		
Unit –IV	No. of Lectures:12	% Weightage:25
Organic acid metabolism –Metabolism and roles of oxalic acid, ascorbic acid and malic acid. 5. Secondary metabolites –Shikimate Pathway and its role in biosynthesis of Secondary Metabolites. Phosphorus nutrition – Forms of phosphorus in soil. Phosphorus uptake, factors controlling ‘P’ uptake.		

REFERENCES

1. Bidwell, R. C. S. (1979): Plant Physiology.
2. Bonner, J. and Varner, E. (1976): Plant Biochemistry. Edwards
3. Edwards, G., Walker, D. W. (1983): C3- C4 mechanism and cellular environmental regulation of photosynthesis
4. Introduction to Plant Physiology. Krishnamurthy

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Semester-3

BCT: 304 - BIOSTATISTICS AND SCIENTIFIC COMMUNICATION

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
BCT-304	Biostatistics and Scientific Communication	4	48	30	70	100

COURSE CONTENT

Section A

Unit1	No. of Lectures:12	% Weightage:25
Biostatistics: Scopes and Methods1: Mean, Median, Mode, measures of Central tendency, Coefficient of variation		

Unit 2	No. of Lectures:12	% Weightage:25
Biostatistics: Scopes and Methods2: Principles and scopes of statistical methods in biological research, sampling, data types, data collection, presentation of data, standard deviation/error, Coefficient of variation.		

Section B

Unit 3	No. of Lectures:12	% Weightage:25
Probability: Definition, Various events in probabilities, laws, linear correlation, linear regression, Hypothesis testing, tests of statistical significance (Chi square, Student T test, ANOVA, SPSS)		

Unit 4	No. of Lectures:12	% Weightage:25
Scientific communication: Types of reports; Scientific writing skills, Elements of a Scientific paper including Abstract, introduction, Materials & Methods, Results, Discussion, References; Drafting titles and framing abstracts, plagiarism.		

REFERENCES:

1. Attwood TK and Parry-Smith DJ (2004) Introduction to Bioinformatics, Pearson Education (Singapore) Pvt. Ltd.
2. David Edwards (Ed.) (2007) Plant Bioinformatics: Methods and Protocols, Humana Press, New Jersey, USA.
3. Biostatistics by Wayne. W. Deniel (6th addition)
4. Pagano M, Gauvreau K (2007) Principles of Biostatistics. Thomson India Edition, New Delhi.
5. Randal Schwartz, Tom Phoenix and Brian d Foy (2005) Learning Perl (4th edition), O'Reilly & Associates, ISBN: 0-596-10105-8.
6. Rex A. Dwyer (2004) Genomic Perl: From Bioinformatics Basics to Working Code, Cambridge University Press, 1st South Asian Edition.
7. Rosenkrantz WA (2009) Introduction to Probability and Statistics for Science, Engineering and Finance. CRC Press, Boca Raton.
8. Kulas JT (2008) SPSS Essential: Managing and Analyzing Social Science Data. John Wiley & Sons, New York.
9. Pagano M, Gauvreau K (2007) Principles of Biostatistics. Thomson India Edition, New Delhi.
10. Randal Schwartz, Tom Phoenix and Brian d Foy (2005) Learning Perl (4th edition), O'Reilly & Associates, ISBN: 0-596-10105-8.
11. Rex A. Dwyer (2004) Genomic Perl: From Bioinformatics Basics to Working Code, Cambridge University Press, 1st South Asian Edition.
12. Rosenkrantz WA (2009) Introduction to Probability and Statistics for Science, Engineering and Finance. CRC Press, Boca Raton.

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Semester-3

BCP 305 PRACTICAL WORK

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Practical		Total Marks
			Hrs/ week	Max Marks	
BCP 305	Practical work	8	16	200	200

Practicals related to core theory papers of Semester 3 shall be conducted.

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Semester 3

BET-306A: RESEARCH METHODOLOGY-I

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
BET -306A	Research Methodology-I	2	24	15	35	50

COURSE CONTENT

Unit1 **No. of Lectures:12** **% Weightage:50**

Research Methodology: An Introduction, Meaning of research, Objectives of research, motivation in research, Types of research, Research Approaches, significance of research, research method vs methodology, research and scientific method, importance of knowing how research is done, research process, criteria of good research, problems encounter by researchers in India.

Unit 2 **No. of Lectures:12** **% Weightage:25**

Defining Research Problem: what is research problem? Selecting the problem, necessity of defining the problem, Technique involved in defining a problem, an illustration, conclusion. **Research Design:** Meaning of research design, need for research design, features of good design, important concepts relating to research design, different research designs, basic principles of experimental design.

Reference Books:

1. Research Methodology: Methods & Techniques by C R Kothari, 2e, Wishwa Publication, New Delhi
2. Research Methodology by D K Bhattacharyya, 1 e, Excel Books, New Delhi, 2003
3. How to Research by Loraine Blaxter, Christina Hughes and Molcolm Tight, Viva Books Pvt.Ltd., New Delhi
4. Writing Your Thesis by Paul Oliver, Vistaar Pulication, New Delhi, 2006
5. The Research Student's Guide to Success by Pat Cryer, Viva Books Pvt Ltd., New Delhi

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Semester 3

BET 306B GENOMICS

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
BET 306B	Genomics	2	24	15	35	50

COURSE CONTENT

Unit 1	No. of Lectures: 12	Weightage: 50%
<p>Genomics: Concepts and Applications - Microbial genome and genome epidemiology. Organization of eukaryotic genomes. Repetitive and transposable genetic elements. Telomere regions. Structural genomics, Functional genomics and comparative genomics.</p> <p>Whole genome analysis - Preparation of genome libraries (cosmid, BAC), shotgun sequencing, conventional and automated sequencing methods, Next generation sequencing methods. Genome mapping and DNA fingerprinting. Gene knockout, genome-wide mutagenesis</p>		

Unit 2	No. of Lectures: 12	Weightage: 50%
<p>Transcriptomics and Microarray - Introduction to transcriptomics and Global gene expression profiling. RNA and DNA Microarray preparation, working and analysis. DNA Chips, SNPs EST, SAGE.</p> <p>Proteomics - concepts and applications of Expressional Proteomics, Functional Proteomics, Structural Proteomics.</p> <p>Protein separation techniques: Affinity purification of proteins and TAP tag, 2D Gel electrophoresis, ITRAQ Isoelectric Focusing (IEF).</p>		

REFERENCES:

S. N.	Name of Book	Authors
1	Biochemistry	J. M. Berg, J. L. Tymoczko, L. Stryer
2	Principles and Techniques of Biochemistry & Mol. Biology	Keith Wilson & John Walker
3	The Cell: A Molecular Approach	G.M.Cooper & R.E.Hausman
4	Gene IX	Lewin
5	Molecular Biology of the Gene	Watson et al.
6	Protein Structure Prediction: Methods and Protocols	Webster, David
7	Bioinformatics: A Practical guide to the Analysis of genes and Proteins	A. D. Bzxevanis and B. F. F. Onellette
8	Bioinformatics Methods and protocols: Methods molecular biology Vol. 132	S. Misenes and S. A. Krawetz (Eds)
9	Biopharmaceuticals Biochemistry and Biotechnology	G. Walsh

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Semester-4

BDI 401 – DISSERTATION/ INDUSTRIAL TRAINING

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory		Total Marks	
			Hrs.	Max Marks		
				Mid Term		End Term
BDI 401 -	DISSERTATION? INDUSTRIAL TRAINING	24		---	600	600

- All semester 4 students shall pursue Dissertation in 4th semester.
- Project work and Dissertation must be based on Botany and its applied aspects.
- Semester IV students will be on Dissertation during entire term for Project Work and Dissertation. The Students have to devote 6 days, 8 hours per day at the work place that may be an Institute, Industry, Department and Research Institute.
- The Students will have to undergo continuous interaction and one evaluation of progress by a team of Departmental experts. A student who has undergone such evaluations only will be entitled to present his complete project work to the University for Exam.
- The University End Term Examination will be carrying 600 marks divided as underneath and shall be conducted by One external expert along with an Internal expert:
 - Thesis Write up : 200 marks
 - Thesis Content : 200 marks
 - Thesis Presentation : 100 marks
 - Viva Voce : 100 marks
- Industrial Training is Optional instead of Dissertation in 4th semester
- Industrial Training must be in an Industry related to Biosciences based on applied aspects of Biosciences.
- Semester IV students will be on Industrial Training at an Industry and the Students have to devote 6 days, 8 hours per day at the work place.
- The Students will have to undergo continuous interaction and one evaluation of progress by a team of Departmental experts. A student who has undergone such evaluations only will be entitled to present his complete project work to the University for Exam.
- The University End Term Practical Examination will be carrying 600 marks divided as underneath and shall be conducted by One external expert along with an Internal expert:
 - Industrial Training Report Write up : 200 marks
 - Industrial Training Report Content : 200 marks
 - Industrial Training Report Presentation : 100 marks
 - Viva Voce : 100 marks

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Semester 4

BET -402A: RESEARCH METHODOLOGY-II

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
BET -402A	Research Methodology-II	2	24	35	15	50

COURSE CONTENT

Unit 1 No. of Lectures: 12 Weightage: 50%

Methods of Data Collection: collection of primary data, observation method, Interview method, collection of data through questionnaires, collection of data through schedules, difference between questionnaires and schedules, some other method of data collection, collection of secondary data, selection of appropriate method for data collection, role of computer in research.

Unit 2 No. of Lectures: 12 Weightage: 50%

Processing And analysing data: Processing operations, solving problems in processing, types of analysis, statistics in research, measures of central tendency, measures of dispersion, measures of asymmetry, measures of relationship, simple regression analysis, multiple correlation and regression, partial correlation, association in case of attributes, significance of writing thesis, different types of research writing, guidelines of writing good thesis.

Reference Books:

1. Research Methodology: Methods & Techniques by C R Kothari, 2e, Wishwa Publication, New Delhi
2. Research Methodology by D K Bhattacharyya, 1 e, Excel Books, New Delhi, 2003
3. How to Research by Loraine Blaxter, Christina Hughes and Molcolm Tight, Viva Books Pvt.Ltd., New Delhi
4. Writing Your Thesis by Paul Oliver, Vistaar Pulication, New Delhi, 2006
5. The Research Student's Guide to Success by Pat Cryer, Viva Books Pvt Ltd., New Delhi

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Semester 4

BET-402B PROTEOMICS

Teaching and Evaluation Scheme:

Subject Code	Subject Title	Credits	Theory			Total Marks
			Hrs.	Max Marks		
				Mid Term	End Term	
BET -402B	PROTEOMICS	2	24	35	15	50

COURSE CONTENT

Unit 1	No. of Lectures: 12	Weightage: 50%
<p>Protein-Protein interactions- Yeast-two hybrid Assays, Phage display. Fluorescent tagging and FRET microscopy. Protein crystallization: technique and application.</p> <p>Mass spectrometry in proteomics – Principle, techniques, data analysis and applications (MALDI-TOF, LC-MS, MS/MS). Peptide sequencing. Protein Microarray</p>		

Unit 2	No. of Lectures: 12	Weightage: 50%
<p>Applications of Genomics and Proteomics: In basic research and medical genetics: Met genomics, Pharmacogenomics: Overview, concept and application of Individualized Therapy; RNAi: Targeted Medicine and gene silencing. Peptidomics/ Drug discovery, Biomarkers in disease diagnosis, Identification and characterization of novel proteins.</p> <p>Genomics and proteome data analysis: Introduction, homology, sequences alignments and genome analysis program (BLAST, FASTA, GCC, ClustalW etc.). ORFs, genes annotation.</p>		

REFERENCES:

S. N.	Name of Book	Authors
1	Biochemistry	J. M. Berg, J. L. Tymoczko, L. Stryer
2	Principles and Techniques of Biochemistry & Mol. Biology	Keith Wilson & John Walker
3	The Cell: A Molecular Approach	G.M.Cooper & R.E.Hausman
4	Gene IX	Lewin
5	Molecular Biology of the Gene	Watson et al.
6	Protein Structure Prediction: Methods and Protocols	Webster, David
7	Bioinformatics: A Practical guide to the Analysis of genes and Proteins	A. D. Bzxevanis and B. F. F. Onellette
8	Bioinformatics Methods and protocols: Methods molecular biology Vol. 132	S. Misenes and S. A. Krawetz (Eds)
9	Biopharmaceuticals Biochemistry and Biotechnology	G. Walsh

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Unit wise marks distribution and the question paper scheme of Core Theory paper End Term Examinations

Section A	Questions from each Unit	Questions to be answered	Marks
Unit 1	Five MCQ, Two 5M questions, four 3M questions	MCQ-5 5M questions -1 3M questions –at least 1& maximum 4	35 Marks
Unit 2	5 MCQ, four 5M questions, four 3M questions	MCQ-5 5M questions -1 3M questions –at least 1& maximum 4	
Section B	Questions from each Unit	Questions to be answered	Marks
Unit 3	5 MCQ, four 5M questions, four 3M questions	MCQ-5 5M questions -1 3M questions –at least 1& maximum 4	35 Marks
Unit 4	5 MCQ, four 5M questions, four 3M questions	MCQ-5 5M questions -1 3M questions –at least 1& maximum 4	
		Total	70 Marks

Unit wise marks distribution and the question paper scheme of Elective Theory paper End Term Examinations

Section A	Questions from each Unit	Questions to be answered	Marks
Unit 1	Five MCQ, Two 5M questions, four 3M questions	MCQ-5 5M questions -1 3M questions –at least 1& maximum 4	35 Marks
Unit 2	5 MCQ, four 5M questions, four 3M questions	MCQ-5 5M questions -1 3M questions –at least 1& maximum 4	
		Total	35 Marks

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Question Paper Scheme for End Term Examination Core Theory

Time: 3 hrs

Date:

Maximum marks: 70

SECTION-A

Q.1 Answer all questions. Each question carries 1 mark (10X1=10 Marks)
(MCQ. Out of these 5 will be from Unit 1 and 5 will be from Unit 2)

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)
- 10)

Q. 2 Answer all questions. Each question carries 5 marks (2X5=10M)

I) 5M Question (Unit1)

or

II) 5 M Question (Unit1)

III) 5M Question (Unit2)

or

IV) 5 M Question (Unit2)

Q. 3 Answer any 5 questions. Each question carries 3 marks (5X3=15 Marks)
(4 questions from Unit 1 and 4 from Unit 2)

- a)
- b)
- c)
- d)
- e)
- f)
- g)
- h)

P.T.O

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SECTION-B

Q.4 Answer all questions. Each question carries 1 mark (10X1=10 Marks)
(MCQ. Out of these 5 will be from Unit 3 and 5 will be from Unit 4)

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)
- 10)

Q. 5 Answer all questions. Each question carries 5 marks (2X5=10M)

I) 5M Question (Unit3)

or

II) 5 M Question (Unit3)

III) 5M Question (Unit4)

or

IV) 5 M Question (Unit4)

Q.6 Answer any 5 questions. Each question carries 3 marks (5X3=15 Marks)
(4 questions from Unit 3 and 4 questions from Unit 4)

- a)
- b)
- c)
- d)
- e)
- f)
- g)
- h)

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Question Paper Scheme for End Term Examination Elective Theory

Time: 2 hrs

Date:

Maximum marks: 35

Q.1 Answer all questions. Each question carries 1 mark (10X1=10 Marks)

(MCQ. Out of these 5 will be from Unit 1 and 5 will be from Unit 2)

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)
- 10)

Q. 2 Answer all questions. Each question carries 5 marks (2X5=10M)

I) 5M Question (Unit 1)

or

II) 5 M Question (Unit 1)

III) 5M Question (Unit 2)

or

IV) 5 M Question (Unit 2)

Q. 3 Answer any 5 questions. Each question carries 3 marks (5X3=15 Marks)

(4 questions from Unit 1 and 4 from Unit 2)

- a)
- b)
- c)
- d)
- e)
- f)
- g)
- h)
