



GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005.

(Re-accredited with 'A' Grade status by NAAC and Affiliated to Bharathidasan University, Tiruchirappalli)

M.Sc., BOTANY COURSE STRUCTURE UNDER CBCS SYSTEM

(For the candidates admitted from the year 2021-2022 onwards)

POST GRADUATE COURSES

ABOUT THE DEPARTMENT OF BOTANY

About PG program

PG programme was started in the year 1978. Course structure of the syllabus framed following affiliated Bharathidasan University. Students can choose their elective subject. Each and every course content chosen to promote placement of the students. Students can compete with competitive examinations like CSIR/NET. PG students cannot move other departments all courses are thought by the department itself. Students are given hands on training during practical hours. During final semester there is a project work useful for the students to get basic knowledge about future research. Since it's an autonomous body, board of studies constituted every three years once to update the syllabus.

GOVERNMENT ARTS COLLEGE (AUTONOMOUS)

VISION

It is our vision to persuade every mind in this temple of learning to tirelessly seek the truth to face the challenges of the times and honestly participate in the establishment of universal peace, progress and love.

MISSION

It is our mission to create in everyone an honest searching mind to be ready for value-based creative citizenship for regional, national and global peace and progress.

DEPARTMENT OF BOTANY

VISION

Provide Skill oriented quality education of Botany to the students for contributing in the process of social development.

MISSION

Offer wide and relevant education to the students through research and teaching with view of shaping their scientific temperament and environmental awareness.

Objectives:

1. To behave with the highest level of honesty.
2. To encourage the innovative ideas and approaches both in Teaching and Research.
3. To create the safe and sustainable environment.
4. To uplift the students capable of facing challenges in life efficiently and carve their own future.
5. To introduce students to modern ideas and thoughts for sustaining in global level.

What is Credit system?

Weightage to a course is given in relation to the hours assigned for the course. The following Table shows the correlation between credits and hours. However, there could be some flexibility because of practical, field visits, tutorials and nature of project work.

For PG courses, a student must earn a minimum of **90 (+4)** credits as mentioned in the table below. The total number of minimum courses offered by a department is given in the course pattern.

POST GRADUATE COURSE PATTERN (2021 ONWARDS)

PART	SEMESTER	SPECIFICATION	NO. OF COURSES	HOURS	CREDITS	TOTAL CREDITS
III	I - IV	Core courses Theory	8	48	41	84
	I - IV	Core courses Practical	6	36	18	
	I - IV	Elective Course	5	30	25	
IV	II	Extra credit course Internship programme (It should be completed in the semester Holidays)	1	-	(2)	(4)
	III	Extra Credit Course Massive Open Online Course (MOOC)	1	-	(2)	
III	IV	Project Work	1	6	6	6
TOTAL				120	90 + (4)	90 + (4)

Course Pattern

The Postgraduate degree course consists of five vital components. They are as follows:

Part - III: Core Course (Theory), Core Practical, Core Electives, Project Work, Extra credit course.

Part - IV: Internship Programme, MOOC's.

Core Courses

A core course is the course offered by the parent department related to the major subjects, components like theories, practical's, Project work, field visits and etc.

Core Elective

The core elective course is also offered by the parent department. The objective is to provide choice and flexibility within the department. There are THREE core electives. They are offered in different semesters according to the choice of the college.

Extra Credit Courses

In order to facilitate the students gaining extra credits, the extra credit courses are given. There are two extra credit courses - Massive Open Online Courses (MOOC) and Skill-based Course - offered in the III and V Semesters respectively. According to the guidelines of UGC, the students are

encouraged to avail this option of enriching by enrolling themselves in the MOOC provided by various portals such as SWAYAM, NPTEL, etc. Skill based course is offered by the department apart from their regular class hours.

Subject Code Fixation

The following code system (11 characters) is adopted for Under Graduate courses:

Year of Revision	PG Code of the Dept	Semester	Specification of Part	Running number in the part
↓	↓	↓	↓	↓
2021	P21	x	x	xx
2021	PBO	1	x	1

For example:

I M.Sc., BOTANY - PLANT DIVERSITY - I

The code of the paper is **P21 BO 1C1**.

Thus, the subject code is fixed for other subjects.

EXAMINATION

Continuous Internal Assessment (CIA):

PG - Distribution of CIA Marks	
Passing Minimum: 50 Marks	
Theory CIA Maximum = 25	Theory CIA Minimum = 10
Practical CIA Maximum = 40	Practical CIA Minimum = 16

End - Semester Tests

Centralized - Conducted by the office of Controller of Examinations.

Semester Examination

Testing with Objective and Descriptive questions.

Section - A: 10 Questions x 2 Marks = 20 Marks (No Choice - Two questions from each unit)

Section - B: 5 Questions x 5 Marks = 25 Marks (Either... or Type - One pair from each unit)

Section - C: 3 Questions x 10 Marks = 30 Marks (3 Out of 5 - One question from each unit)

Duration of Examination:

3- Hours examination for courses.

Grading System

1. Grading

Once the marks of the CIA and the end-semester examination for each of the courses are available, they will be added. The marks thus obtained, will then be graded as per the scheme provided in Table 1.

From the second semester onwards the total performance within a semester and the continuous performance starting from the first semester are indicated by **Semester Grade Point Average (GPA)** and **Cumulative Grade Point Average (CGPA)**, respectively. These two are calculated by the following formulae

$$\text{GPA} = \frac{\sum_{i=1}^n C_i G_i}{\sum_{i=1}^n C_i} \quad \text{WAM (Weighted) Average Marks} = \frac{\sum_{i=1}^n C_i G_i}{\sum_{i=1}^n C_i}$$

Where, 'C_i' is the Credit earned for the Course - i,

'G_i' is the Grade Point obtained by the student for the Course 'i'.

'M' is the marks obtained for the course 'i', and

'n' is the number of Courses **Passed** in that semester.

CGPA: Average GPA of all the Courses starting from the first semester to the current semester.

2. Classification of Final Results

- i) For each of the three parts, there shall be separate classification on the basis of the CGPA, as indicated in the following Table - 2.
- ii) For the purpose of Classification of Final Results, the Candidates who earn CGPA 9.00 and above shall be declared to have qualified for the Degree as 'Outstanding'. Similarly, the candidates who earn the CGPA between 8.00 - 8.99, 7.00 - 7.99, 6.00 - 6.99 and 5.00 - 5.99 shall be declared to have qualified for their Degree in the respective programmes as 'Excellent', 'Very Good', 'Good' and 'Above Average' respectively.
- iii) Absence from an examination shall not be taken as an attempt.

Table - I - Grading of the Courses

Marks Range	Grade Point	Corresponding Grade
90 and above	10	O
80 and above but below 90	9	A+
70 and above but below 80	8	A
60 and above but below 70	7	B+
50 and above but below 60	6	B
40 and above but below 50	5	C
Below 40	0	RA

Table - 2 - Final Result

CGPA	Classification of Final Results	Corresponding Grade
9.00 and above	O	Outstanding
8.00 to 8.99	A+	Excellent
7.00 to 7.99	A	Very Good
6.00 to 6.99	B+	Good
5.00 to 5.99	B	Above Average
4.00 to 4.99	C	Average
Below 4.00	RA	Re – Appearance

Credit based weighted Mark System is adopted for individual semesters and cumulative semesters in the column 'Marks Secured' (for 100).

Declaration of Result:

Mr./Ms. _____ has successfully completed the Post Graduate in _____ programme. The candidate's Cumulative Grade Point Average (CGPA) in Part - III is _____ and the class secured is _____ by completing the minimum of **90** credits. The candidate has acquired _____ (if any) extra credits offered by the parent department courses.

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PG AND RESEARCH DEPARTMENT OF BOTANY

M.Sc., BOTANY

(For the candidates admitted from the year 2021-2022 onwards)

Programme Outcomes

- To enrich the students with recently developed fields such as Biotechnology.
- To understand the importance of plant molecular techniques.
- To impart knowledge in latest learning resources in e - learning and digital Instrumentation.
- To understand the principle and application of various biological equipments.

Programme Specific Outcomes

- It gives knowledge about identification of herbal plants and its constituents from plants sources to rapid development of pharmacognosy and phytochemistry.
- To create awareness about cultivation, conservation and sustainable utilization of the biodiversity.
- To inculcate strong fundamentals on modern and classical aspects of Botany.
- Students will be able to communicate biological knowledge in oral and written form.
- To generate Research opportunities in various fields.
- To understand the principles and applications of various biological equipments.

NUMBER OF CREDITS: 4	COURSE CODE: P21BO1C1
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - I SEMESTER - CORE COURSE - I (For the candidates admitted from the year 2021 - 2022 onwards) PLANT DIVERSITY - I (ALGAE, FUNGI, BRYOPHYTES AND LICHENS)	
Course Objectives <ol style="list-style-type: none"> 1. To study the outline information's of algae. 2. To know the details of fungi and lichens. 3. Study about salient features of bryophytes. 	
UNIT - I	ALGAE: Introduction, Classification (Fritsch, 1935), phylogeny of algae. Thallus organization, algal pigments, reserve food materials, structure, reproduction, life cycle of major groups of algae.
UNIT - II	Salient features of major divisions of algae - Cyanophyta (Cyanobacteria), Chlorophyta, Charophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta. Ecology and economic importance of algae.
UNIT - III	FUNGI: Introduction, Classification (Alexopolus and Mimes, 1979) phylogeny and life cycle of major groups of fungi. A general knowledge of nutrition, heterothallism, sexual reproduction, economic importance of fungi.
UNIT - IV	Salient features of major divisions of Mastigomycetes, Myxomycetes, Zygomycetes, Basidiomycetes, Ascomycetes and Deuteromycetes. <i>LICHENS:</i> A general account of lichens with reference to structure, reproduction, nutrition, classification and economic importance.
UNIT - V	BRYOPHYTES: Classification (Rothmaler, 1951), general features of major divisions - Hepaticopsida, Anthocerotopsida and Bryopsida. Evolution of sporophytes, Fossil Bryophytes. Distribution of Bryophytes in India. Economic importance of Bryophytes.
Text Book <ol style="list-style-type: none"> 1. Sing V. Pande, P.C. Jain, D.K. (2010) - A text book of Botany - Rastogi Publications, Meerut. 	
Reference Books <p>Algae:</p> <ol style="list-style-type: none"> 1. Fritsch, F.F. (1935) The structure and reproduction of the Algae volume I & II. New Delhi. 2. Pandey. S.N., S.P. Misra and P.S. Trivedi. 2002. A Textbook of Botany Volume II. Vikas Publishing House Pvt Ltd, New Delhi. 3. Sambamurthy A.V.S.S. 2005. A Textbook of Algae. I.K. International Pvt.Ltd, New Delhi. 4. Bilgrami, K.S. and L.C.Saha, 2004. A textbook of Algae, CBS publications. <p>Fungi :</p> <ol style="list-style-type: none"> 1. Alexopoulos, C.J.C.W. Mims and M. Blackwell. 2007. Introductory Mycology. IV Edition. Wiley India (P) Ltd., Daryaganj, New Delhi. 2. Bessay, E.A. 1979. Morphology and Taxonomy of Fungi. Vikas publishing House, New Delhi. 3. Mukta Bhargava, 2003. The latest portfolio of theory and practice in Fungi, A.S Saini Dominant Publications. <p>Bryophytes :</p> <ol style="list-style-type: none"> 1. Rashid. A. 2007. An Introduction to Bryophyta - Vikas publications, New Delhi. 2. Chopra, R.N. and P.K.Kumar, 2003. Biology of Bryophytes, New age International Pvt. 3. Chandrakant Pathak, 2003. The latest portfolio of theory & practice in Bryophyta, Dominant Publications. 	

Course Outcomes

Course Outcome No.	Course Outcome
CO1	A student understands characteristics of Algae.
CO2	Acquire knowledge major classes of algae.
CO3	Know about salient features of fungi.
CO4	Understand about lichens.
CO5	Know about important features about bryophytes.

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	✓

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	3	3	3	4	3	3	3	3.0
CO2	2	3	2	3	3	4	3	3	3	2.8
CO3	3	3	3	3	3	3	3	3	3	3.0
CO4	2	3	3	3	4	3	3	3	3	3.0
Mean Overall Score										2.95

Result: The core for this course is **2.95** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = ----- Total No. of Pos & PSOs	Mean overall score for COs = ----- Total No. of COS

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 4	COURSE CODE: P21BO1C2
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - I SEMESTER - CORE COURSE - II (For the candidates admitted from the year 2021 - 2022 onwards) PLANT DIVERSITY - II (PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY)	
Course Objectives <ol style="list-style-type: none"> 1. To have comprehensive knowledge on basics of Bryophytes, Pteridophytes, Gymnosperms and Paleobotany. 2. To understand the structure, reproduction and life history of plants. 3. To understand the evolutionary significance of lower plants and Gymnosperms. 	
UNIT - I	PTERIDOPHYTES: Introduction, Classification (Reimers, 1951), phylogeny of pteridophytes. Range of morphology, Structure, Reproduction and Evolution of the sporophytes and gametophytes of Psilopsida and Lycopsidea.
UNIT - II	Range of morphology, Structure, Reproduction and Evolution of the sporophytes and gametophytes of Sphenopsida and Pteropsida. Stelar evolution. Heterospory and seed habit, morphogenesis, phylogeny and economic importance of Pteridophytes.
UNIT - III	GYMNOSPERMS: Introduction, Classification (Sporne, 1968), phylogeny of gymnosperm. Range of morphology, Structure, Reproduction and Evolution of sporophytes and gametophytes of Cycadopsida and Coniferopsida.
UNIT - IV	Range of morphology, Structure, Reproduction and Evolution of the sporophytes and gametophytes of - Gnetopsida. Economic importance of gymnosperms. Evolutionary significance of Welwitschiales, Pteridospermales, Cycadales, Pentoxylales and Cordaitales.
UNIT - V	PALAEOBOTANY: General account on geological time scale – Types of fossils, methods of fossilization, age determination and methods of study of fossils. Role of fossil in oil exploration.
Text Books <ol style="list-style-type: none"> 1. Vashishta, P.C, Sinha and Anilkumar (2010). Pteridophytes, S.Chand & company Ltd, New Delhi. 2. Biswas, C. and Johri, B.M. (2004). The Gymnosperms. Narosa Publishing House, New Delhi. 	
Reference Books <p>Pteridophytes:</p> <ol style="list-style-type: none"> 1. Sporne, K.R. (1970) - The morphology of pteridophytes (The structure of ferns and allied plants). 2. Singh, V.Pande, P.C. and Jain, D.K - 4th Edition (2014 - 15) - A Text of Botany - Rastogi Publications, Meerut. <p>Gymnosperms:</p> <ol style="list-style-type: none"> 1. Johri, RM, Lata S, Tyagi K (2005), A text book of Gymnosperms, Dominate Pub. & Distributer, New Delhi. <p>Palaeobotany:</p> <ol style="list-style-type: none"> 2. A.C. Arnold 2000. An introduction to palaeobotany, Tata McGraw Hill Education Private Limited, New Delhi. 3. Kimura, M. (1983). The natural theory of molecular evolution, Cambridge University Press, Cambridge. 4. Arora M.P. (1990). Evolutionary biology, Himalaya Publication House, Delhi. 	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome No.	Course Outcome
CO1	Study the classification, phylogeny, characteristics and lifecycle of pteridophytes and gymnosperms.
CO2	Gain the knowledge on the structure, reproduction and evolution of pteridophytes and gymnosperms.
CO3	Understand the economic importance of pteridophytes and gymnosperms.
CO4	Study the geological time scale, process of fossilization, methods of studying fossils and its role.

Nature of Course			
Knowledge and skill		Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	✓

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	3	2	3	4	3	3	3	2.8
CO2	2	3	2	3	3	4	3	3	3	2.8
CO3	3	3	3	3	3	3	3	3	3	3.0
CO4	2	3	3	3	4	2	3	3	3	2.8
Mean Overall Score										2.85

Result: The core for this course is **2.85** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$	Mean overall score for COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 4	COURSE CODE: P21BO1C3
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - I SEMESTER - CORE COURSE - III (For the candidates admitted from the year 2021 - 2022 onwards) MICROBIOLOGY AND PLANT PATHOLOGY	
Course Objectives <ol style="list-style-type: none"> 1. To know the basic principles and characteristics involved in microbial Taxonomy. 2. To find out the structure and methods of Reproduction found in Bacteria. 3. To predict the morphology of Viruses. 4. To recall the components involved in development of plant diseases. 5. To identify the various types of plant diseases. 	
UNIT - I	History and scope of Microbiology. Major characteristics used in microbial taxonomy - Classification of Microorganisms - Five kingdom, Eight kingdom and Three Domain classification concepts. Bergey's system of bacterial classification - classification of Mycoplasma and Classification of virus.
UNIT - II	Bacteria: Morphology and structure of bacterial cells. Chemical composition of cell wall - Gram positive, Gram negative and Archaeobacteria. Nutritional types of bacterial - reproduction - recombinations - Transformation, Transduction and Conjugation.
UNIT - III	Viruses - Classification of viruses (LHT system). General characteristics, morphology of viruses - shape, size, structure - Helical, icosahedral and complex viruses. Viral envelope, Nucleic acids and proteins. Plant viruses and Transmission of plant viruses- Serological tests for diagnosis of plant viruses.
UNIT - IV	Introduction to Plant Pathology. Classification of plant diseases. Components of plant diseases. Causal organism and causal factors responsible for plant diseases. General symptoms of plant diseases (Bacterial, fungal and viral symptoms). Effect of environment on disease development. Defense mechanism in plants. Methods of control of plant diseases.
UNIT - V	Study of selected Plant diseases (Causal Organism/symptoms and Control) Bacterial Diseases: Leaf Blight of Paddy, Stalk rot of Maize. and Red stripe of sugar cane Fungal Diseases: Rust of Sunflower. Tikka disease of groundnut - Damping - off of seedlings. Viral Diseases: Leaf curl of Papaya - Tomato mottle and yellow vein mosaic of okra / Bhindi. Mycoplasma Diseases: Little leaf of Brinjal.
Text Books <ol style="list-style-type: none"> 1. Dubey, R.C. and D.K.Maheswari, 2007. A Textbook of Microbiology, S. Chand & Company, New Delhi. 2. P.D.Sharma 2014. Microbiology, Rastogi publications; Meerut. 3. Singh.R.S. 2005. Principles of Plant Pathology - 4th edition. Oxford & IBH. 4. P.D.Sharma 2014.Plant pathology Rastogi publications; Meerut. 5. 7. B.P.Panday. Plant Pathology, Chand and Company Pvt. Ltd., New Delhi. 	
Reference Books <ol style="list-style-type: none"> 1. Michael,J Pelczar, E.C.S. Chan , NoelR. Krieg, 1993. Microbiolog - concepts and applications, McGraw Hill Inc, New York. 2. Prescott,John, P.Harley, Donald, A Klein,1995. Microbiology (2nd Edition), WMC Brown brothers. 3. George N. Agrios, 2006. Plant Pathology - 5th edition, Elsevier. New Delhi. 4. Mehrotra, R.S, and Ashok Aggarwal, 2004. Plant pathology - 2nd Edition, Tata Mc Graw - Hill, New Delhi. 	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome No.	Course Outcome
CO1	Make students understand the diversity and different types of classifications related to Bacteria, Viruses and Mycoplasma.
CO2	Studied the general characteristics of Bacteria and Viruses.
CO3	Understand the interaction of pathogen with host and disease development.
CO4	Categorise the various types of plant diseases

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented		Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	3	3	3	3	3	2	3	3	4	3.0
CO2	3	3	2	3	3	2	2	2	4	2.6
CO3	4	3	3	2	3	2	4	2	4	3.0
CO4	2	4	2	2	2	2	4	3	3	2.6
CO5	4	4	2	3	2	4	4	3	3	3.2
Mean Overall Score										2.88

Result: The core for this course is **2.88** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

$\text{Mean Score of COs} = \frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$	$\text{Mean overall score for COs} = \frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$
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COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 4	COURSE CODE: P21BO1C4P
<p>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005</p> <p>M.Sc., BOTANY - I SEMESTER - CORE COURSE - IV (For the candidates admitted from the year 2021 - 2022 onwards)</p> <p>PRACTICAL - I (COVERING CC - I, CC - II AND CC - III)</p>	
<p>Course Objectives</p> <ol style="list-style-type: none"> 1. To study and observe of morphological and internal organization of thallophytes and Bryophytes. 2. To analyze the structural organization and similarities and difference between Pteridophytes and Gymnosperms. 3. To understand and acquire knowledge on fossil pteridophytes and Gymnosperms. 4. To enrich their knowledge and skills in isolation and identification of microbes by various techniques. 5. To analyze the various plant diseases caused by different pathogens. 	
<p>Algae: Study of the morphology of algae with particular reference to forms: <i>Chlamydomonas</i>, <i>Volvox</i>, <i>Hydrodictyon</i>, <i>Codium</i>, <i>Nitella</i>, <i>Vaucheria</i>, <i>Liagora</i>, <i>Chambia</i>, <i>Gracillaria</i> and <i>Ceramium</i>.</p> <p>Fungi: Study of <i>Phytophthora</i>, <i>Taphrina</i>, <i>Erisyphae</i>, <i>Septoria</i>, <i>Penicillium</i>, <i>Pyricularia</i>, <i>Alternaria</i>, <i>Cercospora</i> and <i>Sclerotium</i>.</p> <p>Bryophytes: Study of <i>Reboulia</i>, <i>Targionia</i>, <i>Porella</i>, <i>Ricardia</i>, <i>Anthoceros</i> and <i>Bryum</i>.</p> <p>Pteridophytes: Study of <i>Psilotum</i>, <i>Selaginella</i>, <i>Lycopodium</i>, <i>Equisetum</i>, <i>Ophioglossum</i>, <i>Osmunda</i>, <i>Gleichenia</i>, <i>Salvinia</i> and <i>Azolla</i>.</p> <p>Gymnosperms: Study of <i>Araucaria</i>, <i>Podocarpus</i>, <i>Cedrus</i>, <i>Cupressus</i> and <i>Ephedra</i>.</p> <p>Paleobotany: Fossil Pteridophytes and Gymnosperms : <i>Horneophyton</i>, <i>Stigmaria</i>, <i>Calmostachys</i>, <i>Spenophyllum</i>, <i>Botryopteris</i>, <i>Archaeopteris</i>, <i>Lyginopteris</i>, <i>Hetrangium</i>, <i>Lagenostoma</i>, <i>Medullosa</i> and <i>Cordiates</i> Diagram only.</p> <p>Microbiology :</p> <ol style="list-style-type: none"> 1. Isolation of microbes from Soil - Serial dilution and plating technique. 2. Gram's staining of Bacteria. 3. Disc diffusion assay (Antibiosis). 4. Methylene blue reduction test. <p>Plant Pathology: Study of selected plant diseases (Causal Organism/symptoms and Control).</p> <p>Bacterial Diseases: Bacterial blight of Cotton, Red rot of Sugarcane and Leaf Blight of Rice.</p> <p>Fungal Diseases: <i>Rhizopus</i> soft rot of fruits and vegetables, Tikka disease of Groundnut and Rust of Sunflower.</p> <p>Viral Diseases: Bunchy top Banana, Leaf curl of Papaya and Tobacco mosaic</p> <p>Mycoplasma: Little leaf of Brinjal.</p>	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome No.	Course Outcome
CO1	Study and observe of morphological and internal organization of thallophytes and Bryophytes.
CO2	Analyze the structural organization and similarities and difference between Pteridophytes and Gymnosperms.
CO3	Understand and acquire knowledge on fossil pteridophytes and Gymnosperms.
CO4	Enrich their knowledge and skills in isolation and identification of microbes by various techniques.

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	2	3	2	2	2	2	3	3	4	2.5
CO2	2	3	2	3	2	3	3	3	3	2.6
CO3	2	3	2	3	3	2	3	3	3	2.6
CO4	4	4	3	3	3	2	3	3	3	3.1
CO5	4	3	2	3	3	2	3	3	4	3.0
Mean Overall Score										2.76

Result: The core for this course is **2.76** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$	Mean overall score for COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 4	COURSE CODE: P21BO1E1
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - I SEMESTER - ELECTIVE COURSE - I (For the candidates admitted from the year 2021 - 2022 onwards) HORTICULTURE	
Course Objectives <ol style="list-style-type: none"> 1. To provide knowledge and skills in horticultural techniques. 2. To study about the Horticultural crops and applications of growth hormones. 3. To study the vegetable and flower cultivation, vegetative propagation methods, Garden designing and types. 	
UNIT - I	Introduction: History, scope, divisions of horticulture. Importance of Soil, Water, and climatic factors. Nutritional requirements and growth of horticultural crops. The role of computers in horticulture.
UNIT - II	Importance, design and types of gardens (indoor, outdoor and kitchen gardens). Maintenance of nursery, methods of rockery and water gardens. Cultivation of commercial flowers (Rose, Jasmine, and Chrysanthemum). Cultivation and preservation methods of vegetables (bhendi, brinjal and tapioca) and fruits (mango, banana and orange).
UNIT - III	Establishment orchards, plant propagation techniques - vegetative propagation - cutting, budding, layering, pruning and grafting. Methods of shoot and root induction, making a potted and bonsai plants. Flower thinning and decorations.
UNIT - IV	Introduction of botanical gardens, lawn making and pathway designing. Role of green house, mist chamber and seed bank in gardening. Methods of Irrigation. Development and preservation of cacti and orchids.
UNIT - V	Arboretum in India - Factors affecting in gardening:- Light, Temperature, Soil pH, Humidity, Water and wind. Role of growth hormone in horticultural crops.
Text Books <ol style="list-style-type: none"> 1. Manibhushan Rao, 1991. The text book of horticulture, MacMillan Indian Ltd, New Delhi. 2. Chadha, (2001). Hand Book of Horticulture. ICAR Publications, New Delhi. 	
Reference Books <ol style="list-style-type: none"> 1. H. D. Kumar 1999 Introduction to Horticulture. 2. Prasad, S and U. Kumar, 1999. Principles of Horticulture. Agrobotanica, bikaner. 3. Benu Singh, (2010). A Modern Book on Forestry and Horticulture, Vista International Pub. New Delhi. 4. Williams, C.N. Uzo, J.O. and Peregrine, W.T.H. (1991). Vegetable production in Tropics. Longman Scientific & Technical, Essex (UK). 5. Edmond J B. T. L. Senn. F. S. Andrews and R. G. Halfacre 1975. Fundamentals of Horticulture. Tata McGraw Hill Publishing Co., New Delhi. 6. Jules Janic (1979). Horticultural Science Surjeet Publications, New Delhi. 7. Allard (1960). Principles of plant breeding John Wiley Publications New York. 	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome No.	Course Outcome
CO1	To describe about Horticulture.
CO2	To know the nutritional requirements for horticultural crops.
CO3	To understand the basic plant propagation methods.
CO4	To apply the practical knowledge for cultivation and preservation of vegetables.
CO5	To evaluate different growth hormones for horticultural crops.

Nature of Course			
Knowledge and skill		Employability oriented	
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	4	2	2	3	3	4	4	3	4	3.2
CO2	3	3	3	2	2	3	4	4	3	3.0
CO3	4	4	3	3	3	3	4	4	3	3.4
CO4	3	4	3	3	3	3	4	3	3	3.2
CO5	4	4	3	3	2	4	4	3	4	3.4
Mean Overall Score										3.24

Result: The core for this course is **3.24** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = ----- Total No. of Pos & PSOs	Mean overall score for COs = ----- Total No. of COS

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 5	COURSE CODE: P21BO2C5
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - II SEMESTER - CORE COURSE - V (For the candidates admitted from the year 2021 - 2022 onwards) CELL AND MOLECULAR BIOLOGY	
Course Objectives <ol style="list-style-type: none"> 1. To understand the structural organization and function of different cell organelles. 2. To study the cell cycle. 3. To understand the phenomenon of cell signaling. 4. To acquire knowledge on genetic code. 5. To study the mechanism of transcription in prokaryotes. 	
UNIT - I	Prokaryotic and Eukaryotic cells: shape, size and organization of cells - Cell organelles - Ultra structure and function of Cell wall, Nucleus, Chromatin, Nucleolus, Ribosomes, Mitochondria, Plastids, Endoplasmic reticulum, Golgi complex, Lysosome, Microbodies - Peroxisomes and Glyoxisomes.
UNIT - II	Cytoskeleton - Structure, chemical composition, functions of Microtubules, Microfilaments, Intermediate filaments, Centrioles and Basal bodies, Cilia and flagella. Cell cycle - Mitosis and Meiosis. Cell communication: general principles. Signaling molecules and their receptors. Receptors: Cell surface receptors - ion - channel linked receptors, G-protein coupled receptors, and Tyrosine - kinase linked receptors (RTK). Programmed cell death.
UNIT - III	Transcription: - Central dogma - Transcription mechanism in prokaryotes and eukaryotes - initiation - elongation - termination - RNA polymerases and their role. Post-transcriptional events: Split genes, splicing signals, splicing mechanisms. Alternative splicing, exon shuffling, cis & trans splicing. Replication of DNA in Prokaryotes and Eukaryotes.
UNIT - IV	Stages in translation: Initiation (initiation factors in prokaryotes and eukaryotes, Kozak and Shine-Dalgarno sequences); Elongation (process of polypeptide synthesis, active centers in ribosome, elongation factors) and Termination (process of termination, release factors, ribosome recycling). Protein sorting and translocation: Post - translational modification of proteins.
UNIT - V	Genetic code - codon assignment - characteristics of the genetic code. Principles of gene regulation: lac and trp operons of E. coli. DNA Damage - Types of Damage - Simple Mutations - Deamination - Missing Bases - Chemical Modification of Bases - Formation of Pyrimidine Dimers - Strand Breaks. DNA repair mechanisms - Direct repair, Excision Repair - Mismatch Base repair - Recombination repair - SOS Repair.
Text Books <ol style="list-style-type: none"> 1. Verma P.S. and Agarwal, V.K. Cytology, Revised Edition 2010. S.Chand & Co. Publication. New Delhi 2. Ajoy paul (2009). Text book of Cell and molecular biology, books and Allied (p) Ltd, Kolkata. 3. Cell Biology, genetics, molecular biology, evolution and ecology. P.S.Verma and V.K.Agarwal 2006. S. Chand & Co. Publication. New Delhi. 	
Reference Books <ol style="list-style-type: none"> 1. Friedfielder, D (1986) Molecular Biology Jones & Barriett Publishing INC., Boston, Portola Valley. 2. Ajoy paul (2009). Text book of Cell and molecular biology, books and Allied (p) Ltd, Kolkata. 3. Walker J.M and Rapley, R (2006). Molecular biology and biotechnology (4th edition) Panima Publishing Corporation, New Delhi. 4. Karp. G. (2008) Cell and Molecular Biology.5th edn. John Wiley & sons. London. 5. De Robertis and De Robertis. (1998).Cell and Molecular Biology. B.I. Waverly Pvt. Ltd. New Delhi. 6. Geoffrey M. Cooper (1997). The Cell - A Molecular approach. ASM Press, Washington. 7. William D. Stan field et al., (1996). Schaur's outline of theory and problems of Molecular and Cell biology. McGraw Hill, New York. 	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome No.	Course Outcome
CO1	To bring out the knowledge about cell structure, organization and its function.
CO2	To gain knowledge about cell organelles and its chemical composition and functions. To acquired knowledge about cytoskeletons and pattern of cell cycle.
CO3	To understand the mechanism of DNA and RNA.
CO4	To know the Genetic code and recent advances related to molecular biology.

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	3	2	2	3	3	4	3	3	3	2.8
CO2	3	3	3	2	2	3	4	4	3	3.0
CO3	2	4	3	3	3	2	3	4	3	3.0
CO4	3	2	3	3	3	2	4	3	3	2.8
CO5	3	3	3	3	2	4	2	3	4	3.0
Mean Overall Score										2.92

Result: The core for this course is **2.92** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$	Mean overall score for COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 5	COURSE CODE: P21BO2C6
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - II SEMESTER - CORE COURSE - VI (For the candidates admitted from the year 2021 - 2022 onwards) PLANT ANATOMY AND EMBRYOLOGY	
Course Objectives <ol style="list-style-type: none"> 1. To know basic concepts of cell and Tissue system and their organization in higher plants. 2. To differentiate dicot and monocot plants based on their growth patterns. 3. To understand the abnormal (anomalous) secondary growth in higher plants as well as wound healing and Abscission processes. 4. To study and differentiate ovules and its types. 5. To know the importance of polyembryony and development pattern in higher plants. 	
UNIT - I	Introduction, scope and history of plant Anatomy, Plant Tissues - Types; Meristems: General account, Cytological characteristics and Classification. Organization of Shoot apex and Root apex. Theories on organization of meristems. Simple Permanent Tissues: Structural and functional aspects of Parenchyma, Collenchyma and Sclerenchyma. Secretory ducts and Laticifers. Epidermis - Epidermal Appendages; Stomata - Structure and Types. Transfer cells - Structure and Functions.
UNIT - II	Complex Tissues: Xylem and Phloem. Structural variations, Types and Functions. Primary structure of Stem, Leaf and Root. Secondary Xylem: Structure, types and ontogeny, Dendrochronology, Compression Wood, Tension wood. Secondary Phloem Structure, Types and Ontogeny. Anomalous secondary growth, Dicotyledons - <i>Bignonia</i> , <i>Boerhaavia</i> , <i>Nyctanthes</i> and <i>Aristolochia</i> . Monocotyledons: <i>Dracaena</i> , Nodal Anatomy, Uni and Trilocular. Branch Traces and Leaf gaps. Closing of Leaf gaps.
UNIT - III	Vascular cambium: General Account, Structure, Types, Seasonal Activities and Factors Influencing Cambial activity. Healing of wounds. Periderm; Structure and Development, Commercial Cork, Polyderm. Lenticels: Structure and Development.
UNIT - IV	Flower Ontogeny, Vascularization of Flower. Anther: Structure and Development Microsporogenesis - Palynology. Microgametogenesis. Pollen - Pistil Interaction, Structure, Types and Development of Ovule - Megasporogenesis - Structure and development of female gametophyte - types of Embryo sac.
UNIT - V	Double Fertilization, Self and Sexual incompatibility. Barriers to Fertilization Genetics, Physiology and Biochemistry of incompatibility. Embryo Development - Dicot and Monocot. Endosperm: Structure, Development and Types. Structure of fruit wall and seed coat. Polyembryony and Apomixis. Embryology in relation to Taxonomy.
Text Books <ol style="list-style-type: none"> 1. Pandey, B.P. (1989) - Plant Anatomy - S.Chand & co, New Delhi. Revised Edition (2010). 2. Singh V. P.C.Pandey and D. K.Jain. (2003). Embryology of Angiosperms. Rastogi Publications. Meerut. 3. Bhojwani, S.S. and Bhatnagar S.P, (1981). Embryology of Angiosperms - Vikas publication House (P) Ltd, New Delhi. 	
Reference Books <ol style="list-style-type: none"> 1. Pijushroy,(2010).plant Anatomy, New central Book Agency ,Pvt Lit, New delhi 2. Pandey, P.B. (2000). Plant Anatomy. S.Chand & Co. 3. Pandey.S.N and Ajanta Chandha. (2006). Plant Anatomy and Embryology. Vikas Publishing House Pvt. Ltd, New Delhi. 	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome
On the completion of this course the students will be able.
Analyze various tissue systems, structure and its function.
Understand the vascular tissues and structure of types of wood.
Analyze the difference in normal and anomalous secondary cambial activity.
Gain the knowledge on the reproductive phases of plant systems.
Understand the origin and development of embryological structure and fertilization process.

Nature of Course

Knowledge and skill	✓	Employability oriented	
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	4	4	3	3	4	3	3	3	4	3.4
CO2	3	3	3	3	4	2	3	3	4	3.1
CO3	4	2	3	4	3	3	3	3	4	3.2
CO4	3	4	4	4	4	3	3	3	4	3.5
Mean Overall Score										3.3

Result: The core for this course is **3.3** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = -----	Mean overall score for COs = -----
Total No. of Pos & PSOs	Total No. of COS

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 5	COURSE CODE: P21BO2C7
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - II SEMESTER - CORE COURSE - VII (For the candidates admitted from the year 2021 - 2022 onwards) MICROSCOPY AND PLANT MICROTECHNIQUES	
Course Objectives <ol style="list-style-type: none"> 1. To managing the techniques of microscopic slides making, microscopic measurements and methods of identification of some organic compounds in plant cells. 2. To make temporary microscopic slides, using different cutting techniques and permanent microscopic slides using paraffin method. 3. Do microscopic measurements using image analyzing programs - detect the presence of different groups of organic compounds in plant material. 	
UNIT - I	Killing and Fixing - Dehydration - Infiltration - Embedding. Paraffin Embedding, Microwave Paraffin Embedding and Plastic Embedding techniques - Reagents for embedding - Fixatives - Post fixatives - Buffers - Resins used for different kinds of embedding. Advantages and disadvantages of embedding techniques.
UNIT - II	Sectioning Methods - Freehand and Serial sectioning - Types and Applications of microtomes - Sledge Microtome, Rotary microtome, Sliding microtome, Cryomicrotome - Microtomy. Stains - General stain, Specific stain, Monochromatic stain and Metachromatic stain, Acidic stain, Basic stain, Neutral stain, Staining Procedure - Double Staining - Mounting.
UNIT - III	Slide preparations - Temporary, Semi-permanent and Permanent slide preparations - Smear - Squash - Clearing - Whole Mount - Peeling – Maceration techniques. Drawing microscopic images - Camera lucida - types (prism and mirror) and applications. Micrometry - Ocular and Stage micrometers - Calliberation. Measuring and Scaling methods.
UNIT - IV	Histochemistry - Definition, staining methods, is staining theory. Scope of histochemistry and Cytochemistry in Biology. Gus staining methods, Histochemical Techniques - Identification and localization of structural and storage components in plants using specific dyes and fluorochomes - Starch, protein, lipid, nucleic acids, cellulose, lignin, alkaloids, phenolics (tannin) and glycosoides.
UNIT - V	Microscopy - Principles, Parts, Functioning and Applications of Bright Field, Dark Field, Phase Contrast, Polarized and Fluorescence microscopy. Structure, Function and Application methods of TEM and SEM. Photomicrography - Principles and uses of Photomicrography.
Text Books <ol style="list-style-type: none"> 1. Kothari, C.R. and Gaurav Garg, 2014. Research Methodology: Methods and Techniques (3rd revised dition) New Age International publisher, New Delhi. 2. Gurumani, N 2010, An introduction to Biostatistics, MJB publisher. 3. Text Book of Bioinformatics By Vinay Sharma • 2008. Publisher: Rastogi Publications 4. Charles PP and Frank JO, (2006). Introduction to Nanotechnology, Wiley India Ed. 5. A text book of nano science and nanotechnology, By T Pradeep, 2012, Tata McGraw Hill Publication, New Delhi. 6. A text book of nano science and nanotechnology, By Murthy, Shankar, Baldev Raj, Rath and James Murday 2013, University Press India Ltd. Bangalore and Chennai. 	
Reference Books <ol style="list-style-type: none"> 1. Parsons, C.J 1973 Thesis and project work. A guide to research and writing, George Allen and Unwin Ltd London. 2. Antorson, Durston and Polle 1970. Thesis and assignment writing, Wiley eastern Ltd. 3. Krishnaswamy, K.N.Sivakumar, Appa Iyar and Mathirangen M 2006. Management of research methodology integration of principles, methods and techniques (Pearson education New Delhi 4. Attwood T K and Parry Smith D J, (1999).Introduction to Bioinformatics Addison Wesley Longman Limited, England. 5. Shanmugam, S. (2011) Nanotechnology - MJP Publication New Delhi. 6. Charles PP and Frank JO, (2006). Introduction to Nanotechnology, Wiley India Ed. 	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome
• On the completion of this course the students will be able
• To identify and discuss the complex issues inherent in selecting a research problem.
• Get the idea in the developing strong hypothesis and methodology for research
• Acquire knowledge on basic concepts in Biostatistics
• To know the importance of Bioinformatics in Biology and Apply various tools for genomic and proteomic studies
• Understand the basic concepts and application Nanotechnology

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	3	3	3	3	3	2	3	3	4	3.0
CO2	3	3	2	3	3	2	2	2	4	2.6
CO3	4	3	3	2	3	2	4	2	4	3.0
CO4	2	4	2	2	2	2	4	3	3	2.6
CO5	4	4	2	3	2	4	4	3	3	3.2
Mean Overall Score										2.88

Result: The core for this course is **2.88** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$	Mean overall score for COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 5	COURSE CODE: P21BO2C8P
<p>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005</p> <p>M.Sc., BOTANY - II SEMESTER - CORE COURSE - VIII (For the candidates admitted from the year 2021 - 2022 onwards)</p> <p>PRACTICAL - II (Covering CC - V, CC - VI AND CC - VII) (CELL AND MOLECULAR BIOLOGY, PLANT ANATOMY AND EMBRYOLOGY, MICROSCOPY AND PLANT MICROTECHNIQUES)</p>	
<p>Cell and Molecular Biology:</p> <ol style="list-style-type: none"> 1. Squash and smear techniques - Onion Root Tip (Mitosis) and Rheo flower buds (Meiosis) 2. Study of karyotypes and ideograms 3. Isolation of DNA 4. Isolation of plasmid 5. pBR322 Genome map Demonstration 	
<p>Plant Anatomy:</p> <ol style="list-style-type: none"> 1. L.S of shoot and root apices 2. Identification of stomatal types 3. T.S. of Boerhaavia, Nyctanthes, Aristolochia and Dracaena 4. Nodal Anatomy - Uni and Trilocunar 5. Examination of secondary wall thickenings. 6. Wood structure T.S., T.L.S and R.L.S 	
<p>Embryology:</p> <ol style="list-style-type: none"> 1. Palynology - Study of pollen morphology 2. Study of pollen germination. 3. Developmental stages of Anther, Ovule, Embryosac, Endosperm and Embryo 4. Types of ovules, embryo sacs, endosperms. 5. Dissection of endosperm haustoria of Cucurbitaceae members 6. Dissection of embryo Tridax. 	
<p>Plant Microtechnique:</p> <ol style="list-style-type: none"> 1. Microtomy - killing and fixing, infiltration, embedding - sectioning mounting 2. Staining - single staining and double staining 3. Peeling - Clearing - Maceration 4. Freehand sectioning and preparation of semi-permanent slide 5. Micrometry - calibration 6. Drawing of microscoping images using camera lucida 7. Magnification and Scaling 8. Histochemical staining for starch, protein, lipid, nucleic acids, cellulose, lignin, alkaloids, terpenoids, phenolics (tannin), glycosoides. 	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome
1. Study the anatomy and analyze the internal structure by proper sectioning.
2. Gain knowledge on squash and smear techniques and isolation of DNA and plasmid.
3. Understand the origin and development of embryological structures.
4. Perform the plant micro techniques and gain knowledge about microtome and micrometry.

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	3	4	3	3	4	4	2	3	4	3.3
CO2	4	3	3	3	4	4	3	3	3	3.3
CO3	3	3	3	4	4	4	3	3	5	3.5
CO4	4	4	4	3	4	4	4	3	4	3.7
Mean Overall Score										3.45

Result: The core for this course is **3.45** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = -----	Mean overall score for COs -----
Total No. of Pos & PSOs	Total No. of COS

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 4	COURSE CODE: P21BO2E2
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - II SEMESTER - ELECTIVE COURSE - II (For the candidates admitted from the year 2021 - 2022 onwards) FOOD SCIENCE	
Course Objectives <ol style="list-style-type: none"> 1. To understand the basic characteristics of food materials. 2. To learn about the types of food materials derived from plant origin. 3. To gain knowledge regarding food preparation methods. 4. To know about the various kinds of food spoilage and their impact on human being. 5. To apply knowledge related to the food industry. 	
UNIT - I	Introduction to food science - Types, Constituents and functions of food - Nutritive aspects of food constituents. Quality factors in food. Microorganisms associated with food - Aims of food science and technology.
UNIT - II	Food materials of plant origin - Cereals and cereal products, Pulses, Nuts and Oil Seeds. Vegetables and fruits - Sugar and related products - Fats, Oil and Spices.
UNIT - III	Food Preservation - Impact of science and technology in food preservation - Principles of food preservation - Physical methods - Low temperature - Freezing - Drying - Irradiation - Canning - High temperature and modification of atmosphere.
UNIT - IV	Chemical preservatives – Traditional antimicrobials - Organic acids and esters - Acetic acid and acetates - Benzoic acid and benzoates, lactic acid and lactates - Probiotic acid and propanoates - sorbic acid and sorbates - Nitrites - Parabens - NaCl - Sulphites - Dimethyl Dicarbonate - Phenolic anti oxidants and phosphates.
UNIT - V	Microbial and biochemical aspects of food spoilage - Causes of food spoilage - Spoilage of cereals, vegetables and fruits. Food adulteration - Types of adulterants - Quality factors in foods - Food poisoning - Food borne intoxications and food borne infections - Food borne Bacteria, Fungi and Viruses.
Text Books <ol style="list-style-type: none"> 1. Subbulakshmi, G., Subhadra & Mandalika (2014) - Functional Foods and Nutrition, ASTRAL International (P) Ltd, New Delhi. 2. Khetarpaul, Neelam (2013) - Food Microbiology. ASTRAL International (P) Ltd, New Delhi 3. Adams M.R, Moss Mo.2007. Food Microbiology New ase international (p) Limited, New Delhi. 	
Reference Books <ol style="list-style-type: none"> 1. Khatkar, Bhupendra Singh (2013 - Food Science and Technology. ASTRAL International (P) Ltd, New Delhi. 2. Khetarpaul, Neelam (2013) - Food Processing and Preservation. ASTRAL International (P) Ltd, New Delhi. 	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome
<ul style="list-style-type: none"> Stared the basic characteristics of food materials.
<ul style="list-style-type: none"> Learn about the types of food materials derived from plant origin.
<ul style="list-style-type: none"> Gain knowledge regarding food preparation methods.
<ul style="list-style-type: none"> Know about the various kinds of food spoilage and their impact on human being.
<ul style="list-style-type: none"> Apply knowledge the related the food industry.

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented		Entrepreneurship oriented	✓

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	4	3	2	2	4	2	2	3	4	2.8
CO2	3	2	3	3	3	4	4	3	4	3.2
CO3	4	3	2	4	3	3	3	3	3	3.1
CO4	4	4	3	4	4	2	3	2	3	3.2
CO5	4	4	3	3	3	3	3	3	4	3.3
Mean Overall Score										2.88

Result: The core for this course is **2.88** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$	Mean overall score for COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 5	COURSE CODE: P21BO3C9
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY- III SEMESTER - CORE COURSE - IX (For the candidates admitted from the year 2021 - 2022 onwards) GENETICS AND CROP IMPROVEMENT	
Course Objectives <ul style="list-style-type: none"> • To learn about Mendelian principles. • To know about gene mapping methods and extra chromosomal inheritance to familiarize about Evolution & Emergence of evolutionary thoughts. • To gain knowledge on plant breeding techniques. 	
UNIT - I	Transmission Genetics: History of Mendel's studies - Mendel's law of inheritance - Test Cross. Mendel's experiments in modern context - Allelic and Nonallelic interactions between genes. Qualitative vs. Quantitative traits. Genetic segregation in human pedigrees.
UNIT - II	Chromosomal Basis of Heredity: Structure and Function of chromosomes. Autosomes and sex chromosomes. Structural and Numerical variations of chromosomes - Mutation, Euploidy, Aneuploidy and Polyploidy. Evolutionary significance of chromosomal aberrations. Sex determination, differentiation and Sex-linkage, Sex-influenced and Sex-limited inheritance.
UNIT - III	Gene Linkage and Genetic Mapping: Linkage detection, estimation; Recombination and genetic mapping in eukaryotes, Somatic cell genetics, Extra chromosomal inheritance. Population Genetics: Mendelian population - Random mating population - Frequencies of genes and genotypes. Causes of change: Hardy-Weinberg equilibrium. Historical background on quantitative inheritance.
UNIT - IV	Introduction to Plant breeding: History, objectives, achievements. Plant introduction, Selection and Hybridization. Centres of origin of Crop Plants, gene pool concept - primary, secondary and tertiary gene pool, and gene introgression. Plant genetic resources: Importance of plant genetic resources and diversity in plant breeding, collection, evaluation and conservation of germplasm.
UNIT - V	Methods of breeding: Self pollinated, cross pollinated and asexually propagated crops; Land races, pure line selection and mass selection; Pedigree selection, bulk method and its modification; Clonal selection. Mutation breeding, use of polyploidy and distant hybridization in plant breeding. Application of biotechnology in Plant breeding: Embryo rescue, somaclonal variation, diploidization of haploids, protoplast fusion, transgenics, molecular plant breeding, biosafety issues involved with genetically modified organisms.
Reference Books <ol style="list-style-type: none"> 1. Allard, R.W. 1960. Principles of Plant Breeding. John Wiley & Sons, New York. 2. Hays, H.K., Immer, F.R. and Smith, D.C. 1955. Methods of Plant Breeding. McGraw Hill Book Company, Inc., New York. 3. Jain, H.K. 2000. Genetics, Oxford & IBH, New Delhi. 4. Poehlman, J.M. 1986, Breeding Field Crops. AVI Publishing Company, Connecticut. 5. Singh, B.D. 2000. Plant Breeding Principles and Methods. Kalyani Publishers, New Delhi. 6. Comstock, R.E. 1996, Quantitative Genetics with Special Emphasis on Plant and Animal Breeding. Iowa State University Press, Iowa. 7. Falconer, D.S. and Mackay, J. 1996. Introduction to Quantitative Genetics, Longman Group Ltd., London. 8. Mather, K. and Jinks, J.L. 1971. Biometrical Genetics. Chapman and Hall, London. 	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome
• Learn about Mendelian principles.
• Know about gene mapping methods and extra chromosomal inheritance.
• Familiarize about Evolution & Emergence of evolutionary thoughts.
• Gain knowledge on plant breeding techniques.

Nature of Course			
Knowledge and skill		Employability oriented	
Skill oriented		Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	4	4	3	3	4	2	2	3	2	3.0
CO2	4	3	3	3	2	2	3	4	5	3.2
CO3	4	2	3	4	3	4	3	3	4	3.3
CO4	4	4	3	3	4	4	4	4	4	3.7
Mean Overall Score										3.3

Result: The core for this course is **3.3** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = -----	Mean overall score for COs = -----
Total No. of Pos & PSOs	Total No. of COS

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 5	COURSE CODE: P21BO3C10
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - III SEMESTER - CORE COURSE - X (For the candidates admitted from the year 2021 - 2022 onwards) TAXONOMY AND BIOSYSTEMATICS	
Course Objectives <ol style="list-style-type: none"> 1. To know the basic morphological features of plants and its parts. 2. To study the classification of plants based on their habitual and morphological characters. 3. To study the taxonomical description, flower characters and economic importance of plants belongs to selected families. 	
UNIT - I	MORPHOLOGY Plant taxonomy: Scope and importance; principles and goals; applications IUCN Red List, Conservation priorities. Floras, Revisions and Monographs: Flora, Revisions and Monographs as basis of taxonomy; Role of herbaria, botanic gardens and literature in taxonomic studies; important literature resources. International Code of Plant Nomenclature: Purpose, Principles and overall knowledge of Articles pertaining to typification, publication, priority, author citation and their application.
UNIT - II	Systems Of Classification: Natural system (Bentham & Hooker); Phylogeny and Classification of Angiosperms (Takhtajan, APG III system of classification), Taxonomic characters and Numerical methods in taxonomy.
UNIT - III	Molecular Systematics: Introduction - Classical taxonomy as base for molecular systematic. The choice of molecules in systematic - Nucleic acids, proteins and amino acids. Molecular evolution - neutral theory, molecular clock. Cladistics (Phylogeny): Concepts, parsimony, cladograms and trees; characters; apomorphic and plesiomorphic characters. Trees monophyly, ployphyly and paprphyly.
UNIT - IV	Study Of Families And Their Economic Importance: Polypetalae - <i>Menispermaceae, Violaceae, Portulacaceae, Meliaceae, Vitaceae, Sapindaceae, Aizoaceae.</i> Gamopetalae - <i>Rubiaceae, Genitanceae, Boraginaceae and Scrophulariaceae.</i>
UNIT - V	Study to Families and their Economic Importance: Monochlamydeae - <i>Nyctaginaceae, Aristolochiaceae, Loranthaceae, Moraceae (Urticaceae).</i> Monocotyledonae - <i>Orchidaceae, Cannaceae, Liliaceae, Commelinaceae, Arecaceae (Palmae) and Cyperaceae.</i>
Text Book <ol style="list-style-type: none"> 1. Manilal, K. S. and M. S. Muktesh Kumar (ed.) 1998. A Hand book of Taxonomy Training, DST, New Delhi. 2. Davis, P. H. and V. H. Heywood 1991. Principles of Angiosperm Taxonomy. Today and Tomorrow Publications, New Delhi. 	
Reference Books <ol style="list-style-type: none"> 1. Cronquist, A. 1981. An Integrated system of Classifications of flowering plants. Columbia University Press, New York. 2. Gurcharan Singh. 2004. Plant Systematic: Theory and practice Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi. 3. Stoeckle, M. (2003).Taxonomy, DNA and the bard code of life .bioscience 53: 796- 797. 4. Simpson M.G. (2006). Plant systematics, Elsevier Academic Press, USA. 5. Lawrence George H. M. 1951. Taxonomy of vascular plants Oxford and IBH Publ. Co. Pvt. Ltd., New Delhi. 	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome
• Learn the types of classifications- artificial, Natural and phylogenetic.
• Gain knowledge about Botanical Survey of India (BSI).
• Briefly study on herbarium techniques.
• Learn the taxonomic evidences from molecular, numerical and chemical methods.

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	4	3	3	3	4	4	3	4	3	3.4
CO2	3	4	4	3	2	4	3	3	4	3.3
CO3	4	3	3	4	3	4	3	3	5	3.5
CO4	3	4	4	3	4	4	4	3	3	3.5
Mean Overall Score										3.42

Result: The core for this course is **3.42** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = ----- Total No. of Pos & PSOs	Mean overall score for COs = ----- Total No. of COS

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 5	COURSE CODE: P21BO3C11P
<p>GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005</p> <p>M.Sc., BOTANY - III SEMESTER - CORE COURSE - XI (For the candidates admitted from the year 2021 - 2022 onwards)</p> <p>PRACTICAL - III (Covering CC - IX and CC - X)</p> <p>(GENETICS AND CROP IMPROVEMENT, TAXONOMY AND BIOSYSTEMATICS)</p>	
<p>Course Objectives</p> <ol style="list-style-type: none"> 1. To learn about Mendelian principles. 2. Paraphrase the conventional methods of plant breeding. 3. To observe the salient features of plants belonging to the selected families. 4. To indicate the importance of herbarium. 5. Differentiate the morphological variation in monocot and dicot plants. 	
<p>Plant Genetics and Crop Improvement</p> <ol style="list-style-type: none"> 1. Simple problems of Mendelian and Post Mendelian experiments. 2. Learning to use rules of probability to predict genetic results chisquare test to fine the fitness of Mendelian and Post Mendelian experiments. 3. Recombination and Genetic Mapping. 4. Conduction Self pollination and Cross pollination. 5. Emuasculation and Bagging. 	
<p>Taxonomy and Biosystematics:</p> <ol style="list-style-type: none"> 1. Study to published Flora; identification, listing analysis of their components. 2. Botanical illustrations (line drawing) basic rules regarding proportion, scientific accuracy, scale, numbering and legend. 3. Identification of any two species and families (selection one from Polypetalae or Gamopetalae and another from Monochlamydeae or Monocotyledonae) with author citation and reference of locally available angiosperms using Flora. 4. Salient features of families, Identification of species, Author Citation with complete reference Identification of family wit salient features, detailed study of identification, dissection, description and illustration of at least 18 families studied in theory. 	
<p>Polypetalae:</p> <p><i>Menispermaceae, Violaceae, Portulacaceae, Meliaceae, Vitaceae, Sapindaceae, Aizoaceae.</i></p>	
<p>Gamopetalae:</p> <ol style="list-style-type: none"> 1. <i>Rubiaceae, Gentianaceae, Boraginaceae, Scrophulariaceae.</i> 	
<p>Monochlamydeae:</p> <p><i>Nyctaginaceae, Aristolochiaceae, Loranthaceae, Moraceae</i></p>	
<p>Monocotyledonae:</p> <p>Orchidaceae, Cannaceae, Liliaceae, Commelinaceae, Arecaceae, Cyperaceae</p> <ol style="list-style-type: none"> 1. Study of economic importance. 2. Collection, preparation and identification of herbarium of at least two species per family studied by you from a field trip for 3 - 5 days. Each student should submit 50 Herbarium Sheets with nomenclature, author citation, description, phenology and notes. Herbarium should be associated with field note and field report. 	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome
• Dissect out the floral parts of plants coming under the families prescribed in the theory syllabus.
• Make a field study to a floristic rich area is must for a period of three days only under supervision to observe and collect the plants in their natural habitats.
• Submit minimum of twenty herbarium plants with a proper field note book with correct identification for external valuation.
• Identify the economic products related ti theory syllabus and write Botanical name, family and uses.
• Observe the genetic variations among inter and intra specific plants.
• Demonstration emasculation experiment.

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	4	3	3	4	4	4	2	3	3	3.3
CO2	4	3	4	4	2	4	3	3	3	3.3
CO3	4	3	3	4	3	4	3	3	4	3.4
CO4	4	3	4	3	4	4	4	3	3	3.5
Mean Overall Score										3.4

Result: The core for this course is **3.4** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$	Mean overall score for COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 4	COURSE CODE: P21BO3E3
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - III SEMESTER - ELECTIVE COURSE - III (For the candidates admitted from the year 2021 - 2022 onwards) PLANT BIOTECHNOLOGY	
Course Objectives <ul style="list-style-type: none"> • To understand the basic concept of biotechnology. • To understand the structure, reproduction and life history of plants. • To learn the importance of producing virus free plants through tissue culture. • To create awareness about the plant products obtained through transgenic plants. 	
UNIT - I	Biotechnology: Definition, History, Scope and importance of biotechnology. Plantbiotechnology status and scope. Plant cell culture in plant biotechnology and plant pathology. Market potential of plant biotechnology in India.
UNIT - II	Genetic Engineering: Definition and concepts Methodology of plant genetic engineering. Gene transfer mechanism in Plants. Vectors for Gene transfer - Ti and Ri plasmids vectors, viral vectors. Agroinfection and Gene transfer. Direct gene transfer methods - Microinjection and Macroinjection, Gene Gun, Electroporation, Liposome mediated gene transfer.
UNIT - III	Transgenic crops: Resistance to Biotic and abiotic stresses - Herbicide resistant plants, Insect resistant transgenic plants. Resistance against viral infection, resistance genes from extremophiles - resistance against drought, salinity, chilling, heat and heavy metals.
UNIT - IV	Molecular Farming / Pharming. Transgenic plants as bioreactors. Genetically Engineered Plants as Protein factories - Production of Industrial Enzymes in plants - Production of antibiotics, Edible Vaccines, Bio Pharmaceuticals and Lipids.
UNIT - V	Biodiversity and Plant Biotechnology: Steps to conserve Biodiversity - In situ and Exsitu conservation, Gene Banks. Genetically modified crops and their impacts on agriculture, human health and Ecological impacts. Plant biotechnology and IPR.
Text Books <ol style="list-style-type: none"> 1. Dubey, R.C., (2001). A text book of biotechnology. S.Chand & Co., New Delhi. 2. Gupta P.K. 2005 Elements of Biotechnology. Rastogi Publications Meerut. 	
Reference Books <ol style="list-style-type: none"> 1. Ignacimuthu, S.J.(2003). Plant Biotechnology. Oxford & IBH Publishing, New Delhi. 2. John Jothi Prakash, E. (2005). Outlines of Plant Biotechnology. Emkay Publishers, New Delhi. 3. Trivedi, P.C. 2000 – Plant Biotechnology, Panima Publishing Corporation, New Delhi. 4. Singh B.D. 2003 Biotechnology Expanding Horizons. Kalyani publishers Ludhiana. 	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome
• On the completion of this course the students will be able.
• Learn the basic concept and importance of Biotechnology.
• Know about the morphogenesis and organogenesis in plants.
• To learn the specific and non-specific methods of gene transfer Know Recombinant DNA Technology.
• Apply Biotechnology in ecology and IPR, Biosafety, Biopiracy, Bioterrorism and Bioethics.

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	4	3	2	4	4	3	3	4	4	3.4
CO2	3	3	4	3	4	3	2	3	3	3.1
CO3	3	3	3	3	3	2	3	3	3	2.8
CO4	4	3	4	3	4	3	4	3	3	3.4
Mean Overall Score										3.2

Result: The core for this course is **3.2** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = -----	Mean overall score for COs = -----
Total No. of Pos & PSOs	Total No. of COS

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 4	COURSE CODE: P21BO3E4
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - III SEMESTER - ELECTIVE COURSE - IV (For the candidates admitted from the year 2021 - 2022 onwards) PLANT TISSUE CULTURE	
Course Objectives <ul style="list-style-type: none"> • To understand the concepts of plant tissue culture, laboratory requirements and organization of laboratory. • To acquire knowledge related to the development of plant cells in invitro conditions. • To find out the techniques for haploid product. • To recall the values of presence of secondary metabolites in plants. • To relate the importance of plant tissue culture in crop improvement in recent years. 	
UNIT - I	History, Scope and Concepts of Plant Tissue Culture. Tissue Culture Laboratory: Requirements, Establishment and Safety. Sterilization Types: Filter Heat and Chemicals. Media Preparation: Inorganic nutrients, Organic Supplements, Carbon Source, Gelling Agents, Growth Regulators. Composition of different Culture Media: MS, B5 and White's Media.
UNIT - II	Totipotency - Cytodifferentiation. Plant Cell, Tissue and Organ Culture. Explants for Culture. Organogenesis: Direct and Indirect. Meristem culture, Callus Culture, Suspension culture. Micropropagation: Methods, Stages and Advantages.
UNIT - III	Protoplast culture and Somatic hybridization. Isolation of protoplasts - Mechanical and Enzymatic. Protoplast Fusion - Somatic Hybrids - importance of Somatic Hybrids. Somatic Embryogenesis, Artificial Seeds. Somaclonal and Gametoclonal variations.
UNIT - IV	Haploid Production: Androgenesis and Gynogenesis. Anther and Pollen Culture Embryo and Endosperm Culture. Types of Secondary metabolites, Valuable natural compounds by plant cell and Tissue Culture. Elicitors, Allelopathy and Phytoalexins.
UNIT - V	Cryopreservation and Gene Banks. Application of plant Tissue Culture in Forestry, Horticulture, Agriculture and Pharmaceutical industries.
Text Books <ol style="list-style-type: none"> 1. London Timir Baran Jha and Biswajit Ghost, Plant tissue culture (Basic and Applied).University Press, Hyderabad. 2005. 2. Pullaiah, T. (2013), Plant Tissue Culture: Emerging Trends - ASTRAL International (P) Ltd, New Delhi. 3. Jha, T.B. and Ghosh, B. (2005)- Plant Tissue Culture. Agrobios (India) Revised Edition. 	
Reference Books <ol style="list-style-type: none"> 1. Bhojwani, S.S. & Razdan, M.K. (2004). Plant Tissue Culture, Read Elsevier India Pvt. Ltd. 2. Kalyankumar De, (2008). Plant tissue culture. New Central Book Agency, Calcutta. 3. Purohit, S.S. 2010. Plant Tissue Culture. Agrobios (India) Revised Edition. 4. Purohit, S.S. 2010. Plant Tissue Culture. Agrobios (India) Revised Editio. 	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome
• Help to establish and management of plant tissue culture laboratory.
• Understanding of metabolism, growth, differentiation and morphogenesis of plant cell.
• Knowledge obtained from tissue culture to develop improved crops and ornamental plants.
• Achieve the target of creating a new plant with desired characteristics.
• Wide range of applications in the field of molecular biology, plant breeding and various industries.

Nature of Course			
Knowledge and skill	✓	Employability oriented	✓
Skill oriented		Entrepreneurship oriented	✓

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	4	3	4	4	4	3	3	4	4	3.6
CO2	4	3	4	4	4	4	4	4	3	3.7
CO3	3	4	4	4	3	4	3	3	4	3.5
CO4	2	3	2	2	2	3	4	3	4	2.7
CO5	4	3	3	3	4	4	3	4	3	3.4
Mean Overall Score										3.4

Result: The core for this course is **3.4** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = -----	Mean overall score for COs = -----
Total No. of Pos & PSOs	Total No. of COS

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 5	COURSE CODE: P21BO4C12
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - IV SEMESTER - CORE COURSE - XII (For the candidates admitted from the year 2021 - 2022 onwards) PLANT PHYSIOLOGY AND BIOCHEMISTRY	
Course Objectives <ol style="list-style-type: none"> 1. To know the fundamental aspects of physiology. 2. To understand the functional aspects of plants. 3. To gain knowledge about recent advances in the field of plant physiology. 4. To acquire knowledge about biochemical and metabolic aspects of plants. 5. To know about Enzymes, Biomolecules and phytochemicals of plants. 	
UNIT - I	Water relations of plants Physicochemical properties of water, chemical potential and water potential in the plant, bulk movement of water, soil plant atmosphere continuum, Transpiration - stomatal physiology and regulation. Modern concepts of mineral salt absorption and translocation.
UNIT - II	Photosynthesis - Photophysical and photochemical phases - Light reactions - sequence of photosynthetic pathway - Electron Transport Chain - Cyclic and Non- Cyclic Photophosphorylation. Pathways of CO ₂ fixation (C ₃ , C ₄ and CAM). Respiration: Photorespiration (C ₂) and dark respiration - Glycolytic pathway - Aerobic and Anaerobic Respiration - Kreb's cycle, Oxidative phosphorylation, Pentose Phosphate Pathway, Gluconeogenesis.
UNIT - III	Plant growth regulation - Growth - Growth Curve - Plant Growth Regulators - auxins, giberrellins, cytokinins - Growth retardants - Mode of action, physiological actions and applications in agriculture and horticulture. Photoperiodism - Phytochromes and Flowering. Physiology of Seed Dormancy - Causes of seed dormancy - Breaking seed dormancy - Vernalization - Senescence and Aging.
UNIT - IV	Carbohydrates - Classification, structure and functions of mono, di, oligo and polysaccharides. Proteins and aminoacids - Classification, structure and composition of amino acids. Primary, secondary, tertiary and quaternary structure of proteins. Lipids - Classification, structure and functions - properties. Biosynthesis of fattyacids.
UNIT - V	Enzymes - classification, mode of action, Michaelis - Menton constant, coenzymes, isoenzymes. Reverse turn and Ramachandran Plot. Nucleic acids - Structure, composition - Nucleotides - cyclic nucleotides - biosynthesis of purines and pyrimidins. Secondary metabolites - A general account - Biosynthesis and function of lignins, suberins, terpenes, phenols, alkaloids and flavonoids.
Text Books <ol style="list-style-type: none"> 1. Plant Physiology, Biochemistry and biotechnology - S.K.Verma - 1995, S.Chand & Co - New Delhi. 2. Fundamental physiology - V.K.Jain - 2000 - S. Chand & Co - New Delhi. 3. Jain, J.L.Sunjay Jain and Nitin Jain, 2007 - Fundamentals of Biochemistry S.Chand & Co - New Delhi. 	
Reference Books <ol style="list-style-type: none"> 1. Lincoln Taiz and Eduardo Zeiger, 2005. Plant Physiology Sinauer Associates Inc. Sublishers, Sunderland, Massachusetts. 2. Salisbury, F.B. and Cleon Ross 2007. Plant Physiology, Wadsworth publishing company Belimont. 3. William G.Hopkins, 1999 - Introduction to Plant Physiology, John Wiley and sons, INC - New York. 	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome
1. Fundamental understanding of morpho-physiological mysteries seen in plants.
2. Enable the students to grab the functional aspects of plants.
3. Advanced knowledge of the physiological processes in plants.
4. Understand the biochemistry of plant growth and development.
5. Acquired Knowledge on the biomolecules, secondary metabolites and its significance.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented		Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	3	3	2	2	4	4	3	4	4	3.22
CO2	3	3	2	3	2	3	3	4	4	3.00
CO3	4	4	4	4	3	4	3	4	3	3.66
CO4	4	3	4	3	3	4	2	3	4	3.00
CO5	4	3	4	2	3	3	4	4	3	3.33
Mean Overall Score										3.2

Result: The core for this course is **3.2** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = -----	Mean overall score for COs =-----
Total No. of Pos & PSOs	Total No. of COS

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 5	COURSE CODE: P21BO4C13
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - IV SEMESTER - CORE COURSE - XIII (For the candidates admitted from the year 2021 - 2022 onwards) BIOPHYSICS, BIOINSTRUMENTATION AND BIOLOGICAL TECHNIQUES	
Course Objectives 1. To Acquire knowledge of biophysical processes 2. To gain knowledge on measurements in cellular and molecular biology. 3. To Learn the principle and applications of some common biological instruments and techniques 4. To understand basic principles and application of tools and technique in biology for higher studies and research based career.	
UNIT - I	Biophysics - Bioenergetics, Energy and work. Laws of Thermodynamics. Energy transductions in biological systems. Redox potential, Redox couples, ATP bioenergetics. Photobiology: Dual nature of light, characteristics of solar radiation, solar energy - Efficiency of atoms Absorption spectra in molecules, energy states, Deexcitation.
UNIT - II	Separation technique - Centrifuge and centrifugation - Basic principles, Types of centrifuges - Analytical and Preparative centrifugation, Differential and density gradient centrifugation. Preparative, analytical and ultra centrifugation techniques with special reference to determination of molecular weight of macromolecules.
UNIT - III	Separation technique - Chromatography - Principles, procedures and applications of Paper (PC), Thin layer (TLC), High performance thin layer chromatography (HPTLC), Ion exchange, Affinity, Gas chromatography (GC), Gas liquid chromatography (GLC), High performance liquid chromatography (HPLC).
UNIT - IV	Separation technique - Electrophoresis - Basic principles - Isolation and staining of DNA and Protein from plant sample - AGE, PAGE, PFGE - Extraction and estimation of DNA by AGE - Extraction and estimation Protein by PAGE.
UNIT - V	Analytical Techniques - Principle and applications of Colorimetry, Spectrophotometry. Spectroscopy: Flame emission spectroscopy, Atomic absorption spectroscopy, Nuclear Magnetic Resonance spectroscopy (NMR), Circular Dichroism Spectroscopy, ESR spectroscopy, Mass spectroscopy, X-ray crystallography.
Text Book 1. Casey, E.J. (1962). Biophysics: Concepts and Mechanics. Van No strand Reinhold Co. and East West Press, New Delhi. 2. Rajeshwari, M.R. (2012)- Biophysics, Rastogi Publications, Meerut. 3. Salil Bose, S. (1982). Elementary Biophysics. Vijaya Printers, Madurai	
Reference Books 1. Aggarwal S.K, 2009 Foundation Course in Biology Students Edition P 7993. 2. Eldon D.Enger, Frederick C.Ross and David Bailey (2008) -11th Edition, Concepts inBiology. Tata McGraw Hill, New Delhi. 3. Wilson & Walkar 2008 Principles and Techniques of Biochemistry and Molecular BiologyCambridge University Press. 4. Ghatak K.L. 2011.Techniques and Methods in Biology. PHI Learning Pvt. Ltd. New Delhi. 5. Gupta A. 2009. Instrumentation and Bio Analytical Techniques. Pragati Prakashan, Meerut. 6. Steven Ruzin, (2005). Plant Micro technique and Microscopy. Oxford university press,London. 7. Jayaraman - Laboratory manual in Biochemistry, Madurai. 8. Sadasivan, S. and Manickam - Biochemical methods, Coimbatore. 9. David T. Plummer - Introduction to Practical Biochemistry, New Delhi.	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome
<ul style="list-style-type: none"> The student acquires the ability to use application relevant to the biological subjects taught, regarding First, Second and third laws of thermodynamics.
<ul style="list-style-type: none"> Acquire fundamental knowledge in instruments of biology.
<ul style="list-style-type: none"> Understand the principle, concepts and mechanism of various separation techniques.
<ul style="list-style-type: none"> Gain knowledge about techniques employed in X - ray crystallography and spectroscopy useful for higher studies.
<ul style="list-style-type: none"> The student gets knowledge about bioinstruments like, Electrophoresis - Basic principles - Isolation and staining of DNA and Protein from plant sample - AGE, PAGE, PFGE.

Nature of Course

Knowledge and skill	✓	Employability oriented	✓
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	4	3	3	3	4	4	2	2	2	3.0
CO2	3	3	3	3	3	4	3	2	2	2.8
CO3	4	2	3	4	3	4	3	3	4	3.0
CO4	3	4	3	4	4	4	4	3	3	3.3
Mean Overall Score										3.0

Result: The core for this course is **3.0** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = -----	Mean overall score for COs = -----
Total No. of Pos & PSOs	Total No. of COS

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 5	COURSE CODE: P21BO4C14P
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - IV SEMESTER - COURE COURSE - XIV (For the candidates admitted from the year 2021 - 2022 onwards) PRACTICAL - IV (Covering CC - XII, AND CC - XIII) (PLANT PHYSIOLOGY, BIOCHEMISTRY, BIOPHYSICS, BIOINSTRUMENTATION AND BIOLOGICAL TECHNIQUES)	
Course Objectives <ol style="list-style-type: none"> 1. To understand the knowledge about estimation and separation of photosynthetic pigments. 2. To know the various techniques for phytochemical analyze and separation. 3. To know the knowledge about instrument operation and utilization. 	
LOT - I (Any one from A and B) A) Plant Physiology (Individual Experiments) <ol style="list-style-type: none"> 1. Determination of water potential in plant tissues. 2. Estimation of photosynthetic pigments (chlorophyll and carotenoid). 3. Estimation Respiratory Quotient in flower buds or germinating seeds. B) Separation techniques (Individual Experiments) - Anyone from the lot for examination. <ol style="list-style-type: none"> 1. Separation of photosynthetic pigments by Paper Chromatography 2. Separation of amino acids by Paper Chromatography 3. Separation of alkaloids by TLC 4. Electrophoretic separation of DNA and Protein 	
LOT - II (Any one from C) C) Biochemistry (Individual Experiments) - <ol style="list-style-type: none"> 1. Extraction and estimation of starch. 2. Extraction and estimation of total sugar 3. Extraction and estimation of total protein 4. Extraction and estimation of total amino acid. 5. Extraction and estimation of lipid 6. Estimation of total acidity. 7. Extraction and estimation of total phenol. 	
LOT - III (Any two from D) D) Qualitative analysis of primary and secondary metabolites (Individual Experiments) <ol style="list-style-type: none"> 1. Carbohydrates 2. Proteins and amino acids 3. Alkaloids 4. Flavonoids 5. Terpenoids 6. Coumarins 7. Glycosides 8. Tannins 9. Phenols 10. Saponins 	
Demonstration only: (Spotters) Physiology Osmosis Anaerobic respiration Growth regulators and their role (IAA, IBA, NAA, 2,4-D, GA ₃ , KIN) Biochemistry Enzymes and their actions - peroxidase, catalase, amylase, nitrate reductase Bio - instrumentation pH Meter Centrifuge Spectrophotometer Electrophoretic apparatus	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome
1. To understand the physiological details of photosynthesis and respiration.
2. To understand phytochemical metabolism in plants.
3. To understand the physiological activity and its role in plants.
4. To learn about the methods of separation of pigments.

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	3	4	4	3	4	3	4	3	4	3.5
CO2	3	4	4	2	4	2	4	3	3	3.2
CO3	3	4	4	2	4	3	3	2	4	3.2
CO4	4	4	4	2	4	4	2	2	4	3.3
Mean Overall Score										3.3

Result: The core for this course is **3.3** (High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = -----	Mean overall score for COs = -----
Total No. of Pos & PSOs	Total No. of COS

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 4	COURSE CODE: P21BO4E5
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - IV SEMESTER - ELECTIVE COURSE - V (For the candidates admitted from the year 2021 - 2022 onwards) RESEARCH METHODOLOGY	
Course Objectives <ol style="list-style-type: none"> 1. To provide the knowledge on research and interpretation. 2. To learn the methods of writing research paper and making a dissertation. 3. To know the fundamental ideas about research. 	
UNIT - I	Introduction, meaning of research, objectives and types of research, Choosing problems for research. Literature collection - citation & citation index (primary, secondary and tertiary sources) -Abstracting.
UNIT - II	Bibliography - bibliometrics (scientometrics), biblioscope - Plagiarism - Project Proposal Writing - Components of research report - Research report Writing (thesis and publications). Planning and preparing a thesis and scientific papers. - Impact factor of journals - H - index - Proof corrections. - Paper presentation (oral/poster) - E-learning tools- monograph.
UNIT - III	Biostatistics: Importance, tabulation and Collection of data, classification of data, graphical representation of data. Measures of central tendency - mean, median and mode, Standard deviation and Standard error (Theory and Calculation). Test of significance - t-test, and chi-square test - Correlation and regression analysis (Only theory).
UNIT - IV	Bioinformatics: Definition and Scope. Biological databases - Primary and secondary. Genomics: Definition - Gen Bank, DDBJ - Sequence and molecular file formats. - NCBI and EMB net. BLAST - Proteomics: Definition - Protein secondary structure prediction (SOPMA and JPRED) -Molecular visualization tool - Rasmol and Swiss PDB Viewer - SWISS PROT.
UNIT - V	Nanotechnology. Concept of Nanotechnology. Classification of nonmaterial's, nano structures and dynamics of bio-compatible materials, green synthesis of nanoparticles, nanotubes, colloidal gold, nanocrystals and microarray. Impact of nanotechnology on environment and society, Nanobiology, Nanosensors and Nanomedicines.
Text Book <ol style="list-style-type: none"> 1. Abdelhamid Elaissari, (2008). Colloidal Nanoparticles in Biotechnology, John Wiley. 2. Pradeep T. (2007). NANO: The Essentials - Understanding Nanoscience and Nanotechnology, TATA McGraw - Hill Education. 	
Reference Books <ol style="list-style-type: none"> 1. Kothari C.K. 2004 2nd Ed. Research methodology methods and techniques (New age international, New Delhi) 2. Krishnaswamy, K.N. Sivakumar, Appa Iyar and Mathirangen M 2006. Management of research methodology integration of principles, methods and techniques (Pearson education New Delhi) 3. Antorson, Durston and Polle 1970. Thesis and assignment writing, Wiley eastern Ltd. 4. Parsons, C.J 1973 Thesis and project work. A guide to research and writing, George Allen and Unwin Ltd London. 5. Satguru Prasad (2013), Elements of Biosatistics - Rastogi Publications, Meerut. 6. Harisha S (2007). Fundamentals of Bioinformatics. IK International Publishing house Pvt. Ltd. New Delhi 7. Attwood T K and Parry Smith D J, (1999).Introduction to Bioinformatics Addison Wesley Longman Limited, England. 8. Shanmugam, S. (2011) Nanotechnology - MJP Publication New Delhi. 9. Charles PP and Frank JO, (2006). Introduction to Nanotechnology, Wiley India Ed. 	

Course Outcomes

On the completion of this course the students will be able to

Course Outcome
• To identify and discuss the complex issues inherent in selecting a research problem.
• Get the idea in the developing strong hypothesis and methodology for research.
• Acquire knowledge on basic concepts in Biostatistics.
• To know the importance of Bioinformatics in Biology and Apply various tools for genomic and proteomic studies.
• Understand the basic concepts and application Nanotechnology.

Nature of Course			
Knowledge and skill	✓	Employability oriented	
Skill oriented	✓	Entrepreneurship oriented	

Mapping Course Outcome with PO and POS

Course Outcomes (COs)	Programme Outcomes (POs)					Programme Specific Outcomes (PSOs)				Mean Scores of COs
	PO1	PO2	PO3	PO4	PO5	PSO1	PSO2	PSO3	PSO4	
CO1	2	4	3	3	2	3	4	3	4	2.8
CO2	3	4	4	2	4	2	4	3	3	3.2
CO3	3	3	4	2	4	3	3	2	4	3.1
CO4	4	4	4	2	4	4	2	2	4	3.3
Mean Overall Score										3.1

Result: The core for this course is **3.1**(High relationship)

Note:

Strength level	Low	Medium	High
value	1	2	3

Mapping Scale

Mapping	1 - 20%	21 - 40%	41 - 60%	61 - 80%
Scale	1	2	3	4
Relation	0.0 - 1.0	1.1 - 2.0	2.1 - 3.0	3.1 - 4.0
Quality	Very poor	Poor	Moderate	High

Mapping Score

Total of Value	Total of Mean Score
Mean Score of COs = $\frac{\text{Total of Value}}{\text{Total No. of Pos \& PSOs}}$	Mean overall score for COs = $\frac{\text{Total of Mean Score}}{\text{Total No. of COS}}$

COURSE DESIGNER:

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS

NUMBER OF CREDITS: 4	COURSE CODE: P21BO4PW
GOVERNMENT ARTS COLLEGE (AUTONOMOUS), KARUR - 639 005 M.Sc., BOTANY - IV SEMESTER - PROJECT WORK (For the candidates admitted from the year 2021 - 2022 onwards) PROJECT WORK	

SI. No	AREA OF WORK	MAXIMUM MARKS		
		INT	EXT	TOTAL
1.	PROJECT WORK:			
	i) Plan of the Project	10	10	20
	ii) Execution of the plan / Collection of data / Organization of materials / Fabrication Experimental study / Hypothesis, Testing etc., and Presentation of the report.	22.5	22.5	45
	iii) Individual Initiative.	7.5	7.5	15
2.	VIVA VOCE EXAMINATION	10	10	20
TOTAL		50	50	100

Passing Minimum - 50 Marks.

CHAIRMAN - BOS

CONTROLLER OF EXAMINATIONS