

(First page for SECs, model only)

ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION  
REVISED UG SYLLABUS UNDER CBCS  
(Implemented from Academic Year 2020-21)  
PROGRAMME: THREE YEAR B.Sc.,

Domain Subject: BOTANY

Skill Enhancement Courses (SECs) for Semester V, from 2022-23  
(Syllabus-Curriculum)

Structure of SECs for Semester – V

(To choose One pair from the Four alternate pairs of SECs)

Univ. Code	Courses 6 & 7	Name of Course	Th. Hrs. / Week	IE Mar-ks	EE Mar-ks	Credits	Prac. Hrs./ Wk	Mar-ks	Credits
	6A	Plant Propagation	3	25	75	3	3	50	2
	7A	Seed Technology	3	25	75	3	3	50	2

OR

	6B	Vegetable Crops – Cultivation Practices	3	25	75	3	3	50	2
	7B	Vegetable Crops – Post Harvest Practices	3	25	75	3	3	50	2

OR

	6C	Plant Tissue Culture	3	25	75	3	3	50	2
	7C	Mushroom Cultivation	3	25	75	3	3	50	2

OR

	6D	Gardening and Landscaping	3	25	75	3	3	50	2
	7D	Agroforestry	3	25	75	3	3	50	2

**Note-1:** For Semester–V, for the domain subject Botany, any one of the four pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C or 6D & 7D. The pair shall not be broken (ABCD allotment is random, not on any priority basis).

**Note-2:** One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate field skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented. Hence, teachers shall also impart practical training to students on the field skills embedded in the syllabus citing related real field situations.

*(Template for each course, for Model only)*

A.P. State Council of Higher Education  
Semester-wise Revised Syllabus under CBCS, 2019-20

Course Code:

Three-year B.Sc.

Domain Subject: **BOTANY**

III Year B. Sc., – Semester – V

Course 6: **Plant Tissue Culture**

(Skill Enhancement Course (Elective), 05 Credits)

Max Marks: Theory:100 + Practical:50

**I. Learning Outcomes:**

Students after successful completion of the course will be able to:

1. Identify various facilities required to set up a plant tissue culture laboratory.
2. Acquire a critical knowledge on sterilization techniques.
3. Demonstrate skills related to callus culture through hands on experience
4. Understand the biotransformation technique for production of secondary metabolites.
5. Comprehend the applications of plant tissue culture.

**II. Syllabus:** *(Total Hours: 90 including Teaching, Lab, Field Training and unit tests etc.)*

**Unit - 1: Basic concepts of plant tissue culture** (10h)

1. Plant tissue culture: Definition, history, pioneer experiments, scope and significance.
2. Totipotency, differentiation, dedifferentiation, and redifferentiation; types of cultures.
3. Infrastructure and equipment required to establish a tissue culture laboratory.

**Unit - 2: Sterilization techniques and culture media** (10h)

1. Aseptic conditions – Fumigation, wet and dry sterilization, UV sterilization, ultrafiltration.
2. Nutrient media: Composition of commonly used nutrient culture media with respect to their contents like inorganic chemicals, organic constituents, vitamins, amino acids etc.
3. Composition and preparation of Murashige and Skoog culture medium.

**Unit - 3: Callus culture technique** (10)

1. Explants for tissue culture: Shoot tip, axillary buds, leaf discs, cotyledons, inflorescence and floral organs. Methods of their isolation and surface sterilization. Inoculation techniques.
2. Callus culture: Definition, various steps in callus culture.
3. Initiation and maintenance of callus - Growth measurements and subculture; somaclonal variations.

**Unit – 4 : Micropropagation** (10h)

1. Direct and indirect morphogenesis, organogenesis, role of PGRs; somatic embryogenesis and synthetic seeds.
2. Greenhouse hardening unit operation and management; acclimatization and hardening of plantlets - need, process, packaging, exports.
3. Pathogen (Virus) indexing- significance, methods, advantages, applications.

**Unit – 5 : Applications of plant tissue culture** (10h)

1. Germplasm conservation: cryopreservation methods, slow growth, applications and limitations; cryoprotectants.
2. Plant transformation techniques and bioreactors; production of secondary metabolites-optimization of yield, commercial aspects, applications, limitations.
3. Transgenic plants- gene transfer methods; Bt cotton

**Practical Syllabus: Course 6: Plant Tissue Culture**

**III. Skills Outcomes:**

On successful completion of this practical course, student shall be able to:

1. List out, identify and handle various equipment in plant tissue culture lab.
2. Demonstrate the procedures of preparation of media.
3. Exhibit skills on inoculation, establishing callus culture and micropropagation.
4. Acquire skills in observing and measuring callus growth.
5. Perform techniques related to plant transformation for secondary metabolite production.

**IV. Practical Syllabus:**

1. Principles and applications of- Autoclave, Laminar Airflow, Hot Air Oven.
2. Sterilization techniques for glass ware, tools etc.,
3. MS medium - Preparation of different stock solutions; media preparation
4. Explant preparation, inoculation and initiation of callus from carrot.
5. Callus formation, growth measurements.
6. Induction of somatic embryos, preparation of synthetic seeds.
7. Multiplication of callus and organogenesis.
8. Hardening and acclimatization in green house.

**V. References:**

1. Kalyan Kumar De (2001) An Introduction to Plant Tissue Culture, New Central Book Agency (P) Ltd., Calcutta
2. Razdan, M.K. (2005) Introduction to Plant Tissue Culture, Oxford & IBH Publishers, Delhi
3. Bhojwani, S.S. (1990) Plant Tissue Culture: Theory and Practical (a revised edition). Elsevier Science Publishers, New York, USA.
4. Vasil, I.K. and Thorpe, T.A. (1994) Plant Cell and Tissue Culture. Kluwer Academic Publishers, the Netherlands.
5. *Web resources suggested by the teacher concerned and the college librarian including reading material.*

## VI. Co-Curricular Activities:

a) **Mandatory:** (*Training of students by teacher on field related skills: 15 hrs*)

1. **For Teacher:** Training of students by teacher in laboratory and field for a total of 15 hours on sterilization procedures, preparation of media, establishment of callus culture, growth measurements; morphogenesis and organogenesis; acclimatization and hardening of plantlets done in the field.
2. **For Student:** Individual visit to a local plant tissue culture facility or related field or to a laboratory in a university/research organization/private sector and study of plant tissue culture practices. Submission of a hand-written Fieldwork Report not exceeding 10 pages in the given format.
3. Max marks for Field Work Report: 05.
4. Suggested Format for Field work: *Title page, student details, content page, introduction, work done, findings, conclusions and acknowledgements.*
5. Unit tests (IE).

b) **Suggested Co-Curricular Activities**

1. Training of students by related industrial experts.
2. Assignments (including technical assignments like identifying tools in plant biotechnology and their handling, operational techniques with safety and security, IPR)
3. Seminars, Group discussions, Quiz, Debates etc. (on related topics).
4. Preparation of videos on tools and techniques in plant biotechnology.
5. Collection of material/figures/photos related to products of plant tissue culture, writing and organizing them in a systematic way in a file.
6. Visits to plant tissue culture/biotechnology facilities, firms, research organizations etc.
7. Invited lectures and presentations on related topics by field/industrial experts.

## VII. Suggested Question Paper Pattern:

Max. Marks: 75

Time: 3 hrs

### **SECTION A** (Total: 15 Marks)

Very Short Answer Questions ( 10 Marks : 5 x2)

### **SECTION B** (Total: 5x5=25 Marks)

(Answer any four questions. Each answer carries 5 marks  
(At least 1 question should be given from each Unit)

1.	
2.	
3.	
4.	
5.	

6.	
7.	
8.	

**SECTION C** (Total: 4x10 = 40 Marks)  
 (Answer any four questions. Each answer carries 10 marks  
 (At least 1 question should be given from each Unit)

1.	
2.	
3.	
4.	
5.	
6.	

**Suggested Question Paper Model for Practical Examination**  
 Semester – V/ Botany Course – 6 (Skill Enhancement Course)  
**Plant Tissue Culture**

Max. Time : 3 Hrs.

Max. Marks : 50

- |  |              |
|--|--------------|
| 1. Demonstration of a sterilization technique ‘A’                    | 8 M          |
| 2. Preparation of MS medium ‘B’                                      | 8 M          |
| 3. Demonstration of callus culture technique/growth measurements ‘C’ | 12 M         |
| 4. Scientific observation and data analysis                          | 4 x 3 = 12 M |
| A. Tissue culture equipment /photograph                              |              |
| B. Morphogenesis or organogenesis - photograph                       |              |
| C. Bioreactor/Secondary metabolite                                   |              |
| D. Transgenic plant/photograph                                       |              |
| 5. Record + Viva-voce  | 6+4 = 10 M   |

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