

**Scheme of Teaching, Learning & Examination leading to the Degree in Bachelor of Science in the Programme Botany Science
(Three years- Six Semester Degree Programme- C.B.C.S.) (B.Sc. Part II) Semester IV**

Sr.	Subject	Subject code	Teaching & Learning Scheme					Duration of Exam Hours	Examination & Evaluation Scheme								
			Teaching Periods Per Week			Credits			Theory	Practical		Total Marks	Minimum Passing				
			L	T	P	Total	T/T			Practical	Internal		External	Marks	Grade		
1	DSC IV Cell Biology, Genetics and Plant Breeding	BOT 4S	6	-	-	6	4.5	-	4.5	03	80	20	-	-	100	40	P
2	Lab	BOT 4S PR	-	-	6	6	-	2.25	2.25	04	-	-	25	25	50	25	P
3	Total		6	-	6	6	4.5	2.25	6.30	07	80	20	25	25	150	65	P

L: Lecture, T: Tutorial, P: Practical

Student may complete their Internship/ Field Work/ Work experience from Second to Fifth semester of Bachelor of Science in the Programme, according to their convenience; @ denotes Non-Examination credits.

Note: Internship/ Apprenticeship/ Field Work Experience (during vacations of semester II to V This will carry 5 credits for learning of 150 hours. Its credits and grades will be reflected in final semester VI credit grade report.

Part B
Syllabus Prescribed for 2022 Year UG

Syllabus Prescribed for Three Year UG Programme

Programme: B.Sc. II

Semester III

Code of the Course/Subject	Title of the Course/Subject	Total Number of Periods
BOT (4S)	Cell Biology, Genetics and Plant Breeding	72

COs:

After completion of this course successfully, the students would be able to

1. **Understand** the structure and purpose of basic components of prokaryotic and eukaryotic cells.
2. **Identify** the concept that explains chemical composition and structure of cell wall and membrane
3. **Differentiate** cell organelles on the basis of structure and function.
4. **Comprehend** the effect of chromosomal abnormalities in numerical as well as structural changes.
5. Have **conceptual understanding** of laws of inheritance, genetic basis of loci, alleles, their linkage and crossing over.
6. **Understand** the basic concepts of plant breeding.
7. **Analyse** the different selection and breeding methods applied in crop improvement.

	Unit	Content
UNIT-I	Cell Biology- Ultrastructure and functions of cell 1.1The cell: Cell as a unit of structure and function, Characteristics of Prokaryotic and Eukaryotic cell 1.2 The cell wall-chemical structure and function 1.3 Plasma membrane –Structure (models) and Functions 1.4 Cell Organelles: Structure and function of the following: Endoplasmic Reticulum, Golgi complex, Vacuole, Ribosome, Peroxisome.	12
UNIT-II	Cell Biology-Cell Cycle 2.1 Nucleus – Ultra structure and functions (nuclear membrane, nuclear pore complex and nucleolus) 2.2 Chloroplast- Structure and functions 2.3 Mitochondria- Structure and functions 2.4 Cell Cycle- G1,S,G2 and M phases, Mitosis stages and significance, Meiosis- stages and significance, Amitosis,	12
UNIT-III	Physical Basis of Inheritance 3.1 Chromosome- Morphology, Types, Primary& Secondary constriction, Centromere & Telomere 3.2 Special types of chromosomes- Ex. Polytene 3.3 Chromosomal aberrations – 3.3.1 Structural aberrations: Deletion (Terminal, Interstitial) Duplication (Tandem, Reverse tandem and Displaced), Inversion (Pericentric and Paracentric) and Translocation (Simple, Isochrome, Reciprocal, Displaced)	12

	3.3.2 Numerical aberrations: Euploidy and aneuploidy 3.4 Significance of chromosomal aberrations.	
UNIT-IV	Mendelian Genetics 4.1 Concepts of Phenotype, Genotype, Heredity, Variation, Mendel's experiments on Pea plants. 4.2 Mendelism: Mendel's law of Dominance, Back cross and Test cross, Segregations and Independent assortment, Incomplete dominance and co-dominance. 4.3 Interaction of genes- Complimentary, Supplementary and Epistasis (Dominant and Recessive) 4.4. Problems based on Mendelism and Interaction of Genes	12
UNIT-V	Neo Mendelian Genetics 5.1 Linkage – Concept, Linkage group, Types and Theories-Sutton and Bovary theory 5.2 Crossing over- Concept, Types and mechanism of crossing over 5.3 Gene mutations- Spontaneous and Induced-physical and chemical mutagens 5.4 Cytoplasmic Inheritance- Chloroplast DNA	12
UNIT-VI	Plant Breeding 6.1 Historical account, objectives and scope of plant breeding, 6.2 Inbreeding depression and heterosis 6.3 Selection methods for self and cross pollinated crops 6.4 Recent advances in plant breeding- cultivar development, tissue Culture based approaches.	12
	<p>*SEM : Skill Enhancement Module</p> <p>1. Microscopic techniques-</p> <p>1.1 Introduction to the Microscope 1.2 Optical microscopy (conventional light microscopy (LM), fluorescence microscopy (FM), confocal and Phase contrast microscopy 1.3 Scanning and Transmission Electron Microscopy 1.4 Microscope Maintenance: Best Practices 1.5 Applications of Microscopy in Biological Sciences</p> <p>2. Plant Breeding techniques-</p> <p>2.1 Collection of Variability 2.2 Evaluation and Selection of Parents 2.3 Hybridization and mutation breeding 2.4 Selection and Testing of Superior germplasm 2.5 Commercialization of New Cultivars</p> <p>3. Plant propagation-</p> <p>3.1 Need and potentialities for plant multiplication 3.2 Sexual and asexual methods of propagation 3.3 Advantages and disadvantages. 3.4 Micro grafting, hardening of plants 3.5 Tissue culture propagation (Media preparation, Sterilization, culture initiation)</p> <p>COs:</p> <p>On completion of this course the learner will be able to</p> <ol style="list-style-type: none"> enhance sense of sight by microscopic techniques to describe the principle, construction and working of various microscopes allow to follow curiosity outdoors and explore hands-on, experiential learning to achieve an increase in numbers and preserve the essential characteristics of the plant. Excellent research skills 	

	ACTIVITIES <ol style="list-style-type: none"> 1. Botanical Excursion/Short/Long Tour- Report submission 2. Collection and observation of Chironomus larvae. 3. Visit to krushi kendra for variety of crop plant seeds 4. Germplasm collection of locally available crops 5. Visit to Research Institutes/Industries 	

Suggested Readings:

1. Biology: The Dynamic Science, 2nd Edition, Peter J. Russell, Paul E. Hertz.. Beverly Mc Millan publications. 2012
5. Karp, G. (2010). Cell Biology, John Wiley & Sons, U.S.A. 6th edition.
6. Cell and Molecular Biology, 4th Edition, P.K. Gupta. 2014
7. Cytogenetics, 1st Edition, P.K. Gupta. 2013
8. Cell Biology, 10th Edition, S.P. Singh and B. S. Tomar. 2014.
9. Principles of Genetics, 7th Edition, Robert H. Tamarin. 2002. Tata- Mc Graw Hill publications.
10. Gardner, E.J., Simmons, M.J., Snustad, D.P. (1991). Principles of Genetics, John Wiley & Sons, India.
11. Strickberger, M.W. (1985) Genetics, 3rd Edition. Pearson Printice Hall (printed in India by Anand Sons).
12. Ahluwalia K.B 2005 (First Edition). Genetics. New Age International Private Ltd. Publishers, New Delhi.
13. Gupta, P.K. (2018) Genetics. 5th Edition, Rastogi Publications, Meerut.
14. Theory and Problems of Genetics. W. D. Stansfield. 2002. Mc Graw Hill publications.
15. Genes- IX, 9th Ed., Benjamin Lewin. Jones and Bartlett Publishers, 2008.
16. Chromosomal Aberrations: Basic and Applied aspects by Obe.G. and A.T. Natarajan (1990) Springer Verlag, Berlin.
17. Cytogenetics, Plant Breeding and evolution by U.Sinha and Sunita Sinha , Vikas Publishing House Private, Limited, 1998.
18. Principles of Plant Breeding Allard R. W. Wiley & Sons
19. Plant Breeding Theory and Practice Stoskopf N. C., Tomes D. T. & Christie, B. R. Westview Press

PRACTICAL

Cell Biology, Genetics and Plant Breeding

1.	Cell Biology <ol style="list-style-type: none"> 1. Study of plant cell structure with the help of epidermal peel mount of Onion/Rhoeo 2. Study of polytene chromosome either by slide preparation or photographs. 3. Study of various stages of mitosis (Squash preparation) 4. Study of various stages of meiosis (Smear preparation) 5. Study of chromosomal aberrations by using Photographs/Permanent Slides 6. Study of Chromosome Morphology using Permanent Slide/ Photograph
2.	Genetics <ol style="list-style-type: none"> 7. To prove Mendel's Monohybrid ratio. 8. To prove Mendel's Dihybrid ratio. 9. Problems based on Interaction of genes (Complementary/ Supplementary/Epistasis) 10. Study of polyploides using photographs.

3.	Plant Breeding
	11. Study of vital floral structures for plant breeding. 12. To perform Emasculation in various plants. 13. To demonstrate hybridization techniques in plants. 14. To study pollen viability. 15. To study seed viability percentage in various crops

**SANT GADGE BABA AMRAVATI UNIVERSITY,
AMRAVATI PRACTICAL EXAMINATION
B. Sc. II (Botany) SEMESTER – IV**

(CBCS New)

Practical –IV- Cell Biology, Genetics and Plant Breeding

Schedule- External Practical

Time: 4 hours	Marks: 25
Q. 1: Cell Biology: To perform given experiment (Any one)	05 Marks
Q. 2: Genetics: To perform given experiment (Any one)	05 Marks
Q. 3: Plant Breeding: To perform given experiment (Any one)	05 Marks
Q. 4: Spotting	05 Marks
Q. 6: Viva-voce by External Examiner	05 Marks

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B. Sc. II (Botany) SEMESTER – IV**

(CBCS New)

Practical –IV- Cell Biology, Genetics and Plant Breeding

Schedule- Internal Practical

Time: 4 hours	Marks: 25
Q. 1: Student Attendance	05 Marks
Q. 2: Student Performance	05 Marks
Q. 3: Viva-voce by Internal Examiner Marks	05
Q. 4: Botanical Excursion/Short/Long Tour: Report submission	05 Marks
Q. 5: Class record	05 Marks