Criterion I–Curricular Aspects

Name of the Department: Botany

Key Indicator – 1.1 Curriculum Design and Development (50)

Metric No. QlM 1.1.1 (20) (Department/Academic)

1. Curricula developed /adopted have relevance to the local/ national / regional/global developmental needs which is reflected in the Program Outcomes (Pos), and Course Outcomes (Cos) of the programs offered by the University.

Botany is a vital branch of science which deals with the study of Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms, and Angiosperms, their classification, structure, growth, reproduction, metabolism, development, diseases, chemical properties, uses and ecological & evolutionary relationships among the different groups. The continued investigations of plants are fundamental in this post-industrial, knowledge-based modern era because they provide countless precious goods and services that underpin almost all life on the planet Earth. A greater understanding and knowledge of plants and their unique processes is inevitable to the future of human societies as it will enable us to overcome the challenges posed and reap benefits from the opportunities offered in this century.

Programme's Mission & Objectives:

To offer a High Quality Post Graduate Degree M. Sc., Botany through to the graduate-aspirant in order to nurture the natural science- Botany among the young minds. The pupil nurtured with botanical knowledge is the need of the hour to save the natural environment, educate the human resources towards conservation and save planet thereon.

The objectives of the programme include:

- To give an expanded knowledge about various kind of life forms of plant kingdom.
- To teach about naming and classification of plants.
- To understand about anatomical, embryological, cellular and molecular level approach of science in studying plants.
- To study about microorganisms, their impact on plants and various kind of plant diseases.
- To understand about modern concepts like plant molecular biology, plant genetic engineering and plant tissue culture.

- To introduce inter-disciplinary approaches like biostatistics and bioinformatics.
- To study about application part of botany viz., Medicinal plants and phytochemistry, Plant Breeding, Plant Biotechnology, Aesthetic Botany and Economic Botany.
- To enlighten the students about biodiversity, conservation and Intellectual Property Rights.

Programme outcomes

The program focuses on the unified nature of Plant Science and aims to generate young minds through competent teaching, and training on key technologies. Students will be encouraged to participate in research providing them opportunity to experiment their understanding and to reveal the relationship between the conventional education and research. Students after completing the M.Sc. Botany can join various National and International government organizations for their Ph.D. through CSIR JRF and as Research Assistants in various Govt. and private institutions/Corporate sectors, plant based private companies and can also join teaching profession

2. Attach the relevant document supporting Program outcomes, Program specific outcomes and course outcomes of all the Programs offered by the department **(Enclosure- 1).**
3. Attach the latest syllabus copy along with the syllabus approved for the year 2020-21. **(Enclosure - 2).**

4. **Metric No. QnM 1.1.2 (30) (Department/Academic)**

1. Programmes offered by the institution focus on employability/ entrepreunership/ skill development and their course syllabi are adequately revised to incorporate contemporary requirements.
2. List activities with direct bearing on Employability/ Entrepreneurship/ Skill development :

Name of the Course	Course Code	Name of the Programme	Activities with direct bearing on Employability/ Entrepreneurship/ Skill development	Year of introduction
Biostatistics and Bioinformatics	SCT-1.1	M.Sc. Botany	Students are eligible and given preference for getting selection in Pharmaceutical Industries and Agriculture Departments.	2012
Biostatistics and Bioinformatics	SCP-1.1	M.Sc. Botany	Understand tools, techniques and data analysis with the help of information technology	2012
Methods in Plant	SCT-2.1	M.Sc. Botany	Advances laboratory and analytical skill, which	2012

Sciences			enables students to be acquainted with various laboratory techniques	
Methods in Plant Sciences	SCP-2.1	M.Sc. Botany	Enhance analytical methods in plant sciences	2012
Medicinal Plants and Phytochemistry	SCT-3.1	M.Sc. Botany	Herbal drug formulation and pharmaceutical industry	2012
Medicinal Plants and Phytochemistry	SCP-3.1	M.Sc. Botany	Gain knowledge of medicinal aspects of plants and their uses in home remedies. Become able to understand drug abuse like excess and unnecessary use of antibiotics, steroids and opioids etc.	2012
Plant Biotechnology	SCT-4.1	M.Sc. Botany	Skill in Biotechnological methods and practices; Employability in Biotech based industries.	2012
Plant Biotechnology	SCP-4.1	M.Sc. Botany	Advances in genetic engineering techniques to produce genetically modified plants	2012
Plant Breeding	SCT-4.1	M.Sc. Botany	Tools and techniques used for quality enhancement of economically important plants and crops	2012
Plant Breeding	SCP-4.1	M.Sc. Botany	Modify and improve the traits of plants in order to produce desired characteristics	2012
Plant Propagation techniques	OE-3.1	M.Sc. Botany	Commercial Nursery establishment/ gardening /self-employment	2016
Medicinal Botany	OE-4.1	M.Sc. Botany	Herbal drug formulation pharmaceutical industry	2018
Aesthetic Botany	OE-4.1	M.Sc. Botany	Ornamental plant industries/ gardening /self-employment	2018

5. Attach Curriculum/ Syllabus of the courses that have activities: **Enclosure 3**
6. Enclose MoU's with relevant organizations for these courses, if any: Nil

Key Indicator – 1.2 Academic Flexibility (30)

Metric No. QnM 1.2.1 (30) (Department/Academic)

1. How many new courses were introduced? : **Nil**

2. Number of courses offered by the department across all Programmes during the last five years: **27**
3. Enclose the curriculum of new courses offered : **NA**
4. new courses introduced of the total number of courses across all Programmes offered : **Nil**

Name of the new course introduced	Programme name	Programme code	Course code	Year of introduction	Link of the relevant document

5. Minutes of BOS clearly specifying the syllabus approval of new courses (**Enclosure 4)**
6. Academic Council meeting extracts endorsing the decision of BOS.

Key Indicator – 1.3 Curriculum Enrichment (50)

Metric No. QlM 1.3.1 (15) (Department/Academic)

1. Whether institution integrates cross cutting issues relevant to Gender, Environment and Sustainability, Human Values and Professional Ethics and other value framework enshrined in SDG and NEP 2020 into the Curriculum
   Write description in maximum of 500 words: _____
2. Upload the list and description of the courses which address the Gender, Environment and Sustainability, Human Values and Professional Ethics and other value framework enshrined in SDG and NEP 2020 into the Curriculum :_____ _____

Metric No. QnM 1.3.2 (30) (Department/Academic)

1. How many new certificate/value-added courses/Diploma program/ online courses of MOOCs/SWAYAM/e-Pathashala/NPTEL etc where students of the institution have enrolled and successfully completed are added : Nil

Name of the add on/certificate/value added courses/ Diploma programs/ Online courses of MOOC/SWAYAM/e-pathashala/NPTEL etc (with 30 or more contact hours) offered during last five years	Program duration (Number of contact hours)	Number of students benefited through the program

2. Attach Institutional Program brochure/ notice for certificates/ value added programs with course modules and outcomes : NA
3. List of students and the attendance sheet for the above mentioned programs with course modules and outcomes : NA
4. Evidence of course completion like course completion certificate etc. : NA

Metric No. QnM 1.3.3 (Department/Academic) (5)

1. Number of Programs offered that have components of field projects/research projects/internships during the academic year (Without repeat count) (2020-2021) : 01
2. Number of Programs offered during last five year (Without repeat count) (2020- 2021) : 01.

Programme name	Components of field projects/ research projects/internships along with course code	Link of the relevant document

3. Program and course contents having element of field projects/ research projects/internships as approved by BOS:
4. Sample internship completion letter provided by host institutions
5. Sample evaluated project report/ field work report submitted by the students (**Enclosure 5)**

Key Indicator – 1.4 Feedback System (20)

Metric No. QnM 1.4.1 (20) (Not required)

1. Structured feedback for curriculum and its transactions is regularly obtained from stakeholders like Students, Teachers Employers, Alumni Academic peers and feedback processes of the institution may be classified as follows

   Options:

   A. Feedback collected, analyzed and action taken and communicated to relevant body and feedback hosted on the institutional website
   B. Feedback collected, analyzed and action has been taken and communicated to the relevant body
   C. Feedback collected and analyzed
   D. Feedback collected
   E. Feedback not collected
2. Attach Report of analysis of feedback received from different stakeholders' year wise:_____
3. Attach Action taken report of the University on feedback report as stated in the minutes of the Governing Council, Syndicate, Board of Management :
4. Attach At least 4 filled in feedback form from different stakeholders like students,

teachers, employers, alumni etc.

List of enclosures (From A1 onwards)

1. Programme / Course outcomes
2. CBCS curriculum (2020-21)
3. Curriculum/ Syllabus of the courses that have activities
4. Minutes of relevant Academic Council/BOS meeting
5. Number of students undertaking field project or internships (2020-21)

Enclosure- 1

Name of the Department : Department of Botany

Academic Year : 2020-2021

Plant science is now an amalgamation of basic and applied science. Plants besides having the unique capability to trap solar energy also provide food to all cannot be replicated by any system. Conventional studies like plant identification is now being supplemented with molecular techniques like DNA Barcoding. The courses have been designed to benefit all Botany students to study various aspects of plant science including its practical applications. Keeping in mind that these students can take up teaching at different levels, research work in research institutes and or industry, doctoral work, environment impact assessment, biodiversity studies, entrepreneurship, scientific writing relevant topics have been included in the curriculum.

Programme outcomes and Programme specific outcomes

Name of the programme	Programme outcomes	Programme specific outcomes
M.Sc. Botany	Knowledge and understanding about plant diversity	Enable the students to be resourceful in identifying of plants.
	Practical skills in the field and laboratory experiments promotes creative and novel ideas in biological concepts.	Students will become Hands on expertise in plant Sciences.
	It enhances skills in handling scientific instruments, planning and executing biological research.	They become focused to take up Research and Teaching opportunities
	Scientific knowledge in life science and fundamental metabolism of plants.	They will be able to clear IFS, CSIR-NET, SET, GATE, ICMR.NET, ICAR.NET etc.,
	Knowledge about biodiversity exploration and conservation	Career opportunities and job opportunities.
	Presentation skills (oral & writing) in life sciences.	Entrepreneurship skill development
	It provides Entrepreneurship skill development	It promotes career and job opportunities in both Govt. and private sectors.

Course outcomes of all the Programme offered by the Department

Sl. No.	Name of the Course	Course code	Programme specific outcomes
1.	Phycology, Mycology, Bacteriology and Virology	HCT 1.1	Understand the structure, function of algae, fungi, viruses and bacteria
			Identify algae and fungi in their natural habitat on the basis of characters
			Develop the cultures of algae and fungi
2.	Bryophytes and Pteridophytes	HCT 1.2	The students will learn about the structure and reproduction of certain selected species of Bryophytes and Pteridophytes.
			Understand the structure and life cycle of different bryophytes
			Understand the structure and life cycle of different pteridophytes
3.	Gymnosperms and Palaeobotany	HCT 1.3	The students will learn about the structure and reproduction of certain selected species of Gymnosperms.
			Learn few representatives of fossil forms.
			Study the different types of fossils of extinct plants/ flora
			Study the evolutionary affinity between Cordiatales, Cycadales, and Coniferales.
4.	Biostatistics and Bioinformatics	SCT 1.1	The students will know the basic principles of biostatistics and computer applications in biology.
			understand the fundamental concepts of biostatistics.
			learn about the computer and imbibe computer skills for biological data management and graphical presentation.
			be enlightened about the need for computer applications, programs and techniques for biology.
			In bioinformatics they will gain deep understanding of using computer to visualize, explore and model sequence analysis.
5.	Ecology and Environmental Biology	HCT 2.1	The students get to understand the basic concepts of geology, pedology, ecology, autecology, synecology, phytogeography and advanced ecology.
			know the establishment of ecosystem, vegetation, plant succession and adaptations.
6.	Cell and Molecular Biology	HCT 2.2	By the end of this course students will be able to understand the structure of cells in relation to the functional aspects.
			The students will be able to learn about the basics of cell and its inclusions

			to understand the difference between prokaryotic and eukaryotic cells.
			to study the details of the plant cell wall, cytosol and cytoplasmic organelles.
			to understand the properties of nucleic acids (DNA &RNA) and their synthesis
			to study the details of protein synthesis and cell signalling.
7.	Genetics and Evolution	HCT 2.3	The students will be able to acquire knowledge about the nature and function of genes and processes of inheritance as they influence the characteristics of populations and species.
			understand the basic concepts of mendelian genetics, its variations and applications
			familiarize with the various concepts of evolution
			The students will understand the concepts of microbial and human genetics and genetic mapping.
			to study the details of protein synthesis and cell signalling.
8.	Methods in Plant Science	SCT 2.1	The course will nurture the knowledge on biological samples especially plant samples.
			The course will give an expertise in understanding the various important biological techniques to be employed in the field of botany.
9.	Systematic Botany of Angiosperms	HCT 3.1	The students are able to understand about Plant taxonomy and their systematic classification systems
			are able to understand about modern approaches in taxonomic studies.
			enlightened about the role of taxonomy in conservation of biodiversity
10.	Botanical Tour and Herbarium preparation	HCT 3.2	Understand and identify the plants under natural environment
			Preparation of herbarium
			Analyze the floral formula of monocot and dicot families
11.	Reproductive Biology of Angiosperms and Plant Anatomy	HCT 3.3	Understand photo morphogenesis and seedling development
			Evaluate the root developments, flower development in plants
			Study the reproduction in plants with the help of male female gametophyte
			Study of microspogesis and megasprogenesis.

			Understand pollen-pistil interacting and seed development.
12.	Medicinal Plants and Phytochemistry	SCT 3.1	Learner will definite witness the role of plants in survival of human beings and other organism.
			They will also well verse with contribution made by our primitive people in exploration of plant knowledge to alleviate common diseases and development of system of medicine.
			Students will be able to Identify the biological source, morphology, cultivation, collection, drying, packing, storage, medical as well as non-medical uses of plants and plant secretions.
			Students will also be able to identify the different chemical constituents present in plants their biosynthetic origin, characterization, natural occurrence and pharmacological action.
13.	Plant Physiology	HCT 4.1	The Students will learn about absorption, translocation and utilization of water and other minerals.
			comprehend the changes during growth process (germination to abscission).
			understand the energy flow and various metabolic cycles with their integration.
			get an overall perception about various physiological processes occurring in plants.
14.	Project work		Staff members are in different areas viz, cytology, and genetics, taxonomy and ethno botany, mycology, paleobobatany
			Select their topic as per teacher's supervision
			Learn various techniques
			Examiners are appointed from other universities.
15.	Plant Breeding	SCT 4.1	Students will understand the concepts of plant breeding involving the principles, selection procedure and achievements in plant breeding. So they will be enabled to implement their knowledge on plant breeding techniques in their agriculture fields for the improvement of crops.
			students will understand the various processes in crop improvement program.
			By knowing the elementary principles in plant breeding students will understand the importance and value of producing disease and insect resistant plants.

16.	Plant Biotechnology	SCT 4.1	The students will understand the basic concepts of genome organization in plants and molecular markers.
			have a clear knowledge of plant tissue culture techniques
			have a basic understanding of the plant genetic transformation methods.
			be fully aware of the basics and applications of plant biotechnology.

Enclosure- 2

Karnataka State Akkamahadevi Women's University, Vijayapura

M.Sc. Botany Programme - Choice Based Credit System (CBCS) Syllabus

CORE SUBJECT: BOTANY – [Post Graduate]

Course code	Course name	Credits				Marks										Remark
						C1			C2			C3			Total	
		L	T	P	Total	L	T	P	L	T	P	L	T	P		
Semester I																
HCT-1.1	Phycology, Mycology, Bacteriology and Virology	04			04	15			15			70			100	
HCT-1.2	Bryophytes and Pteridophytes	04			04	15			15			70			100	
HCT-1.3	Gymnosperms and Palaeobotany	04			04	15			15			70			100	
SCT-1.1*	Plant Pathology Phytogeography and Evolution Biostatistics and Bioinformatics *(One of the above SOFT CORE subjects shall be selected by the candidate/ as per the decision of the Departmental Council one SC may be offered)	04			04	15			15			70			100	
HCP-1.1	Phycology, Mycology, Bacteriology and Virology			02	02			15			15			70	100	
HCP-1.2	Bryophytes and Pteridophytes			02	02			15			15			70	100	
HCP-1.3	Gymnosperms and Palaeobotany			02	02			15			15			70	100	
SCP-1.1*	*Based on Soft Core Paper offered			02	02			15			15			70	100	
O.E -1.1	Offered by Department of Women's Studies	04			04	15			15			70			100	
	Total	**20**		**08**	**28**	**75**		**60**	**75**		**60**	**350**		**280**	**900**	
Semester II																
HCT-2.1	Ecology and Environmental Biology	04			04	15			15			70			100	
HCT-2.2	Cell and Molecular Biology	04			04	15			15			70			100	

HCT-2.3	Genetics and Evolution	04			04	15			15			70			100	
SCT-2.1*	Methods in Plant Science Plant Genetic Engineering Nutraceuticals *(One of the above SOFT CORE subjects shall be selected by the candidate/ as per the decision of the Departmental Council one SC may be offered)	04			04	15			15			70			100	
HCP-2.1	Ecology and Environmental Biology			02	02			15			15			70	100	
HCP-2.2	Cell and Molecular Biology			02	02			15			15			70	100	
HCP-2.3	Genetics and Evolution			02	02			15			15			70	100	
SCP-2.1*	*Based on Soft Core paper offered			02	02			15			15			70	100	
OE-2.1	Offered by Department of Women's studies	04			04	15			15			70			100	
	Total	**20**		**08**	**28**	**75**		**60**	**75**		**60**	**350**		**280**	**900**	
Semester III																
HCT-3.1	Systematic Botany of Angiosperms	04			04	15			15			70			100	
HCP-3.2	Botanical Tour and Herbarium preparation 1. The candidate shall undertake compulsorily field work outside the campus area/ District, a minimum of 3 to 4 days to understand floristic diversity of Angiosperms and to collect specimens from various agro-climatic conditions for the preparation of the Herbarium. 2. The University shall encourage the Department by providing required funds to undertake field studies by the students, since it is hard core subject required for the completion of the M.Sc. Botany programme.			02	02										50	
HCT-3.3	Reproductive Biology of Angiosperms and Plant Anatomy	04			04	15			15			70			100	
SCT-3.1*	Economic Botany	04			04	15			15			70			100	

	Medicinal Plants and Phytochemistry Biodiversity and Conservation *(One of the above SOFT CORE subjects shall be selected by the candidate/ as per the decision of the Departmental Council one SC may be offered)															
HCP-3.1	Systematic Botany of Angiosperms			02	02			15			15			70	100	
HCP-3.3	Reproductive Biology of Angiosperms and Plant Anatomy			02	02			15			15			70	100	
SCP- 3.1*	*Based on Soft Core paper offered			02	02			15			15			70	100	
OE-3.1*	Plant Propagation Techniques Plant Diversity and Human Welfare *(One of the above OPEN ELECTIVE subjects shall be selected by the candidate/ as per the decision of the Departmental Council one OE may be offered)	04			04	15			15			70			100	
	Total	**16**		**06**	**24**	**75**		**45**	**75**		**45**	**350**		**210**	**750**	
Semester IV																
HCT-4.1	Plant Physiology	04			04	15			15			70			100	
HCPW-4.2	Project work*			06	06										150	
SCT-4.1*	Plant Breeding Plant Biotechnology Ethnobotany and IPR *(One of the above SOFT CORE subjects shall be selected by the candidate/ as per the decision of the Departmental Council one SC may be offered)	04			04	15			15			70			100	
HCP-4.1	Plant Physiology			02	02			15			15			70	100	
SCP-4.1*	*Based on Soft Core paper offered			02	02			15			15			70	100	
O.E-4.1*	Medicinal Botany Aesthetic Botany *(One of the above OPEN ELECTIVE subjects	04			04	15			15			70			100	

	shall be selected by the candidate/ as per the decision of the Departmental Council one OE may be offered)																
	Total	**12**		**08**	**20**	**45**		**30**	**45**		**30**	**210**		**140**	**650**	
	Programme total														**3200**		

L- Lecture, T- Tutorial, P- Practical.

HCT- Hard Core Theory; SCT- Soft Core Theory; OE- Open Elective; HCP- Hard Core Practical; SCP- Soft Core Practical.

HCPW- Hard Core Project Work/Dissertation.

*The Project work shall be evaluated for 150 marks (100 marks for dissertation, 25 marks for presentation of the work using power point slides and 25 marks for viva-voce examination by inviting external examiner along with internal examiner).

Board of Studies Members

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2. Dr. K.N. Amruthesh, Professor,Dept. of Botany, University of Mysore - Member
3. Dr. H.R. Raveesha, Professor, Dept. of Botany, Bangalore University - Member
4. Dr. Prashanth S J, Associate Professor, Coordinator, Dept. of Botany - Member and Convener

Sd/-
Chairman/ Co-ordinator
Board of Studies (BOS) in Botany
Dept. of Botany, Karnataka State Akkamahadevi Women's University
Vijayapura – 586 108, Karnataka

Scheme of Teaching, Examination and Credit points of M.Sc. Botany Programme w.e.f. 2020-21

Semester	Paper No. and Title	Teaching Hrs/week	Internal Assessment	Exam Hrs	Exam Marks	Credits
I	HCT-1.1: Phycology, Mycology, Bacteriology and Virology	04	30	03	70	04
	HCT-1.2: Bryophytes and Pteridophytes	04	30	03	70	04
	HCT-1.3: Gymnosperms and Palaeobotany	04	30	03	70	04
	SCT-1.1: Plant Pathology SCT-1.1: Phytogeography and Evolution SCT-1.1: Biostatistics and Bioinformatics	04	30	03	70	04
	HCP-1.1: Phycology, Mycology, Bacteriology and Virology	04	30	04	70	02
	HCP-1.2: Bryophytes and Pteridophytes	04	30	04	70	02
	HCP-1.3: Gymnosperms and Palaeobotany	04	30	04	70	02
	SCP-1.1: Based on Soft Core Paper offered	04	30	04	70	02
	OE-1.1: Offered by Department of Women's Studies	04	30	03	70	04
II	HCT-2.1: Ecology and Environmental Biology	04	30	03	70	04
	HCT-2.2: Cell and Molecular Biology	04	30	03	70	04
	HCT-2.3: Genetics and Evolution	04	30	03	70	04
	SCT-2.1: Methods in Plant Science SCT-2.1: Plant Genetic Engineering SCT-2.1: Nutraceuticals	04	30	03	70	04
	HCP-2.1: Ecology and Environmental Biology	04	30	04	70	02
	HCP-2.2: Cell and Molecular Biology	04	30	04	70	02
	HCP-2.3: Genetics and Evolution	04	30	04	70	02
	SCP-2.1: Based on Soft Core Paper offered	04	30	04	70	02
	OET-2.1: Offered by Department of Women's Studies	04	30	03	70	04
III	HCT-3.1: Systematic Botany of Angiosperms	04	30	03	70	04
	HCP-3.2: Botanical Tour and Herbarium preparation	04	14	--	36	02
	HCT-3.3: Reproductive Biology of Angiosperms and Plant Anatomy	04	30	03	70	04
	SCT-3.1: Economic Botany SCT-3.1: Medicinal Plants and Phytochemistry SCT-3.1: Biodiversity and Conservation	04	30	03	70	04
	HCP-3.1: Systematic Botany of Angiosperms	04	30	04	70	02
	HCP-3.3: Reproductive Biology of Angiosperms and Plant Anatomy	04	30	04	70	02
	SCP-3.1: Based on Soft Core Paper offered	04	30	04	70	02
	OET-3.1: Plant Propagation Techniques OET-3.1: Plant Diversity and Human Welfare	04	30	03	70	04
IV	HCT-4.1: Plant Physiology	04	30	03	70	04
	HCPW-4.2: Project Work	06	50	--	70	06
	SCT-4.4: Plant Breeding SCT-4.4: Plant Biotechnology SCT-4.4: Ethnobotany and IPR	04	30	03	70	04
	HCP-4.1: Plant Physiology	04	30	04	70	02
	SCP-4.1: Based on Soft Core Paper offered	04	30	04	70	02
	OET-4.1: Medicinal Botany OET-4.1: Aesthetic Botany	04	30	03	70	04
Total Marks (I to IV Semester) = 2800 + 400 (OET)						

HCT: Hard Core Theory; SCT: Soft Core Theory; HCP: Hard Core Practical
SCP: Soft Core Practical; HCPW: Project Work and Dissertation, OET: Open Elective Theory

Karnataka State Akkamahadevi Women's University, Vijayapura
M. Sc. Botany, Choice Based Credit System (CBCS) Syllabus,
CORE SUBJECT: Botany – [Post Graduate]

Semester I	**Hrs/week**	**Credits**
HCT-1.1: Phycology, Mycology, Bacteriology and Virology	04	04
HCT-1.2: Bryophytes and Pteridophytes	04	04
HCT-1.3: Gymnosperms and Palaeobotany	04	04
SCT-1.1: Plant Pathology	04	04
SCT-1.1: Phytogeography and Evolution		
SCT-1.1: Biostatistics and Bioinformatics		
HCP-1.1: Phycology, Mycology, Bacteriology and Virology	04	02
HCP-1.2: Bryophytes and Pteridophytes	04	02
HCP-1.3: Gymnosperms and Palaeobotany	04	02
SCP- 1.1: Based on Soft Core Paper offered	04	02
OE-1.1: Offered by Department of Women's Studies	04	04
		Sub. Total:28
Semester II		
HCT-2.1: Ecology and Environmental Biology	04	04
HCT-2.2: Cell and Molecular Biology	04	04
HCT-2.3: Genetics and Evolution	04	04
SCT-2.1: Methods in Plant Science	04	04
SCT-2.1: Plant Genetic Engineering		
SCT-2.1: Nutraceuticals		
HCP-2.1: Ecology and Environmental Biology	04	02
HCP-2.2: Cell and Molecular Biology	04	02
HCP-2.3: Genetics and Evolution	04	02
SCP-2.1: Based on Soft Core Paper offered	04	02
OET-2.1: Offered by Department of Women's Studies	04	04
		Sub. Total:28
Semester III		
HCT-3.1: Systematic Botany of Angiosperms	04	04
HCP-3.2: Botanical Tour and Herbarium preparation	04	02
HCT-3.3: Reproductive Biology of Angiosperms and Plant Anatomy	04	04
SCT-3.1: Economic Botany	04	04
SCT-3.1: Medicinal Plants and Phytochemistry		
SCT-3.1: Biodiversity and Conservation		
HCP-3.1: Systematic Botany of Angiosperms	04	02
HCP-3.3: Reproductive Biology of Angiosperms and Plant Anatomy	04	02
SCP-3.1: Based on Soft Core Paper offered	04	02
OET-3.1: Plant Propagation Techniques	04	04
OET-3.1: Plant Diversity and Human Welfare		
		Sub. Total:24
Semester IV		
HCT-4.1: Plant Physiology	04	04
HCPW-4.2: Project Work	04	04
SCT-4.4: Plant Breeding	04	04
SCT-4.4: Plant Biotechnology		
SCT-4.4: Ethnobotany and IPR		
HCP-4.1: Plant Physiology	04	02
SCP-4.1: Plant Breeding	04	02
OET-4.1: Medicinal Botany	04	04
OET-4.1: Aesthetic Botany		
		Sub. Total:20

Total Credits: 64+04 (Theory + Project) +32 (Practical + Field study or Study tour) = 100 credits

Note:

1. There shall be 30 marks as internal assessment (IA) for each theory paper and practical paper
2. There shall be 70 marks for each theory paper and practical final examination at the end of each semester.
3. The project work carries 150 marks (Dissertition-100, Presentation -25 and Viva voce- 25).

Open Elective Papers for other Department students:

	Hrs/Week	Credits
Semester- I		
OET 1.1 – Offered by the Department of Women's Studies	04	04
Semester- II		
OET 2.1 – Offered by the Department of Women's Studies	04	04
Semester-III		
OET-3.1- Plant Propagation Techniques Plant Diversity and Human Welfare	04	04
Semester-IV		
OET-4.1- Medicinal Botany Aesthetic Botany	04	04

OET Total Credits: 16

Note:
1. There shall be 30 marks as internal assessment (IA) for each theory paper
2. There shall be 70 marks for each theory paper

DEPARTMENT OF BOTANY

Karnataka State Akkamahadevi Women's University, Vijayapura

Syllabus

For

P.G. Studies in

BOTANY

Choice Based Credit System
2020-21 onwards

Karnataka State Akkamahadevi Women's University, Vijayapura

DEPARTMENT OF BOTANY

M.Sc. Botany Programme under Choice Based Credit System (CBCS) w.e.f. 2020-21

1.1. Duration: Two years with four semesters, each of 16 weeks duration.

1.2. Eligibility for admission: B.Sc. graduates of AWU, Vijayapura or any other recognized university with Botany as one of the main subject are eligible for admission to M.Sc. Botany course. Relaxation is for SC/ST/Cat-I students as per university norms.

1.3. Intake: 20 students for the first semester that excludes seats under enhanced fee. other rules for admission for intake of students may change from time to time as per university notification.

2. Attendance: Every student must have at least 75% attendance in each semester for eligibility to appear for semester end examination.

3. Medium of Instruction: The medium of instruction shall be English.

4. Course structure:

The student desirous for a degree M.Sc. in Botany shall complete 78 credits in Botany. Department also offers 8 credits each for elective papers in I, II, III and IV semester for students from other science subjects. Given below are the details about credits for each theory paper/practical/project work/Study tour and number of teaching hours for the four semesters along with marks allocation for students offering M. Sc. Botany or elective paper in Botany.

Master of Science (M.Sc.) in Botany

Botany is a vital branch of science which deals with the study of Algae, Fungi, Lichens, Bryophytes, Pteridophytes, Gymnosperms, and Angiosperms, their classification, structure, growth, reproduction, metabolism, development, diseases, chemical properties, uses and ecological & evolutionary relationships among the different groups. The continued investigations of plants are fundamental in this post-industrial, knowledge-based modern era because they provide countless precious goods and services that underpin almost all life on the planet Earth. A greater understanding and knowledge of plants and their unique processes is inevitable to the future of human societies as it will enable us to overcome the challenges posed and reap benefits from the opportunities offered in this century.

Programme's Mission & Objectives:

To offer a High Quality Post Graduate Degree M. Sc., Botany through to the graduate-aspirant in order to nurture the natural science- Botany among the young minds. The pupil nurtured with botanical knowledge is the need of the hour to save the natural environment, educate the human resources towards conservation and save planet thereon.

The objectives of the programme include;

- To give an expanded knowledge about various kind of life forms of plant kingdom.
- To teach about naming and classification of plants.
- To understand about anatomical, embryological, cellular and molecular level approach of science in studying plants.
- To study about microorganisms, their impact on plants and various kind of plant diseases.
- To understand about modern concepts like plant molecular biology, plant genetic engineering and plant tissue culture.
- To introduce inter-disciplinary approaches like biostatistics and bioinformatics.
- To study about application part of botany viz., Medicinal plants and phytochemistry, Plant Breeding, Plant Biotechnology, Aesthetic Botany and Economic Botany.
- To enlighten the students about biodiversity, conservation and Intellectual Property Rights.

Programme outcomes

The program focuses on the unified nature of Plant Science and aims to generate young minds through competent teaching, and training on key technologies. Students will be encouraged to participate in research providing them opportunity to experiment their understanding and to reveal the relationship between the conventional education and research. Students after completing the M.Sc Botany can join various National and International govt

organisations for their Ph.D through CSIR JRF and as Research Assistants in various Govt. and private institutions/Corporate sectors, plant based private companies and can also join teaching profession

SEMESTER I

HCT-1.1: PHYCOLOGY, MYCOLOGY, BACTERIOLOGY AND VIROLOGY		48 Hours
Course objectives: • To understand the occurrence, basic structure, organization and reproduction of algae, fungi, lichen, viruses and bacteria. • To understand the reproduction and economic importance of algae, fungi, lichens, viruses and bacteria. **Possible outcomes:** By studying this course the students will learn about general account and economic importance of algae, fungi, lichens, viruses and bacteria with their impact on human life.		
Unit-I	Phycology: Introduction and History, with special reference to Indian work. Distribution and important systems of classification in Algae. Comparative account of Algal pigments. Structure and function of cell wall, flagella, food reserves, pyrenoids, eye spot and their importance in classification.	**8hrs**
Unit-II	Thallus organization, reproduction and life-cycle of the following: Cyanophyta, Chlorophyta, Xanthophyta, Bacillariophyta, Pheophyta and Rhodophyta. .	**8hrs**
Unit-III	Economic importance of Algae: Algae as food and medicine, Algal blooms and toxic Algae.	**2hrs**
Unit-IV	Mycology: Introduction, diversity, general characters and classification of Fungi. (As per Alexopolous and Mims). Morphology, ultra-structure of fungal cell. Reproduction and life cycle in Myxomycotina, Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina and Dueteromycontina. Heterothallism and Parasexuality.	**8 hrs**
Unit-V	Detailed account of economic importance of Mushroom: Cultivation, edible and poisonous mushrooms fungi.	**6hrs**
Unit-VI	Lichens: General account and systematic of Lichens. Structure of thallus, reproduction and ecological significance.	**4hrs**
Unit VII	Viruses and Bacteria: Viruses: General account of plant and animal viruses. Transmission of plant viruses. Structure and reproduction in TMV and T4 phage. Prions and viroids.	**6hrs**
Unit VIII	Bacteria: Ultrastructure, classification, Bergey's Manual Trust, reproduction, nutrition and economic importance.	**6hrs**

References:

1. Alexopoulos C. J. (1963). Introduction to Mycology.
2. Chapman V. J. and Chapman DJ (1973). The algae.
3. Biligrami K.S. and Saha L.S. (1992). A text book of Algae.
4. Jackson D.F. Algae and Man.
5. Burnett, J.H. Fundamentals of Mycology.
6. Aneja K. R. Experiments in Microbiology, Plant Pathology and Biotechnology 2003 New Age International (P) Limited, Publishers, New Delhi.
7. E Rosenberg, Microbial biology.
8. M. Pelezar, DR Reid and ECS Chan, Microbiology
9. R.C. Dubey and Maheshwari. D.K. 2002.A text book of Microbiology. S.C Chand and Co. Ltd.Ramnagar,NewDehli.
10. Sullia S.B and Shantaram.S.1998. General Microbiology. Oxford and IBH Publishing Co. Pvt. Ltd. New Dehli
11. Sharma O. P. and Shivani Dixit 2001 Experiments and Techniques in Microbiology, Plant Pathology, Ecology and Soil Science, Pollution, Biochemistry and Plant physiology. Pragati Prakashen meerut.

HCT-1.2: BRYOPHYTES AND PTERIDOPHYTES		48 Hours
Course objectives: • To understand the classification and evolution of Bryophytes and Pteridophytes. • This course is intended to provide the basic understanding of morphology and reproduction in Bryophytes and Pteridophytes and their Economic importance. **Possible outcomes:** After studying this paper students will be able to classify Bryophytes and Pteridophytes. They will also be able to describe heterospory, origin of seed habit and evolutionary trends in stele and spore producing organs. Besides above, they will also be able to understand the economic importance and experimental works in Bryophytes and Pteridophytes.		
Unit-I	Bryophytes: Introduction, distribution origin, evolution and classification, economic and ecological importance.	**6hrs**
Unit-II	Range in thallus structure, anatomy and evolutionary tendencies in sporophytes (Progressive sterilization of sporogenous tissue)	**8hrs**
Unit-III	Reproduction, life history, inter-relationships and affinities of various groups (Marchantiales, Jungermaniales, Anthocerotales, Sphagnales and Polytrichales) of Bryophytes.	**10hrs**
Unit-IV	Pteridophytes: Introduction, general characters, origin, evolution and classification.	**6hrs**
Unit-V	Psilopsida: Comparative account of Psilophytales and Psilotales. Lycopsida: Range in vegetative and reproductive structures in Lycopodials and Isoetales. Heterospory and seed habit. Sphenopsida: Range in vegetative and reproductive structure Pteropsida: Range in vegetative and reproductive structure, sori and sporangia in ferns.	**12hrs**
Unit-VI	Stelar and soral evolution, economic importance and experimental work in Ptridophytes.	**6hrs**

References

1. Puri, P. 1980. Bryophytes. Atma Ram and Sons, Delhi.
2. Parihar, N. S. 1996. Bryophytes. Central Book Depot, Allahabad.
3. Parihar, N. S. 1996. Biology and Morphology of Pteridophytes. Central Book Depot, Allahabad.
4. Sporne, K. R. 1991. The Morphology of Pteridophytes. B.I. Publishing Pvt. Ltd., Bombay
5. Manju C Nair, Rajesh K.P. and Madhusudanan P.V. Bryophytes of Waynad in Western Ghats. Malabar Natural History Society, Kozikode.

HCT-1.3: GYMNOSPERMS AND PALAEOBOTANY		48 Hours
Course objectives: • This course is intended to provide the basic understanding of morphology and reproduction in Gymnosperms and their Economic importance. • It also give details of Geological time scale and an understanding of the past history of the biosphere and evolution of plants through fossils. **Possible outcomes:** After successfully completing this course, the student will be able to recognize morphological, anatomical and reproductive characteristics of Gymnosperms and the extinct Bryophytes, Pteridophytes and Gymnosperms. The student will understand the evolutionary history of plant kingdom.		
Unit-I	Gymnosperms-Introduction Distribution, General characters, Origin, Evolution and Classification of Gymnosperms.	**4hrs**
Unit-II	Comparative account of habit, anatomy and reproduction of Cycadales: Cycas and Zamia. Coniferales: Pinus, Araucaria, Thuja. Gnetales: Gnetum, Ephedra and Welwitschia Ginkgoales: Ginkgo	**20hrs**
Unit-III	Economic importance of Gymnosperms. Experimental works in Gymnosperms	**4hrs**
Unit-IV	Paleobotany - Objectives, Nomenclature and Geological time scale	**4hrs**
Unit-V	Fossilization and types of fossils, techniques for fossil study, factors affecting fossilization.	**4hrs**
Unit-VI	Study of morphology, anatomy and evolutionary trends of following group of fossil plants: Psilophytales, Lepidodendrales, Calmitales, Filicales, Coenopteridales, Pteridospermales, Bennettitales, Pentoxylales, Cordiatales, Cycadales, Coniferales.	**12hrs**

References:

1. Bhatnagar, S.P. and Moitra, A. 1996. Gymnosperms. New Age International Pvt. Ltd., New Delhi.
2. Coulter and Chamberlin, J. M. 1978. Morphology of Gymnosperms.
3. Dutta, S.C. 1973. An introduction to Gymnosperms.
4. Sporne, K. R. 1967, Morphology of Gymnosperms.
5. Stewart W. N. and Rathwell G.W. 1993. Palaeobotany and Evolution of Plants.
6. Shila A. C. and Mishra S. D. 1975. Essentials of Palaeobotany.

SCT-1.1: PLANT PATHOLOGY		48 hrs
Course objectives: • This paper deals about plant diseases caused by bacteria, fungi & viruses. • To understand mechanism of infection, diagnosis procedure and control measures. **Possible outcomes:** Learner will definitely realize how food production is severely is affected by pathogens. They will participate in food production by eliminating major threats that affect plants and management practices.		
Unit-I	Introduction, scope and significance of plant pathology, significant contributions of plant pathologists. Importance of plant diseases. Methods of studying plant diseases, classification of plant diseases.	**4 hrs**
Unit-II	Major diseases caused by fungi, bacteria, viruses, mycoplasma, nematodes, angiosperm parasitic diseases, non-parasitic diseases on cereals, pulses, vegetables and oil crops.	**8 hrs**
Unit-III	Pathogenesis: penetration - indirect entry of pathogens through natural openings, wounds, root hairs, buds, direct penetration. Role of toxins in pathogenesis- Introduction, microscopic system, bioassay, Host-relation toxins, non-host selective toxins, control of toxin biosynthesis	**8 hrs**
Unit-IV	Mode of transmission of pathogens by seeds air, soil, water, vectors, contagious, animals. Effect of environmental factors on disease development disease epidemiology and forecasting.	**6 hrs**
Unit-V	Detection and diagnosis of plant pathogenesis- Introduction host range and symptomatology, morphology of the causal organism, selective media, biochemical markers-substrate metabolism, fatty acid profiles (FAME analysis), protein analysis, serological techniques, nucleic acid techniques, choice of diagnostic techniques.	**8 hrs**
Unit-VI	Management of plant diseases by conventional methods: cultural, chemical and biological.	**4 hrs**
Unit-VII	Mycoparasitism of soil borne plant pathogens- biotropic and necrotropic parasitism, techniques for studying mycoparasitism in natural system, ecological factors affecting parasitism, distribution of mycoparasites, mycoparasites in biological control. Predatory and parasitic fungi - predatory hyphomycetes, and hymenomycetes.	**10 hrs**

References:

1. Singh, R.S. 1973. Plant Disease. Oxford and IBH Pub. Co., New Delhi.
2. Agrios, G.N. 1994. Plant Pathology. 2nd Edn. Academic Press New York.
3. Johnston, A. and Both, C. 1983. Plant Pathologists Pocket Book. 2nd Edn. Commonwealth Mycological Institute, Oxford and IBH Pub. Co., Calcutta.

4. Rangaswamy, G. and Mahadevan, A. 2002. Diseases of Crop Plants in India. Prentice Hall of India Pvt.Ltd., New Delhi.
5. Mehrotra, R.S. 1983. Plant Pathology. Tata McGraw Hill Pub. Co., Ltd., New Delhi.
6. Vidhyasekaran, P. 2004. Encyclopedia of Plant Pathology. Viva Books Pvt. Ltd., New Delhi.

SCT-1.1: PHYTOGEOGRAPHY AND EVOLUTION		48 hrs
Course objectives: • The purpose of the course is to give a fundamental understanding of the distribution of vascular plants and of the basic models which describe it. • In particular, the students will know about the floristic regions and plant formations of the Planet, in the light of previous continental and climatic evolution. **Possible outcomes:** The, the student will deepen the applied points of view floristic recording of specific habitats and the assessment of their naturality on the basis of chronological and life form spectra of the flora.		
Unit-I	Phytogeographical regions of the World. India: Western Himalaya, Eastern Himalaya, Indus plane, Gangetic sub-mountain zone, Temperate zone, Alpine zone. General characters of flora of India. Native taxa, naturalization of exotic taxa.	**8hrs**
Unit-II	Floristics: Floristic study of the world and India. Continental drift: A general account, tectonic movements, disjunct distribution, dispersal, migration and endemics.	**4hrs**
Unit-III	Plant Distribution: Continuous, discontinuous, Centre of origin endemic, bathymetric distribution, Centre of origin of crop plants. Evolution and Plant Migration, Dispersal, isolation, migration and barriers, vicarious species, relict species, isofloras, polytopy, centers of origin of crop plants.	**12hrs**
Unit-IV	Darwin and origin of species, models of speciation- Allopatric speciation, Sympatric speciation, Statispatric speciation. Isolating mechanism and rate of speciation. Genetic variation-inbreeding depression, protein polymorphism, variation in nucleotide sequences. Formation of species.	**12hrs**
Unit-V	Evolution of sex in plants-Asexual reproduction, origin and evolution of sex organs, alternation of generations. Parthenogenesis and its applications.	**12hrs**

References:

1. Alberts, B. Bray, D. Lewis, Ralf M., Roberts, K and Watson, J.D. 1994. Molecular Biology of Cell. 3rd Edition Garland publishing co. New York.
2. Arumugam, N. 1992. Organic evolution. Saras Publication, Nagercoil.
3. Cain, S.A. 1944. Foundations of Plant Geography. Harper & Bros, NY.
4. Good, R.D. 1974. The Geography of flowering Plants. 3rd edition, Long Mans, London.
5. Jha, A. P. 1993. Genes and Evolution. Mac Millan India Ltd, New Delhi.
6. Kumar, H.D. 1992. Modern concept of Ecology. Eighth revised edition, Vikas Publishing House Pvt. Ltd. Bangalore.

7. Lawrence, G.H.M. 1965. Taxonomy of vascular plants. The McMillan Company, New York.
8. Radford, A.E. Dickinson, W.C. Massey, J. R. and Ben, C.R. 1974. Vascular Plant Systematics. Harper and Row, New York. London.
9. Shukla, R. S. and Chandel, P. S. 1989. Plant Ecology. S. Chand and Company Ltd. New Delhi.
10. Solomon, P. Elder, Berg, R. Linda and Martin, W. Diana 2003. Biology Brooks / cohe. Thomson learning. 6th edition. Prentice Hall University of Massachusetts, Amherst.
11. Stickberger, M.W. 1994. Evolution. Mac Millan Publishing co, New Delhi.
12. Strickberger, M. W, 2002. Evolution. Jones and Barlett Publishers. Sudbury.
13. Teresa Andesirk, Gerald Audesirk and Bruce, E. Byers. 2003. Biology-Life on Earth. 6th edition. Prentice Hall University of Massachusetts, Amherst.
14. Valentine, D.H. 1972. Taxonomy, Phytogeography and Evolution. Academic Press, London. New York.
15. Webber, P and Punnett, N. 1999. Physical geography and people Stanley. Thomas (Pub) Ltd. England.

SCT-1.1: BIOSTATISTICS AND BIOINFORMATICS		48 hrs
Course objectives: • To study about basics of statistics and utilization of statistical method in biology. • To study about modern tools of bioinformatics an inter-disciplinary subject to help the biologists in research perspectives. **Possible outcomes:** The course will give knowledge about data collection, processing and interpretation of biological samples through statistical methods. The course will give knowledge about modern tools of bioinformatics. Students will learn necessary skills in the use of databases and online tools related to biological data.		
Unit-I	Biostatistics -Introduction and scope of Biostatistics. Basic concepts of Biostatistics: Variables, constants, observation, data, population.	**2 hrs**
Unit-II	Types and collection of data: Sampling, primary data, Secondary data. Presentation of data: Line diagram, bar diagram, pie diagram, graphic presentation of data.	**4 hrs**
Unit-III	Measurement of central tendency: Mean, Median, Mode. Measures of dispersion: Range, Quartile deviation, Mean deviation, Standard deviation, Standard error, Coefficient of variation.	**6 hrs**
Unit-IV	Probability and Probability distribution: Binomial, passion and normal distribution. Testing of Hypothesis: Null hypothesis, alternative hypothesis, z test, t test and chi-square test.	**8hrs**
Unit-V	Correlation and regression: Scatter diagram, simple linear regression and nonlinear regression, correlation and correlation coefficient and application. One way and two way analysis of variance and multivariate analysis of variance.	**4hrs**
Unit-VI	Computer application: Knowledge of computer systems, hardware and software, CPU and other peripheral devices, software packages, programming language, scientific application of packages.	**8 hrs**
Unit-VII	Internet: The World Wide Web and local area network (LAN), wide area network (WAN). Information retrieval, communication using internet, web data base directories, search engine.	**8hrs**
Unit-VIII	Biological Databases, Bioinformatics tools, Sequence Alignment tool, Database Searching (BLAST, FASTA), Comparative genomics, Structural and Functional genomics.	**8hrs**

References:

1. Bliss CK, Statistics in Biology, 1970.
2. Daniel WW, Biostatistics, 1995
3. Minieka E and Kuzeja Z.D. Statistics for businesses with computer application. 2001
4. Karne, Fundamental Concepts Of Bioinformatics 1ed, Pearson publishers, 2012

5. Patil C. S., Ajit Gangawane and Srinath Rao, Bioinformatics and Bioinformation (2011) APH Publishing Corporation. New Delhi.
6. Arumugam N., Gopi A., Sundaralingam R., Meena A., and Kumarasen V Biostatistics Computer Application Bioinformatics instrumentation (2010) Saras publication Nagarcoil (TN).
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9. Padmini E. Biochemical calculations and Biostatistics (2007) Books and Allied (P.) Ltd. Kolkata
10. Sudara Rajan S. and Balaji R. Introduction to Bioinformatics (2003) Himalaya Publishing House.
11. Dhamu K. P. and Ramamoorthy K 2009 Fundamentals of Agriculture Statistics Scientific publishers (India) Jodhpur.
12. Sharrma T. R. 2009 Genome Analysis and Bioinformatics I. K. International Publishing House Pvt. Ltd. New Delhi.

HCP-1.1: PHYCOLOGY, MYCOLOGY, BACTERIOLOGY AND VIROLOGY	
Phycology	
	Cynophyta*: Microcystis ,* *Spirulina, Scytonema and Oscillatoria* Chlorophyta : *Chlymydomonas, Volvox, Pediastrum, Scenedesmus, Hydrodictyon* Diatoms : *Pinnate and Centric – Synendra, Pinnuria, Navicula* & *Cyclotella* Xanthophyta : *Botrydium* Phaeophtae : *Dictyota and Ectocarpus* Rhodophyta*: Polysiphonia and Gracillaria* Economic important product : *Agar-Agar, Spirulina tablets*
Mycology	
	Phycomycetes : *Mucor, Phytophthora, Saprolegnia* Ascomycetes : *Saccharomyces, Xylaria, Aspergillus,Peziza* Basidiomycetes : *Polyporus, Lycoperdon, Ustilago,Agaricus* Duetoromycetes : *Alternaria , Cercospora, Cladosporium*
Bacteriology and Virology	
	Staining of Bacteria (Positive, Negative & Gram's staining) Demonstration of Bacterial motility by hanging drop method Test for coliform Bacteria- Streak plate method Viral disease of Tobacco,Papaya & Bhendi.

HCP-1.2: BRYOPHYTES AND PTERIDOPHYTES	
Bryophytes: Study of vegetative habit, Anatomy and Reproductive Structures of the following taxa:	
	Targionia, Marchantia, Porella, Pellia *Anthoceros, Notothyllus* *Sphagnum, Polytrichum* & *Bryum* Comparative structure of sporophytes of Bryophytes
Pteridophytes: External morphology, Anatomy & reproductive structures of the following:	
	Psilotum and Lycopodium *Selaginella, Isoetes, Equisetum* *Ophiglossum* and *Botrychium* *Angiopteris, Pteris* & *Hymenophyllum* *Marselia, Salvinia and Azolla*

HCP-1.3: GYMNOSPERMS AND PALAEOBOTANY	
Gymnosperms : Study of vegetative habit, Anatomy and reproductive structure of the following	
	Cycas and Zamia *Pinus, Taxus and Thuja* *Gnetum, Ephedra, Welwitschia* *Ginkgo*
Paleobotany: Study of fossil forms using moulds, charts, photography and slides	
	Lepidodendron *Calamites* *Lyginopteris* Geological Time scale using chart

SCP-1.1: PLANT PATHOLOGY
1. Classification of plant disease Fungal: (Powdery mildew of cluster bean, leaf blight of paddy, leaf spot of chilli, frog eye spot, leaf spot of tobacco) Bacterial: (Citrus canker) Viral: (Mosaic, leaf curl, pepper wilt, bunchy top of banana, katte disease of cardamom) Mycoplasma: (little leaf of brinjal, grassy shoot of sugar cane) Nematode: (root of brinjal/tomato) Angiospermic parasites: (Loranthus, Viscum, Cuscuta)
2. Pure culture – identification of fungi based on conidia and mycelial morphology. 3. Spore release by wash-off method 4. Disease assessment 5. Anthracnose disease in French bean/ Cluster bean 6. Downy mildew of pearl millet 7. Leaf rust of coffee 8. Disease of crop plants - Fungal, mycoplasmal, bacterial, nematodal, viral, angiospermic parasitic diseases (other than above mentioned disease)

SCP-1.1: PHYTOGEOGRAPHY AND EVOLUTION
1. Floristic regions of India. 2. Evolutionary concepts 3. Drawing maps of continental drift 4. Listing plants of AMWU campus 5. Listing of wild edible plants and 6. Listing of medicinal plants and their uses in Vijayapur area. 7. Studying species distribution and its measurements. 8. Examples of exotic / invasive species

SCP-1.1: BIOSTATISTICS AND BIOINFORMATICS	
Biostatistics	
	Measures of central tendency Measures of Dispersion Correlation and Regression
Bioinformatics	
	<u>Biological Databases</u> a) Nucleotide Database 1. GenBank 2. Embl 3. DDBJ b) Protein Database 1. Swiss-Prot 2. PDB **Sequence collection from NCBI** **Alignment Tool** 1. PSA (Pairwise Sequence Alignment-Align tool) 2. MSA (Multiple Sequence Alignment- clustal w tool) **Database Searching Tool** 1. BLAST 2. FASTA

SEMESTER II

HCT-2.1 ECOLOGY AND ENVIRONMENTAL BIOLOGY		48 hrs
Course objectives: • This course aims to introduce the students to the concepts and principles of ecology, population, community and ecosystem structure and function and application of these concepts to solve environmental problems. • To understand the importance of environment and the problems related with it at global and local level. **Possible outcomes:** Students will understand the importance of nature surrounding us and their role. Students will know the disturbance of climatic changes on human beings. Students will understand the evil effect of global warming and UV radiation. By understanding these concepts, the student will be able to develop attitude, value system and ethics towards environment related issues.		
Unit-I	Scope of ecology in environmental management. Climatic factors: interaction of ecological factors- light-temp, precipitation, humidity, wind and atmospheric gases; Fire factor; Edaphic factors-composition of soil- formation of soil, soil profile, soil classification, soil components and properties, soil erosion and conservation.	**8hrs**
Unit-II	Ecosystem – Structure and function; Energy flow, food chain, tropic levels. Ecological pyramids, charting of ecology; pathway and measurement rate; primary and secondary metabolic activities.	**6hrs**
Unit-III	Biogeochemical cycles : Hydrological, gaseous (Carbon and Nitrogen) & sedimentary cycles, nutrient budget with reference to nitrogen, and carbon sequestration, climate change protocol, global warming issues. Ecological succession: models, trends and causes; time factor and stability.	**8hrs**
Unit-IV	Population ecology: attributes, density and distribution, natality, mortality, age distribution, population growth, growth rate composition, Hardy Weinberg law.	**8hrs**
Unit-V	Major ecosystems of the world: pond, river, marine, deserts, tundra and forest, productivity of different ecosystems: grassland, forest, shola, savanna, thar, Chillka lake, Western and east Himalaya, Western Ghats. Ganga action plan.	**4hrs**
Unit-VI	Environmental pollution: Introduction, causes, effects and control measures of water pollution, air pollution, soil (Land) pollution, noise pollution, acid rain, global warming, ozone depletion and public health	**6hrs**
Unit VII	Remote sensing and GIS: Basic and fundamental concepts of remote	**4hrs**

	sensing.	
Unit VIII	Environmental Impact Assessment: Introduction, process and methods of impact analysis. International biological program, UNESCO, MAB. UNEP.	**4hrs**

References

1. Ambasht, K.S. 1969. Plant Ecology. Published by Student's Friends and Co., Lanka Varansi, India.
2. Anji Reddy, M. 2006. "A Textbook of Remote Sensing and Geographical information System". 03rd Edition B.S. Publications.
3. Botkin, D.B. and E.A. Keller. 2004. Environmental Science. 5th ed. John Wiley and Sons.
4. Bernhardsen, T. 1999. Geographic Information System: An Introduction. 02nd Edition, John Wiley and Sons.
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6. Charan and Anil, K. 1992. Plant Geography. Rawat Publications. Jaipur.
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9. Eug. Warming. 1998. Ecology of Plants. Ambey Publications, New Delhi.
10. Eugene P. Odum. 1996. Ecology. Sinauer Associates Inc Publishers, Sunderland, USA.
11. Goel, P.K. 1997. Water Pollution Causes, Effects and Control. New Age International Pvt., Ltd., new Delhi.
12. Kumar, A., Bohra, C. and L.K. Singh. 2003. Environment, Pollution and Management. A.P.H. Publishing Corporation, New Delhi.
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14. Mohan P. Arora. 1995. Ecology. Himalaya Publishing House, Bombay.
15. Ross, R.D. 1998. Air Pollution and Industry. Van Norstrand Company Publication.
16. Sapru, R.K. 1987. Environment Management in India. Patel Enterprises, New Delhi.
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HCT-2.2 CELL AND MOLECULAR BIOLOGY		48 hrs
Course objectives: • To understand the structure and function of basic components of prokaryotic and eukaryotic cells, especially its membrane organization and organelles. • To introduce to rapid contemporary changes witnessed in plant molecular biology. • Basic organization of genetic material and the realms of events associated with replication and gene expression will be examined. **Possible outcomes:** Students will gain knowledge about the basic and fundamental organization of life and genetic material and their applications. It will also impart knowledge about the regulation of molecular mechanisms involved in the control of gene expression and regulation.		
Unit-I	Prokaryotic cell, ultrastructure of mycoplasma, bacteria. Structure of eukaryotic cell. Plasma membrane – organization and function. Cytoskeleton – microtubules, cilia and flagella. Structure and function of endoplasmic reticulum, Golgi complex, Ribosomes, mitochondria, chloroplast, lysosomes and peroxisomes. Structure and function of nucleus and nucleolus.	**10hrs**
Unit-II	Structure and organization of eukaryotic chromosome, centromeric and telomeric structure, Law of DNA constancy and C-value paradox. Special chromosomes – B-chromosomes, polytene and lampbrush chromosomes.	**6hrs**
Unit-III	Mechanism of cell division: Cell cycle regulatory enzymes and proteins, chiasma formation, mechanism of recombination, synaptonemal complex.	**4hrs**
Unit-IV	Chromosomal Aberrations: types and evolutionary significance. Numerical changes in chromosomes – euploidy, haploidy, polyploidy, aneuploidy and evolutionary significance.	**6hrs**
Unit-V	Mutagenesis – physical and chemical mutagens, molecular basis of mutation, DNA repair mechanism. Transposable elements, transposon tagging of genes, genetic and evolutionary significance.	**4hrs**
Unit-VI	DNA replication, transcription (RNA synthesis and processing), DNA and RNA polymerases, genetic code, translation.	**8hrs**
Unit VII	Cell communication: Membrane transport principles-active and passive transport, Brief on cell signaling with reference to plant systems.	**4hrs**
Unit VIII	Gene isolation and characterization through PCR, RAPD, RFLP, AFLP, SSR markers.	**6hrs**

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HCT-2.3: GENETICS AND EVOLUTION		48 hrs
Course objectives: • This course is intended to provide the basic understanding of genetic, Inheritance, variation. • The paper will deal with Mendelian and non-Mendelian inheritance, quantitative genetics, molecular markers and linkage mapping. • Evolutionary biology is to teach past history & origin of living organisms. Describes concepts, theories & experimental evidences that support origin of high order organism from primitive one. **Possible outcomes:** The students are expected to have better understanding of basic principles of Mendelian inheritance, concept of linkage and mutagenesis. It also develops the understanding of management of inherited diseases. Learners will certainly understand how biological organisms including human beings have evolved, survived with natural adaptations possibilities of destruction for the survival of human beings & other organisms.		
Unit-I	Mendelian principles, alleles, linkage and crossing over, genetic maps. Sex determination in plants. Extrachromosomal inheritance, somatic cell genetics. Inheritance of quantitative characters.	**8hrs**
Unit-II	Concept of genes – fine structure of gene, split genes, overlapping genes, included genes. Recombination in bacteria and phages – conjugation, transformation and transduction.	**8hrs**
Unit-III	Gene expression in prokaryotes and eukaryotes.	**4hrs**
Unit-IV	Genetic engineering – Restriction endonucleases, ligase, vectors, gene cloning techniques, polymerase chain reaction, southern and northern blotting.	**6hrs**
Unit-V	Origin of life, chemical evolution, molecular evolution. Theories of evolution – Lamarckism, neo-Lamarckism, Darwinism, neo-Darwinism, Mutation theory and synthetic theory.	**6hrs**
Unit-VI	Population genetics and evolution – Mendelian population, gene pool, gene frequency, genetic drift, founder effect, genetic polymorphism. Hardy-Weinberg law, mechanism of speciation	**8hrs**
Unit VII	Molecular Evolution: Concepts of neutral evolution, molecular divergence and molecular clocks; Molecular tools in phylogeny, classification and identification; Protein and nucleotide sequence analysis; origin of new genes and proteins; Gene duplication and divergence.	**8hrs**

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SCT-2.1: METHODS IN PLANT SCIENCE		48 hrs
Course objectives: • To acquire the knowledge about biological techniques. • To know about the basic concepts, principles and significance of various analytical and molecular techniques. • To understand the various anatomical techniques. **Possible outcomes:** The course will nurture the knowledge on biological samples especially plant samples. The course will give an expertise in understanding the various important biological techniques to be employed in the field of botany.		
Unit-I	Microscopy – Principles and working mechanism of transmitted and incident microscopy. Principles, working mechanism and uses of Dark field microscopy, polarization microscopy, fluorescence microscopy, phase contrast microscopy. Electron microscopy – TEM, SEM, STM.	**8hrs**
Unit-II	Processing of plant material for light and electron microscopy. Principles and uses of microtomy; Fixing of plant material, dehydration, staining procedures.	**6hrs**
Unit-III	Centrifugation techniques – differential, density gradient centrifugation. Spectroscopic methods – ultraviolet and visible spectroscopy, Raman spectroscopy, nuclear magnetic resonance technique, fluorescence and mass spectroscopy.	**8hrs**
Unit-IV	Isolation and purification of RNA, DNA (genomic and plasmid), different separation methods. Generation of genomic and cDNA libraries in plasmid, phage, cosmid, BAC and YAC vectors. Expression vector and expression of protein in brief, Autoradiography, Method of DNA sequencing, micro array technique.	**12hrs**
Unit-V	Techniques of protein isolation, purification and separation – chromatographic techniques, ion exchange, gel filtration and affinity chromatography, high performance liquid chromatography. Electrophoresis techniques – agarose, polyacrylamide electrophoresis, capillary and immuno-electrophoresis.	**10hrs**
Unit-VI	Principles and applications lasers, tracer techniques in biology, radiolabelling –carbon dating, molecular imaging of radioactive material, safety guidelines. .	**4 hrs**

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SCT-2.1: PLANT GENETIC ENGINEERING		48 hrs
Course objectives: • This course is designed to provide a contextual and inquiry based learning of modern day advances in the field of recombinant DNA technology and molecular farming. • The main objective of this course is to familiarize students with techniques of genetic manipulations of plants and quality enhancement of plant products through the use of recombinant DNA technology. **Possible outcomes:** Students will acquire understanding of basic principles and modern age applications of recombinant DNA technology. Students should be able to learn the utility of genetic engineering tools that are helpful in creation of transgenic plants for better production. Learning molecular and technical skills along with applications of the instrumentation.		
Unit-I	Introduction to Genetic Engineering: Concepts and scope of genetic engineering. Milestones in Plant Recombinant DNA Technology. Importance of gene manipulation in future perspectives.	**2hrs**
Unit-II	Tools in Genetic Engineering: Enzymes in genetic engineering - Restriction endonucleases- types and action, All DNA modifying enzymes. Cloning vectors: Plasmids isolation and purification- Ti Plasmid, pBR322, pUC –series. Phage vectors-M13 phage vectors, Cosmids-Types, Phasmids or Phagemids, Shuttle vectors-types. YAC and BAC vectors, Lambda phage vectors, Lamda phage DNA as a vectors. Cloning vectors and expression vectors.	**10hrs**
Unit-III	Techniques for plant Transformation: Integration of plant tissue culture in to plant transformation protocols. Introduction, *Agrobacterium* mediated gene transfer, The Ti-plasmid, The process of T-DNA transfer and integration, Practical applications of Agrobacterium-mediated plant transformation, Transformation in Plants, Direct gene transfer methods.	**8hrs**
Unit-IV	The genetic manipulation of herbicide resistance: The use of herbicide in modern agriculture, Strategies for engineering herbicide resistance, The environmental impact of herbicide-resistant crops. The genetic manipulation of pest resistance: GM strategies for insect resistance. The *Bacillus thuringiensis* approach to insect resistance, The Copy Nature Strategy, Insect resistant crops and food safety. The genetic manipulation to plant disease resistance: Plant pathogen interaction, Natural disease resistance pathways-Overlap between pests and diseases, Biotechnological resistance to disease resistance. Transgenic approaches to viral disease resistance.	**12hrs**
Unit-V	Engineering stress tolerance: The nature of abiotic Stress, the nature of Water deficit stress, Targeted approaches towards the manipulation	**4hrs**

	of tolerance to specific water deficit stresses.	
Unit-VI	The Improvement of crop yield and quality: The genetic manipulation of fruit ripening, engineering plant protein composition for improved nutrition, The genetic manipulation of crop yield by enhancement of photosynthesis.	**4hrs**
Unit-VII	Molecular Farming/Pharming: Metabolic engineering of plants. Carbohydates and lipids, Molecular farming of proteins, Economic consideration of molecular farming.	**4hrs**
Unit-VIII	Future prospects for GM crops: The current state of transgenic crops, Concerns about GM crops, the regulations of GM crops and products.	**4hrs**

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9. R.W. Old, S.B. Primrose. 2004. Principles of Gene Manipulation. An Introduction to Genetic Engineering. Fifth Edition, Blackwell Science Publications.

SCT-2.1: NUTRACEUTICALS		48 hrs
Course objectives: • To impart the concept of nutraceuticals and functional ingredients in foods, and to determine their role in health and disease prevention. • To learn about various phytochemicals-their sources, functions and usefulness. • To illustrate the importance of food safety, food quality, food laws and regulations in Food industry. **Possible outcomes:** Students will acquire basic knowledge on the physiology of human nutrition and the importance of nutraceuticals in the context of the human well-being. Nutraceuticals/bioactive compounds familiarize students with the scientific evidence about the role of diet and dietary components in the modulation of risk factors associated with chronic diseases and human health. The study enables the students to understand the concept of food safety and their role in the human health and well-being.		
Unit-I	Nutraceuticals as science: Importance of nutraceuticals in human health; basic food types, cultural diets, fast foods, street foods, junk foods; functional foods; food pyramids; classification of nutrients and their functions; anti-nutritional factors. Industrial fortification, forms of nutrient supplementation, vitamin and mineral supplements; biofortification, fortified crops; Golden Rice; energy drinks and infant food formulae; dietary supplements, health benefits; nutriceuticals on the market.	**12hrs**
Unit-II	Plant and animal based nutraceuticals: Antioxidants, saponins, vitamins, minerals, carotenoids, amino acids, gum and resins, chitin, chitosan, glucosamine, chondroitin, cod liver oil; Algal nutraceuticals (Spirulina, Sea weeds); Bacterial nutraceuticals, Probiotics (youghurt), Prebiotics and Synbiotics; fermented foods in health care. Lipid, carbohydrate and protein based nutriceuticals; dietary fibers, source and health benefits. Recommended Daily Allowances.	**12hrs**
Unit-III	Nutraceuticals in health and disease: In preventive and protective medicine, in cancer treatment, cholesterol and obesity control. Nutraceuticals from home garden (Aloe, Honey, Turmeric, Saffron, Ginseng, Neem, fruits, spices, herbs, Bramhi, Tulasi, Bitter guard, Fenugreek, Asafoetida, Ginger, Pepper, Garlic, Onion, Betel leaves). Diets in pregnancy, geriatric diets, paediatric diets; diets in diabetes and hypertension. Cosmeceuticals, plant based cosmeceutics in skin, hair, eye and dental care.	**12hrs**
Unit-IV	Legal control of food safety and standards: National and international regulation of food and nutriceutical standards. The Food Safety and Standards Authority of India: Food Safety and	**12hrs**

	Standards Act, 2006, Indian National Codex Committee, US Foods and Drugs Administration, Codex Alimentarius Commission.	

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HCP-2.1 ECOLOGY AND ENVIRONMENTAL BIOLOGY

1. Analysis of water samples of lotic and lentic with reference to.
    a. Corbon dioxide
    b. Dissolved oxygen
    c. Total hardness
    d. Phosphate
    e. Sulphate
    f. Nitrates
2. Soil texture and Soil profile.
3. Effect of SO_2 and Cl_2 gasses on plants.
4. Water holding capacity of different soil samples
5. Determination of organic content, carbonates, exchangeable bases and oxidzable organic content of soils
6. Study of vegetation by quadrat and transect method
7. Ecological instruments-Animometer, Lux meter, Rain guaze, Max and min thermometer
8. Visit to meteorological station
9. Morphological and anatomical adaptation in hydrophytes, xerophytes (succulents and non-succulents), epiphytes and halophytes

HCP-2.2 CELL AND MOLECULAR BIOLOGY

1. Study of cell division – Mitosis (*Allium cepa, Allium sativum, Rhoeo*)
2. Study of Meiosis - (*Allium cepa, Helianthus, Tredescantia* flower buds)
3. Karyotype analysis – ideogram – preparation of ideogram.
4. Isolation of genomic DNA from leaf tissue
5. Agarose Gel electrophoresis.
6. Separation of protein by SDS.
7. Isolation of RNA from plants.

HCP-2.3: GENETICS AND EVOLUTION

1. Study of life cycle in *Drosophila melanogaster*.
2. Observation of mutant flies.
3. Special type of chromosome in *Drosophila melanogaster*.
4. Genetics problem in Mendelian inheritance, gene interaction, quantitative inheritance, multiple alleles, sex linkage and genetic map.
5. Application of Hardy –Weinberger law in gene frequencies.
6. Models and photographs related to genetics.

SCP-2.1: METHODS IN PLANT SCIENCE
1. Fixation of plant materials, dehydration, sectioning, staining and analysis. 2. Demonstration of pH meter, UV-Visible spectra, Chromatography and PCR 3. Demonstration of serial dilution and sterilization methods 4. Isolation of Chloroplast by centrifugation. 5. Isolation of plant pigments and paper chromatography. 6. Estimation f chlorophyll pigments by spectrophotometer 7. Estimation of protein by UV-Visible spectrophotometer. 8. Estimation of DNA by UV-Visible spectrophotometer.

SCP-2.1: PLANT GENETIC ENGINEERING
1. Isolation of genomic DNA from bacteria/plants and purification by agarose gel electrophoresis. 2. Restriction analysis of plasmids, gel purification of DNA, small and large scale purification of plasmids. 3. Preparation of competent *E. coli* cells. Bacterial transformation and recovery of plasmid clones. 4. Gene cloning in plasmids, analysis of recombinant plasmids. 5. DNA amplification by PCR, RT-PCR 6. Analysis of DNA and RNA and Protein by Southern and Northern and Western blotting. 7. Demonstration: Plant tissue culture-preparation of Murashige and Skoog medium, shoot differentiation in tobacco. Transformation of *Agrobacterium* by triparental mating and by electroporation, *Agrobacterium*-mediated transformation of tobacco, detection of GUS and GFP in transgenic plants. Acclimatization of transgenic plants and maintenance in greenhouse.

SCP-2.1: NUTRACEUTICALS
1. Extraction and estimation of total sugars from food products (dairy product, fruit juices, bread). 2. Estimation of crude fat contents of foods by Soxhlet's method (Butter, Margarine, edible oil). 3. Estimation of total Nitrogen of foods by Kjeldahl and Micro Kjeldahl methods. 4. To study nutritional composition (Proteins, carbohydrates, lipids, vitamin C and presence of secondary metabolites) of the following: Bee honey, Mushrooms, dairy products, Beans, Spinach, Carrot, Apple, Amla, Pineapple, Papaya, Lentil and Soya. 5. Extraction and estimation of oil or crude fat content in oil seeds. 6. Estimation of total phenols and chlorogenic acid (Phenolic compound) in plant material. 7. Qualitative test for tannins, phenolics and alkaloids using TLC. 8. Extraction and quantification of alkaloids.

SEMESTER III

<table>
<tr><th colspan="2">HCT-3.1 SYSTEMATIC BOTANY OF ANGIOSPERMS</th><th>48 hrs</th></tr>
<tr><td colspan="2">Course objectives:
To acquire the fundamental knowledge of plant systematics.
To know about the basic concepts and principles of plant systematics. To know how to identify the plants.
To create awareness of the f taxonomic relationships in plant systematic studies.
Possible outcomes:
The course will nurture the knowledge on classification of plants. The course will give an expertise in understanding characteristic features of various plant families.</td><td></td></tr>
<tr><td>Unit-I</td><td>Introduction and History of Plant Taxonomy. Botanical Survey of India- a brief account. International Code of Botanical Nomenclature (ICBN/ICN), salient features, important rules and recommendations. Binomial nomenclature, Botanical gardens of world and India. Maintenance and importance of herbaria.</td><td>8hrs</td></tr>
<tr><td>Unit-II</td><td>The species concept, Taxonomic hierarchy, species, genus, family and other categories. Material basis of systematics; correlation, weighting, variations of characters and isolation</td><td>4hrs</td></tr>
<tr><td>Unit-III</td><td>Systems of classification:
Artificial- Linneaus
Natural- Bentham and Hooker
Phylogenetic systems<ol type="a">
Transitional- Engler and Prantl
Intentional-Charles Bessay and Hutchinson
Modern phylogenetic-Takhatajan, Cornquist
A brief note on APG III system of classification</td><td>6hrs</td></tr>
<tr><td>Unit-IV</td><td>Taxonamy in relation to Anatomy, Embryology, Palynology, Cytology, Phytochemistry and Serology. A brief account of Numerical taxonomy.</td><td>6hrs</td></tr>
<tr><td>Unit-V</td><td>Study of diagnostic,variability and systematic position of the following:-
Dicotyledons:
Magnoliaceae, Nymphaeaceace, Papaveraceae, Urticacecae, Menispermaceae, Casuarinaceae, Nyctaginaceae, Malvaceae, Passifloraceae, Euphorbiaceae, Amaranthaceae, Droseraceae, Podostemaceae, Loranthaceae, Fabaceae, Caesalpiniaceae, Mimosaceae, Meliaceae, Sapindaceae, Linaceae, Scrophulariaceae, Bignoniaceae, Acanthaceae, Lamiaceae, Rubiaceae, Asteraceae, Chenopodiaceae, Apocynaceae,Zygophyllaceae, Polygonaceae;</td><td>20 hrs</td></tr>
<tr><td>Unit-VI</td><td>Monocotyledons-
Alismataceae, Araceae, Cyperaceae, Poaceae, Commelinaceae,</td><td>4hrs</td></tr>
</table>

	Zingiberaceae, Liliaceae, Dioscoreaceae, and Orchidaceae.	

References:

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HCP-3.2: BOTANICAL TOUR AND HERBARIUM PREPARATION

Course objectives:

- To conduct field trip outside the campus area/ District, a minimum of 3 to 4 days to understand floristic diversity of Angiosperms and to collect specimens from various agro-climatic conditions for the preparation of the Herbarium.
- Compilation of field notes and preparation of herbarium sheets of the plants at least 20 abundant wild or cultivated plants.

Possible outcomes:

The course will give an expertise in understanding characteristic features of various plant families. Students will be able to give description of various species of a genus; location of key characters and preparation of keys at generic level. The species recorded from the field should be submitted as herbarium specimens.

Contents: Botanical tour, plant collection, identification and documentation, methods of collecting plants, herbarium specimens, herbarium preparations and submission.

HCT-3.3 REPRODUCTIVE BIOLOGY AND PLANT ANATOMY		48 hrs
Course objectives: • To study the plant anatomy which facilitate the process of understanding the internal structures of various plant parts and their significance. • To study the development of male and female gametes, pollination and fertilization reveals the various steps involved in development of new plant. **Possible outcomes:** The course will illustrate anatomy of various plant parts. The course will make the learners understanding about various stages of development. The student will be able to know details about various tissue system in plants. The students will also understand the scope and importance of anatomy and embryology in plants. In addition, they will clearly understand the seed-to-seed developmental aspects of angiosperms.		
Unit-I	Embryology: Introduction, History and scope of Embryology	**2hrs**
Unit-II	Microsporogenesis: Development, types and functions of tapetum. Role of tapetum in pollen development, sporopollinin, pollen allergy. Male gametophyte: Development of pollen tube, pollen mitosis, vegetative and generative cells and heterospory. Megasporogenesis: Megaspore, diad, tetrad and coenomegaspore. General account of mono, bi and tetrasporic embryo sac development (No type studies of tetrasporic embryo sac). Female gametophyte: Organization of mature Embryo sac, Ultra structure of Egg apparatus, Nutrition of Embryo sac.	**10hrs**
Unit-III	Pollination: Brief account of Structure, Histochemical details of Style and Stigma, Pollen germination, Pollen embryo sac. Self-incompatibility. Fertilization: Path of entry of Pollen tube, Site of pollen discharge. Double fertilization.	**6hrs**
Unit-IV	Endosperm: Types of Endosperm development, Endosperm haustoria and function. Embryogenesis: Monocot and dicot embryo development. Apomixis: A general account, causes, significance and genetics of apomixes and Polyembryony.	**6hrs**
Unit-V	Introduction and History, Primary and Secondary cell walls, Ultra Structure and Chemistry of cell wall. Theories of organization of root and shoot apical meristems. Cambium: General account. Xylem: Ontogeny, Phylogeny, Evolution, ultra-Structure and function. Phloem: Ontogeny, phylogeny, Evolution, Ultra structure of sieve	**10hrs**

	tube elements and functions.	
Unit-VI	Primary and secondary growth: Anamolous primary structures with special reference to *Nyctanthus, Achyranthus*. Anamolus secondary growth with reference to *Boerrhavia, Bignonia, Leptadinia, Piper, Tinospora, Thunbergia, Coccinea*.	**8hrs**
Unit-VII	Wood anatomy, Softwood, Hard wood, Ring and Diffuse porous wood, Xylem parenchyma, Ray parenchyma.	**4hrs**
Unit-VII	Epidermal tissue system: Types of stomata, trichomes and glands.	**2hrs**

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17. Shivanna K. R. and Sawhney V. K. (eds) 1997. Pollen Biotechnology for crop production and improvement. Cambridge University, Cambridge.

SCT-3.1 ECONOMIC BOTANY		48 hrs
Course objectives: • The course is also designed to provide the knowledge about economic importance of various plants. • To learn the diverse human uses of plants and plant products. • To acquire an increased awareness and appreciation of plants and plant products encountered in everyday life. **Possible outcomes:** The study will develop a basic knowledge of taxonomic diversity and important families of useful plants and Increase the awareness and appreciation of plants & plant products encountered in everyday life. Students will be able to appreciate the diversity of plants and the plant products in human use.		
Unit-I	Introduction: Plants in commerce and industry. General account: History, methods of cultivation and uses of economic crops.	**2hrs**
Unit-II	Study and utility of the useful parts of the following: Cereals and Millets- Rice, Wheat, Maize, Barley, Sorghum and Millets. Pulses: Red gram, Green gram, Black gram, Horse gram, Pea, Cow pea, Bengal gram. Oil Yielding plants: Sunflower, Safflower, Groundnut, Linseed, Rape seed. A brief introduction to horticultural plants. Floriculture.	**12hrs**
Unit-III	Study and utility of the useful parts of the following: Sugar yielding plants- Sugar cane and Sweet potato. Spices and condiments- Ginger, Turmeric, Cardamom, Cinnamon, Clove, Saffron, All spice, Black pepper, Nutmeg, Red pepper, Coriander, Cumin, Fennel and Vanilla,	**10hrs**
Unit-IV	Study and utility of the useful parts of the following: Fibre- Cotton, Jute, Flax, Hemp, Sann hemp, China grass, Coconut and Kapok. Timber yielding plants- Tectona, Dalbergia and Rosewood. Dyes- Indigo, Henna: Masticatories and fumitories: Areca nut, Beetle leaf, Tobacco. Rubber- Para rubber and other substitutes Gums- Gum Arabic, Karya gum	**12hrs**
Unit-V	Medicinal Botany: Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences. Ethnomedicinal plant Gardens. Important medicinal plants and their uses. Palaeoethnobotany. Folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.	**12hrs**

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SCT-3.1 MEDICINAL PLANTS AND PHYTOCHEMISTRY		48 hrs
Course objectives: • To study the concept of Ethanobotany and Ethanomedicine. • To identify the most important medicinal plants. • To provide the basic information on pharmacognosy including: taxonomy of the crude drugs, their cultivation and medicinal importance. • To describe the basic methods of extracting the active components from plants and how to identify them. • State the phytochemical classification and memorize the main categories of active components, contained in medicinal plants. **Possible outcomes:** Learner will definite witness the role of plants in survival of human beings and other organism. They will also well verse with contribution made by our primitive people in exploration of plant knowledge to alleviate common diseases and development of system of medicine. Students will be able to Identify the biological source, morphology, cultivation, collection, drying, packing, storage, medical as well as non-medical uses of plants and plant secretions. Students will also be able to identify the different chemical constituents present in plants their biosynthetic origin, characterization, natural occurrence and pharmacological action.		
Unit-I	Ethnobotany and Ethnomedicine: A brief account at world level and in India. A brief account on therapeutic values of important plant drugs of different taxonomic groups. Classification of medicinal plants.	**10hrs**
Unit-II	Pharmacognosy: Raw drug analysis, microscopic, macroscopic, Characteristics, preliminary chemical analysis, qualitative and quantitative analysis of raw drug using Colorimetry, Spectophotometry, Chromatography (*Senna, Datura, Cinchona, Ginger, Nuxvomica, Withania, Rauwolfia, Emblica*)	**10hrs**
Unit-III	Cultivation of medicinal and aromatic plants: Cultivation practice, disease and pest control, harvesting and storage of medicinal plants, post-harvest care, deterioration and disintegration of active compounds during storage and its control. (*Dioscorea, Isabgol, Senna, Liquiorice, Rauwolfia, Costus, Withania, Citronella, Vetiver, Artimisia, Acorus, Vanilla*)	**12hrs**
Unit-IV	Phytochemistry - Occurrence, classification and properties of Alkaloids, Steroids, Terpenoids, Lectins, Non Protein Amino acids. Pesticidal, and Insecticidal properties of compounds of plant origin	**8hrs**
Unit-V	Medicinal oil: occurrence, distribution and importance of aromatic and non-aromatic oils of plant source. Use of vegetable oil as food, medicine and industry.	**4hrs**
Unit-VI	Plants in the treatment of Stress, Heart diseases, Cancer, AIDS, anti-fertility, anti-microbial activity	**4hrs**

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10. Vijay adnhaleshi C 2004 Compendium on Controversial Drugs, Jagdguru Sriman Madhwacharya Moolamahasamsthana Sri Raghavendraswamy Matha, Manthralayam.

SCT-3.1 BIODIVERSITY AND CONSERVATION		48 hrs
Course objectives: • This paper is meant for students to gain in-depth knowledge of different levels, threats and distribution of Biodiversity and focus on the different approaches for biodiversity conservation. • To emphasize the importance of conserving rare plants and animals. **Possible outcomes:** The student will be able to appreciate the value of biodiversity. They will also develop the skills necessary to work efficiently in areas of in-situ and ex-situ conservation. Students will know the position of India in conserving rare plants and animals.		
Unit-I	Species concept: Concept and importance of biodiversity, Earth summit 1992, and agenda 21, species diversity, genetic diversity, ecosystem diversity, Biodiversity of the world, India and Karnataka, Hotspots of world and India, Mega biodiversity centres of world and India. Origin centers of crop plants.	**10hrs**
Unit-II	Loss of Biodiversity: Casual factors of threat, Impact of habitat loss and habitat fragmentation, Categories of treat endangered, vulnerable, rare, threatened and extinct. Red Data Book. Environmental impact assessment, sustainable development.	**10hrs**
Unit-III	Biodiversity Conservation: Objectives, implication and action plans, International and National organizations for conservation of natural resources. In situ conservation – protected areas, biosphere reserves, national parks, sanctuaries and sacred groves. ex situ – conservation, botanical gardens, gene banks, medicinal conservation parks, herbal gardens.	**10hrs**
Unit-IV	International organizations for biodiversity conservation- IUCN, Species survival commission (SSC), convention on biological diversity (CBD), CITES, TRAFFIC, WWF. Plant genetic resources: Conservation, gene bank- methods, types, NBPGR, IPGR.	**10hrs**
Unit-V	Biodiversity conservation Legal aspects: Legal aspects of biodiversity in India. Policy and priority setting. Biodiversity conservation future strategies for India.	**8hrs**

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HCP-3.1 SYSTEMATIC BOTANY OF ANGIOSPERMS.
1. Description of plants using technical terms 2. Identification of plants to species using flora 3. Preparation of dichotomous key for identification.

HCP-3.3 REPRODUCTIVE BIOLOGY AND PLANT ANATOMY
1. Endosperm/ Embryo dissection 2. Observation of slides of microsporogenesis and megasporogenesis. 3. Pollen germination and viability 4. Preparation of permanent slides of free hand /paraffin Sections 5. Wood anatomy study based on T.S., T.L.S. and R.L.S. 6. Dermal tissue system.

SCP-3.1: ECONOMIC BOTANY
1. Field survey for collection of economically important plants of the region. 2. Study of locally available economic products of plant origin. 3. Study of important medicinal plants and their uses.

SCP-3.1: MEDICINAL PLANTS AND PHYTOCHEMISTRY
1. Identification of medicinal plants. 2. Identification of raw drugs- pharmacognistic studies. 3. Identification of controversial drugs. 4. Preliminary tests for the occurrence of secondary metabolites. 5. Estimation of alkaloids 6. Estimation of Phenols 7. Estimation of Essentail oils.

SCP-3.1: BIODIVERSITY AND CONSERVATION
1. Field survey of important plants of the region. 2. Study of the characters and threatened plants included in the theory. 3. Survey of important timber yielding trees of the region. 4. Determination of the minimum size of the quadrat suitable for an area using ‘species area curve’ method. 5. Determination of Importance Value Index (IVI) of the plant species in the community by quadrant method. 6. Study of Phytogeographic maps of world and India. 7. Map of hot spots, Continental drift.

OE-3.1 PLANT PROPAGATION TECHNIQUES		48hrs
Course objectives: • To introduce the botanical concepts that underlie the propagation of plants and to acquaint the students with the methods and technologies that are used in the propagation industry. • To make students think critically about plant propagation to solve problems and communicate and explain the scientific basis for the different techniques and their individual use and application. **Possible outcomes:** The course will make the learners knowing about various techniques of propagating plants by seeds, rooting cuttings, grafting, budding, layering, and micropropagation (tissue culture). Students will be able to select the appropriate methods of asexual and sexual propagation based upon biological characteristics of the crops and manipulate the propagation environment to promote the successful propagation of plants.		
Unit-I	Plant propagation- History, scope and importance. Propagation structures with reference to greenhouse equipment and media.	**3hrs**
Unit-II	Seed propagation; Germination, type of seed dormancy and breaking, techniques of seed production and handling principles.	**6hrs**
Unit-III	Vegetative propagation: Techniques of propagation a) Cuttings: Stem cuttings – hard wood, semi hard wood, soft wood and herbaceous, leaf cuttings, leaf bud cuttings, root cuttings. b) Layering: Simple layering, compound, tip layering, stool, air, serpentine and trench layering. c) Budding: T – budding patch budding, chip budding, ring budding. d) Grafting: Whip and tongue, wedge and cleft, bark, side grafting, approach. e) Propagation by specialized stems and roots	**12hrs**
Unit-IV	Micropropagation – Techniques and applications in forestry and horticulture.	**5hrs**
Unit-V	Advantage, limitations and applications of vegetative propagation, clones, genetic variation in asexually propagated plants, different methods.	**5hrs**
Unit-VI	Seed propagation: Seed production, types of seed sowing, harvesting, drying and thrashing, storage, types of storage, pathogens in storage and their control, seed health, purity, vigor, and tests to check. Dormancy types, factors affecting dormancy, methods to overcome dormancy, advantages of dormancy. Seed germination and viability tests seed protectants; priming. Coating, pelleting, Classes of seeds; breeder seeds, nuclear seeds, founder seeds, certified seeds and cultivar seeds, seed act 1966, seed certification. Liner production and	**12hrs**

	hardening of seedlings, seed certification, seed act	
Unit-VII	Propagation methods of some selected plants – Citrus, Grape, Mango, Mulberry, Hibiscus, Rose, Croton, and Eucalyptus.	**5hrs**

References

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OE-3.1 PLANT DIVERSITY AND HUMAN WELFARE		48hrs
Course objectives: • To enlighten the students on the sources and role of plants in meeting the basic demands of the human. • To reveal the range of products and their novel usage in human life. **Possible outcomes:** Students will understand the inseparable interaction between human and plants and the related ecology as a whole. This will create a respect for plants among the community.		
Unit-I	Plant diversity and its scope- Genetic diversity, Species diversity, Plant diversity at the ecosystem level, Agrobiodivesity and cultivated plant taxa, wild taxa. Values and uses of Biodiversity: Ethical and aesthetic values, Precautionary principle, Methodologies for valuation, Uses of plants, Uses of microbes.	**12hrs**
Unit-II	Loss of Biodiversity: Loss of genetic diversity, Loss of species diversity, Loss of ecosystem diversity, Loss of agrobiodiversity, Projected scenario for biodiversity loss, Management of Plant Biodiversity: Organizations associated with biodiversity management-Methodology for execution-IUCN, UNEP, UNESCO, WWF, NBPGR; Biodiversity legislation and conservations, Biodiversity information management and communication	**14hrs**
Unit-III	Conservation of Biodiversity: Conservation of genetic diversity, species diversity and ecosystem diversity, In situ and ex situ conservation, Social approaches to conservation, Biodiversity awareness programmes, Sustainable development.	**10hrs**
Unit-IV	Role of plants in relation to Human Welfare; a) Importance of forestry their utilization and commercial aspects b) Avenue trees, c) Ornamental plants of India. d) Alcoholic beverages through ages. Fruits and nuts: Fruit crops of Karnataka and their commercial importance. Wood and its uses.	**12hrs**

References:

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SEMESTER IV

HCT-4.1 PLANT PHYSIOLOGY		48 hrs
Course objectives: • The course would deal with the study of plant physiology especially the water transport, absorption, mineral nutrition, photosynthesis, respiration and phytohormones. • Explains physiological responses produced by plants against environmental stresses. **Possible outcomes:** The students will be able to understand how plants acquire and use the energy and material resources required to complete their life cycle. Students will understand the phenomena of carbohydrate synthesis in plants and use of the carbon to generate energy to maintain plant functions; and control of plant functions through growth regulators. Students will understand the physiological changes occurred during different stress conditions such as water deficit, salinity and heat stresses.		
Unit-I	Water relations: solutions, colloids, molarity, buffer molar solutions, pH, emulsion and gels. Permeability, theories of cell permeability and biosignaling, diffusion, osmosis, membranes, osmotic pressure, turgor pressure, wall pressure, relation between OP, DPD and TP, concept of water potential, plasmolysis, significance of osmosis and imbibitions.	**5hrs**
Unit-II	Active and passive water absorption, mechanism of ascent of sap: root pressure theory and mechanism of cohesion tension theory, water potential gradient Transpiration: types, mechanism, theories of opening and closing of stomata, factors affecting rate of transpiration, anti-transpirants and guttation	**5hrs**
Unit-III	Mineral nutrition: macro and micronutrients and their role and deficiency symptoms, absorption of mineral salts, nature of membranes general mechanism of solute absorption	**4hrs**
Unit-IV	Photosynthesis: structure of chloroplast and photosynthetic pigments, action spectrum, concept of two photosystems, red drop and Emerson enhancement effect, photophosphorylation, Calvin cycle, C_4 and CAM pathways, photorespiration and factors affecting on photosynthesis	**8hrs**
Unit-V	Respiration: aerobic, anaerobic and fermentation glycolysis, Krebs cycle, electron transport system, redox potential, oxidative phosphorylation, pentose phosphate pathway. Respiratory quotient (RQ) and factors affecting on respiration	**6hrs**
Unit-VI	Nitrogen fixation, importance of nitrate reductase its regulation and ammonium assimilation. Proteins- structure and synthesis, lipid metabolism.	**4hrs**

Unit-VII	Enzymes- classification, properties and nomenclature (IUBMB), co factors, co-enzymes, isozymes, mechanism of enzyme action, enzyme inhibition enzyme kinetics.	**6hrs**
Unit-VIII	Growth: photomorphogenesis, photoperiodism, phytochrome, vernalization and concept of biological clock. Seed dormancy- causes and methods of breaking dormancy. Stress physiology- concept and plant responses to water, salt and temperature stresses, physiological action of Auxins, Gibberellins, Cytokinins, ABA, ethylene and growth inhibitors.	**10hrs**

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HCPW-4.2: PROJECT WORK

Course objectives:

- The objective of this advanced course is to provide students with a hands on training in specialized area of plant sciences.
- To enable the student to develop deeper knowledge, understanding, capabilities and attitude in the context of research.
- To know about selection of research topic.
- To enable the student towards collection and compilation of literature.

Possible outcomes:

Students will be able to designing the experiment with clear objectivity and demonstrate the ability to collate and critically assess/interpret data. Students will acquire knowledge on techniques and tools of research, quantitative and qualitative data analysis and interpretation of data in the perspective of existing knowledge. Students will be able to effectively communicate knowledge in a scientific manner and provide recommendations based on research findings.

Contents: The student will be reading and analysing the published information in the chosen area of plant science under direct mentoring of a faculty member and will participate in research activity.

SCT-4.1 PLANT BREEDING		48 hrs
Course objectives: • To realize the significance of plant breeding techniques in improving the plant productivity and strain improvement. • To describe sources and types of genetic variation and explain their importance for plant improvement. • To enlighten students on practical problems of plant breeding and the ways and means of solving the problems. **Possible outcomes:** The course will give a scientific approach to plant breeding techniques and their significances. Students will acquire basic knowledge of conventional and non-conventional methods of plant breeding. By knowing the elementary principles in plant breeding students will understand the importance and value of producing disease and insect resistant plants. They will also be familiar with methods used to change the traits of a plant to create the desired genotype/phenotype.		
Unit-I	Introduction: Objectives of plant breeding, important achievements and future prospects, Genetic variability and its role in plant breeding, Domestication and centres of origin of cultivated plants.	**4 hrs**
Unit-II	Systems of reproduction in plants: Reproductive system; sexual and asexual Pollination; cross and Self-pollination control mechanism, Incompatibility, male sterility and their types, Apomixsis	**10 hrs**
Unit-III	Hybridization: Methods of hybridization and its role.Inter-varietal, inter specific and inter generic crosses. Heterosis and inbreeding depression.	**8 hrs**
Unit-IV	Breeding for resistance: abiotic stresses (drought and salinity), biotic stresses (disease and insects).	**10hrs**
Unit-V	Mutation breeding: Mutations (Spontaneous and induced), Chemical and physical mutagens.Methods of mutation breeding, Limitations and achievements of mutation breeding.	**8 hrs**
Unit-VI	Molecular breeding : Molecular marker system, RFLP, RAPD, AFLP, SSR and SNPs.Methods and importance of marker assisted breeding	**8 hrs**

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SCT-4.1 PLANT BIOTECHNOLOGY		48 hrs
Course objectives: • To train the students in the aspects of innovative applications and techniques in tissue culture to conserve endemic, endangered plants and improve the quality of the economically important plants. • To learn the recent advances in genetic engineering and production of transgenic plants **Possible outcomes:** Systematic training given in the different branches of applied biotechnology will enhance the confidence in students to take up entrepreneurial ventures in developing bio tagged products, and provide services in national and multinational industries dealing with bio utility and bio resource management.		
Unit-I	Plant tissue culture: Scope and Importance of plant tissue culture- Media composition and types, explants for organogenesis, somaclonal variation and cell line selection, production of haploid plants and homozygous cell lines. Micro propagation, somatic embryogenesis, protoplast culture and somatic hybridization. Selection and maintainance of cell lines, cryopreservation, germplasm collection and conservation, plant tissue culture certification.	**8hrs**
Unit-II	Plant transformation techniques: Mechanism of DNA transfer – Agro bacterium mediated gene transfer, Ti and Ri plasmids as vectors, role of virulence genes; design of expression vectors; 35S promoter, genetic markers, reporter genes; viral vectors and binary vectors. Direct gene transfer methods-particle bombardment, electroporation and microinjection. Binary vectors.	**8hrs**
Unit-III	Metabolic engineering of plants: Plant cell culture for the production of useful chemicals and secondary metabolites (Hairy root culture, Biotransformation, Elicitation) - pigments, flavonoids, alkaloids; mechanism and manipulation of shikimate pathway. Commercial production of enzymes, biodegradable plastics, therapeutic proteins, edible vaccines and antibiotics using transgenic technology.	**8hrs**
Unit-IV	Plant Development: Plant growth regulators- auxins, gibberellins, cytokinins, abscicic acid and acetylene. Biological nitrogen fixation, importance and mechanism. Biofertilizers- production, VAM, *Rhizobium*, *Azotobacter*, Mycorrhiza, Actinorhiza, Vermicomposting technology and Biopesticides.	**6hrs**
Unit-V	Gene Manipulation Technology: Crop improvement, productivity, performance and fortification of agricultural products – Bt cotton, Bt brinjal. Herbicide resistance, viral resistance, bacterial resistance, fungal resistance crops. Golden rice and transgenic sweet potato. Strategies for engineering stress tolerance. Transgenic plants; Current	**10hrs**

	status of transgenic plants in India and other countries, Ethical issues associated with GM crops and GM food; labelling of GM plants and products. Importance of integrated pest management.	
Unit-VI	Post-harvest technology: RNAi and antisense RNA technology for extending shelf life of fruits and flowers (ACC synthase gene and polygalactoronase); delay of softening and ripening of fleshy fruits (tomato, banana, watermelons). Post-harvest protection of cereals, millets and pulses.	**8hrs**

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SCT -4.1 ETHNOBOTANY AND IPR		48hrs
Course objectives: • The main objective of this course to explain the basic concepts of ethnobotany and the geographical distribution of the most important pharmaceutical plants. • To make the students recognize the ethnobotanically important plants species. • To explain which parts of these plants are important for usage. • To familiarize the students with the issues of intellectual property rights and disputes arising due to biotechnological patents. **Possible outcomes:** The study will express the historical development of ethnobotany. Give information about the plants and their natural habitats and cultivated lands and explain in which sectors these plants are used. Impart knowledge on various tribal groups of India. Students will know and/or identify important plant species. Get knowledge on important plant families, their characteristics and its economic importance. Students will become aware of biosafety, bioethics and IPR.		
Unit-I	Ethnobotany: Introduction, concept, scope and objectives; Ethnobotany as an interdisciplinary science. The relevance of ethnobotany in the present context; Ethnic groups and Ethnobotany: Major and minor ethnic groups or Tribals of India, and their life styles. Forest Vs. ethnic groups; Plants in Tribal life with reference to Magico-religious rituals and social customs. Sacred groves.	**12hrs**
Unit-II	Methodology of Ethnobotanical studies: a) Field work b) Herbarium c) Ancient Literature d) Archaeological findings e) temples and sacred places f) Protocols.	**10hrs**
Unit-III	Role of ethnobotany in modern Medicine with special examples; Medico-ethnobotanical sources in India with special reference to Karnataka; Tribals Vs. Agriculture: Shifting, Podu and Jhum cultivation. Role of ethnic groups on surrounding environment. Crop Genetic sources. Endangered taxa and forest management (participatory forest management).	**12hrs**
Unit-IV	Ethnobotany and legal aspects. Ethnobotany as a tool to protect interests of ethnic groups. Sharing of wealth concept with few examples from India. Ethnobotany as a source (recent) of already known drugs: a) Withania as an antioxidant and relaxant b) Sarpagandha in brain ailments c) *Becopa* and *Centella* in epilepsy and memory development in children d) *Phyllanthus fraternus* in diabetic and viral jaundice e) *Artemisia* as a powerful cerebral antimalarial agent and its possible use in tuberculosis. Biopiracy, Intellectual Property Rights and Traditional Knowledge.	**14hrs**

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9. Plant Biochemistry. P.M. Dey and J.B. Harborne
10. Plant Biochemistry. Hans-Walter Heldt
11. Physicochemical and Environmental Plant Physiology. Park S. Nobel.

HCP-4.1 PLANT PHYSIOLOGY
1. Study of permeability of membranes using different concentration of organic solvents 2. Determination of osmotic potential of cell sap by plasmolytic methods 3. Separation of chloroplast pigments by solvents methods 4. Determination rate of photosynthesis using different wavelengths 5. Determination of RQ of carbohydrates, fats and proteins 6. Detection of carbohydrates, fats, oils, alkaloids, enzyme activity in plant tissue 7. Study of plant movements 8. Physiological action of plant hormones 9. Study of inorganic elements in plant tissues/ash 10. Experiments on stress physiology.

SCP-4.1 PLANT BREEDING
1. Visiting a plant breeding station to familiarize with breeding programmes. 2. Hybridization techniques, selfing and crossing techniques. 3. Technique of emasculation; Techniques in selfing and hybridization 4. Different types of layering (Simple layering, tip layering, serpentine layering, Air layering, mound layering). 5. Grafting – Whip (or splice), cleft, bark, wedge, stone and approach grafting. 6. Budding − T-budding, Inverted T-budding and chip budding. 7. Pollen viability; germination test and TTC test. 8. PCR – Technique with known primers.

SCP-4.1 PLANT BIOTECHNOLOGY
1. Isolation of plasmids DNA from 2. Preparation of tissue culture media and organ culture (shoot tips, leaf) 3. Anther culture and haploid production 4. Isolation, culture and fusion of protoplast 5. Production of synthetic seeds from explants 6. Extraction and quantification of leg haemoglobin from root nodules (Rhizobium) of leguminous plant 7. Agro bacteria culture and transformation of explants

SCP-4.1 ETHNOBOTANY AND IPR
1. A visit to a Tribal area to collect data 2. Listing of Crude drugs and their identification (little known drugs only). 3. A visit to nearby Sacred Groves.

OE-4.1 MEDICINAL BOTANY		48hrs
Course objectives: • To enlighten the students on the sources and role of plants in meeting the basic demands of the human. • To appreciate how plants have influenced medicine throughout human history. • To reveal the range of products and their novel usage in human life. **Possible outcomes:** The study explores the uses of plants as medicine by traditional indigenous approaches. Student will understand different systems of medicine and their uses. Students will be able to explain how current medicinal practices are often based on indigenous plant knowledge. Students will get introduced to different perspectives on treating ailments.		
Unit-I	History, Scope and Importance of Medicinal Plants. Indigenous Medicinal Sciences; Definition and Scope-Ayurveda: History, origin, panchamaha bhutas, sapta dhatu and tridosha concepts, Rasayana, plants used in ayurvedic treatments, Siddha: Origin of Siddha medicinal systems, Basis of Siddha system, plants used in Siddha medicine. Unani: History, concept: Umoor-etabiya, tumors treatments/ therapy, polyherbal formulations.	**12hrs**
Unit-II	Conservation of endangered and endemic medicinal plants. Definition: endemic and endangered medicinal plants, Red list criteria; *In situ* conservation: Biosphere reserves, sacred groves, National Parks; *Ex situ* conservation: Botanic Gardens, Ethnomedicinal plant Gardens. Propagation of Medicinal Plants: Objectives of the nursery, its classification, important components of a nursery, sowing, pricking, use of green house for nursery production, propagation through cuttings, layering, grafting and budding.	**14hrs**
Unit-III	Sources of financial aids for medicinal plant cultivation: Aims and objectives, Functions and activities of the board, Schemes and Projects for Financial assistance, Funding of projects; Procedure for processing project proposal for approval, Implementation and monitoring.	**12hrs**
Unit-IV	Ethnobotany and Folk medicines. Definition; Ethnobotany in India: Methods to study ethnobotany; Applications of Ethnobotany: National interacts, Palaeo-ethnobotany. Folk medicines of ethnobotany, ethnomedicine, ethnoecology, ethnic communities of India. Application of natural products to certain diseases- Jaundice, cardiac, infertility, diabetics, Blood pressure and skin diseases.	**10hrs**

References

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2. Purohit and Vyas, 2008. Medicinal Plant Cultivation: A Scientific Approach, 2nd edn. Agrobios, India.
3. Yoganarasimhan S N. Medicinal Plants of India- Vol 1- Karnataka, Interline Publishing Pvt. Ltd.

OE-4.1 AESTHETIC BOTANY		48 hrs
Course objectives: • To learn about Phytogeographical regions of India. • To make students appreciate the Aesthetic beauty of beautiful plants and their value in nature. • To reveal the cultivation methods of aesthetic plants. • To learn about various types of gardening and maintenance of the same. **Possible outcomes:** Students will know about the floristic regions and plant formation of the planet. The study of aesthetic botany gives knowledge about the art, science, technology and business of growing plants. The course will make the learners skilled in cultivation of plants. Students will get familiar with the aesthetic value and the importance on improving the aesthetics of the surrounding.		
Unit-I	**Phytogeography:** Climate and Vegetation of the world, Floristic regions of the world. Phytogeographical regions of India; Endemism; Concept of hotspots, hot spots of the world. Forest types of India	**8hrs**
Unit-II	**Gardening** Garden Design: Scope and objectives of gardening; Style of gardens (Formal, Informal); Types of gardens (English, Mughal and Japanese) Components of garden; Planning of outdoor gardens- Small, Residential, Larger Home Garden, Roof Garden, Terrace Garden, Industrial garden, Housing complex, Indoor gardening Garden Features and Ornamentation: Water, Garden pool, Stream, Waterfall, Fountain, Rocks, Roads, Walks, Pavements and Steps, Walls fences and Gates, Hedges, Edges, Arches, Statues, Towers.	**12hrs**
Unit-III	**Floriculture** Nursery production and management: Scope, Site, Soil, Environment, Layout, Manure, Fertilizers, Maintenance, Garden tools, Culture and Garden calendar, Types, Nursery beds, Pest & Disease management. Propagation of ornamental plants by seeds, bulbs, layering, cuttings, grafting, budding & tissue culture. Plant disorders including nutrition, pests and diseases, and chimeras Ornamental ferns and their propagation; herbaceous perennials, Annuals & Biennials: Important Genera and Species, their importance in garden designs.	**14hrs**
Unit-IV	**Landscaping** Landscape Design: Definition, objectives and scope, Landscape elements of construction and designing of Residential, Commercial, Bungalow, Public area, Hotel, Educational Institute and religious places Palms and Cycas: Characteristics, propagation, culture, pest	**14hrs**

	and disease, importance and uses, genera and species of palms and Cycads. Bamboo and conifers: Genera, species and varieties Lawns & Grasses: Planting methods, maintenance, pest management Ornamental succulents, Cacti Polyhouse technology: Scope and objectives of floriculture.	

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2. Swarup Vishnu. 2003. Garden Flowers. National Book Trust
3. Hartmann HT, Kester DE, Davies FT and Geneve RL. 2002. Plant Propagation – Principles and Practices. Prentice Hall India Ltd.
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Karnataka State Akkamahadevi Women's University. Vijayapura

M.Sc. Degree Examination, Nov/ Dec 2019

Subject: Botany (CBCS)

Theory Model Question Paper

Time: 3 Hrs **Max. Marks: 70**

Instructions to the candidates: Answer all the questions; Draw diagrams wherever necessary

I. Answer **any FIVE** of the followings **5X2 = 10**

1.

2.

3.

4.

5.

6.

7.

II. Write in brief **any SIX** of the followings **6X5 = 30**

8.

9.

10.

11.

12.

13.

14.

15.

III. Write in detail **any THREE** of the followings **3X10 = 30**

16.

17.

18.

19.

20.

Karnataka State Akkamahadevi Women's University. Vijayapura

M.Sc. Degree Examination, Nov/ Dec 2018

Subject: Botany (CBCS)

Practical Model Question Paper

Time: 4 hrs **Max. Marks: 70**

Q. I Major Question	**20 marks**
Q. II Minor Question	**18 marks**
Q. III Comment on	**3X4=12 marks**
Q. IV Viva-voce	**10 marks**
Q. V Journal /Record	**10 marks**

Enclosure- 3

Courses that have activities

HCP-3.2: BOTANICAL TOUR AND HERBARIUM PREPARATION

Course objectives:

- To conduct field trip outside the campus area/ District, a minimum of 3 to 4 days to understand floristic diversity of Angiosperms and to collect specimens from various agro-climatic conditions for the preparation of the Herbarium.
- Compilation of field notes and preparation of herbarium sheets of the plants at least 20 abundant wild or cultivated plants.

Possible outcomes:

The course will give an expertise in understanding characteristic features of various plant families. Students will be able to give description of various species of a genus; location of key characters and preparation of keys at generic level. The species recorded from the field should be submitted as herbarium specimens.

Contents: Botanical tour, plant collection, identification and documentation, methods of collecting plants, herbarium specimens, herbarium preparations and submission.

HCPW-4.2: PROJECT WORK

Course objectives:

- The objective of this advanced course is to provide students with a hands on training in specialized area of plant sciences.
- To enable the student to develop deeper knowledge, understanding, capabilities and attitude in the context of research.
- To know about selection of research topic.
- To enable the student towards collection and compilation of literature.

Possible outcomes:

Students will be able to designing the experiment with clear objectivity and demonstrate the ability to collate and critically assess/interpret data. Students will acquire knowledge on techniques and tools of research, quantitative and qualitative data analysis and interpretation of data in the perspective of existing knowledge. Students will be able to effectively communicate knowledge in a scientific manner and provide recommendations based on research findings.

Contents: The student will be reading and analysing the published information in the chosen area of plant science under direct mentoring of a faculty member and will participate in research activity.

Enclosure- 4

KARNATAKA STATE AKKAMAHADEVI WOMEN'S UNIVERSITY, VIJAYAPURA

(Formerly: Karnataka State Women's University)

Prof. G. G. Rajput
Chairman, BoS

Department of Botany
Jnanashakti Campus Toravi, Vijayapura – 586 108

Date: 30/06/2020

BoS (PG) BOTANY

Proceedings of the meeting of BoS (PG) in Botany subject held through circulation from 03-06-2020 to 15-06-2020.

The members present:

1. Dr. G.G. Rajput, Dean, Faculty of Science and Technology, KSAWUV,	**Chairman**	
2. Dr. K. N. Amruthesh, Dept. of Botany, University of Mysore, Mysore	**Member**	
3. Dr. Prashanth S J, Coordinator, Dept. of Botany, KSAWU, Vijayapura.	**Member**	

Agenda 1: Review of the existing syllabus under CBCS scheme for corrections (Credits, title and content modification enclosed).
Resolution: The board reviewed the existing MSc (Botany)I-IV semester syllabus. The board made necessary changes/corrections in text, credit allocation, marks for practical course and. The board also resolved to approve the updated M.Sc (Botany) syllabus w.e.f. 2020-21 and onwards.

Agenda 2: Preparation and approval of Panel of Examiners for the year 2020-21.
Resolution: The board prepared and approved the panel of examiners for Botany for the academic year 2020-21.

Agenda 3: Modification of question paper pattern for M.Sc. Botany practical (I to IV Sem) examination as per the CBCS pattern.
Resolution: The board revised that marks for practical course and also revised question paper pattern for practical exam.

(Prof. G. G. Rajput)
Chairman, BoS (PG)
in Boatny

Enclosure- 5

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Certificate

I hereby certify that the project work " **SURVEY ON WEED DIVARSITY OF GRAPE CROP FIELDS OF VIJAYAPURA.**" submitted by **Miss. PIYANKA A.G. Miss. PRIYANKA NATEEKAR, Miss. SUHASINI** for partial fulfillment of the degree of **"Master of Science"** in **Botany** to Karnataka state Akkamahdevi Women's University, Vijayapura, is the project work done by them in the Department of Botany, Karnataka state Akkamahadevi Women's University, Vijayapura

I further, certify that the research work done by them is original and has not been submitted for any degree either in part or in full to any other university.

Place: Vijayapura
Date: 13-10-2021

DR. PRATIMA. H.
Guide
Department of Botany
Karnataka state Akkamahadevi Women's University,
Vijayapura

13/10/21

Forwarded through Co-ordinator

13.10.21

Certificate

I hereby certify that the project work " **SCREENING OF HEPATOPROTECTIVE AND ANTIOXIDANT POTENTIAL OF PHYLLANTHUS GENUS: A REVIEW"** submitted by **Miss. ANITA SHIRAGUPPI Miss. PRIYADARSHINI JOOJAGAR ,Miss. SUDHARANI S CHEERALADINNI** for partial fulfillment of the degree of **"Master of Science"** in **Botany** to karanataka state Akkamahdevi Women's University, Vijayapur, is the project work done by them in the Department of Botany, Karanataka State Akkamahadevi Women's University, Vijayapur.

I further, certify that the research work done by them is original and has not been submitted for any degree either in part or in full to any other university.

Place: Vijayapura
Date: 12-10-2021

DR. PRATIMA. H
Guide
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Co-ordinator
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CERTIFICATE

This is to certify that the dissertation entitled **"Floristic Diversity of Almatti Gardens"** submitted by **Mrs. Vaibhavi** for the partial fulfilment of award of the Degree of Master of Science in Botany, Karnataka State Akkamahadevi Women's University, Vijayapur is carried out by her in the Department of Botany under the guidance and supervision of **Dr. Arati Laddimath**, Department of Botany, KSAWU, Vijayapur. The subject on which the dissertation has been prepared is her original work.

Akkamahadevi Women's University
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VIJAYAPURA

Place: Vijayapura

Date: 13/10/2021

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Department of Botany

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13.10.21

KARNATAKA STATE AKKAMAHADEVI WOMEN'S UNIVERSITY
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CERTIFICATE

This is to certify that; the thesis entitled **"Review on role of ornamental plants as Air purifiers"** is being submitted here with for the partial fulfillment of the requirement for the Degree of Master of Science in Botany of Karnataka state Akkamahadevi Women's University, Vijayapura. The work reported in this thesis is based upon the results of the literature survey carried out by **Ms. Asma Pathan, Roopa M Masalaji & Rukhsar Mutagi** under my supervision and guidance. To the best of my knowledge and belief the work embodied in this thesis has not formed earlier the basis for the award of any degree or similar title of this and for any another university or examining body.

Place: Vijayapura
Date: 13/10/2021

Dr. FIRDOSE R. KOLAR
(Project Guide)

13/10/21

Forwarded through Co-ordinator

13.10.21

Akkamahadevi Women's University ★ VIJAYAPURA ★ Dept. of Botany

KARNATAKA STATE AKKAMAHADEVI WOMEN'S UNIVERSITY
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CERTIFICATE

This is to certify that; the thesis entitled **"A REVIEW OF PLANTS USED IN THE TREATMENT OF RESPIRATORY DISORDERS"** is being submitted herewith for the partial fulfillment of the requirement for the Degree of Master of Science in Botany of Karnataka state Akkamahadevi Women's University, Vijayapura. The work reported in this thesis is based upon the results of the literature survey carried out by **Ms. ASMA KALBURGI, Ms. SADEEQUA MUSHRIF and Ms. ZEBA SULTANA MULLA,** under my supervision and guidance. To the best of my knowledge and belief the work embodied in this thesis has not formed earlier the basis for the award of any degree or similar title of this and for any another university or examining body.

Place: Vijayapura
Date: 13/10/2021

Dr. FIRDOSE R. KOLAR
(Project Guide)

13/10/21

13/10/21

Forwarded through Co-ordinator

13.10.21

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CERTIFICATE

This is to certify that the dissertation entitled **"Floristic Assessment of Dakshina Kashi Mudanoor (Sacred grove)"** submitted by **Miss. Akshata Konnur** for the partial fulfilment of award of the Degree of Master of Science in Botany, Karnataka State Akkamahadevi Women's University, Vijayapuris carried out by her in the Department of Botany under the guidance and supervision of **Dr. Arati Laddimath**, Department of Botany, KSAWU, Vijayapura. The subject on which the Project has been prepared is her original work.

Akkamahadevi Women's University
Dept. of Botany
VIJAYAPURA

Place: Vijayapura

Date: 13-10-2021

13/10/21

13.10.21

(Coordinator)

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KARNATAKA STATE AKKAMAHDEVI WOMEN'S UNIVERSITY VIJAYAPURA
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Certificate

On the basis of declaration submitted by **Ms. Akshata Kannur., Ms. Anuradha Pawar., Ms. Shweta Patil., and Ms. Spoorti Kulkarni.** I hereby certify that the project titled **"STUDIES ON BIOLOGICAL CONTROL OF DRY ROOT ROT OF CHICKPEA"** which is submitted to the Dept. of Botany, KSAWU Vijayapura. in partial fulfillment of the requirements of the award of the degree of Master of Science, is an original contribution of project work carried by them under my guidance and supervision.

To the best of my knowledge, this work has not been submitted in part or full for any Degree or Diploma to this University or elsewhere.

Shankar Mavinamar
Supervisor

Place: Vijayapura
Date: 11/10/2021

Forwarded through
The Co-ordinator

Akkamahadevi Women's University
Dept. of Botany
VIJAYAPURA

Valued

1. 13/10/21

2. 13.10.21

CERTIFICATE

This is to certify that this project dissertation entitled "FLORISTIC DIVERSITY OF ROYAL PALACE AND IT'S SURROUNDING AREA JAMAKHANDI,BAGALKOT DISTRICT,KARNATAKA STATE,INDIA. It Is being submitted here with for the partial fulfillment of award of the Degree of master of sciene in Botany, Karnataka State Akkamahadevi women's University Vijayapura . The work reported in this report is based upon the results of the original work carried out by miss Manjula Dhasyal and miss Anushree chougala under my supervision and guidance.

Place: Vijayapura

Date: 12/10/2021

Dr.Arati Laddimath M.Sc,M.Ed,M.Phill,Ph.D

Project Guide

12/10/2021

13/10/21

Akkamahadevi Women's University Dept. of Botany VIJAYAPURA

The Co-ordinator

KSAW University, Dept of

Post Graduated Studied and Research in

Botany , Vijayapura.

13.10.21

CERTIFICATE

KARNATAKA STATEAKKAMAHADEVI WOMEN'S UNIVERSITY, VIJAYAPURA

CERTIFICATE

This is to certify that the project entitled "" submitted by**Miss.Shalomsofiya.M (Reg no:BO191016)Mrs.BhuvaneshwariPatil(Reg no BO191008) "DOCUMENTATION OF ECO-FRIENDLY PLANT SPECIES"**to Karnataka State Akkamahadevi Women's University during the period from 2020 to 2021.The project report has not formed the basis for the award of any degree, diploma, associateship and fellowship or other similar title to any candidate of this or any other university.

Date :

Place: Vijayapura

Dr. Babu R.L,
Co-ordinator
Department of Botany
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13/10/21

Dr. AratiLaddimath
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13.10.21

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