

**AC/24.02.2024/RS1**



**SIES**

College of Arts,  
Science &  
Commerce (Autonomous)

**RISE WITH EDUCATION**

NAAC REACCREDITED - 'A' GRADE

**SIES College of Arts, Science and Commerce (Autonomous)**

**Sion (West) Mumbai: 400022**

**Affiliated to Mumbai University**

**Syllabus under NEP effective from June 2024 Offered by:**

**Department of Botany**

**Program: S. Y. B.Sc. Course: Botany (DSC) Minor**

**Choice Based Credit System (CBCS) with effect from the  
academic year 2024-25**

SYUGP Credit Structure break-up from 2023-24 (Across All courses)										
Level	Sem	Major	Elect	Minor	OE	VSC	VEC	OJT, FP, RP, CEP		Degree/ Cum Cr
						SEC		CC		
5 (2024-25)	Sem 3	(3T+1P) + (3T+1P)	0	(3T+1P)	2	VSC Major/ Minor	2	FP/CEP 2 (Sci) & CC 2	22	<b>88 UG Diploma</b>
	Sem 4	(3T+1P) + (3T+1P)	0	(3T+1P)	2	SEC Major/ Minor	2	FP/CEP 2 (Art/Com) & CC 2	22	

### PROGRAMME SPECIFIC OUTCOMES (PSOs)

After completing the graduation (B. Sc.) course in Botany, the learners would be able to:

- **PSO1:** Identify the different groups of plants and gain knowledge about plant biodiversity and its conservation.
- **PSO2:** Learn different techniques, protocols, methodologies during study and apply them in future.
- **PSO3:** Utilize botanical knowledge for problem solving and for taking real time decisions while working with plants.
- **PSO4:** Learn good laboratory practices and acquire research skills required for industrial support services.
- **PSO5:** Inculcate scientific temperament, good reasoning power, technological and analytical skills while designing the experiments.
- **PSO6:** Develop interest in pursuing higher studies in plant sciences and allied fields to develop a better future.
- **PSO7:** Understand the scope, current trends, job prospects and career avenues in Botany.
- **PSO8:** Share social and environmental consciousness with fellow citizens and motivate them towards taking fundamental steps towards environmental conservation.

## **PREAMBLE**

Keeping in tune with the revised autonomous syllabus of F. Y. B. Sc. the committee has taken utmost care to maintain the continuity in the flow of information of higher level at S. Y. B. Sc. Hence some of the modules of the existing S. Y. B. Sc. syllabus have been upgraded with the new modules as per the guidelines of NEP, to make the learners aware about the recent developments in various branches of Botany (like Cytogenetics, Plant physiology and Biochemistry, Ecology and Environmental Botany, Medicinal Botany, Plant biotechnology, Industrial Botany, etc.). Various interdisciplinary courses such as Biotechnology & Bioinstrumentation are also introduced to keep the students on par with the updated tools and techniques.

One paper of theory and one practical each (Semester - III & Semester - IV) are compulsory for the students.

Each theory period shall be 60 minutes in duration. The theory component shall have 48 instructional periods per semester. Each practical will be 2 periods of 60 minutes each.

**S. Y. B. Sc. Botany Syllabus Under NEP**  
**To be implemented from the Academic year 2024-2025**

**Minor subject: 1 SEM – III SECOND YEAR BSc (BOTANY MINOR)**  
**(Credits: 4)**

<b>Theory: Paper I –Functional Botany III</b>				
<b>Paper Code</b>	<b>Unit No.</b>	<b>Unit Name</b>	<b>Credits</b>	<b>Lectures/week</b>
<b>SIUBOMN211</b>	1	Ecology and Phytogeography	03	01
	2	Plant Physiology: Photosynthesis and Respiration		01
	3	Pharmacognosy & Phytochemistry		01
<b>Practical I – Functional Botany III</b>				
<b>SIUBOMNP211</b>	Based on SIUBOMN211(Practical I)		01	02

<b>Semester III Functional Botany III (4Cr) (Minor)</b>	<b>Hr45</b>
<b>Course code: SIUBOMN211</b>	<b>Cr.03</b>
<b>Paper II - Functional Botany III</b>	
<p><b>LEARNING OBJECTIVES:</b> The course, Functional Botany III, comprises units on Ecology and Phytogeography, Plant physiology and Pharmacognosy &amp; Phytochemistry. The course would create awareness about basic concepts in ecology, phytogeography, and their significance. The course will aid students in understanding the basic mechanism of photosynthesis, respiration, and photorespiration in plants. The course would introduce different allied branches of medicine and also enhance students' understanding of traditional medicines in grandma's pouch, secondary metabolites, psychoactive drugs, and adulteration in medicinal drugs.</p>	
<p><b>COURSE OUTCOMES:</b></p> <p>After completion of the course, learners will be able to understand:</p> <p><b>CO1:</b> The different types of energy pyramids and the process of energy flow in an ecosystem.</p> <p><b>CO2:</b> The ecological adaptations observed in plants in response to the surrounding environment.</p> <p><b>CO3:</b> Phytogeographical regions of India and scope of phytogeography.</p> <p><b>CO4:</b> Basic process of photosynthesis in plants.</p> <p><b>CO5:</b> Various processes related to respiration and photorespiration.</p>	

<p><b>CO5:</b> Allied systems of medicine.</p> <p><b>CO6:</b> Traditional use of plants from Grandma's pouch.</p> <p><b>CO7:</b> Various secondary metabolites produced in plants and their role.</p> <p><b>CO8:</b> Psychoactive drugs from plants.</p> <p><b>CO9:</b> Adulterations in medicinal drugs.</p>			
<b>UNIT I – Ecology and Phyto geography</b>		<b>15</b>	
1	Energy pyramids, Energy flow in an ecosystem. (04)		
2	Ecological adaptations in plants. (04)		
3	Phyto geography – Introduction, scope, significance. (03)		
4	Phyto geographical regions of India. (04)		
<b>UNIT II – Plant physiology</b>		<b>15</b>	
1	<b>Photosynthesis:</b> Introduction and significance, site of photosynthesis, photosynthetic pigments – nature and functions, role of light, absorption and action spectrum, photosynthetic unit, photoluminescence, Emerson's effect, photosystems, Factors affecting photosynthesis. (04)		
2	<b>Light reaction</b> – Photolysis of water, photophosphorylation: Cyclic, noncyclic, chemiosmotic pathway. (03)		
3	<b>Dark reaction-</b> C <sub>3</sub> cycle, C <sub>4</sub> cycle & CAM. (03)		
4	<b>Respiration: Aerobic:</b> Glycolysis, TCA Cycle, ETS & Energetics of respiration; Anaerobic respiration (04)		
5	<b>Photorespiration</b> (01)		
<b>UNIT III – Pharmacognosy &amp; Phytochemistry</b>		<b>15</b>	
1	Traditional and alternative systems of medicine- Ayurveda, Siddha, Unani and homoeopathy (03)		
2	Botanical source, Active constituents, and Medicinal uses of some medicinal plants from Grandma's pouch – <i>Zingiber officinalis</i> , <i>Mentha piperita</i> , <i>Piper nigrum</i> , <i>Ocimum sanctum</i> , <i>Adhatoda vasica</i> . (02)		
3	Study of secondary metabolites w.r.t chemical properties, occurrence, examples, and therapeutic uses – alkaloids, glycosides, volatile oils, tannins. (04)		
4	Psychoactive drugs from plant sources and their effects. (02)		
5	Adulteration and Substitution of medicinal drugs – Reasons & types. Adulteration of <i>Saraca asoca</i> with <i>Polyalthia longifolia</i> ; <i>Glycyrrhiza glabra</i> with <i>Abrus precatorius</i> ; <i>Bacopa monnieri</i> with <i>Centella asiatica</i> . (04)		

<b>Course Code: SIUBOMN211</b>	<b>REFERENCE BOOKS: Course Title: Functional Botany III</b>
<b>Unit I:</b>	<b>Ecology and Phytogeography</b>
<ul style="list-style-type: none"> <li>● Ambasht, R. S., and Ambasht, N. K. (2019). A Textbook of Plant Ecology.</li> <li>● Braun-Blanquet, J. (1932). Plant Sociology. McGraw-Hill Book Company, New York.</li> <li>● Dash, M. C. (1993). Fundamentals of Ecology. McGraw-Hill Education (India) Pvt Limited. ISBN:9780074601037, 0074601032.</li> <li>● Kupchella, C. E., and Hyland, M. C. (1989). Environmental Science - Living Within the System of Nature. Allyn and Bacon. ISBN: 9780205120161, 0205120164.</li> <li>● Misra, K. C. (1974). Manual of Plant Ecology. Oxford &amp; IBH Publishing Company.</li> <li>● V. Verma. Plant Ecology. ANE Books. ISBN: 9789380618005, 9789380618005.</li> <li>● Verma, P. S., and Agarwal, V. K. (1983). Environmental Biology (Principles of Ecology). S. Chand Publishing. ISBN: 9788121908597.</li> <li>● Weaver, J. E. and Clements, F. E. (1938). Plant Ecology. New York: McGraw-Hill Book Co., Inc. Ed. 2.</li> <li>● Bharucha, F. R. (1983). A textbook of the plant geography of India, Oxford University Press.</li> </ul>	
<b>Unit II:</b>	<b>Plant Physiology</b>
<ul style="list-style-type: none"> <li>● Berg, J. M., Tymoczko, J. L., and Stryer, L. Biochemistry. (2002). W. H. Freeman and Company. ISBN: 0716730510; ISBN 13: 9780716730514.</li> <li>● Lehninger, A. L., Nelson, D. L., and Cox, M. M. (2005). Lehninger Principles of Biochemistry. W. H. Freeman and Company. ISBN: 9780716743392, 0716743396.</li> <li>● Salisbury, F. B. and Ross, C. W. (1969). Plant Physiology. Wadsworth Publishing Company. ISBN: 9780534416751, 0534416756.</li> <li>● Taiz, L. and Zeiger E. (2002). Plant Physiology. Sinauer Associates; 3 Edition. ISBN: 0878938230.</li> <li>● Voet, D., Voet, J. G., Pratt, C. W. (2008). Fundamentals of Biochemistry - Life at a Molecular Level. John Wiley &amp; Sons, Inc. ISBN-13 978-0470-12930-2.</li> </ul>	
<b>Unit III:</b>	<b>Pharmacognosy and Phytochemistry</b>
<ul style="list-style-type: none"> <li>● Trivedi P C, (2006). Medicinal Plants: Ethnobotanical Approach, Agrobios, India.</li> <li>● Purohit and Vyas, (2008). Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. Agrobios, India.</li> <li>● Wallis, T. E. (1946). Textbook of Pharmacognosy, J &amp; A Churchill Ltd. 2. Roseline, A. 2011. Pharmacognosy. MJP Publishers, Chennai.</li> <li>● Gurdeep Chatwal, (1980). Organic chemistry of natural products. Vol. I. Himalaya Publishing house.</li> <li>● Kokate, C.K.; Purohit, A.P. and Gokhale, S.B. (2010). Pharmacognosy (45th ed.). Nirali Prakashan, Pune.</li> </ul>	

- Anonymous. (1999). The Ayurvedic Pharmacopoeia of India. Vol. I & II. Ministry of Health and Family Welfare, Govt. of India, New Delhi.
- Sivarajan, V.V. and Balachandran, I. (1994). Ayurvedic Drugs and Their Plant Sources. Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi.
- Trease and Evans. (2009). Pharmacognosy (16th ed.). W. B. Saunders Co. Ltd., London.
- Khandelwal, K.R. (2002). Practical Pharmacognosy: Techniques and Experiments (9th ed.). Nirali Prakashan, Pune.

	<b>Semester III (Minor)</b>	<b>Hr20 Cr. 1</b>
	<b>Course code: SIUBOMNP211</b>	
	<b>Practical Paper II – Functional Botany III</b>	
1	Estimation of primary productivity by harvest method.	
2	Estimation of primary productivity by chlorophyll method.	
3	Identification of plants adapted to different environmental conditions: Hydrophytes: Free floating ( <i>Pistia/Eichhornia</i> ); Rooted floating ( <i>Nymphaea</i> ); Submerged ( <i>Hydrilla</i> ), Mesophytes (any common plant); Hygrophytes ( <i>Typha/Cyperus</i> ), Xerophytes: Succulent ( <i>Opuntia</i> ); Woody Xerophyte ( <i>Nerium</i> ); Halophyte ( <i>Avicennia pneumatophore</i> ).	
4	Study of phytogeographical regions of India.	
5	Estimation of the amount of chlorophyll present in the leaf tissue	
6	Separation of photosynthetic pigments by paper chromatography.	
7	Q10 – germinating seeds using Phenol red indicator.	
8	Study of an absorption spectrum of chlorophyll.	
9	Macroscopic and microscopic study to analyze the Adulteration of <i>Saraca asoca</i> with <i>Polyalthia longifolia</i> ; <i>Glycyrrhiza glabra</i> with <i>Abrus precatorius</i> ; <i>Bacopa monnieri</i> with <i>Centella asiatica</i> .	
10	Test for alkaloids, glycosides, saponins, and phenolics.	
11	Identification of medicinal plants from Grandma's pouch - <i>Zingiber officinalis</i> , <i>Mentha piperita</i> , <i>Piper nigrum</i> , <i>Ocimum sanctum</i> , <i>Adhatoda vasica</i> .	

**Minor subject: 2 SEM – IV SECOND YEAR BSc (BOTANY Minor)**

**(Credits: 4)**

<b>Theory: Paper II –Functional Botany IV</b>				
<b>Paper Code</b>	<b>Unit No.</b>	<b>Unit Name</b>	<b>Credits</b>	<b>Lectures/week</b>
<b>SIUBOMN221</b>	1	Cell biology & Cytogenetics	03	01
	2	Plant biotechnology		01
	3	Industry based on plant products		01
<b>Practical I – Functional Botany IV</b>				
<b>SIUBOMNP221</b>	Based on SIUBOMN221(Practical II)		01	02

<b>Semester IV Functional Botany IV (4Cr) (Minor)</b>		<b>Hr45 Cr.03</b>
<b>Course code: SIUBOMN221</b>		
<b>Paper II - Functional Botany IV</b>		
<p><b>LEARNING OBJECTIVES:</b> The course Functional Botany IV comprises of the units Cell Biology and Cytogenetics, Plant Biotechnology and Industry based on plant products. The course would allow the students to explore the ultrastructure and functions of various cell organelles. It would encourage students to learn concepts related to cell division as well as types of nucleic acids. It would make students understand the structures, causes and effects of chromosomal aberrations, sex determination, maternal effects with their examples. It would make students understand the applications of plant tissue culture and R-DNA technology. It would also highlight the applications of protoplast fusion and somatic hybridization in agriculture. It would enhance students’ understanding of the economic and commercial value of botanical products as well as understanding of the industrial relevance of botanicals with respect to current demands of industry. It would teach them about the role of industrial enzymes and the process of biofuel production.</p>		
<p><b>COURSE OUTCOMES:</b></p> <p>After completion of the course, learners would be able to understand:</p> <p><b>CO1:</b> Ultrastructure and functions of cell organelles.</p> <p><b>CO2:</b> The process of Cell Division and its significance.</p> <p><b>CO3:</b> Ultrastructure of Interphase Nucleus. Types, structure, and functions of Nucleic Acid.</p> <p><b>CO4:</b> The Cytological and Genetic Effects Chromosomal Aberrations.</p>		



<p><b>CO5:</b> Basic concepts of Sex determination, Sex linked, and sex influenced- sex limited traits.</p> <p><b>CO6:</b> Learning the fundamentals of Extranuclear Genetics.</p> <p><b>CO7:</b> Various sterilization techniques, seed sterilization &amp; techniques in plant tissue culture.</p> <p><b>CO8:</b> Basic concepts of gene cloning.</p> <p><b>CO9:</b> Study of somatic embryogenesis and somatic hybridization along with their applications in agriculture.</p> <p><b>CO10:</b> The concept of aromatherapy &amp; nutraceuticals.</p> <p><b>CO11:</b> Basic concepts and economic importance of plant-based beverages, plant enzyme industry and biofuels.</p> <p><b>CO12:</b> Study of plants as sources of rubber, paper and fibres.</p>			
<b>UNIT I – Cell biology and Cytogenetics</b>		<b>15</b>	
1	<b>Nucleic Acids:</b> Types, structure and functions of DNA and RNA. (02)		
2	Cell division Meiosis and its significance. (02)		
3	<b>Variation in Chromosome Structure (Chromosomal Aberrations):</b> Definition, origin, cytological and genetic effects of the following: Deletions, Duplications, Inversions and Translocations. (04)		
4	<b>Sex Determination, Sex Linked and Sex Influenced - Sex Limited Traits:</b> <b>Sex determination:</b> Chromosomal Methods: heterogametic males and heterogametic females. Sex determination in monoecious and dioecious plants. Genic Balance theory of sex determination in <i>Drosophila</i> , Lyon's Hypothesis of X chromosome inactivation. (04)		
5	<b>Sex Linked:</b> Eye colour in <i>Drosophila</i> , Haemophilia, Colour blindness (01)		
6	<b>Sex Influenced - Sex Limited Traits:</b> Baldness in man (01)		
7	<b>Extranuclear Genetics:</b> Organelle heredity: Chloroplast determined heredity - Plastid transmission in plants, Streptomycin resistance in <i>Chlamydomonas</i> . Male sterility in maize (01)		
<b>UNIT II – Plant Biotechnology</b>		<b>15</b>	
1	<b>r-DNA technology: (4)</b> <ul style="list-style-type: none"> <li>▪ Gene cloning</li> <li>▪ Enzymes involved in Gene cloning.</li> <li>▪ Vectors used for Gene cloning.</li> </ul>		
2	<b>Introduction to plant tissue culture: (5)</b> <ul style="list-style-type: none"> <li>▪ Laboratory organization and techniques in plant tissue culture</li> <li>▪ Totipotency</li> </ul>		

	<ul style="list-style-type: none"> <li>▪ Organogenesis</li> <li>▪ Organ culture – root cultures, meristem cultures, anther and pollen culture, embryo culture.</li> </ul>		
3	Somatic embryogenesis and artificial seeds: Concept, definition, various methods, and applications. (3)		
4	Protoplast isolation, various methods of protoplast fusion, somatic hybridization, and its applications in agriculture. (3)		
<b>UNIT III – Industry based on plant products</b>		<b>15</b>	
1	Aromatherapy oils concerning botanical source, extraction, properties and applications: Ylang-ylang, Rose, Vetiver, Eucalyptus, Jasmine. (04)		
2	Botanical and nutraceuticals: <i>Spirulina</i> , <i>Vanillin</i> , <i>Garcinia indica</i> / <i>Garcinia cambogia</i> , <i>Chlorella</i> and <i>Kale</i> . (03)		
3	Plant-based beverages: Alcoholic- Wine, Beer and Toddy; Non- alcoholic Neera, Coffee and Cocoa. (03)		
4	Enzymes industry: Cellulases, Papain, Bromelain. (02)		
5	Plants as a source of Biofuels- <i>Jatropha</i> , <i>Euphorbia</i> , <i>Calotropis</i> and algae. (02)		
6	Plants as sources of rubber, paper and fibres. (01)		

<b>Course code: SIUBOMN221</b>	<b>REFERENCE BOOKS: Course Title: FUNCTIONAL BOTANY IV</b>
<b>Unit I:</b>	<b>Cell biology and Cytogenetics</b>
<ul style="list-style-type: none"> <li>● De Robertis and De Robertis. (2017). Cell and Molecular Biology 8Ed.</li> <li>● Karp, G. (1999). Cells and Molecular Biology: Concepts &amp; Experiments. John Wiley and Sons, Inc., USA.</li> <li>● Powar C.B. (1991). Cell biology Himalaya Publishing House.</li> <li>● Verma, P. S., V. K. Agrawal. (2008) Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. 3rd edition S. Chand &amp; Co, New Delhi, India.</li> <li>● Atherly, A.G., Girton, J.R. and McDonald, J. F. (1999) The science of genetics. Saunders College Pub. Fort Worth USA.</li> <li>● Benjamin Lewin, Jones and Bartlett (2009), Genes IX, Oxford, University press. New York, USA.</li> <li>● Benjamin Lewin, Jones and Bartlett (2011), Genes X, 2011 Oxford, University press. New York, USA.</li> <li>● Burnham, C.R. (1962) Discussions in cytogenetics. Burgess Pub. Co., Minnesota.</li> <li>● Channarayappa, (2010) Cell biology University Press.</li> <li>● Freifelder David (1990) Microbial Genetics, Narosa Publishing House</li> <li>● Gardner E J (2006) Principles of Genetics, Wiley; 8th edition.</li> </ul>	

- Griffiths, A.J.F and Gilbert, W.M (2007) Modern genetic analysis. (2nd edn). W.H. Freeman and Company, New York.
- Hartl, D.L., Jones E.W. (2001). Genetics: Principle and analysis (4th edn) Jones and Barlett Pub., USA.
- Khush, G S (1973) Cytogenetics of Aneuploids. Academic press New York, London.
- Russel, P.J. (1998). Genetics (5th edn). The Benjamin/ Cummins Pub. Co., Inc. USA.
- Snustad, D.P. and Simmons, M.J. (2000). Principles of genetics (4th edn). John Wiley and Sons, Inc., USA.
- Strickberger, M.W (2015) Genetics (4th edn). McMillan Publishing company, New York.

**Unit II:**

**Plant Biotechnology**

- Abdin, M. Z., Kiran, U., Kamaluddin, and Ali, A. (2017). Plant Biotechnology: Principles and Applications. Springer. ISBN: 981102961X, 9789811029615.
- Chawla, H. S. (2002). Introduction to Plant Biotechnology. United Kingdom: Science Publishers. ISBN: 9781578082285, 1578082285.
- Glick, B. R., and Pasternak, J. J. (1998). Molecular Biotechnology: Principles and Applications of Recombinant DNA. ASM Press. ISBN:9781555811365, 1555811361.
- Peter, K. V. (2008). Plant Biotechnology: Methods in Tissue Culture. India: Universities Press. ISBN: 9788173716164, 8173716161.
- Plant Cell and Tissue Culture. (2013). Netherlands: Springer Netherlands. ISBN: 9789401726818, 9401726817.
- Principles of Plant Biotechnology. (2019). United States: Callisto Reference. ISBN: 9781641162258, 1641162252.
- Slater, A., Scott, N., and Fowler, M. (2008). Plant Biotechnology: The Genetic Manipulation of Plants. Oxford University Press. SBN: 9780199282616, 0199282617.

**Unit III:**

**Industry based on plant products**

- Aehle, W. Enzymes in Industry: Production and Applications. Wiley-VCH. ISBN: 978-3-527-31689-2.
- Buckle, J. (2003). Clinical Aromatherapy: Essential Oils in Practice. Elsevier Science. ISBN 0-443-07236-1.
- Chandrasekaran, M. (2016). Enzymes in Food and Beverage Processing. CRC Press, Taylor & Francis Group. ISBN - 13: 978-1-4822-2128-2.
- Crozier, A., Ashihara, H., Tomas-Barberan, F. (2012). Teas, Cocoa and Coffee: Plant Secondary Metabolites and Health. Wiley & Blackwell. ISBN-13: 978-1-4443-3441-8.
- Hui, Y. H. (2012). Handbook of Plant-Based Fermented Food and Beverage Technology. Taylor & Francis Group, LLC. ISBN-13: 978-1-4398-7069-3.
- Jenkins, N. (2006). Aromatherapy in Essence. Hodder Arnold. ISBN-10: 0 340 92606 6; ISBN-13: 978 0 340 92606 2.

- Kumar, A., Ogita, S., and Yau, Y. (2018). Biofuels: Greenhouse Gas Mitigation and Global Warming - Next Generation Biofuels and Role of Biotechnology. Springer (India) Pvt. Ltd. ISBN 978-81-322-3761-7; ISBN 978-81-322-3763-1 (eBook).
- McGuinness, H. (2003). Aromatherapy: Therapy Basics. Hodder Arnold. ISBN-10: 0 340 876808; ISBN-13: 978 0 340 87680 0.

	<b>Semester IV (Minor)</b>	<b>Hr20</b>
	<b>Course code: SIUBOMN221</b>	<b>Cr. 1</b>
	<b>Practical Paper II – Functional Botany IV</b>	
1	Estimation of DNA and RNA from plant material (one Std & one Unknown, No Std Graph).	
2	Study of meiosis from suitable plant material	
3	Study of inheritance pattern concerning Plastid Inheritance.	
4	Study of cytological consequences of chromosomal aberrations (Laggards, Chromosomal Bridge, Ring chromosome, Chromosomal ring) from permanent slides or photomicrographs. Study of karyotypes Cri-du-chat, Philadelphia syndrome & D-G translocation.	
5	Study of Sex-linked inheritance (eye colour in <i>Drosophila</i> , Haemophilia, Colour blindness) & Sex influenced characters (baldness in man, Hypertrichosis). Problems based on sex-linked inheritance.	
6	Preparation of Stock solutions; Preparation of MS medium	
7	Various sterilization techniques. Seed sterilization and inoculation.	
8	Callus induction & Regeneration of plantlets from callus (Demonstration).	
9	Identification of the cloning vectors – pBR322, pUC18, Ti-plasmid	
10	Identification – somatic embryogenesis, artificial seeds.	
11	Identification of plants as sources of biofuels, rubber, paper, and fibers.	

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