

शासकीय कमला राजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय,  
ग्वालियर (मध्य प्रदेश)

17



वनस्पतिशास्त्र विषय के अध्ययनमंडल  
द्वारा अनुमोदित वनस्पतिशास्त्र विषय के  
स्नातक (2017-2020) एवं स्नातकोत्तर (2017-2019) पाठ्यक्रम

अनुमोदन अकादमिक सत्र  
2017-2018

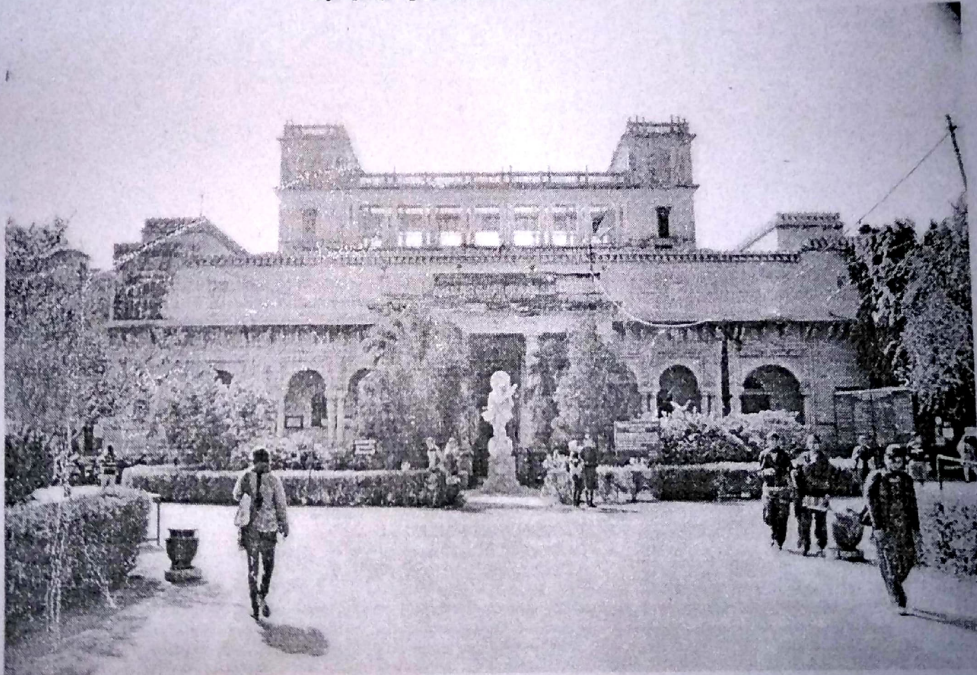
प्रस्तुतकर्ता

स्नातकोत्तर अध्ययन केन्द्र

वनस्पतिशास्त्र विभाग

प्राप्तकर्ता

अकादमिक प्रकोष्ठ



वेबसाइट : [www.krgc.gwl.org](http://www.krgc.gwl.org) ईमेल : [krgc@rediffmail.com](mailto:krgc@rediffmail.com)

दूरभाष : 0751 - 2625495, 0751 - 2438173, फ़ैक्स : 0751 - 2625495

शासकीय कमला राजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय,  
ग्वालियर (मध्य प्रदेश)



वनस्पतिशास्त्र विषय के अध्ययनमंडल  
द्वारा अनुमोदित वनस्पतिशास्त्र विषय के  
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2017-2018

प्रस्तुतकर्ता

स्नातकोत्तर अध्ययन केन्द्र

वनस्पतिशास्त्र विभाग

प्राप्तकर्ता

अकादमिक प्रकोष्ठ



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दूरभाष : 0751 - 2625495, 0751 - 2438173, फ़ैक्स : 0751 - 2625495

## कार्यालय प्राचार्य, शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय, ग्वालियर

क्र० ...299.../अका.प्र./अध्ययन मंडल/2016

ग्वालियर दिनांक 10 जून, 2016

### अधिसूचना

स्वशासी महाविद्यालय हेतु विश्वविद्यालय अनुदान आयोग दिल्ली द्वारा जारी दिशा निर्देश की कंडिका 8 परिशिष्ट 5 में वर्णित प्रावधान अनुसार वनस्पतिशास्त्र विषय के अध्ययन मंडल का गठन दो वर्ष (2016-17 एवं 2017-18) के लिये निम्नानुसार किया जाता है -

(अ)	श्रेणी-1	-	अध्यक्ष :	डॉ. बी.एम. कुलश्रेष्ठ, विभागाध्यक्ष
(ब)	श्रेणी-2	-	सदस्य :	डॉ. मधुलक्ष्मी शर्मा डॉ. साधना पाण्डे डॉ. डी.एस. राठौर डॉ. प्रीति कुलश्रेष्ठ
(स)	श्रेणी-3	-	सदस्य :	डॉ. एस.एच. कुरैशी, शा. स्ना. महा. शिवपुरी, डॉ. रेनू राजेश, शा. नेहरू महा. अशोकनगर, म.प्र.
(द)	श्रेणी-4	-	सदस्य :	डॉ. अविनाश तिवारी, प्राध्यापक, वनस्पतिशास्त्र अध्ययनशाला, जीवाजी विश्वविद्यालय, ग्वालियर
(इ)	श्रेणी-5	-	सदस्य :	कु. रीना ओझा
(य)	श्रेणी-6	-	सदस्य :	श्रीमती चरनजीत मेहता, शा. वी.आर.जी. महा., मुरार, ग्वालियर डॉ. ए.सी. रघुवंशी, शा. आदर्श विज्ञान महा., ग्वालियर डॉ. आर.एन. चतुर्वेदी, कुशलनगर, गांधीनगर, ग्वालियर डॉ. जी.के. श्रीवास्तव, शा. स्ना. महा., दतिया

(प्रो. संजय स्वर्णकार)  
अकादमिक सचिव  
प्रतिलिपि:-

(प्रो. सरोज मोदी)  
प्राचार्य

1. अध्यक्ष, अध्ययन मंडल, वनस्पतिशास्त्र विषय की ओर सूचनार्थ।
2. समस्त सदस्य, अध्ययन मंडल, वनस्पतिशास्त्र विषय की ओर सूचनार्थ।
3. डॉ. आर. सी. उपाध्याय, परीक्षा नियंत्रक, शा. के.आर.जी. कालेज, ग्वालियर की ओर सूचनार्थ।

(प्रो. संजय स्वर्णकार)  
अकादमिक सचिव

(प्रो. सरोज मोदी)  
प्राचार्य

अध्ययन मंडल विभाग

अध्ययन मंडल की बैठक का कार्यवाही विवरण

नवीन सत्र 2017-18 हेतु अध्ययन मंडल विषय से सम्बंधित

अध्ययन मंडल की बैठक आज दिनांक 30 जून, 2017 को प्रातः 11:00 बजे

अध्ययन मंडल विभाग में आयोजित की गई, जिसमें निम्नानुसार उपस्थिति रही -

1. डॉ. वी.एम. कुलकर्णी BML 30/6/17
2. डॉ. मधुसूदन शर्मा 30/6/17
3. डॉ. लक्ष्मी पांडे Sankar 30/6/17
4. डॉ. डी.एल. शर्मा 30/6/17
5. डॉ. श्री कुलकर्णी P. Kulkarni 30/6/17
6. डॉ. एम.एल. कुलकर्णी 30/6/17
7. डॉ. रंजु राजेश
8. डॉ. आदिनाथ शिंदे AB
9. डॉ. यशजीन के.एम. C. के.
10. डॉ. श.बी. रघुवंशी 30/6/17
11. डॉ. आर.एन. चव्हाण
12. डॉ. जी.से. श्रीवास्तव 30/6/17

अध्ययनमंडल की बैठक की कार्यवाही निम्नानुसार रही -

1. ~~9944/21/22~~ विषय के स्नातक स्तर के प्रथम वर्ष के पाठ्यक्रम अंक योजना सहित सत्र 2017-2018 हेतु अध्ययनमंडल द्वारा मान्य किया जाता है।
2. ~~9944/21/22~~ विषय के स्नातक स्तर के तृतीय, चतुर्थ, पंचम एवं षष्ठ सेमेस्टर के पाठ्यक्रम अंक योजना सहित सत्र 2017-2018 हेतु अध्ययनमंडल द्वारा मान्य किया जाता है।
3. ~~9944/21/22~~ विषय के स्नातकोत्तर स्तर के प्रथम वर्ष के पाठ्यक्रम अंक योजना सहित सत्र 2017-2018 हेतु अध्ययनमंडल द्वारा मान्य किया जाता है।
4. ~~9944/21/22~~ विषय के स्नातकोत्तर स्तर के तृतीय, एवं चतुर्थ, सेमेस्टर के पाठ्यक्रम अंक योजना सहित सत्र 2017-2018 हेतु अध्ययनमंडल द्वारा मान्य/अथवा आंशिक संशोधन के साथ मान्य किया जाता है।
5. ~~9944/21/22~~ विषय की सत्र 2017-2018 में होने वाली परीक्षाओं हेतु संलग्न परीक्षकों की सूची को अध्ययनमंडल द्वारा मान्य किया जाता है।
6. विभाग में सत्र 2017-2018 में यदि कोई शोध संगोष्ठी/कार्यशाला/अधिवेशन/अध्ययन भ्रमण आदि के आयोजन का प्रस्ताव है तो उसका विवरण एवं अनुशंसा-----

① Workshop on Training on Techniques in Botany  
Practicals - Co-ordinator - Dr. Madhulaxmi Sharma

② Educational tour - One long trip - Estimated exp  
for Chitrakoot - Appx. 5000/-  
- Three local trips - Estimated  
exp 7500/-

7. यदि विभाग में स्ववित्तीय योजना के तहत कोई पाठ्यक्रम/अतिरिक्त विषय/डिप्लोमा कोर्स/सर्टिफिकेट कोर्स प्रारंभ करने की योजना हो तो उसका विवरण एवं अनुशंसा।

Dept of Botany has decided to launch one short term (Skill based) course on Herbarium Techniques of one month duration under the Ordinance short-term course.

8. यदि अन्य कोई विषय हो तो उसका विवरण एवं अनुशंसा।

KRC College, 2017  
course co-ordinator -  
Pandi,

हस्ताक्षर अध्ययन मंडल अध्यक्ष एवं समस्त सदस्य

1-Dr. C.K. Shivakshi

Glee  
30/6/17

Dr. J. S. ...  
30/6/17

Dr. ...  
30/6/17

Dr. ...  
30/6/2017

Dr. ...  
30/06

Dr. ...  
30/6/17

## PROPOSAL FOR WORKSHOP

Dept. of Botany, Microbiology and Biotechnology

TITLE: TRAINING ON TECHNIQUES IN BOTANY PRACTICALS.

### Introduction:

There has been a general observation that the students of undergraduate and post-graduate classes face many difficulties in the understanding of techniques during the performance of botany practicals. With this view in mind the present workshop is proposed to provide a better understanding and knowledge about the technique used in practical exercises.

### Objective:

The training given to the students will be very much helpful in the better performance of practicals.

### Workshop Programme:

This will be a one-day workshop with the following programme

1. Registration of students
2. Inauguration
3. Technique of DNA isolation and separation of DNA by gel electrophoresis.
4. Practical exercise on angiosperm taxonomy.
5. Working and handling of apparatus and

instruments.

c. Validatory function.

Justification:

To provide understanding of the technique and solve problems and difficulties that come during the performance of practicals in laboratory.

Eligible Participants:

Students of UG and PG classes from Botany, Microbiology and Biotechnology from local colleges.

Signature

30/6/17

P. Karthika

Signature

Signature

Signature



कार्यालय आयुक्त, उच्च शिक्षा, मध्यप्रदेश

सतपुड़ा भवन, भोपाल-462004

क्रमांक: 7/0/55 आउशि/शाखा-5'अ'/2017, भोपाल, दिनांक:-08/06/2017

प्रति,

1. कुलसचिव, समस्त विश्वविद्यालय पारम्परिक (07) म.प्र.
2. संभागीय अतिरिक्त संचालक, उच्च शिक्षा (08)
3. प्राचार्य, समस्त शासकीय महाविद्यालय/अशासकीय महाविद्यालय म.प्र.

विषय- वार्षिक परीक्षा पद्धति के पाठ्यक्रमों के मूल्यांकन व अंको का पुर्ननिर्धारण विषयक।  
संदर्भ:- केन्द्रीय अध्ययन मण्डल की बैठक दिनांक 27 एवं 28 अप्रैल 2017।

विषयान्तर्गत लेख है कि प्रदेश के महाविद्यालयों के लिए पाठ्यक्रमों में द्वि-प्रश्नपत्र प्रणाली में नियमित विद्यार्थियों के लिए 20 अंको का आंतरिक मूल्यांकन (10 अंक त्रैमासिक एवं 10 अंक छ:माही) के साथ 40-40 अंको के सैद्धान्तिक दो प्रश्न-पत्र होंगे। इस तरह कुल 80 अंक सैद्धान्तिक प्रश्न पत्र के लिए रहेंगे। जिसमें वस्तुनिष्ठ, लघु उत्तरीय एवं दीर्घ उत्तरीय प्रश्न होंगे। अमहाविद्यालयीन (स्वाध्यायी) विद्यार्थियों के लिए प्रति प्रश्न पत्र 50 अंको का होगा। प्रायोगिक विषयों के लिए 50 अंको की प्रायोगिक परीक्षा होगी जो नियमित एव अमहाविद्यालयीन (स्वाध्यायी) होगी।

उपरोक्त निर्देशों का कड़ाई से पालन सुनिश्चित किया जाए।

(नीरज मण्डलोई)

आयुक्त

उच्च शिक्षा, मध्यप्रदेश

पृ. क्रमांक: 7// /55/आउशि/शाखा-5'अ'/2017,

भोपाल, दिनांक:-08/06/2017

प्रतिलिपि

1. विशेष कर्तव्यस्थ अधिकारी, माननीय मंत्री जी उच्च शिक्षा मध्यप्रदेश शासन, भोपाल।
2. स्टॉफ ऑफिसर, प्रमुख सचिव उच्च शिक्षा, मंत्रालय, भोपाल।
3. विशेष कर्तव्यस्थ अधिकारी विश्वविद्यालय समन्वय प्रकोष्ठ उ.शि.वि. मंत्रालय, भोपाल।
4. कुलपतिगण, समस्त पारम्परिक विश्वविद्यालय, मध्यप्रदेश।
5. अध्यक्ष/सदस्य, समस्त केन्द्रीय अध्ययन मण्डल समस्त विश्वविद्यालय मध्यप्रदेश।

(डॉ. ए.एस.यादव)

विशेष कर्तव्यस्थ अधिकारी

उच्च शिक्षा, मध्यप्रदेश

30/6/17

3-7

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**Department of Higher Education, Govt. of M.P.**  
**Under Graduate Annual Pattern Syllabus**  
**As recommended by Central Board of Studies and approved by Governor of M.P.**

उच्च शिक्षा विभाग, म.प्र. शासन  
 स्नातक कक्षाओं के लिये वार्षिक पद्धति अनुसार पाठ्यक्रम  
 केन्द्रीय अध्ययन मण्डल द्वारा अनुशसित तथा म0प्र0 के राज्यपाल द्वारा अनुमोदित

**Syllabus For Degree ( B.Sc) Course**  
**Subject – Botany**  
**Year – 2017 Onwards**

S.NO.	Class	Paper	Title of the Paper	Marks Theory	Marks CCE	Total Marks	Year
1	B.Sc Ist Year	Ist	Diversity of Lower Plants	42.5	7.5	50	2017-18
	B.Sc Ist Year	IInd	Diversity of Higher Plants	42.5	7.5	50	
	B.Sc Ist Year	PRACTICAL ( Based on Paper I & II)				50	
2	B.Sc IInd Year	Ist	Structure Development & Reproduction of Flowering Plants	42.5	7.5	50	2018-19
	B.Sc IInd Year	IInd	Plant Ecology Biodiversity and Phytogeography	42.5	7.5	50	
	B.Sc IInd Year	PRACTICAL ( Based on Paper I & II)				50	
3	B.Sc IIIrd Year	Ist	Plant Physiology & Biochemistry	42.5	7.5	50	2019-20
	B.Sc IIIrd Year	IInd	Cell Biology Genetics & Biotechnology	42.5	7.5	50	
	B.Sc IIIrd Year	PRACTICAL ( Based on Paper I & II)				50	

*BM*  
 28.4.17  
 (Dr. ARS) (Chaitanya)

*BM*  
 28.4.17  
 (DR. S. CHITNIS)

*BM*  
 R. C. V. S.

*Shival*  
 28/4/17  
 Suman Tripathi

*BM*  
 28/4/17  
 (KIRTI JAIN)

*BM*  
 28/4/17  
 (S. Shrivastava)

*BM*  
 28.4.17  
 (U.M. CHITNIS)

*Sie Chichy*  
 (S.K. Mishra)

*BM*  
 30.6.17

*BM*  
 30.6.17

*BM*  
 30.6.17

*BM*  
 30.6.17

*BM*  
 30.6.17



**Unit-5 Pteridophyta : Important characters and Classification. Stellar organization. Morphology and anatomy of *Rhynia*. Structure; anatomy and reproduction in *Lycopodium*, *Selaginella*, *Equisetum* and *Marsilea*.**

टेरिडोफाइटा : प्रमुख लक्षण एवं वर्गीकरण। स्टीलर संगठन, राहिनिया की बाह्य एवं आंतरिक संरचना। लाइकोपोडियम, सिलेजिनेला, इक्वीसिटम एवं मारसीलिया की बाह्य तथा आंतरिक संरचना एवं प्रजनन।

Suggested Books :

1. G.M. Smith 1971 Cryptogamic Botany. Vol - I Algae & Fungi Tata McGraw Hill pub. Co. New Delhi.
2. G.M. Smith 1971 Cryptogamic Botany. Vol - II Bryophytes & pteridophytes. Tata McGraw Hill pub. Co. New Delhi.
3. O.P. Sharma, 1992. Text book of thallophyta McGraw Hill pub. Co.
4. O.P. Sharma, 1990. Text book of Pteridophyta Mcmillan indai Ltd.
5. P.D. Sharma, 1991. The Fungi. Rastogi & co. Meerut.
6. H.C. Dubey, 1990. An introduction of Fungi. Vikas pub. House pvt. Ltd.
7. P. Puri, 1980. Bryophyta Atma ram & sons, Delhi.
8. A. Clifton, 1995. Introduction to the Bacteria. Mcgrew Hillpub. Co. New delhi.

(Chaitan) 28/4/17  
 (DR. S. SUDHYANI) 28/4/17  
 (S.K. Mishra) 28/4/17  
 (U.M. Chitnis) 28/4/17  
 (DR. S. SHRIDHARA) 28/4/17  
 (Suman Trihal) 28/4/17  
 (KIRTI JAIN)  
 (P. KUMAR)  
 (S. K. MISHRA)  
 (U. M. CHITNIS)

Department of Higher Education, Govt. of M.P.  
Under Graduate Annual Pattern Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

उच्च शिक्षा विभाग म0प्र0 शासन  
स्नातक कक्षाओं के लिए वार्षिक पद्धति अनुसार पाठ्यक्रम  
केन्द्रीय अध्ययन मण्डल द्वारा अनुशसित तथा म0प्र0 के राज्यपाल द्वारा अनुमोदित  
सत्र 2017-18

Class/कक्षा	:	B.Sc. प्रथम वर्ष
Paper/प्रश्न पत्र	:	Second/द्वितीय
Subject/विषय	:	Botany
Title of Subject Group	:	Diversity of Higher Plants
विषय समूह का शीर्षक	:	उच्च पादपों की विविधता
Compulsory/अनिवार्य	:	Compulsory
Max. Marks अधिकतम	:	42.5+7.5 = 50 40

Particulars/विवरण

Unit-I	<p><b>Gymnosperm</b> : General characters and Classification of Gymnosperms. Heterospory and Origin of Seed Habit. Diversity of Gymnosperms. Geological Time Scale and Fossilization. Fossil Gymnosperms: <i>Lyginopteris</i> and <i>Williamsonia</i>.</p> <p>अनावृत्तबीजी : अनावृत्तबीजियों के सामान्य लक्षण एवं वर्गीकरण, विषमबीजाणुकता एवं बीज स्वभाव का उद्गम, अनावृत्तबीजियों की विविधताएं, भू-वैज्ञानिक समय सारणी एवं जीवश्मीभवन, अनावृत्तबीजी जीवाश्म : लाइजीनोप्टोरिस एवं विलियमसोनिया।</p>
Unit-II	<p><b>Gymnosperm</b> : Morphology, Anatomy, Reproduction and life cycle Of <i>Cycas</i>, <i>Pinus</i> and <i>Ephedra</i>.</p> <p>अनावृत्तबीजी : आकारिकी, आन्तरिक संरचना, प्रजनन तथा जीवन-चक्र: साइकस, पाइनस, एवं इफिड्रा।</p>
Unit-III	<p><b>Taxonomy</b> : Origin and Evolution of Angiosperms: Principles and rules of Botanical Nomenclature, Museum, Herbarium and Botanical Gardens; Classification of Angiosperms: Bentham and Hooker, and Modern trends in Taxonomy including Molecular taxonomy. APG IV System.</p> <p>वर्गीकी : आवृत्तबीजियों का उद्गम एवं विकास। वानस्पतिक नामकरण के सिद्धांत एवं नियम, संग्रहालय हरबेरियम एवं वानस्पतिक उद्यान, आवृत्तबीजियों का वर्गीकरण : बेन्थम तथा हुकर की पद्धति। वर्गीकी में आधुनिक प्रवृत्तियाँ एवं आणविक वर्गीकी, एपीजी IV पद्धति।</p>
Unit-IV	<p><b>Taxonomy</b> : Terminology for plant description in semi-technical language: Diagnostic characteristics and Economic Importance of Families – Ranunculaceae, Brassicaceae, Malvaceae, Rutaceae, Fabaceae, and Apiaceae.</p> <p>वर्गीकी : पौधों के वानस्पतिक विवरण की अर्ध तकनीकी शब्दावली। रेननकुलेसी, ब्रेसीकेसी, मालवेसी, रुटेसी, फेबेसी एवं एपिएसी कुलों के विशिष्ट लक्षण एवं आर्थिक महत्व।</p>
Unit-V	<p><b>Taxonomy</b> : Diagnostic characteristics &amp; Economic Importance to Families – Rubiaceae, Asteraceae, Apocynaceae, Solanaceae, Lamiaceae, Euphorbiaceae. Liliaceae, and Poaceae.</p> <p>वर्गीकी : रुबिएसी, ऐस्टेरेसी, ऐपासाइनेसी, सोलेनेसी, लेमिएसी, यूफोरविएसी, लिलिएसी एवं पोएसी कुलों के विशिष्ट लक्षण एवं आर्थिक महत्व।</p>

Handwritten signatures and dates at the bottom of the page, including names like 'S. Mishra', 'R.C. Verma', 'K. M. Mishra', 'S. JAIN', and dates like '28-4-17'.

**SUGGESTED READINGS :-**

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- Bhatnagar, S.P. and Moitra 1996. Gymnosperms. New Age International Limited, New Delhi.
- Davis. P.H. and Heywood, V.H. 1963, Principles of Angiosperm taxonomy. Oliver and Boyd, London.
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- Vasishta, P.C. 2005. Botany for degree students Voll-V, Gymnosperms. S. Chand & Company Ltd. Ramanagar, New Delhi-110055.

(Chaitanya) → 28/4/17  
 DR - S. C. DHANU  
 New Review S.K. Mishra (S.K. Mishra)  
 (U.M. Chitnis)  
 DR KIRTI JAIN

Shreedh 28/4/17  
 (Suresh Shreedh)  
 Dr S. Shrivastava 28.4.17

30/6/17

30/6/17  
 P. Kumar  
 30/6/17  
 30/6/17

# PRACTICAL SCHEME

## B.sc. I Year (BOTANY)

(BASED ON PAPER I & II)

50 MARKS

1.	Algae/Fungi	-	05
2.	Bryophyta/pteridophyta	-	05
3.	Gymnosperms	-	10
4.	Taxonomy	-	10
5.	Spotting (01-05)	-	10
6.	Viva Voce	-	05
7.	Sessionals	-	05

28.4.17  
 (Dr. R. S. Choudhary) (Dr. S. C. Dhyani)

R. C. Verma

S. K. Mishra  
 (S. K. Mishra)

Shree  
 28/4/17  
 (S. S. Shree)

Shirahara  
 28.5.17  
 (S. Shirahara)

KIRTI JAIN

30.6.17

30-6-17

30-6-17

P. K. K...

30-6-17

30-6-17

12

Department of Higher Education, Govt. of M.P.  
Under Graduate Annual Pattern Syllabus

As recommended by Central Board of Studies and approved by the Governor of M.P.

उच्च शिक्षा विभाग म0प्र0 शासन

स्नातक कक्षाओं के लिए वार्षिक पद्धति अनुसार पाठ्यक्रम

केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म0प्र0 के राज्यपाल द्वारा अनुमोदित

सत्र 2018-19

Class/कक्षा	:	B.Sc. द्वितीय वर्ष
Paper/प्रश्न पत्र	:	First/प्रथम
Subject/विषय	:	Botany
Title of Subject Group	:	Structure, Development & Reproduction of Flowering Plants
विषय समूह का शीर्षक	:	पुष्पीय पौधों की संरचना, विकास एवं प्रजनन
Compulsory/अनिवार्य	:	Compulsory
Max. Marks अधिकतम	:	42.5+7.5 = 50 40

Particulars/विवरण

Unit-I	<p><b>Tissue System.</b> Types of vascular bundles, apical meristem, Classification of meristem. The Root System : Root apical meristem. Differentiation of primary and secondary tissues and their role. Anatomy of Monocot and Dicot root. Secondary growth in root. Modification of root for Various Functions, Interaction of root with microbes.</p> <p>ऊतक तंत्र, संवहन पूल के प्रकार, शीर्षस्थ प्रविभाजी ऊतक, प्रविभाजी ऊतक का वर्गीकरण। जड़ तंत्र : जड़ का शीर्षस्थ प्रविभाजी ऊतक: प्राथमिक एवं द्वितीयक ऊतकों का विभेदन एवं उनके कार्य। एकबीजपत्री जड़ एवं द्विवीबीजपत्री जड़ की आन्तरिक संरचना, जड़ में द्वितीयक वृद्धि। विभिन्न कार्यों हेतु जड़ के रूपान्तरण। सूक्ष्मजीवों के साथ जड़ की पारस्परिक क्रिया।</p>
Unit-II	<p><b>The Shoot System :</b> Shoot apical meristem and histological organization. Anatomy of Monocot and Dicot Stem. Vascular cambium and its functions. Secondary growth in stem, characteristics of growth rings: sapwood and heart wood. Secondary Phloem, Cork Cambium and Periderm. Anomalous Secondary growth in <i>Nyctanthus</i>, <i>Boerhavia</i>, <i>Achyranthus</i>, <i>Leptadenia</i>, <i>Salvadora</i>, <i>Bignonia</i> and <i>Dracaena</i>.</p> <p>प्ररोह तंत्र : प्ररोह शीर्षस्थ विभज्योतक एवं ऊतकीय संगठन, एकबीजपत्री एवं द्विवीजपत्री के तने की आन्तरिक संरचना। संवहन एधा एवं उसके कार्य। तने में द्वितीयक वृद्धि, वलय की विशेषताएं, रसदारु एवं कठोरदारु। द्वितीयक फ्लोएम, कार्क केम्बियम एवं परिचर्म। तने में असामान्य वृद्धि - निक्टैन्थस, बोरहाविया, एकाइरेन्थस, लेफ्टाडीनिया, सात्वाडोरा, विग्नोनिया, ड्रेसीना।</p>
Unit-III	<p><b>The Leaf System:</b> Origin and development of leaf. Diversity in size, shape and arrangement. Internal structure of Dicot and Monocot leaf. Adaptations to photosynthesis and water stress, senescence and abscission.</p> <p>पर्ण तंत्र : पर्ण की उत्पत्ति एवं विकास, प्रमाण, आकार एवं विन्यास में विविधताएं, एकबीजपत्री एवं द्विवीजपत्री पर्ण की आंतरिक संरचना, प्रकाश संश्लेषण एवं जलीय प्रतिबल का अनुकूलन जीर्णता एवं विलगन।</p>

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<b>Unit-IV</b>	<b>Embryology</b> : Concept of flower as a modified shoot. Structure of Anther, Microsporogenesis and Male Gametophyte. Structure of Pistil, Ovules, Megasporogenesis and Development of Female Geametophyte (Embryo Sac) and its types. Pollination – Mechanism and Agencies of Pollination, Pollen Pistil interactions and Self incompatibility.
	भूणिकी : पुष्प एक रूपांतरित प्ररोह की अवधारणा। परागकोष की संरचना लघुबीजाणुजनन एवं नर युग्मकोद्भिद। स्त्रीकेसर की संरचना, बीजाण्ड, गुरुबीजाणुजनन, मादा युग्मकोद्भिद का विकास (भ्रूण कोष) एवं प्रकार। परागण-परागण की प्रक्रिया एवं एजेन्सी, पराग स्त्रीकेसर की पारस्परिक क्रिया एवं स्वअनिषेच्यता।
<b>Unit-V</b>	<b>Embryology</b> : Double Fertilization and triple fusion. Development and types of endosperm and its morphological nature, Development of Embryo in Monocot and Dicot plants, Fruit development and maturation, seed structure and dispersal. Mode of Vegetative Propagation.
	भूणिकी : द्विनिषेचन एवं त्रिसंयोजन। भ्रूणपोष का विकास, प्रकार एवं इसकी आकारिकीय प्रकृति। एकबीजपत्रीय और द्विबीजपत्रीय पौधों में भ्रूण का विकास। फल का परिवर्धन एवं परिपक्वता, बीज की संरचना एवं प्रकीर्णन। कायिक प्रवर्धन के प्रकार।

**SUGGESTED READINGS :-**

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- Heywood, V.H. & Moore, D.M. (eds) 1984. Current Concepts in Plant Taxonomy. Academic press, London.
- Jones, S.B. Jr. And Luchisnger, A.E. 1986, Plant Taxonomy (III edition) Mc Graw Hill Book Co. New York.
- Maheshwari, P. 1978. Plant Embryology. Pandey, B.P. 2010. A Text book of Botany-Angiosperms, S. Chand & Company Ltd. Ramnager, new Delhi-110055.
- Radford, A.E. 1986. Fundamentals of Plant Systematics, Harper and Row, New York.
- Shrivastava and Das, Modern text book of botnay vol.III & IV.
- Singh, V., Pande P.C. and Jain, D.K. Structure & Development in Angiosperms. Rastogi Publication, Meerut.

(Chairperson) 28/4/17  
 (Suman Tripathi) 28/4/17  
 (S. S. Shrivastava) 28/4/17  
 (S.K. Mishra) 28/4/17  
 (U.M. Chaturvedi) 28/4/17  
 (K.R. Jain) 28/4/17  
 (B. Singh) 28/4/17  
 (P. K. Mishra) 30/6/17  
 (30/6/17)

Department of Higher Education, Govt. of M.P.  
Under Graduate Annual Pattern Syllabus

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उच्च शिक्षा विभाग म0प्र0 शासन  
स्नातक कक्षाओं के लिए वार्षिक पद्धति अनुसार पाठ्यक्रम  
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म0प्र0 के राज्यपाल द्वारा अनुमोदित  
सत्र 2018-19

Class/कक्षा	:	B.Sc. द्वितीय वर्ष
Paper/प्रश्न पत्र	:	Second/द्वितीय
Subject/विषय	:	Botany
Title of Subject Group	:	Plant Ecology, Biodiversity and Phytogeography
विषय समूह का शीर्षक	:	पादप पारिस्थितिकी, जैव विविधता एवं पादप भौगोलिकी
Compulsory/अनिवार्य	:	Compulsory
Max. Marks अधिकतम	:	42.5+7.5 = 50 40

Particulars/विवरण

<p><b>Unit-I</b></p>	<p><b>Ecosystems</b> : Structure and types, Biotic and Abiotic components, Trophic levels, Food Chain, Food Web, Ecological Pyramids, Energy Flow, Concept of Biogeochemical Cycles: Gaseous Liquid and Sedimentary cycles: Carbon, Nitrogen, Water, Phosphorus and Sulphur cycle.</p> <p>पारिस्थितिक तंत्र : संरचना एवं प्रकार जैविक एवं अजैविक घटक, पोषण स्तर, खाद्यशृंखला खाद्यजाल, पारिस्थितिक पिरामिड, ऊर्जा प्रवाह। जैव भू-रासायनिक चक्र: अवधारणा, गैसीय, द्रव तथा अवसादीय चक्र: कार्बन, नाइट्रोजन, जल, फास्फोरस एवं सल्फर चक्र।</p>
<p><b>Unit-II</b></p>	<p><b>Ecological adaptations</b> : Morphological, Anatomical and physiological responses water adaptation (Hydrophytes and Xerophytes) Temperature adaptation (Thermoperiodism and Vernalization), Light adaptation (Heliophytes and Sciophytes), Photoperiodism, Plant Succession: causes, trends and processes, Types of succession – Hydrosere and Xerosere.</p> <p>पारिस्थितिक अनुकूलन : आकारिकी, आंतरिकी तथा कार्यिकी अनुक्रिया, जल अनुकूलन (जलोदभिद तथा मरूदभिद), तापक्रम अनुकूलन (तापकालिता एवं वसतीकरण) प्रकाश अनुकूलन (प्रकाशरागी तथा छायारागी) प्रकाश दीप्तीकालिता। पादप अनुक्रमण : कारण, प्रवृत्ति एवं प्रक्रिया, अनुक्रमण के प्रकार हाइड्रोसियर (जलीय अनुक्रमण) जीरोसियर, (शुष्क अनुक्रमण)</p>
<p><b>Unit-III</b></p>	<p><b>Biodiversity &amp; Poputation Ecology</b> : Distribution patterns, Density, Natality, Mortality, Growth curves, Ecotypes and Ecads : Community Ecology: Frequency, Density, Abundance, Cover and Life forms. Biodiversity : Basic concept, definition, Importance, Biodiversity of India. Hotspots, in situ and ex-situ conservation. Biosphere reserves, Sancturies and National parks of Madhya Pradesh. Endangered and Threatened species, red data book.</p> <p>जैवविविधता एवं जनसंख्या पारिस्थितिकी : वितरण प्रणाली, घनत्व, जन्मदर, मृत्युदर, वृद्धिवक्र, इकोटाइप एवं इकोइस, समुदाय पारिस्थितिकी : आवृत्ति, घनत्व, बहुलता, आच्छादन एवं जीवनरूप। जैवविविधता-आधारभूत परिकल्पना, परिभाषा, महत्व, भारत की जैवविविधता, तप्तस्थल, स्वस्थाने तथा बाह्य स्थाने संरक्षण। जैव मण्डल संचयन, म0प्र0 के अभयारण एवं राष्ट्रीय उद्यान, विलुप्तप्राय तथा खतरे में पड़ी प्रजातियाँ, रेड डाटाबुक।</p>

Handwritten signatures and dates at the bottom of the page, including names like 'Sial', 'R.V. Verma', 'C.K. Mishra', and dates like '28.11.17', '28.11.17', '14/17', '20/11/17', '30/11/17'.

<b>Unit-IV</b>	<b>Soil &amp; Pollution</b> : Physical and chemical properties, soil formation, Development of Soil Profile, Soil classification, Soil composition, soil factors; Pollution: Definition, Types & Causes; Global Warming, Acid Rain, Climate Change and Ozone Layer & Ozone Hole.  मृदा एवं प्रदूषण : भौतिक एवं रासायनिक गुण मृदा निर्माण, मृदा परिच्छेदिका का विकास, मृदा का वर्गीकरण, मृदा संगठन मृदा कारक। प्रदूषण: परिभाषा प्रकार एवं कारण, वैश्विक तपन, अम्लीय वर्षा जलवायु परिवर्तन, ओजोन परत एवं ओजोन छिद्र।
<b>Unit-V</b>	<b>Phytogeography</b> : Phytogeographical regions of India. Vegetation types of Madhya Pradesh. Natural resources: definition and classification. Conservation and management of natural resources, Land resource management, Water and wet land resource management.  पादप भौगोलिकी : भारत के पादप भौगोलिक क्षेत्र। म0प्र0 के वानस्पतिक प्रकार। प्राकृतिक स्रोत-परिभाषा एवं वर्गीकरण, संरक्षण एवं प्रबंधन। भू-स्रोत प्रबंधन। जल एवं आर्द्रभूमि स्रोत प्रबंधन।

28.4.17  
 (Dr. Arsi) (Chairperson) →  
 (DR S. C. DHYAM) 28.4.17  
 (Dr. S. Srivastava) 28/4/17  
 (KIRTI JAIN) 28.4.17  
 (Dr. M. Chitris) 28.4.17  
 (S.K. Mishra) 28.4.17  
 (Suman Trivedi) 28/4/17  
 P. Kumar 30/6/17  
 30/6/17  
 30/6/17

SUGGESTED READINGS :-

1. Benerjee, S. 1998. Bio Diversity conservation - Agrobotamica, Bikaner.
2. Kumar, U.K. 2006. Bio diversity principles and conservation, A grobios, Jodhpur.
3. Odum, E.P. 5<sup>th</sup> ed. 2004 Fundamentals of Ecology, Natraj Publisher, Dehradun.
4. Puri, G.S. 1960. Indian Forest Ecology.
5. Sharma, P.D. 7<sup>th</sup> ed. 1998. Ecology and Environment, Rastogi Publication, Shivaji Road, Meerut. 250002. India
6. Shukla, R.S. & Chandel, P.S. 2006. A Text Book of Plant Ecology.

*bn*  
28.4.17  
Dr. Arsin (chairperson)

*o. ady*  
28.4.17  
(D.K. S. C. DTHAHI)

*Reva*  
R.C. Verma  
S.K. Mishra  
(S.K. Mishra)

*Udit*  
28.4.17  
(U.M. Choudhary)

*Shred*  
28/4/17  
(Suman Trivedi)

*S. Srivastava*  
28/4/17  
(S. Srivastava)

*30617*  
*Sharma*

*3062*  
*Sharma*

*P. Kumar*  
30/6/17

*Call* *Shi*

*[Faint handwritten notes and signatures]*

PRACTICAL SCHEME

B.sc. II Year (BOTANY)

(BASED ON PAPER I & II)

50 MARKS

1.	Section Cutting-Root/Stem/Leaf	-	10
2.	Embryology – Anther/Ovule/Placentation	-	05
3.	Exercise based on Ecology	-	10
4.	Exercise based on Phytogeography/National Parks	-	05
5.	Spotting (01-05)	-	10
6.	Viva voce	-	05
7.	Sessionals	-	05

Dr. Arvind Chaturvedi  
28.4.17

Dr. S. Chidhambaram  
28.4.17  
(DR. S. CHIDHAMBARAM)

R.C. Verma

S.K. Mishra  
(S.K. Mishra)

Shreed  
28/4/17  
(Shreen Tripathi)

S. Srivastava  
28/4/17  
(S. Srivastava)

Kirti Jain

U.P. Chitnis  
28.4.17  
(U.P. CHITNIS)

Dr. Saurabh  
30.6.17

Dr. P. K. ...  
30/6/17

P. K. ...  
30/6/17

Dr. ...

4

Department of Higher Education, Govt. of M.P.  
Under Graduate Annual Pattern syllabus  
As recommended by central Board of Studies and approved by Governor of M.P.

उच्च शिक्षा विभाग, म.प्र. शासन  
स्नातक कक्षाओं के लिये वार्षिक पद्धति अनुसार पाठ्यक्रम  
केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म0प्र0 के राज्यपाल द्वारा अनुमोदित  
वर्ष 2019-2020

Class/ कक्षा	:	B.Sc. तृतीय वर्ष
Paper/ प्रश्न पत्र	:	First / प्रथम
Subject/विषय	:	Botany /वनस्पति विज्ञान
Title of Subject Group	:	Plant Physiology and Biochemistry
विषय समूह का शीर्षक	:	पादप कार्यिकी एवं जैव रसायन
Compulsory/अनिवार्य	:	Compulsory
Max. Marks अधिकतम	:	42.5+7.5 = 50 40

Unit-1	<p><b>Plant water Relations</b> : Properties of water, Importance of water in plant life, Diffusion, Osmosis &amp; Osmotic relation to plant cell. Water Absorption. Ascent of Sap. Transpiration : Structure &amp; Physiology of Stomata, Mechanism of Transpiration, Factors affecting the rate of Transpiration.</p> <p>पादप जल संबंध : जल के गुण, पादप जीवन में जल का महत्व, विसरण, परासरण तथा पादप कोशिका के परासरण संबंध, जल अवशोषण, रसारोहण। वाष्पोत्सर्जन : रंध की संरचना एवं कार्यिकी, वाष्पोत्सर्जन की क्रियाविधि, वाष्पोत्सर्जन को प्रभावित करने वाले कारक।</p>
Unit-2	<p><b>Plant Nutrition &amp; Biomolecules</b> : Mineral Nutrition, Essential Macro &amp; Micro Nutrients and their role, absorption of mineral nutrients and hydroponics, Translocation of organic solutes. <b>Biomolecules</b> : Structure classification and functions of Carbohydrates Amino Acids, Proteins and Lipids.</p> <p>पादप पोषण एवं जैविक अणु : खनिज पोषण, आवश्यक दीर्घ एवं लघु पोषक तत्व एवं उनकी भूमिका, खनिज लवणों का अवशोषण, जल संवर्धन, कार्बनिक विलेय का स्थानांतरण। जैविक अणु - कार्बोहाइड्रेट, अमीनो अम्ल, प्रोटीन और लिपिड की संरचना, वर्गीकरण और कार्य।</p>
Unit-3	<p><b>Photosynthesis</b> : Chloroplast, Photosynthetic pigments, Concept of two photosystems, Light reaction, Red drop, Emerson's effect, Dark reaction - Calvin cycle, Hatch &amp; Slack cycle, CAM cycle, Factors affecting rate of photosynthesis &amp; Photorespiration.</p> <p>प्रकाश संश्लेषण : क्लोरोप्लास्ट, प्रकाश संश्लेष्य वर्णक, दो प्रकाश तंत्र की अवधारणा, प्रकाश अभिक्रिया, अंधकार अभिक्रिया, रेड ड्रॉप, इमरसन प्रभाव, कैलविन चक्र, हैच एवं स्लेक चक्र, सी ए एम चक्र, प्रकाश संश्लेषण को प्रभावित करने वाले कारक एवं प्रकाशीय श्वसन।</p>

28/4/17  
J. K. Mishra  
(Chairman)

30/6/17  
(Chairman)

25/4/17  
(DR. S. C. DHYANI)

30/4/17  
Shival  
K. K. Mishra

30/4/17

<p><b>Unit-4</b></p>	<p><b>Respiration : Mitochondria, aerobic and anaerobic respiration, fermentation, Respiratory coefficient, mechanism of respiration – Glycolysis, Kreb's cycle, Pentose Phosphate Pathway, Electron transport system, Factors affecting rate of respiration, Redox potential and theories of ATP Synthesis.</b></p> <p>श्वसन : माइटोकॉन्ड्रिया, आक्सी एवं अनाक्सी श्वसन, किण्वन श्वसन गुणांक, श्वसन की क्रियाविधि – ग्लाइकोलिसिस, क्रेब चक्र, पेन्टोस फास्फेट मार्ग, इलेक्ट्रान अभिगमन तंत्र, श्वसन की दर को प्रभावित करने वाले कारक, आक्सीकरण – अपचयन विभव, ए.टी.पी. संश्लेषण के सिद्धांत।</p>
<p><b>Unit-5</b></p>	<p><b>Enzymology &amp; Plant Hormones : Classification, nomenclature and characteristics of Enzymes, Concept of holoenzyme, apoenzyme, co-enzyme and co-factors, Mode &amp; mechanism of enzyme action, Factors affecting enzyme activity.</b></p> <p><b>Plant Hormones : Discovery, Structure mode of action and role of auxins, Gibberellins, Cytokinin, Abscissic Acid and Ethylene.</b></p> <p>एंजाइमोलॉजी एवं पादप हार्मोन्स : विकसो का वर्गीकरण नामकरण एवं अभिलाक्षणिक गुण, होलोएन्जाइम, एपोएन्जाइम, कोएन्जाइम एवं कोफेक्टर्स की अवधारणा, एन्जाइम की कार्यप्रणाली एवं क्रियाविधि, एंजाइम क्रिया को प्रभावित करने वाले कारक। पादप हार्मोन : आक्जिन, जिबबरेलिन, सायटोकायनिन, एब्सीसिक अम्ल एवं इथीलीन की खोज, संरचना कार्य प्रणाली एवं भूमिका।</p>

SUGGESTED READINGS :-

- David, L.N. and Michael, M.C. 2000. Leheniger's Principle of Biochemistry, Macmillan worth Pub. New York, U.S.A.
- Gengulee, H.C. Das, Datta, C. and sen, S. 2007. College Botany Voll. I, New Central Book Agency (P) Ltd. Kolkata. 700009
- Hopkins, W.G. 1995. Introduction of Plant Physiology Pub. John Wiley and sons, New York.
- Taiz & Zeiger, E. 1998. Plant Physiology. Sinauer associates, Inc. Pub. Massachudetts, U.S.A.
- Salisbury & Ross – Plant Physiology.
- Devlin - Plant Physiology .
- Verma, S.K. & Verma, M.A. 1995. Text Book of Plant Physiology & Biotechnology. S. Chand & Company.
- Verma, V. 1995. Plant Physiology, Emkey Pub.

Handwritten signatures and dates:

- 28/4/17 (Chaitanya)
- 28/4/17 (DR. S.C. DHYANI)
- 28/4/17 (Kirti Jain)
- 28/4/17 (Mrs. Shrivastava)
- 28/4/17 (U.M. CHITNIS)
- 28/4/17 (S.K. Mishra)
- 30/6/17
- 29/6/17

**Department of Higher Education, Govt. of M.P.**  
**Under Graduate Annual Pattern Syllabus**  
**As recommended by Central Board of Studies and approved by the Governor of M.P.**

उच्च शिक्षा विभाग म0प्र0 शासन  
 स्नातक कक्षाओं के लिए वार्षिक पद्धति अनुसार पाठ्यक्रम  
 केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म0प्र0 के राज्यपाल द्वारा अनुमोदित  
 सत्र 2019-20

Class / कक्षा	:	B.Sc. तृतीय वर्ष
Paper / प्रश्न पत्र	:	Second/द्वितीय
Subject / विषय	:	Botany
Title of Subject Group	:	Cell Biology, Genetics and Biotechnology
विषय समूह का शीर्षक	:	कोशिका जैविकी, अनुवांशिकी एवं जैव प्रौद्योगिकी
Compulsory / अनिवार्य	:	Compulsory
Max. Marks अधिकतम	:	42.5+7.5 = 50 40

**Particulars/विवरण**

<b>Unit-I</b>	<p><b>The cell envelops and organelles:</b> plasma membrane, lipid bilayer structure, functions of the cell wall. Structure and function of cell organelles: Nucleus Chloroplast, Mitochondria, Golgibodies, ER, Peroxisome and Vacuole.</p> <p>कोशिका आवरण एवं कोशिकांग : प्लाज्मा झिल्ली, द्विस्तरीय लिपिड संरचना, कोशिका भित्ति के कार्य। कोशिकांगों की संरचना एवं कार्य : केन्द्रक, हरित लवक, माइटोकॉण्ड्रिया, गॉल्जीकाय, अतः द्रव्य जालिका, परऑक्सीसोम एवं रिक्तिकाएं।</p>
<b>Unit-II</b>	<p><b>Chromosomal organization :</b> Structure and functions of Chromosome, centromere and telomere. Nucleosome model, special types of chromosomes, Mitosis and Meiosis. Variation in chromosome Structure : Deletion, Duplication, Translocation and Inversion; Variation in chromosome number, Euploidy, Aneuploidy, DNA: The genetic material, DNA Structure and replication.</p> <p>गुणसूत्र संगठन : क्रोमोसोम, सेन्ट्रोमियर एवं टेलोमियर की आकारिकी एवं कार्य। न्यूक्लियोसोम मॉडल। विशेष प्रकार के क्रोमोसोम, समसूत्री एवं अर्धसूत्री विभाजन। गुणसूत्र संरचना में विभिन्नताएं : विलोपन, द्विगुणन, स्थानान्तरण एवं प्रतिलोमीकरण। गुणसूत्र संख्या में विभिन्नताएं। यूप्लॉयडी, एन्यूप्लॉयडी। डी.एन.ए. : अनुवांशिक पदार्थ। डी.एन.ए. की संरचना एवं पुनरावृत्ति।</p>
<b>Unit-III</b>	<p><b>Genetic inheritance: Mendelism:</b> laws of segregation and independent assortment; Linkage analysis; Interactions of genes. Cytoplasmic inheritance, Mutations: spontaneous and induced; Transposable elements; DNA damage and repair.</p> <p>अनुवांशिक वंशांगति : मेण्डलवाद : पृथक्करण एवं स्वतंत्र अपव्यहून के नियम, सहलग्नता विश्लेषण, जीन की अन्योन्य क्रियाएं। कोशिका द्रवीय वंशांगति, उत्परिवर्तन: स्वतः, प्रेरित उत्परिवर्तन, स्थानांतरणशील अवयव। डी.एन.ए. क्षति एवं सुधार।</p>

Handwritten signatures and dates at the bottom of the page, including names like Dr. Arsal Chaurasia, Dr. S. Chhaya, and S.K. Mishra, with dates such as 28.4.17 and 28.4.15.



<p><b>Unit-IV</b></p>	<p><b>Gene</b> : Structure of gene, genetic code, transfer of genetic information; Transcription, translation, protein synthesis, tRNA, and ribosomes. Regulation of gene expression in prokaryotes and eukaryotes.</p> <p>जीन : जीन की संरचना, आनुवांशिक कोड, आनुवांशिक सूचना का स्थानान्तरण, अनुलेखन अनुवाद, प्रोटीन संश्लेषण, ट्रांसफर आर.एन.ए., राइबोसोम। प्रोकैरियोट्स एवं यूकैरियोट्स में जीन अभिव्यक्ति का नियमन।</p>
<p><b>Unit-V</b></p>	<p><b>Biotechnology</b> : Definition; basic aspects of plant tissue culture; cellular totipotency, differentiation and morphogenesis Important achievements of biotechnology in agriculture.</p> <p><b>Genetic engineering</b>: Tools and techniques of recombinant DNA technology; cloning vectors; biology of Agrobacterium; vectors for gene delivery and marker genes. genomic and cDNA library: Gene mapping and chromosome walking.</p> <p>जैव प्रौद्योगिकी : परिभाषा, पादप ऊतक संवर्धन का आधारभूत तत्व, कोशीय टोटीपोटेन्सी, विभेदीकरण एवं मार्फोजेनेसिस, जैव प्रौद्योगिकी की कृषि में प्रमुख उपलब्धियाँ।</p> <p>अनुवांशिक अभियांत्रिकी : पुनर्योजक डी.एन.ए. तकनीकी के औजार एवं तकनीक, क्लोनल वाहक, एग्रोबैक्टीरियम की जैविकी, जीन डिलिवरी के वाहक तथा मार्कर जीन जीनोमिक तथा सी.डी.एन.ए. लाइब्रेरी, जीन मैपिंग तथा गुणसूत्र वाकिंग।</p>

**SUGGESTED READINGS :-**

1. Alberts B.D. Lewis, J. Raff, M. Rubens, K. Nad Watson I.D. 1999 molecular Biology of Cell Garland pub.Co. Inc. New York, U.S.A.
2. P.K. Gupta 1999 a text Book of Cell and Molecular Biology Rastogi Pub. Meerut India.
3. Kleinsmith L.J. and Molecular Biology (2<sup>nd</sup> edition) Harper Collins College Pub. New York USA.
4. P.K. Gupta Genetics Rastogi Pub. Meerut.
5. Sinha & Sinha Cytogenetics & Plant Breeding Vikas Pub.

Handwritten signatures and dates:

- 28.4.17 (DR. S. C. DHYANI)
- 28/4/17 (U.M. Chitnis)
- 28/4/17 (S.K. Mishra)
- 28/4/17 (Dr. S. Srivastava)
- 28/4/17 (Kirti Jain)
- 28/4/17 (Suman Tripathi)
- 30/6/17
- 30/6/17

PRACTICAL SCHEME

B.sc. III Year (BOTANY)

(BASED ON PAPER I & II)

50 MARKS

1.	Exercise based on Physiology	-	10
2.	Biochemical Test	-	05
3.	Exercise based on Cytology	-	10
4.	Exercise based on Genetic Problem	-	05
5.	Spotting (01-05)	-	10
6.	Viva Voce	-	05
7.	Sessionals	-	05

Dr. Arvind  
28.4.17  
(Dr. Arvind chairperson)

Dr. S. C. Dhyani  
28.4.17  
(DR. S. C. DHYANI)

Dr. A. C. Verma

Dr. S. Shrivastava  
28/4/17  
(S. Shrivastava)

S. K. Mishra  
(S. K. Mishra)

Dr. Sumit Tripathi  
28/4/17  
Sumit Tripathi

Dr. S. Shrivastava  
28/4/17  
(S. Shrivastava)

Dr. Kirti Jain  
28/4/17  
(U.M. CHITNIS)

Dr. P. K. ...  
30.6.17

Dr. Ramesh ...  
26.6.17

P. K. ...  
30/6/17

Dr. ...

शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय ग्वालियर (म.प्र.)  
 उच्च शिक्षा विभाग म.प्र. शारान  
 स्नातक स्तर पर सेमेस्टर पद्धति के अन्तर्गत एकल प्रश्न पत्र प्रणाली अनुसार पाठ्यक्रम  
 केन्द्रीय अध्ययन मण्डल द्वारा अनुशसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित

Department of Higher Education, Govt. of M.P.  
 Single Paper Pattern Syllabus for U.G. Classes Under Semester System  
 As recommended by Central Board of Studies and approved by  
 the Governor of M.P.

Syllabus for Degree (B.Sc.) course  
 Subject - BOTANY  
 Year - 2015 Onwards

Semester	Title of Paper	Maximum Marks	Year
B.Sc I	Diversity of Microbes and Cryptogams	85+15= 100	2014-15
B.Sc II	Diversity & Systematics of Seed Plants (Phanerogames)	85+15= 100	2014-15
B.Sc III	Structure, Development & Reproduction in Flowering Plants	85+15= 100	2015-16
B.Sc IV	Plant Ecology, Biodiversity and Phytogeography	85+15= 100	2015-16
B.Sc V	Plant Physiology and Biochemistry	85+15= 100	2016-17
B.Sc VI*	Cell Biology, Genetics and Biotechnology	85+15= 100	2016-17

\* Job oriented Project/Internship will be carried out in VI Semester for 60 hrs as per policy of Department of Higher Education.

30/6/17

30/6/17 P. K. ... 30/6/17

Dr. ...

शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय ग्वालियर (म.प्र.)  
 उच्च शिक्षा विभाग म.प्र. शासन  
 स्नातक स्तर पर सेमेस्टर पद्धति के अन्तर्गत एकल प्रश्न पत्र प्रणाली अनुसार पाठ्यक्रम  
 केन्द्रीय अध्ययन मण्डल द्वारा अनुशसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित

Department of Higher Education, Govt. of M.P.  
 Single Paper Pattern Syllabus for U.G. Classes Under Semester System  
 As recommended by Central Board of Studies and approved by  
 the Governor of M.P.  
 Effective from Session 2016 -17-18

Class / कक्षा : B. Sc.  
 Semester / सेमेस्टर : III Semester  
 Subject / विषय : Botany  
 Title of Subject Group : STRUCTURE, DEVELOPMENT &  
 REPRODUCTION IN FLOWERING PLANTS  
 विषय समूह का शीर्षक : पुष्पीय पौधों की संरचना, विकास एवं प्रजनन  
 Max. Marks अधिकतम अंक : 85+15 CCE =100

Particulars / विवरण

Unit-1	<p><b>The Root system:</b> Root apical meristem. Differentiation of primary and secondary tissues and their role. Anatomy of Monocot and Dicot root. Secondary growth in root. Morphological modification of root for storage, respiration and reproduction. Interaction of root with microbes.</p> <p>जड़ तंत्र : जड़ का शीर्ष विभज्योतक, प्राथमिक एवं द्वितीयक ऊतकों का विभेदन एवं उनके कार्य, एकबीजपत्री एवं द्विवीजपत्री जड़ की आन्तरिक संरचना, जड़ में द्वितीयक वृद्धि के आकारिकीय रूपान्तरण : संचयन, श्वसन एवं प्रजनन। सूक्ष्मजीवों के साथ जड़ की पारस्परिक क्रिया।</p>
Unit-2	<p><b>The Shoot system:</b> Shoot apical meristem and histological organization, Anatomy of Monocot and Dicot Stem : Vascular cambium and its functions, Secondary growth in stem: Characteristics of growth rings: Sapwood and Heart wood, Secondary Phloem, Cork Cambium and Periderm.</p> <p>प्ररोह तंत्र : प्ररोह शीर्षस्थ विभज्योतक एवं ऊतकीय संगठन, एकबीजपत्री एवं द्विवीजपत्री के तने की आन्तरिक संरचना, - संवहन एधा एवं उसके कार्य तने में द्वितीयक वृद्धि: वलय की विशेषताएं, : रसदारु एवं कठोरदारु द्वितीयक</p>

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- Jones, S.B. Jr. and Luchsinger, A.E. 1986, Plant taxonomy (III edition) Me Graw Hill Book Co. New York.
- Maheshwari, P.1978. Plant Embryology.
- Pandey, B. P. 2010. A Text book of Botany- Angiosperms, S. Chand & Company Ltd. Ramnagar, New Delhi- 110055.
- Radford, A.E. 1986. Fundamentals of Plant Systematics, Harper and Row, New York.
- Shrivastava and Das. Modern text book of Botany Vol-III & IV.
- Singh, V., Pande P.C. and Jain , D. K. Structure & Development in Angiosperms. Rastogi Publication, Meerut.

### Practical

#### Objectives

To provide knowledge about structure, development and reproduction in flowering plants.

- To provide skills of section cutting of angiosperms.
- To provide field experiences for studying sources of fire woods, timber yielding and medicinal plants.
- To familiarize the students with morphology and anatomy of flowers.
- To provide the knowledge of sexual reproduction.

#### Scheme of Practical Examination Semester III

	Marks: 50
<b>Time: 4 hrs</b>	
1- Exercise based on anatomy of root/stem.	10
2- Exercise based on anatomy of leaf.	10
3- Study of shoot apex/root apex/Ovules and Anthers .	5
4-Spotting- (1-5)	10
5-Viva- voce	5
6-Sessional	10
Total	50

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शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय ग्वालियर (म.प्र.)  
उच्च शिक्षा विभाग म.प्र. शारान  
स्नातक स्तर पर सेमेस्टर पद्धति के अन्तर्गत एकल प्रश्न पत्र प्रणाली अनुसार पाठ्यक्रम  
केंद्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित

Department of Higher Education, Govt. of M.P.  
Single Paper Pattern Syllabus for U.G. Classes Under Semester System  
As recommended by Central Board of Studies and approved by  
the Governor of M.P.  
Effective from Session 2016 -17-18

Class / कक्षा : B. Sc.  
Semester / सेमेस्टर : IV Semester  
Subject / विषय : Botany  
Title of Subject Group : PLANT ECOLOGY, BIODIVERSITY AND  
PHYTOGEOGRAPHY  
विषय समूह का शीर्षक : पादप पारिस्थितिकी, जैव विविधता एवं पादप भौगोलिकी  
Max. Marks / अधिकतम अंक : 85+15 CCE =100

**Particulars / विवरण**

Unit-1	<p><b>Ecosystems:</b> Structure and types, Biotic and Abiotic components, Trophic levels, Food chain, Food web, Ecological pyramids, Energy flow; Biogeochemical cycles: Concept, Gaseous and Sedimentary cycles, Carbon, Nitrogen, Phosphorus and Sulphur cycle.</p> <p>पारिस्थितिक तंत्र : संरचना एवं प्रकार, जैविक एवं अजैविक घटक, पोषी स्तर, खाद्यश्रृंखला खाद्यजाल, पारिस्थितिक पिरामिड, ऊर्जा प्रवाह; जैवभू रासायनिक चक्र : अवधारणा, गैसीय तथा अवसादीय चक्र, कार्बन, नाइट्रोजन फास्फोरस चक्र।</p>
Unit-2	<p><b>Ecological adaptations:</b> Morphological, Anatomical and Physiological responses Water adaptation (Hydrophytes and Xerophytes Temperature adaptation (Thermoperiodism and Vernalization), Light adaptation (Heliophytes and Sciophytes), Plant Succession: causes, trends and processes, Types of succession - Hydrosere and Xerosere.</p> <p>पारिस्थितिक अनुकूलन : आकारिकी, आंतरिकी तथा कार्यािकी अनुक्रिया, जल अनुकूलन (जलोद्भिद् तथा मरुद्भिद्), तापक्रम अनुकूलन(तापकालिता एवं वसंतीकरण) प्रकाश अनुकूलन (प्रकाशरागी तथा छायारागी) पादप अनुक्रमण :</p>

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	कारण, प्रवृत्ति एवं प्रक्रिया, अनुक्रमण के प्रकार हाइड्रोसियर (जलीय अनुक्रमण) जीरोसियर, (शुष्क अनुक्रमण)
<b>Unit-3</b>	<p><b>Population Ecology:</b> Distribution patterns, Density, Natality, Mortality, Growth curves, Ecotypes and Ecads; Community Ecology: Frequency, Density, Abundance, Cover and Life forms. Biodiversity: Basic concept, definition, Importance, Biodiversity of India, Hotspots, <i>in situ</i> and <i>ex situ</i> conservation. . Biosphere reserves, Sancturies and National parks of Madhya Pradesh. Endangered and Threatended species, red data book.</p> <p>जनसंख्या पारिस्थितिकी : वितरण प्रणाली, घनत्व, जन्मदर, मृत्युदर, वृद्धिवक्र, इकोटाइप एवं इकेड्स; समुदाय पारिस्थितिकी : आवृत्ति, घनत्व बहुलता, आच्छादन एवं जीवनरूप/जैवविविधता - आधारभूत परिकल्पना, परिभाषा, महत्व, भारत की जैवविविधता, तप्तस्थल स्वस्थाने तथा बाह्य स्थाने संरक्षण। जैव मण्डल संघयत, म.प्र. के अभयारण एवं राष्ट्रीय उद्यान, विलुप्तप्राय तथा खतरे में पड़ी प्रजातियों, रेड डाटाबुक।</p>
<b>Unit-4</b>	<p><b>Soil:</b> Physico-chemical properties, Soil formation, Development of Soil Profile, Soil classification, Soil composition, Soil factors; Pollution: Definition, Types &amp; Causes; Global warming, Climate change and Ozone hole.</p> <p>मृदा : भौतिक - रासायनिक गुण मृदा निर्माण, मृदा परिच्छेदिका का विकास, मृदा कारक मृदा का वर्गीकरण, मृदा संगठन प्रदूषण: परिभाषा, प्रकार एवं कारण; वैश्विक तपन, जलवायु परिवर्तन एवं ओजोन छिद्र।</p>
<b>Unit-5</b>	<p><b>Phytogeography:</b> Phytogeographical regions of India, Vegetation types of Madhya Pradesh. Natural resources -- definition and classification . Conservation and management of natural resources. Land resources management, Water and Wet land resource management.</p> <p>पादप भौगोलिकी : भारत के पादप भौगोलिक क्षेत्र, म.प्र. के वानस्पतिक प्रकार, । प्राकृतिक स्रोत- प्राकृतिक स्रोतों की परिभाषा एवं वर्गीकरण, प्रबंधन एवं संरक्षण। भू - स्रोत प्रबंधन। जल आर्द्रभूमि स्रोत प्रबंधन।</p>

### SUGGESTED READINGS:-

- Banerjee, S.1998. Bio diversity conservation- Agrobotamica, Bikaner.
- Kumar, U.K 2006. Bio diversity principles and conservation, Agrobios, Jodhpur.

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- Odum, E.P. 5Th ed. 2004 .Fundamentals of Ecology. Natraj Publisher, Dehradun.
- Puri, G.S. 1960. Indian Forest Ecology.
- Sharma, P.D. 7th ed. 1998.Ecology and Environment, Rastogi Publication, Shivaji Road. Meerut, 250002. India.
- Shukla, R. S. & Chandel, P.S. 2006. A Text book of Plant Ecology.

### Practical

#### Objectives :

- To enable the students to understand the plant in relation to environment.
- To develop the knowledge of different types of vegetation.
- To familiarize the students with conservation practices.

### Semester- IV

#### Scheme of practical examination

Time: 4 hrs	Marks: 50
1-Exercise based on Ecology	10
2- Soil Test	5
3- Exercise based on Ecological adaptation	5
4-To comment upon Phytogeographic region (model/ charts) and National Parks(Photographs).	5
5-Spotting (1-5)	10
6-Viva- voce	5
7-Sessional	10
Total:	50

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<b>Unit-3</b>	<p><b>Photosynthesis:</b> Chloroplast, Photosynthetic pigments, Red drop, Emerson' effect, Concept of two Photosystems, Light reaction, Dark reaction – Calvin cycle, Hatch &amp; Slack cycle, CAM cycle, Factors affecting rate of photosynthesis &amp; Photorespiration.</p> <p><b>प्रकाश संश्लेषण :</b> क्लोरोप्लास्ट, प्रकाश संश्लेषीय वर्णक, रेड ड्रॉप तथा इमरसन प्रभाव, दो प्रकाश तंत्र की अवधारणा, प्रकाश अभिक्रिया, अंधकार अभिक्रिया, केलविन चक्र, हेच एवं स्लेक चक्र, सी ए एम चक्र, प्रकाश संश्लेषण को प्रभावित करने वाले कारक एवं प्रकाशीय श्वसन।</p>
<b>Unit-4</b>	<p><b>Respiration:</b> Mitochondria, aerobic and anaerobic respiration, Respiratory coefficient, mechanism of respiration - Glycolysis, Kreb's cycle, Pentose Phosphate Pathway, Electron transport system, Factors affecting rate of respiration, Redox potential and theories of ATP synthesis.</p> <p><b>श्वसन :</b> माइटोकॉन्ड्रिया, आक्सी एवं अनाक्सी श्वसन, श्वसन गुणांक, श्वसन की क्रियाविधि – ग्लाइकोलिसिस, क्रेब चक्र, पेन्टोस फास्फेट मार्ग, इलेक्ट्रान अभिगमन तंत्र, श्वसन की दर को प्रभावित करने वाले कारक, आक्सीकरण-अपचयन विभव, ए.टी.पी. संश्लेषण के सिद्धांत।</p>
<b>Unit-5</b>	<p><b>Enzymology:</b> Classification, nomenclature and characteristics of Enzymes, Concept of holoenzyme, apoenzyme, co-enzyme and co-factors. Mode &amp; mechanism of enzyme action, Factors affecting enzyme activity.</p> <p><b>Plant Hormones:</b> Discovery, Structure mode of action and role of Auxins, Gibberellins, Cytokinin, Abscissic acid and Ethylene.</p> <p><b>एंजाइमोलॉजी :</b> विकरो का वर्गीकरण, नामकरण एवं अभिलाक्षणिक गुण, होलोएन्जाइम, एपोएन्जाइम, कोएन्जाइम एवं कोफैक्टर्स की अवधारणा, एन्जाइम की कार्यप्रणाली एवं क्रियाविधि, एंजाइम क्रिया को प्रभावित करने वाले कारक पादप हार्मोन : आक्जिन, जिब्वरेलिन, सायटोकायनिन, एब्सीसिक अम्ल एवं इथीलीन की खोज, संरचना, कार्य प्रणाली एवं भूमिका।</p>

### SUGGESTED READINGS:-

- David, L. N. and Michael, M. C. 2000. Lehninger's Principle of Biochemistry, Macmillan worth Pub. New York, USA.
- Gangulee, H.C., Das, K.S., Datta, C. and Sen, S. 2007. College Botany Voll.I, New Central Book Agency (P) Ltd. Kolkata, 700009.
- Hopkins, W.G. 1995. Introduction of Plant Physiology Pub. John wiley and Sons

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New York.

- Jain, V.K. 1974. Fundamentals of Plant Physiology, S. Chand & Company.
- Pandey, B. P. 2010. A Text book of Botany- Angiosperms, S. Chand & Company Ltd. Ramnagar, New Delhi- 110055.
- Taiz & Zeiger, E. 1998. Plant Physiology. Sinauer associates, Inc. Pub. Massachusetts U.S.A.
- Verma, S.K. & Verma, M.A. 1995. Text book of Plant Physiology & Biotechnology. S. Chand & Company.
- Verma, V. 1995. Plant Physiology, Emkey Pub.

### Practical Work

#### Objectives:

To impart the skills of handling and setting up of apparatus to conduct plant Physiological experiments, Collection of data and interpretation of results.

#### Exercise:

- 1- Preparation of solution of specific Normality, Molal and Molar solutions.
- 2- Exercises related to osmosis and osmotic relation.
- 3- Exercises related to Transpiration.
- 4- To separate Plastidial pigments by Paper Chromatography.
- 5- To perform the exercise of Photosynthesis & Respiration.
- 6- To perform biochemical test for Carbohydrate, Lipid and Protein.
- 7- To extract Enzyme from any plant part and demonstrate its activity.

### Practical Scheme B.Sc Sem. V

	Marks: 50
Time: 4 Hrs	
1. Exercise based on plant physiology	15
2. Minor Exercise based on plant physiology	5
3. Comment on plant hormone	5
4. Bio Chemical Test	5
5. Spotting- (1-5)	10
6. Viva- voce	5
7. Sessional	0
Total :	50

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शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय ग्वालियर (म.प्र.)  
 उच्च शिक्षा विभाग म.प्र. शारान  
 स्नातक स्तर पर सेमेस्टर पद्धति के अन्तर्गत एकल प्रश्न पत्र प्रणाली अनुसार पाठ्यक्रम  
 केन्द्रीय अध्ययन मण्डल द्वारा अनुशंसित तथा म.प्र. के महामहिम राज्यपाल द्वारा अनुमोदित

Department of Higher Education, Govt. of M.P.  
 Single Paper Pattern Syllabus for U.G. Classes Under Semester System  
 As recommended by Central Board of Studies and approved by  
 the Governor of M.P.  
 Effective from Session 2017-18-19

Class / कक्षा : B. Sc.  
 Semester / सेमेस्टर : VI Semester  
 Subject / विषय : Botany  
 Title of Subject Group : Cell Biology, Genetics and Biotechnology  
 विषय समूह का शीर्षक : कोशिका जैविकी, अनुवांशिकी एवं जैवप्रौद्योगिकी  
 Max. Marks अधिकतम अंक : 85+15 CCE =100

**Particulars / विवरण**

Unit-1	<p><b>The cell envelops and cell organelles</b> : plasma membrane, lipid bilayer structure, functions of the cell wall. Structure and function of cell organelles Nucleus Chloroplast, Mitochondrion. Golgibodies, ER, Peroxisome and Vacuole.</p> <p>कोशिका आवरण एवं कोशिकांग : प्लाज्मा झिल्ली, द्विस्तरीय लिपिड संरचना कोशिका भित्ति के कार्य। कोशिकाअंगों की संरचना एवं कार्य : केन्द्रक, हरित लवक, माइटोकॉण्ड्रिया, गॉल्जीकाय, अतःद्रव्यी जालिका, परऑक्सीसोम्स एवं रिक्तिकाएँ ।</p>
Unit-2	<p><b>Chromosomal organization</b>: Structure and functions of Chromosome, centromere and telomere special types of chromosomes, Mitosis and Meiosis. Variations in chromosome structure : Deletion, Duplication, Translocation and Inversion; Variation in chromosome number, Euploidy, Aneuploidy, DNA the genetic material, DNA structure and replication. Nucleosome model.</p> <p>गुणसूत्र संगठन: आकारिकी एवं कार्य सेन्ट्रोमियर एवं टेलोमियर। विशेष प्रकार के क्रोमोसोम्स, समसूत्री एवं अर्धसूत्री विभाजन। गुणसूत्र संरचना में विभिन्नताएँ : विलोपन, द्विगुणन, स्थानान्तरण एवं प्रतिलोभीकरण। गुणसूत्र</p>

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	संख्या में विभिन्नताएँ। यूप्लायडी एन्यूप्लॉयडी। डी.एन.ए. : आनुवांशिक पदार्थ। डी.एन.ए. की संरचना एवं पुनरावृत्ति। न्यूक्लियोसोम माडल।
<b>Unit-3</b>	<p><b>Genetic inheritance:</b> Mendelism: laws of dominance, segregation and independent assortment; Linkage analysis; Interactions of genes. Cytoplasmic inheritance Mutations: spontaneous and induced: Transposable elements; DNA damage and repair.</p> <p>आनुवांशिक वंशागति : मेण्डलवाद : प्रभाविता, पृथक्करण एवं स्वतंत्र अपव्यहन के नियम, सहलग्नता विश्लेषण, जीन की अनयोन्म क्रियाएँ। कोशिका द्रवीय वंशागति उत्परिवर्तन, प्राकृतिक, प्रेरित उत्परिवर्तन, स्थानान्तरणशील अवयव। डी.एन.ए. क्षति एवं सुधार।</p>
<b>Unit-4</b>	<p><b>Gene:</b> Structure of gene, genetic code, transfer of genetic information; Transcription, translation, protein synthesis, tRNA, and ribosomes. Regulation of gene expression in prokaryotes and eukaryotes.</p> <p>जीन: जीन की संरचना, आनुवांशिक कोड, आनुवांशिक सूचना का स्थानान्तरण, अनुलेखन, अनुवाद, प्रोटीन संश्लेषण, ट्रांसफर आर.एन.ए., राइबोसोम। प्रोकैरियोट्स एवं यूकैरियोट्स में जीन अभिव्यक्ति का नियमन।</p>
<b>Unit-5</b>	<p><b>Biotechnology:</b> Functional definition; basic aspects of plant tissue culture; cellular totipotency, differentiation and morphogenesis biology of <i>Agrobacterium</i>; vectors for gene delivery and marker genes. Important achievements of biotechnology in agriculture.</p> <p><b>Genetic engineering:</b> Tools and techniques of recombinant DNA technology; cloning vectors; genomic and cDNA library; transposable elements. Gene mapping and chromosome walking.</p> <p>जैव प्रौद्योगिकी : कार्यात्मक परिभाषा, पादप उत्तक संवर्धन के आधारभूत तत्व, कोशीय टोटीपोटेंसी, विभेदीकरण एवं मार्फोजेनेसिस, एग्रोबैक्टीरियम की जैविकी, जीन डिलिवरी के वाहक तथा मार्कर जीन, जैव प्रौद्योगिकी की कृषि में प्रमुख उपलब्धियाँ।</p> <p>आनुवांशिक अभियांत्रिकी : पुनर्योजक डी. एन. ए. तकनीकी के औजार एवं तकनीक, क्लोनल वाहक, जीनोमिक तथा सी.डी.एन.ए. लाइब्रेरी, ट्रांसपोजेबल तत्व, जीन मैपिंग तथा गुणसूत्र वाकिंग।</p>

Dr. K. K. Kulkarni

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### Suggested Books :

1. Alberts B.D. Lewis, J.Raff, M.Rubers, K. and Watson I.D. 1999 molecular Biology of Cell Garland Pub. Co. Inc. New York, U.S.A.
2. P.K. Gupta 1999 A text Book of Cell and Molecular Biology, Rastogi Pub. Meerut India.
3. Kleinsmith L.J. and Molecular Biology (2nd edition) Harper Collins College pub. New York USA.
4. P.K. Gupta Genetics Rastogi Pub. Meerut.
5. Sinha & Sinha Cytogenetics & Plant Breeding Vikas Pub.

### Practical Work

#### Objectives

- i) To impart understanding of internal cell structures and their organization.
- ii) To develop the skills for the preparation of smear for study of cell division.
- iii) To develop the skills for the understanding of mendel's law.
- iv) To impart the skills of isolation of DNA.
- v) To familiarize the students with the technique of micro propagation and isolation of protoplast.

### Semester-VI

#### Scheme of practical examination

	Marks:50
<b>Time: 4 Hrs</b>	10
Exercise Based on cell division (Mitosis/Meiosis)	5
Exercise Based on Genetic problem	5
Study of Cell and Cell inclusions	5
Exercise based on Biotechnology	10
Spotting (1-5)	5
Viva - Voce	10
Sessional	50
<b>Total</b>	

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शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय ग्वालियर (म.प्र.)  
स्नातकोत्तर स्तर पर सेमेस्टर पद्धति के अन्तर्गत वनस्पतिशास्त्र विषय के  
अध्ययन मण्डल द्वारा अनुशंसित तथा अकादमिक परिषद द्वारा अनुमोदित

**Syllabus for P.G. Classes of Botany Under Semester System as recommended  
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Effective from Session 2017-2019  
M.Sc. Botany – I sem**

**BOT 101 : BACTERIOLOGY, VIROLOGY & GENERAL MICROBIOLOGY**

**UNIT I :**

Bacterial taxonomy;

Identification of bacteria

General characters of *Rickettsia* and *Chlamydia*.

Diseases caused by *Rickettsia* and *Chlamydia*.

Mode of nutrition in bacteria; autotrophy, heterotrophy, symbiosis.

**UNIT II :**

General account of sterilization culture media, pure culture techniques;

A general idea about bacterial toxins and enzymes;

Bacteriophage;

Bacterial diseases ; caused by *Escherichia coli*, *shigella*

**UNIT III :**

General properties and evolution of viruses.

Cultivation of virus and viral assay ;

Transmission of plant viruses and control measures.

Oncogenic viruses and tumorigenesis;

Viral diseases : Encephalitis, Hepatitis, AIDS and Rabies.

**UNIT IV:**

Biological nitrogen fixation: symbiotic and non- symbiotic nitrogen – fixation;

Fermentation technology ; principle and types of fermentation.

Microbial degradation of pesticides and hydrocarbons.

Mycoplasma; general account and important diseases caused by them.

**UNIT V :**

Microbial conversion of waster product with particular reference to alcohol and biogas.

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General account of Immunity , properties of antigens and antibodies.  
Allergy and types of allergies  
Mycotoxins and their harmful effects.

### PRACTICALS 101 :

1. Preparation of culture media.
2. Isolation of *Bacillus* and *Rhizobium spp.* From soil and nodules.
3. Various methods of bacterial staining to study cell wall, endospore, capsule and flagella.
4. Identification of important genera by using biochemical tests: *Escherichia*, *Azotobacter*, *Staphylococcus*, *Bacillus*, *Pseudomonas*, *Rhizobium*, *Streptomyces*, *Xanthomonas*.
5. Construction of bacterial growth curve.
6. Quantitative estimation of bacteria in milk.
7. Isolation of streptomycin – resistant mutants of bacteria.
8. Sensitivity test of bacteria using different antibiotics.
9. Purification of TMV and study of thermal inactivation point and dilution point.
10. Virus concentration determination by local lesion on host.
11. Study of common vectors of plant virus: Nematodes, fungi and insects.
12. Bacteriophage isolation
13. Isolation and enumeration of bacteria : Actinomycetes and fungi from soil, rhizosphere and seed using different techniques.
14. Use of selective media for isolating micro-organisms.
15. Fermentation of alcohol and biogas from waste material (demonstration)

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M.Sc. Botany – I sem

**BOT 102 : BIOLOGY AND DIVERSITY OF FUNGI AND PLANT  
PATHOLOGY**

**UNIT I :**

Recent trends on the classification of fungi with reference to morphological and paramorphological criteria.

Comparative study of following sub-division

Mastigomycotina : Albugo, Peronospora, Plasmopora

**UNIT II :**

Comparative study of following sub – division ;

Zygomycotina : *Mucor*, *Rhizopus*, *Syncephalastrum*.

Ascomycotina : *Tapharina* , *Emericella*, *Penicillium* , *Chaetomium* , *Morchella*.

**UNIT III :**

Comparative study of following sub – division ;

Basidiomycotina : *Puccinia*, *Melampsora*, *Ustilago*, *Polyporus*, *Cyathus*.

Deuteromycotina : *Fusarium* , *Cercospora*, *Colletotrichum*.

Mushroom cultivation : Mycorrhizal application in agriculture and forestry.

Fungal cytology and genetics : Heterothallism, heterokaryosis, parasexual cycle, mutation.

**UNIT IV:**

Symptomatology in fungal , bacterial and viral infection of plants.

Etiology and control of the following crop diseases.

1. Paddy: paddy blast, paddy blight
2. Wheat : Black stem rust, Bunt of wheat
3. Bajara: green ear and Ergot
4. Sugarcane : Red rot disease of sugarcane
5. Ground nut : Tikka disease
6. Maize Smut

**UNIT V :**

Role of enzymes and toxins in Pathogenesis.

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Disease control by physical , chemical and biological methods, resistant varieties.  
Crop rotation, plant quarantines, seed certification

### PRACTICAL 102 :

Study of the morphological characters and reproductive structures of the genera mentioned in the theory. Study of symptomatology of diseased species. Carbon and nitrogen utilization by fungi (in culture) vitamin requirement , staining techniques, induction and isolation of mutants.

1. Study of diseased specimens of plants with reference to symptomatology.
2. Isolation , purification and single spore culture of pathogens
3. Measurement of the activity of enzymes of fungal pathogens : Cellulose , Pectinases.
4. Laboratory testing of fungicides (systemic and non- systemic) against pathogenic fungi.
5. Demonstration of biological control of pathogenic fungi *in vitro*.

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**BOT 103 : BIOLOGY AND DIVERSITY OF ALGAE, BRYOPHYTES AND LICHENS**

**UNIT I:**

Comparative survey of important systems of classification of algae;  
Criteria for algal classification and modern trends;  
Diagnostic features of algal phyla, range of thallus and reproductive diversity ; life history , patterns, Parallelism and evolution.

**UNIT II :**

Comparative account of algal pigments ; light microscopic structure, ultra structure and function of cell wall, flagella, chloroplast, pyrenoids and eyespots and their importance in taxonomy.  
Study of Cyanophyta, Chlorophyta, Xanthophyta, Bacillariophyta, Phaeophyta and Rhodophyta up to the order level with reference to the following genera:  
*Anabaena, Gonium , Chlorella, Enteromorpha, Bulbochaete, Clostridium, Acetabularia, Nitella, Botrydium, Navicula, Cyclotella, Batrachospermum and Gracillaria.*

**UNIT III :**

General characteristics of the division : Dihophyta, Chrysophyta and Cryptophyta.  
Distribution of algae in soil, fresh water and marine environment , role of algae in soil fertility, productivity in fresh water and marine environment algae role in fisheries, algae in symbiotic association, algae in polluted habitats, algae as indicator of pollution, fossil algae, algae in biotechnology.

**UNIT IV:**

Origin of Bryophytes : Primitive vs. advanced characters, derived features: evolutionary lines. Classification.  
Comparative morphological, anatomical and cytological studies of gametophyte and sporophytes of Calobryales, Jungermanniales, Sphaerocarcales, Marchantiales , Takakiales, Sphagnales, Andreales and Bryales.

**UNIT V:**

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Unit - V

Experimental studies in Bryophytes

Spore germination, Protonemal differentiation, bud formation

Parthenogenesis, apogamy, apospory and regeneration.

Bryogeographical regions of India with reference to central India.

Lichens : General account, structure and reproduction.

**PRACTICAL 103 :**

1. Collection and study of algae mentioned in theory, identification up to generic level using algal monographs.
2. Preparation of synthetic medium and cultivation of algae, unialgal and axenic culture and their maintenance.
3. Collection preservation of algal herbarium (10 specimens).
4. Preparation of pigments.
5. Staining techniques of cytology studies.
6. Study of electron microscopy of some algae.
7. Morphology and structural study of representative member of the following group using cleared whole mount preparation, dissection and section :  
Jungermanniales – *Pellia* and *Porella* ( or any other leafy liverwort).  
Marchantiales – *Plagiochasma*, *Dumortiera*, *Fimbriaria*, (*Astiralla*, *Reboulia*, *Targionia*, *Conocephelum*/ *Weisnerella*, *Sphagnales* / *sphagnum*/ *Bryales*.
8. Experiments to study spore germination, formation of protonema and bud development.
9. Study of Bryophytes in their natural habitats.

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M.Sc. Botany – I sem

**BOT 104 : BIOLOGY AND DIVERSITY OF PTERIDOPHYTES AND  
GYMNOSPERMS**

**UNIT I :**

Evolution of pteridophytes ; Soral and Stealer evolution.  
Classification of pteridophytes.

**UNIT II :**

Comparative organography, systematics ; reproduction and phylogeny of the  
following :  
Psilophytales, Rhyniales, Zosterophyllophytales.  
Psilotales.  
Lycopdiales, Lepidodendrales  
Sphenophyllales  
Ophioglossates, Marattiales, Osmundales, Filicates, Marsileates, Salviniales.

**UNIT III :**

Speciation and evolutionary trends in ferns;  
Cytology ;  
Polyploidy and hybridization;  
Pteridophytes life – cycle , apospory, vegetative apomixes.  
Recent trends in the classification of Gymnosperms

**UNIT IV :**

Morphology and anatomy of vegetative and reproductive organs, fossil  
representative and interrelationship of cycadales , Ginkgoales, coniferales, Taxales,  
Ephedrales, Welwitschiales and Gnetales.

**UNIT V :**

Structure and evolution of archegonium in Bryophytes , pteridophytes and  
Gymnosperms  
Distribution of living and fossil Gymnosperms in India.  
Economic importance of Gymnosperms.

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### **BOT 201: ECOLOGY-I CLIMATOLOGY, SOIL SCIENCE AND AUTECOLOGY**

#### **UNIT I**

Definition, scope and concept of plant ecology.  
History of ecology and relation of ecology with other disciplines. Principles of  
ecology.  
Concept of environment, habitat and ecological niche.  
The environment we live in.

#### **UNIT II**

Light and temperature as ecological factors.  
Precipitation and Relative Humidity as ecological factors.  
Measurement and analysis of light, temperature, precipitation and relative  
humidity.  
Importance of water as an important factor on the life of plants.

#### **UNIT III**

Origin, development and formation of soil. Soil profile.  
Classification of soil.  
Effects of soil environment of plants.  
Chief soil types of India.

#### **UNIT IV**

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Unit IV

- Biotic components of an ecosystem.
- Interrelation of various organisms.
- Population ecology, Natality, Mortality, Age distribution.
- Concept of carrying capacity.

### UNIT V

- Morphological, anatomical and physiological relation of plants with their environment.
- Plant indicators.
- Ecotypic and Ecadic differentiation
- Physical and physiological dryness.
- Genecology

### PRACTICALS 201

1. Study of physical and chemical characteristics of soil by rapid field test.
2. Determination of moisture constant of soil.
3. Determination of pH of water.
4. Determination of dissolved oxygen in water
5. Determination of following data.
  - a. Solar energy
  - b. Atmospheric temperature
  - c. Relative Humidity
6. Determination of soil profile.
7. Determination of soil texture, colour, consistence.
8. Determination of height of the tree.
9. Determination of light penetration under water by Sechii dish.

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**BOT 202: ANGIOSPERM ANATOMY, EMBRYOLOGY AND  
PALYNOLOGY**

**UNIT I**

Origin, growth, differentiation and ultra structure of cell and tissue, fine structure of plasmodesmata, microtubules, microfibrils and secondary structure. Apical, lateral and intercalary meristems- their ultra structure and histochemistry, organogenesis. Ontogeny, phylogeny, ultra structure and function of primary and secondary xylem; wood anatomy. Ontogeny, phylogeny, ultra structure and function of primary and secondary phloem. Structure variability in leaves, leaf histogenesis, leaf meristem, origin, development ultra structure of trichomes and stomata.

**UNIT II**

Nodal anatomy-nodal types and evolutionary consideration  
Vascular cambium vs. cork cambium factors controlling their activity, periderm, lenticles, abscission, wound healing.  
Anatomy of monocotyledons and dicotyledonous seed and fruits, seed appendages, their anatomy structure and function. Anatomy in relation to taxonomy.  
Contemporary plant anatomy: current trends and prospects

**UNIT III**

Microsporangium- structure and function of wall layers, ultra structure change in tapetum and meiocytes during Microsporogenesis, role of tapetum, pollen development, anther culture and haploid plants. Pollen wall morphogenesis- microspore pollen mitosis; division of generative cell; pollen fertility and sterility; pollen storage viability and germination.  
Megasporengesis, various types of embryosacs, their development and fertilization.

**UNIT IV**

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Unit IV

Embryology and taxonomy; diagnostic embryological characters, primitive and advanced characters, comparative embryology of hybrids dysfunction of endosperm, arrested development of embryo.

**UNIT V**

Development and evolution of pollen types; stereo and ultrastructure of exine, apertures, furrow. Palynology and taxonomy. Aerobiology and its application. Aeropalynology, methods of aerospora survey and analysis, pollen allergy and pollen calendars system approach for allergy. Mellitopalynology: general account Paleopalynology: role in coal and oilgenesis.

**PRACTICALS 202:**

1. Use of paraffin method of microtechnique .
2. Acquaintance with ultratomy: use of wood microtomy and common and anatomy and histochemical methods.
3. Learning techniques of making temporary and permanent microscopic preparation.
4. Knowledge and use of photomicrography in anatomical studies.
5. Knowledge and use of the principles and working of electron microscopes.
6. Learning to use simple experimental method in anatomical studies.
7. Laboratory work planned on the basis of topic listed under theory.
8. Preparation of dissected whole mount of endothecium, tapetum, ovule, endosperm and embryo, squash preparation of tapetum, microspore mother cell, dyads, tetrads, pollinia, massulae.
9. Study of seed appendages from dissection, structure of seed coat from section and macerations.

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**BOT 203: WATER RELATIONS, GROWTH AND DEVELOPMENT**

**UNIT I**

Water relations of plants: Unique physio-chemical properties of water, chemical potential, water potential. Apparent free space, bulk movement of water, soil plant atmosphere, continuum (SPAC), stomatal regulation of transpiration, hormonal and energy dependent hypothesis. Inorganic nutrition, physicochemical aspects of solute transport, diffusion and facilitated diffusion, passive and active transport. Nernst equation and Donnan's potential. Role of ATPase as a carrier, co-transport (symport) and counter transport (antiport). Ion channels, role of calmodulin. Importance of foliar nutrition and use of chelates.

**UNIT II**

Photosynthesis: Energy pathway in photosynthesis, chloroplast as an energy transducing organelle. Composition and characterization of photo systems, I and II, electron flow through cyclic, non cyclic and pseudo cyclic photophosphorylation. Pathways of CO<sub>2</sub> fixation. Differences between C<sub>3</sub> and C<sub>4</sub> fixation and different kinds of C<sub>4</sub> pathways.

**UNIT III**

CAM pathway: Occurrence, biological events and adaptive advantage. Photorespiration: Mechanism and regulation of photorespiration. Introductory studies on water stress and its tolerance mechanisms.

**UNIT IV**

Enzymes: Classification, mode of action, Km value. Industrial application, immobilized enzymes, their preparation and application. Enzyme regulation: Competitive and non-competitive, allosteric enzymes

**UNIT V**

Chemical control of growth and morphogenesis.

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**BOT 204: PLANT BIOCHEMISTRY AND METABOLISM**

**UNIT I**

Carbohydrates: classification, occurrence and structure of monosaccharide, oligosaccharides, polysaccharides (starch, cellulose and pectin).

Proteins: Amino acid, structure and characteristics, peptides and protein structure, function of proteins Conjugate proteins, Account of Lactins their function.

**UNIT II**

Lipids: classification, occurrence, structure and importance of acryl lipids and phosphates. Concept of free energy and entropy, high energy compound, Gibb's free energy concept in biochemical reaction.

Synthesis of ATP through oxidative electron transfer chain, chemiosmotic regeneration of ATP.

**UNIT III**

Gluconeogenesis vs glycolysis

Biosynthesis of fatty acids.

Degradation of fatty acids.

Lipid as high energy molecules.

Role of Kreb's Cycle.

**UNIT IV**

Nitrogen fixation by free living and symbiotic organisms, mechanism of nitrogen fixation, soil nitrogen sources, nitrogen uptake by plants and assimilation.

**UNIT V**

Nitrate reductase system, substrate controlled induction, interrelation between photosynthesis and nitrogen metabolism.

Brief account of amino acid synthesis by reductive amination, GS-GOGAT system, transmission. Basic structure of important phenolics and alkaloids: a general view of their synthesis.

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### PRACTICALS : 203 & 204

1. Determination of water potential in different tissues.
2. Estimation of the Hill reaction activity.
3. Estimation of total nitrogen by kjaldahl method.
4. Principles of colorimetry, spectrophotometry and fluorimetry.
5. Determination of chlorophyll-a chlorophyll-b, total chlorophyll (Arnon's method).
6. Determination of chlorophyll-a chlorophyll-b, ratio in  $C_3$  and  $C_4$  plants.
7. Estimation of titrable and total acidity.
8. Estimation of protein by Biuret and Lowry's method.
9. Estimation of seed germination as affected by red and Infrared radiation.
10. Determination of gibberellic acid by half seed (cereal) method. Demonstration of effects of auxin on abscission, cytokinin on senescence and abscissic acid on stomatal regulation.
11. Determination of carotenoids.
12. Radioisotope methodology, auto-radiography, rule pulse and double labeling, isotope dilution method. Instrumentation and principles of counters.
13. Extraction and estimation of starch.
14. Determination of reducing sugars in fruits.
15. Identification of different kinds of sugars (spot tests).
16. Estimation of amino acids by ninhydrin.
17. Identification of proline, sulphur-containing amino acids with aromatic ring (spot test).
18. Separation and identification of sugars by paper chromatography.
19. Determination of Isoelectric point of proteins.
20. Separation of soluble protein by gel electrophoresis.
21. Extraction of amylase and determination of its activity.
22. Determination of  $K_m$  and  $V_{max}$  of Amylase or phosphorylase

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### **BOT 301 : ANGIOSPERM , MORPHOLOGY AND TAXONOMY**

#### **UNIT I**

General concept of morphology, origin and evolution of flower. Co-evolution of flower vis a vis pollinators.

Origin and evolution of polypetal, sympetal, apetal : monocy, diocy. Monocot flower.

#### **UNIT II**

Stamens origin and evolution from foliar to reduced condition, extension of connective beyond anthers : monodi and poladelph : nectaries and nectar.

Carpels evolution, conduplicate, involute and other types. Validity of the concept of foliar origin of carpel alternative concepts and approaches: specialized carpels : poly and syncarpy : superior, semi- inferior and inferior ovary: appendicular and receptacular concepts: evolution of types of placentations.

#### **UNIT III**

Role of floral anatomy in interpreting the origin and evolution of a flower and floral parts. Floral anatomy and taxonomy.

Experimental study on flower.

#### **UNIT IV**

Botanical exploration – historical perspective , brief account of botanical exploration in south east Asia with special reference to India. Botanical survey of India. Its organization and role.

Principles of plant classification with emphasis on modern tools of taxonomy : molecular systematics. Utility of taxonomy : biosystematics.

Phylogenetic systems of classification : Cronquist , Takhtajan AGP III

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## UNIT V

Botanical nomenclature, ICNB, principles, articles, recommendation and amendments of code.

Familiarity with botanical literature, monographs, icons and floras, important periodicals with emphasis on Indian floristics methods of literature consultation.

Threat assessment, different categories of threat. IUCN, Red Data Book. Important threatened plants of India.

### PRACTICALS 301

1. Preparation of cleared whole mounts of floral parts of polypetalae, sympetalae and monocots for vasculature.
2. With the help hand section and dissection prepare longitudinal and transverse sections of flower. Examination of:
  - a. Transmitting tissue/ canal in stigma and style
  - b. Various types of ovaries and placentations
  - c. Special types of flowers with emphasis on vasculature of androecium and gynoecium.
3. Preparation of models (plasticine/thermocool) of vascular skeleton of flower and placentation.
4. Any other laboratory work based on theory syllabus.
5. Description of specimen.
6. Description of species based on various specimens, collective exercise
7. Description of various species of a genus.
8. Location of key characters, use of keys at generic levels, after the description a collective exercise.
9. Location of key characters, use of keys at family levels.
10. Identification of diagnostic characters and use of key (provided) at level of various families after the description have been made.
11. Preparation of key (using specimens from three four species).

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**BOT 302 : CYTOLOGY AND MOLECULAR BIOLOGY OF PLANTS**

**UNIT I**

The plant cell: structure, organization, cell cycle mechanism and its molecular basis, cytokinesis.

Nuclear : Structure, nucleolus organization.

Generalized structure of plant cell organelles.

**UNIT II**

Chromosome : Structure, molecular basis of chromosome structure. Eukaryotic genome, organization, Prokaryotic genome organization, variations in chromosome and its significance.

**UNIT III**

DNA packaging of DNA, nucleosome, nuclear membranes. C –value paradox, cot curves, chemical structure, genetic code.

DNA replication in prokaryotes and eukaryotes.

Transcription, RNA splicing

Translation : Prokaryotic and Eukaryotic gene regulation (Operon concept).

**UNIT IV**

Meiosis origin and molecular events during meiosis.

Mitosis origin and molecular events during mitosis.

Chromosomal aberrations : Heteroploidy, structural changes in chromosomes.

**UNIT V**

Transposable elements and its molecular basis.

Membrane structure and function, ATPase sites.

Membrane transport with reference to transport protein.

Signal transduction on overview.

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**BOT 303 : BIOMETRY , BIOINFORMATICS AND INSTRUMENTATION**

**UNIT I**

Measurement of central tendency : mean , median , mode and standard deviation.  
Chi square test.  
Analysis of variance (ANOVA)  
Application of probability distribution : binomial and normal.

**UNIT II**

Test of significance.  
Correlation and regression  
Growth curve : exponential and logarithmic.  
Principle of experimental design : randomization , Replication and local control.

**UNIT III**

A general idea of chromatographic techniques theories and applications  
High performance liquid chromatography (HPLC) basic study.  
Electrophoresis techniques and applications : basic study.  
Centrifugation : general theory instrumentation and application.

**UNIT IV**

Microscopy : Light and electron microscopy  
Spectrophotometry : a general study of instrumentation and application of  
colorimetry.  
UV – visible Spectrophotometry NMR and ESR Spectrophotometry, Polarimetry.

**UNIT V**

Brief overview of information technology and science. Computerized database  
and DBMS.  
Introduction of bioinformatics and sequence analysis.  
BLAST and FASTA  
Data types and database in molecular biology  
Sequence databases and sequence alignment  
All computer graphic and information retrieval

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**Syllabus for P.G. Classes of Botany Under Semester System as recommended  
by Board of Studies and approved by the Academic council of the college.  
Effective from Session 2017-2019  
M.Sc. Botany – III sem**

**BOT 304 : ECOLOGY – II SYNECOLOGY, ECOSYSTEMATOLOGY &  
PHYTOGEOGRAPHY**

**UNIT I**

Concept and characteristics of plant community  
Methods of studying vegetation  
Raunkiers Life Forms  
Biological spectrum  
Seasonal aspect of vegetation

**UNIT II**

Plant succession .  
Concept of climax and climax communities  
Energy flow.  
Trophic dynamics aspect of ecology  
Food chain, food web, pyramid of number, biomass and energy.

**UNIT III**

System transfer function  
Agroecosystem.  
Biogeochemical cycles.  
Forest ecosystem.  
Rangeland management.

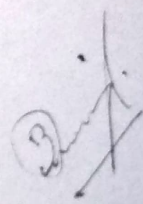
**UNIT IV**

Vegetation types of India  
Floristics regions of India.  
Production and productivity of various ecosystems.

**UNIT V**

Phytogeography as a border line science.  
Principles of interpretation Phytogeography  
Age and Area Hypothesis.  
Discontinuous distribution , endemics and endemism.

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Satpura hypothesis.  
Gates of angiospermy.

**PRACTICALS 304 :**

1. Determination of minimum size of quadrat by species area curve method.
2. Determination of minimum number of quadrat by species area curve method.
3. Determination of frequency of various species by quadrat method and preparation of frequency diagram.
4. Determination of density of quadrat method.
5. Determination of abundance of species by quadrat method.
6. Determination of relative frequency by quadrat method.
7. Determination of relative density by quadrat method.
8. Determination of basal area by quadrat method.
9. Determination of relative dominance by quadrat method.
10. Determination of IVI by quadrat method.
11. Determination of community coefficient of two sites by quadrat method.
12. Preparation of biological spectrum of a locality.

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शासकीय कमलाराजा कन्या स्नातकोत्तर स्वशासी महाविद्यालय ग्वालियर (म.प्र.)  
स्नातकोत्तर स्तर पर सेमेस्टर पद्धति के अन्तर्गत वनस्पतिशास्त्र विषय के  
अध्ययन मण्डल द्वारा अनुशंसित तथा अकादमिक परिषद द्वारा अनुमोदित

**Syllabus for P.G. Classes of Botany Under Semester System as recommended  
by Board of Studies and approved by the Academic council of the college.**

**Effective from Session 2017-2019**

**M.Sc. Botany – IV sem**

**BOT 401: GENETICS, PLANT BREEDING AND EVOLUTION**

**UNIT I**

A brief history, scope and significance of genetics.  
Mendel's law of inheritance.  
Lethality and Interaction of genes.  
Quantitative inheritance: polygenic inheritance.  
Nature and concept of chemical basis of heredity.

**UNIT II**

Multiple alleles.  
Self sterility.  
Linkage and its measurement.  
Crossing over: theories of crossing over.  
Mapping of genes on chromosomes.

**UNIT III**

Genetic recombination in bacteria: conjugation, transformation and transduction.  
Cytoplasmic inheritance.  
Mutations : types, methods of artificial induction, method of detection of mutants.  
Biochemical genetics of *Neurospora*.

**UNIT IV**

Origin of life.  
Mutation and evolution.  
Genetics and evolution.  
Genetic drift.  
Speciation.

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## UNIT V

Method of plant breeding, plant introduction, mass, pure line and clonal selection. Aims and objectives of hybridization types: inter specific and intergeneric; back crossing.

Grafts hybrids, chimeras and bud spot.

Heterosis: theories and applications with reference to maize.

Plant breeding work done in India with reference to wheat and rice.

### PRACTICAL 401:

1. Determination of probability of tossing for one coin.
2. Determination of probability for the throw of dice.
3. Determination of probability for tossing of two coins.
4.  $X^2$  test as applied to the result of above three experiments.
5. Determination of size of the leaves on a specific size of two population of a species and calculation of standard deviation and standard error.
6. Permutation and combination.
7. Correlation analysis.
8. Determination of genotype from the data provided.
9. Determination of linkage values from the data provided and preparation of chromosome map.
10. Determination of various mendelian ratio by checker board as well as by binomial equation.
11. Study of gene frequency in the populations.
12. Use of Anderson's scatter diagrams in the differentiation of the genetic population.
13. Emasculation of flower.
14. The working of the instruments used in various experiments must also explained./ At least 60% of the above mentioned exercises be performed and must be handed over to the external examiner who will select out the exercise to be distributed among at the time examination.

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Cloning construction of genomic and DNA libraries  
Application of r- DNA technology in plant improvement.

**PRACTICAL 402:**

1. Selection of salt tolerance / amino acid analogue resistance through cell culture.
2. Isolation and culture of protoplast.
3. Isolation and screening of industrially important microorganism.
4. Isolation of plant DNA, plasmid DNA, bacteriophage DNA.
5. Genetics colonization and tumour induction Agrobacterium Ti plasmid.
6. Restriction analysis and molecular weight DNA.
7. Sequencing and polymerase Chain Reaction.

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Syllabus for P.G. Classes of Botany Under Semester System as recommended  
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Effective from Session 2017-2019  
M.Sc. Botany – IV sem

**ELECTIVE PAPERS (OPTIONAL)**

**BOT E01: INDUSTRIAL MICROBIOLOGY**

**UNIT I**

Development and scope of Industrial Microbiology. Use of Fermentation equipments: Design and construction of fermenters, Batch and Continuous fermenters. Computer control of fermentation process. Characteristics of fermentation media, Raw materials (substrates).

**UNIT II**

Use of microorganisms in industries through ages.  
Strategies for isolation and screening of industrially important microorganism.  
Strategies for improvement of industrially important microbial strains.

**UNIT III**

Industrial product of vinegar.  
Industrial product of citric acid.  
Industrial product of antibiotics; penicillin and streptomycin.  
Industrial product of amino acids; glutamic acid and lysine.

**UNIT IV**

Microbes as a source of Single Cell protein (SCP).  
Mushrooms and food value of mushrooms.  
Dairy product from microorganisms; butter, yogurt and cheese.  
Hygiene and safety in fermentation industries.

**UNIT V**

Biopesticides: bacterial, fungal and viral control of insect pests.  
Biofertilizer: production and method of application.  
Bioremediation.

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**PRACTICALS E01:**

1. Isolation and identification of bacteria, yeast and fungi from bakeries and fermenters of distilleries.
2. Inoculation of fungi and bacteria on sterilized glucose and sucrose solutions and identification of the different types of amino acids and organic acids in filtrate during different incubation periods. (Chromatography)
3. Isolation and identification of different types of fungi and bacteria from curd, rotten fruits and vegetables.
4. Collection of different types of mushrooms from local area/ region: inventory and analysis of their amino acid contents. (Chromatography)
5. Preparation of spawn for cultivation of edible mushrooms.
6. Observation of the antagonism of three antibiotics against common plant pathogens in Petri plates (disc methods).

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MAJOR ELECTIVE II

**BOT 404: PLANT PATHOLOGY**

**UNIT I**

The concept of Diseases in Plants, History of plant pathology  
Parasitism and Disease developments - Parasitism and Pathogenicity, Development of Disease in  
Plants - How Pathogens attack plants  
Factors influencing infection: colonization and development of symptoms

**UNIT II**

Effect of pathogens on plant pathological function  
Enzymes and toxins in relation to plant disease  
Mechanism of resistance: Phytoalexins  
Environmental effects on the development of infectious plant disease

**UNIT III**

Symptomatology, Etiology and control of the plant disease caused by fungi  
Characteristics of Plant pathogenic fungi  
Diseases caused by Oomycetes  
Diseases caused by Zygomycetes  
Diseases caused by Ascomycetes & Fungi Imperfecti  
Diseases caused by Basidiomycetes

**UNIT IV**

Symptomatology, Etiology and control of the plant disease caused by Bacteria  
Characteristics of Plant pathogenic Bacteria  
Symptomatology, Etiology and control of the plant disease caused by Mollicutes  
Phytoplasma and Spiroplasmas  
Symptomatology, Etiology and control of the plant disease caused Nematodes

**UNIT V**

Symptomatology, Etiology and control of the plant disease caused by Viruses  
Characteristics of Plant Viruses and Diseases caused by Viruses  
Control - Management of plant diseases - General principles of plant quarantine  
Cultural, Biological, Physical and Chemical methods, Disease control by Immunizing or Improving  
Resistance of the Host  
Integrated disease management

**PRACTICALS**

1. Preparation of different types of media: solid, liquid, synthetic, semi-synthetic
2. Isolation of fungi from infected plant material and stored material
3. Identification of fungi and micrometry
4. Pathogenesis: Koch's Postulates
5. Collection of diseases plants and preparation of Herbarium
6. Pathological studies: study of morphological symptoms of host plant
7. Section cutting of Infected parts of plants and preparation of slides
8. Isolation and identification of Plant pathogenic fungi
9. Pathological studies of Viral diseases of plants
10. Pathological studies of Bacterial diseases of plant

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## **BOT E02: BIOCHEMISTRY AND METABOLISM IN PLANTS**

### **UNIT I**

Lipid: General structure, classification.

Synthesis of fatty acid.

$\beta$ -Oxidation.

Synthesis of carbohydrates from fatty acids.

Protein: Amino acid structure and Biosynthesis; protein conformation, protein synthesis.

### **UNIT II**

Secondary plant products: General structure of important phenolic compound groups in plants.

Shikimic acid pathway and phenolic compound synthesis.

General structure and synthesis of alkaloids from amino acids.

Growth regulators: structure and biosynthesis of Ethylene, Jasmonates and Brassinolides.

### **UNIT III**

Cell wall components.

Cellulose: structure and model for biosynthesis, structure and operation of the model for synthesis at plasma membrane level.

Lignin: structure and biosynthesis in plants.

Cyanogenesis: a general account of cyanogenic compounds as glycosides.

### **UNIT IV**

DNA and RNA: structure

DNA replication.

Transcription in prokaryotes and eukaryotes, transcript modification.

Regulation of translation.

### **UNIT V**

Nitrate metabolism in plants.

Nitrogen fixation, Nitrogenase system.

Ammonium assimilation.

GS-GOGAT system.

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## **BOT E03: ETHNOBOTANY AND ISOLATION OF NATURAL PRODUCTS**

### **UNIT I**

Ethnobotany, its scope, interdisciplinary approaches.

Ethnic groups of India : major and minor tribes, life styles of ethnic tribes, conservation practices of biodiversity, taboos and totems.

World centers of Ethnobotany with special reference to India.

### **UNIT II**

Role of Ethnobotany in national priorities, health care and development of cottage industries in India. History and principles of ayurveda, Homeopathy, Allopathy, Unani and Siddha system of medicines.

A general idea of active principles of plants and plant parts their extraction and preparation of medicines in different systems.

### **UNIT III**

Scope and uses of essential oil from plants as perfumes, cosmetics and as flavoring agents. Preparation of perfumes from aromatic plants with special reference to the following Lemon grass, Palm-rosa, Mint, Lavender, Rose, Eucalyptus and Vetiver.

### **UNIT IV**

Plants used in medicine with special reference to following.

*Adhatoda vasica*, *Asparagus racemosus*, *Hollarhina antidysenterica*, *Tinospora cordifolia*, *Terminalia arjuna*, *Terminalia bellerica*, *Terminalia chebula*, *Pterocarpus marsupium*, *Commiphora wightii*.

Regional relevance and credibility of medicinal plants used by tribals of M. P.

### **UNIT V**

Plants used in medicine with special reference to following.

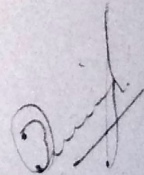
*Argemone mexicana*, *Boerhaavia diffusa*, *Eclipta prostrata*, *Psoralea coralifolia*, *Withania somnifera*, *Tylophora indica*, *Rauwolfia serpentina*, *Dioscorea deltoids*.

Plants used in scarcity, emergency and as supplementary foods by tribals of India.

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**PRACTICAL E03:**

1. Visit to tribal area and study of plant material used tribals.
2. Identification and description of important plants of ethno botanical importance.
3. Identification of important aromatic plants of the locality.
4. Extraction of active ingredients of plant and plant parts.
5. Extraction of perfumes of aromatic plants.
6. Pharmacognostic method of identification of drugs.
7. Methods of preparation of Kwath, Churra, Ark, Saiva Asav.
8. Diseases of some common medicinal plant of the locality.
9. Identification and description of 10 plants used by tribal for household purpose.

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## **BOT E04: STRESS PHYSIOLOGY**

### **UNIT I**

Plants and water: Chemical and water potential gradients. Determination of water potential of plants and tissues by Chardakov's, pressure chamber and psychrometric methods. Diffusion, osmosis, absorption, and conduction of water. Transpiration its role and measurement during water stress. Stomatal size, frequency and measurements of stomatal aperture, porometry, Mechanism of stomatal opening and closing. Physiological principles of dry land farming. Wilting coefficient, water use efficiency, stress - degree - day concept, plant water - stress index and their relationship to several plant physiological processes. Availability of soil water and determination of soil water potential.

### **UNIT II**

C<sub>4</sub> photosynthesis as CO<sub>2</sub> concentrating mechanism and its comparison with C<sub>3</sub> fixation. Drought and drought tolerance mechanisms:

### **UNIT III**

Antitranspirants: Different types, mode of action and their use in alleviation of water stress. Nitrogen fixation and drought. Effect of water stress on accumulation of proline and betaines and its possible role in osmotic adjustment under such conditions. Screening method for water stress tolerant varieties.

### **UNIT IV**

Ultra structural consequences of drought  
Elementary idea about chilling and temperature stresses.  
Introductory idea about Ultra violet radiations stresses.

### **UNIT V**

Salinity and plant growth. Mechanism of ion uptake,  
Salt tolerance: Halophytes; physiological aspects of salt tolerance,  
Screening methods for salt tolerant varieties.

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## PRACTICALS E04

1. Estimation of free proline in leaves subjected to water stress.
2. Estimation of protein using Lowry's Method.
3. NR assay.
4. Determination of relative water content (RWC).
5. Determination of potassium and sodium using flame photometer.
6. To determine soil water potential using Tensiometer.
7. Determination of leaf water potential by using Chardakov's method.
8. Determination of water potential using pressure chamber.
9. Discussion on the working of colorimeter, flame photometer tensiometer and pressure chamber.
10. Separation of amino acid by TLC method.
11. Estimation of free sugars using anthrone method.

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## BOT EO6: AGROECOSYSTEM

### UNIT I

- Introduction and concept of agroecosystem.
- Agroclimatic zones of India.
- Various types of Indian field and plantation crops.
- Various types of Indian commercial and horticultural crops.

### UNIT II

- Various agronomic practices, adapted in cropland ecosystem.
- Weed control-normal, Mechanical and biological.
- Insects and pests of cropland ecosystem-any five forms.
- Green evolution.

### UNIT III

- Structure of biotic and abiotic community of a cropland ecosystem-a case study.
- Herbicide degradation and accumulation in a cropland ecosystem.
- Sink source relationship.

### UNIT IV

- Influence of irrigation cycling on cropland ecosystem.
- Crop geometry.
- Influence of mineral cycling on cropland ecosystem.
- Phytoallelopathy in croplands.

### UNIT V

- Input-output ratio in agroecosystem.
- Energy flow in a cropland ecosystem.
- Biofertilizers.
- Farm management.

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Department of Botany, Govt. K.R.G. College, Gwalior (M.P.)

List of Examiners - 2017-2018

1. School of Studies in Botany, Jiwaji University, Gwalior

1. Dr. R.M. Agrawal
2. Dr. Avinash Tiwari
3. Dr. Mahendra Kumar Gupta
4. Dr. Shushil Mandheria
5. Dr. Sapan Patel

2. Govt. Science College, Gwalior

1. Dr. P.P. Dho
2. Dr. H.O. Sharma
3. Dr. R.K. Khare
4. Dr. A.C. Raghuwanshi
5. Dr. D.P. Sharma
6. Dr. V.K. Sewariya

3. Govt. K.R.G. College, Gwalior

1. Dr. B.M. Kulshrestha
2. Dr. Madhulaxmi Sharma
3. Dr. Sadhana Pandey
4. Dr. D.S. Rathore
5. Dr. Preeti Kulshrestha

4. Govt. V.R.G. College, Gwalior (Morar)

1. Prof. G.D. Vyas
2. Prof. C.J. Mehta

5. Govt. S.L.P. College, Morar, Gwalior

1. Dr. Deep Azad
2. Dr. B.B. Gupta

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Dr. ...

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Dr. ...

6. Govt. P.G. College, Morena

- 1. Dr. R.K.S. Kushwaha  
(Presently - Controller of Exams, Jiwaji Univ. Ujjain)
- 2. Dr. R.P. Singh
- 3. Dr. R.L. Shaktwar

7. Govt. Girls College, Morena

- 1. Dr. J.K. Mishra

8. Govt S.M.S. P.G. College, Skirpuri

- 1. Dr. S.H. Awasthi
- 2. Dr. Manju verma

9. Govt. M.J.S. College, Bind

- 1. Dr. A.K. Shrivastava
- 2. Dr. N.S. Rathore
- 3. Dr. M.R. Kaushal  
(Principal)

10. Govt P.G. College, Dahi

- 1. Dr. G.K. Shrivastava
- 2. Dr. S.K. Pandey
- 3. Dr. Brijesh Kumar
- 4. Dr. Seema Margot Singh

11. Govt College, Bhandar

- 1. Dr. V.K. Kaushal

12. Govt P.G. College, ~~Gupte~~ Guna

- 1. Dr. Archana Shrivastava
- 2. Dr. Manoj Bheroria

13. Govt College, Aron.

- 1. Dr. Niranjan Shrivastava

Dr. V.K. Kaushal

Dr. Manoj Bheroria

Dr. Niranjan Shrivastava

Dr. S.K. Pandey

Dr. Brijesh Kumar

Dr. Seema Margot Singh

Dr. Archana Shrivastava

Dr. Manoj Bheroria

14. Govt P.G. College, Sheopurkalan.  
1. Dr. Shubhesh Chandra

15. Govt Nehru College, Ashoknagar  
1. Dr. Renu Rajesh

16. Govt V.S. College, Dabra  
1. Dr. Vishal Kadam

17. Govt College, Pichore  
1. Dr. Keshav Singh

18. J.C. Mills Girls College, Gwalior  
1. Dr. Preeti

19. P.G. College, Ambah, Dist. Morena  
1. Dr. R.A.S Chauhan

20. C.H.R.I. Gwalior  
1. Dr. Archana Shrivastava  
2. Dr. Madhu Gupta

21. BIMR - Gwalior  
1. Dr. Subhadra Prasad

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Dr. Subhadra Prasad  
BIMR - Gwalior

List of Examiners from other universities and also  
Retired Professors

1. Dr. R.K.S. Chauhan 203, Akkrati Apartment  
Govind puri Gwalior
2. Dr. Shashi Chauhan - 203 Akkrati Apartment  
Govind puri, Gwalior
3. Dr. J.P. Kaushik - Gandhi Nagar, Gwalior
4. Dr. Ashok Jain - Belvant Nagar, Gandhi Road Gwalior
5. Dr. Rekha Bhadamija - Alkapuri, Gwalior
6. Dr. S.P. Bajpai, Dean, faculty of Env. Science,  
AMITY Univ. Gwalior
7. Dr. P. Mehta Dr. H.S. Gaur Univ. Sagar
8. Dr. Archana Mehta - Dr. H.S. Gaur Univ. Sagar
9. Dr. K.K. Kaul Ramenij Nagar
10. Dr. R.N. Chauvedi - Kusthal Nagar, Gandhi Nagar  
Gwalior
11. Dr. K.K. Dubey - Saraswati Neger, Univ. Road, Gwalior
12. Dr. S.K. Raina - Kaul Nursing Home, Gwalior
13. Dr. N.P. Saxena - Gayatri Vihar, Thakipur, Gwalior
14. Dr. R.C. Bhatia - Halipad Colony, Gwalior
15. Dr. Ashok Agrawal - B.S.A. College, Mathura
16. Dr. Alka Pandey - Govt P.G. College, Betul
17. Dr. Akhilesh Pandey - Bhopal
18. Dr. Ranjana verma - Govt Nutan Girls College, Bhopal
19. Dr. Archana Bhatnagar - P.M.B. Gujarat College, Indore
20. Dr. Krishna Mandaria - Gujarat College, Indore

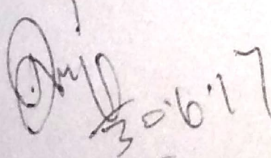
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Gwalior



- 21. Dr. T.R. Sahu - Dr. H.S. Gaur Univ. Sagar
- 22. Dr. K.P. Sahu - ~~Dr. H.S. Gaur Univ. Sagar~~ <sup>Gott. Girls College, Heelmaeh</sup>  
MVM - Bhopal
- 23. Dr. L.C. Chaurasia - Gott. Maharaja College Chhatrapur
- 24. Dr. M. Saxena - Gott. Maharaja College, Chhatrapur
- 25. Dr. Anita Arjaria - Gott. Maharaja College Chhatrapur
- 26. Dr. A.P. Parihar - Gott. Maharaja College Chhatrapur
- 27. Dr. R.L. Prajapati - Gott. Maharaja College Chhatrapur
- 28. Dr. P.K. Khare - Gott. Maharaja College Chhatrapur
- 29. Dr. Kusum Kashyap - Gott. Maharaja College, Chhatrapur
- 30. Dr. A.S. Yadav - MVM College, Bhopal
- 31. Dr. Madhuri Modak - MVM College, Bhopal
- 32. Dr. Khujista Dureski - MVM College Bhopal
- 33. Dr. Nasreen Siddiqui - Aitanjali College, Bhopal
- 34. Dr. S.P. Parmar - Gott. P.G. College, Tikangark
- 35. Dr. Deepak Vyas - Dr. H.S. Gaur Univ. Sagar
- 36. Dr. Surendra Singh - R.D. Univ. Jabalpur
- 37. Dr. Surendra Singh - B.H.U. Varanasi
- 38. Dr. Karuna Verma - R.D. Univ. Jabalpur
- 39. Dr. Anjana Sharma - R.D. Univ. Jabalpur
- 40. Dr. Divya Bagchi - R.D. Univ. Jabalpur
- 41. Dr. Rajbeer Singh - K.K. College Etawah
- 42. Dr. A.K. Bharadwaj - Center of excellence, Bhopal
- 43. Dr. Nath, NBAI - Lucknow
- 44. Dr. R.L.S. Sikaewar - Aarogya Sham, Stadh Sanstha, Chitarkot
- 45. Dr. Rushpa Patel - Gott. P.G. College, Khargone

Dr. K.P. Sahu - Dr. H.S. Gaur Univ. Sagar

- 46. Dr. A.K. Girdi, Bundel Khand Univ. Jhansi
- 47. Dr. T.K. Sharma - Bipin Bihari College, Jhansi
- 48. Dr. G.D. Bhatti - Bundelkhand Univ. Jhansi
- 49. Dr. Harishvras - Mallhar Science College, Jyoti
- 50. Dr. veena Pani Dubey - Bilaspur
- 51. Dr. Rashmi Dubey - So. Sci. BSI - Western Regional Center 7 - Corageon Road, Pune - 41100 Ph. 09405757204
- 52. Dr. A.S. Chauhan - J.C. Mills Girls College, Cochin
- 53. Dr. Alka Chaturvedi - RTM Univ. Nagpur
- 54. Dr. Anil Kumar Tiwari - ECC College Allahabad
- 55. Dr. D.K. Chauhan - Allahabad Univ, Allahabad
- 56. Prof. D.R. Mishra - Retd Prof, Allahabad Univ
- 57. Prof. Manju Sahani - Allahabad Univ.
- 58. Prof. Anupam Dixit - Allahabad Univ.
- 59. Prof. Shiv Mohan - Allahabad Univ

  
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Sanjay  
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