Second Semester

Course No.	Name of the Course	Total
PG 201	Taxonomy of Angiosperms	85 + CCE 15 = 100
PG 202	Morphology and Anatomy of Angiosperms	85 + CCE 15 = 100
PG 203	Embryology and Reproduction of Angiosperms	85 + CCE 15 = 100
PG 204	Utilization and Conservation of Plant Resources	85 + CCE 15 = 100
PG 205	* Practical I. based on Course PG 201 and 202	50
PG 206	Practical II. based on Course PG 203 and 204	50
	Total	500

*N.B.: PG 205 will include the following points:

1. Numbers of representative families (about 25) shall be taken up in the practical classes describing the plants up to species level.
2. Study of the primary and secondary anomalies in dicots and monocots.

Note: **Excursion is compulsory for all students (Both local and out station) in Previous and Final year.**

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Department of Higher Education, Govt. of M.P.
Post Graduate Semester wise Syllabus
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उच्च शिक्षा विभाग, म.प्र. शासन
स्नातकोत्तर कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम
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M. Sc. Botany (Semester System)
Second Semester

Course PG 201: Taxonomy of Angiosperms **85+15**

UNIT I: **Principle and methods of Taxonomy:** Taxonomic hierarchy, species, genus, family and other categories, principle used in assessing relationship, delimitation of taxa and attribution of rank. Silent features of International Code of Botanical nomenclature. Taxonomic Tools- Herbarium, Floras, Botanical Gardens.

UNIT II: **Taxonomic evidence and Phylogeny:** Anatomy, palynology, embryology, cytology, phytochemistry, genome analysis and nucleic acid hybridization in relation to taxonomy, different approaches and views of origin and evolution of Angiosperm.

UNIT III: **Systems of Angiosperm classifications:** Phenetic versus phylogenetic systems, Bentham and Hooker's classification, Takhtajan's classification, APG system of classification, merits and demerits of above classifications.

UNIT IV: **Taxonomic studies:** Magnoliaceae, Annonaceae, Papaveraceae, Capparidaceae, Caryophyllaceae, Meliaceae, Rosaceae, Myrtaceae, Cucurbitaceae and Cactaceae.

UNIT V: **Taxonomic studies:** Rubiaceae, Asteraceae, Apocynaceae, Convolvulaceae, Acanthaceae, Verbenaceae, Orchidaceae, Zingiberaceae, Musaceae and Arecaceae.

Suggested Readings

1. Heywood and Moore, D.M; 1984: CWTent concept *in* Plant Taxonomy Academic Press.
2. Banson, L.B.; 1957: Plant Classification, Health and Co. Boston.
3. Davis, P.R and Heywood, V.H 1973: Principles of Angiosperms and Taxonomy, Robert E.
4. Kreiger Pub. *Co.* New *York,* USA
5. Eames, AI.; 1961: Morphology of Angiosperms, Mc-Graw Hill, New York.
6. Jeffery, C.; 1968: An Introduction to Plant Taxonomy J. and H. Churchill Limited.
7. Lawrence, G .H.M.; 1951: Taxonomy of Vascular Plants Macmillan, New York.
8. Naik V. N.; 1984: Taxonomy of Angiosperms. Tata Mc-Graw Hill Pub. Co. Ltd. New Delhi.
9. Porter, L.L.; 1959: Taxonomy of Flowering Plants. San Francisco. Radfor~ A. E. Dickinson,
10. W.C. Massey J.R and. Ben. C.R: 1974: VQ~llar Plant SYstematics, Harper and Row, New York

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M. Sc. Botany (Semester System)

Second Semester

Course PG 202: Morphology and Anatomy of Angiosperms 85+15

UNIT I **Floral morphology:** Types, origin and evolution of Inflorescence, Floral morphology, Flower: a modified shoot; genetics of floral organ (A,B,C models); Morphology of stamen and carpel and its evolution, inferior Ovary; Types and origin of placentation. Fruit types and its evolution.

UNIT II **Shoot Apical Meristem:** Apical, lateral and intercalary meristems- their ultra structure and histochemistry of Shoot development. Organization of shoot apical meristem (SAM), secretory ducts and laticifers, Nodal Anatomy.

UNIT III **Root Apical Meristem:** Organization of root apical meristem (RAM), cell fate and lineages, lateral roots, root hairs, secondary growth and root stem transition. Root-microbe interactions.

UNIT IV **Leaf differentiation and Anatomy:** Leaf histogenesis, leaf meristem, differentiation of epidermis (with special reference to types of stomata and trichomes), mesophylls and vascular system of dicot and monocot leaf.

UNIT V **Secondary growth and anomalies:** Secondary growth of stem and activity of cambium. Ultra structure and function of primary and secondary xylem (wood anatomy) and phloem. Wood development in relation to environmental factors. Nyctanthes, Boerhaavia, Bougainvillea, Mirabilis, Chenopodium, Bignonia, Leptadenia, Salvadora, Tinospora and Draceana stems.

Suggested Readings :

1. Burgess.J.1985.An introduction to Plant Cell Development. Cambridge University Press, Cambridge.
2. Fahn, A 1 982.Plant Anatomy. (3rd edition).Pergamon Press, Oxford.
3. Fosket, D.E.1994. Plant Growth and Development. A Molecular Approach. Academic Press, San Diego.
4. Lyndon, R.F.1990. Plant Development. The Cellular Basis. Unin Hyman. Lon Chandurkar P.J. Plant Anatomy.
5. Vashishitha, P.C.,1999. Plant Anatomy.
6. Pandey, B.P.,2004. Plant Anatomy
7. Esau, K., 2006. Plant Anatomy.

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M. Sc. Botany (Semester System)
Second Semester

Course PG 203: Embryology and Reproduction of Angiosperm **85 + 15**

UNIT I: **Development and Structure of Stamens:** structure and development of anther (Microsporangium), micro-sporogenesis and micro-gametogenesis, role of tapetum, pollen development and gene expression, male sterility, sperm dimorphism, Nemec phenomenon and pollen development in Cyperaceae.

UNIT II: **Development and Structure of Pistil:** Types, structure and Development of Ovule; Mega-sporogenesis and mega-gametogenesis; Embryosac haustoria; Organisation and structure of Monosporic, bisporic, tetrasporic and Pollen embryo sacs.

UNIT III: **Pollination**: Mechanism, types and vectors. Pollen tube greet and guidance, Pollen Stigma interaction. Self Incompatibility: SSI and GSI (cytological, biochemical and molecular aspects).

UNIT IV: **Embryogeny:** Double fertilization and triple fusion; development, types and significance of Endosperm; Storage proteins of endosperm and embryo; Embryogenesis in monocots and dicots; Polyembryony and parthenocarpy.

UNIT V: **Dynamics of fruit growth:** Dynamics of fruit growth: Biochemistry and molecular biology of fruit maturation; Apomixis; Seed development, biochemical aspects and seed germination.

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Suggested Readings

1. Bhojwani, S.S. and Bhatnagar, S.P.2000. The Embryology of Angiosperms (4th revised and enlarged edition). Vikas Publishing House, New Delhi.
2. Burgess, J.1985.An introduction to Plant Cell Development. Cambridge University Press, Cambridge.
3. Fageri, K. and Van der Pijl,L1979. The Principles of Pollination Ecology. Pergamon Press, Oxford.
4. Fahn, A 1 982.Plant Anatomy.(3rd edition).Pergamon Press, Oxford.
5. Fosket, D .E.1994 .Plant Growth and Development. A Molecular Approach. Academic Press, San Diego.
6. Howell, S.H.1998. Molecular Genetics of Plant Development, Cambridge University Press, Cambridge.
7. Leins, P., Tucker, S.C. and Endress, P .K.1988.Aspects of Floral Development. J. Cramer, Germany.
8. Lyndon, R.F.1990.Plant Development. The Cellular Basis. Unin Hyman .London.
9. Murphy, T. M. and Thompson, W. E. 1988 Molecular Plant Development. Prentice Hall, New Jersey.
10. Proctor, M. and Yeo,P.1973.The Pollination of Flowers. William Collins Sons, London.
11. Raghvan, V.,1997 .Molecular Embryology of Flowering Plants. Cambridge University Press, Cambridge.
12. Raghvan, V., 1999. Development Biology of Flowering P Jants. Springer-verlag.
13. Houpt, A.W., 1953. Plant Morphology.
14. Bold, H.C., 1987. Plant Morphology.

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M. Sc. Botany (Semester System)
Second Semester
Course PG 204: Utilization and Conservation of Plant Resources 85+15

UNIT I: **Organization of Resources:** Utilization of Resources from forest, grassland and aquatic habitat; World centers of primary diversity of domesticated plants; Secondary centers of origin. Threats to quality and quantity of Resources to overexploitation.

UNIT II: **Food Plants:** Botany, cultivation and uses of Cereals(Golden Rice, Recent hybrid varieties of Wheat and Maize); Pulses (Gram and Pigeon pea);Vegetables; Fruits; Beverages (Coffee); Oil Yielding Plants(sunflower) and Sugarcane. A brief account of Spices and Condiments.

UNIT III: **Timber and Non-wood timber plant:** General account of Petro crops and Forage. Important timber yielding plants; Non-wood timber forest products (NWFPs): Paper, Pulp, Gums, Tannins, Resins and Dyes. Fibres and fibre yielding plants (Cotton and Sunn Hemp). Plants used as avenue for shade, pollution control and aesthetics.

UNIT IV: **Conservation of resources:** Principles of Conservation, *in-situ"* conservation: Sanctuaries, National parks, Habitat conservation practices, conservation for forests, ranges, soil and water; Ex-situ conservation- Botanical gardens, gene banks, seed banks and cryo-banks.

UNIT V: **Resource monitoring:** Remote sensing concepts and basic biosensors, Tools, Satellite remote sensing, Visual and digital interpretation, EMR bands and their applications; Indian remote sensing programme; thematic mapping of resources. Application of remote sensing in Ecology and Forestry.GIS.

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Suggested Readings

1. Moldan, B. and Billharz, S. 1997. Sustainability Indicators. John Wiley and Sons, New York.
2. Treshow. M. 1985. Air Pollution and Plant Life. Wiley Interscience.
3. Heywood, V.H. and Watson. R.T.1995. Global Biodiversity Assessment. Cambridge University Press.
4. Mason, C.F. 1991. Biology of Freshwater Pollution. Longman.
5. Hill. M.K.1997. Understanding Environmental Pollution. Cambridge University Press.
6. Brady, N.C. 1990. The Nature and Properties of Soils. MacMillan.
7. Kothari, A 1997. Understanding Biodiversity: Life Sustainability and Equity. Orient Longman.
8. Kohli, R., Arya; K.S., Singh; P.H. and Dhillon, H.S.; 1994. Tree Directory of Chandigarh. Lovedale Educational, New Delhi.
9. Nair, M.N.B. et. al (Eds) 1998. Sustainable Management of Non-wood Forest Products.
10. Faculty of Forestry, University Putra Malaysia. 434004 PM Serdong, Selangor, Malaysia.
11. Paroda, R.S. and Arora, R.K. 1991. Plant Genetic Resources Conservation and Management. IPGRI (Publication) S0uth Asia Office, C/o NBPGR, Pusa Campus, New Delhi.
12. Pjmentel, D. and Hall, C.W. (eds) 1989. Food and Natural Resources. Academic Press, London-New York. .

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Scheme of Practical Examination 2016-17
M.Sc. II Sem. Botany
(Based on PG 201 and 202)
Taxonomy of Angiosperm
and
Morphology and Anatomy of Angiosperm

Time – 4 Hrs **Max. Marks - 50**

1.	Major exercise based on anomalies of stem anatomy.	-	10
2.	Major exercise based on Taxonomy.	-	10
3.	Minor exercise based on RAM / SAM	-	05
4.	Spotting 1 to 5	-	10
5.	Viva-Voce	-	05
6.	Sessional/Record	-	10

Total - 50

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Session (सत्र) 2016–2017

Scheme of Practical Examination 2016-17
M.Sc. II Sem. Botany
(Based on PG 203 and 204)
Embryology and Reproduction of Angiosperm
and
Utilization and Conservation of Plant Resources

Time – 4 Hrs **Max. Marks - 50**

1.	Exercise based on Morphology of stamens and carpels.-		05
2.	Exercise based on Embryology/ Placentation.	-	05
3.	Morphology, anatomy and Economic Important. of any (Food/Forage/Fibre /oil Yielding)	-	10
4.	Exercise based on Non-wood timber Prescribed in Syllabus.	-	05
5.	Spotting 1 to 5	-	10
6.	Viva-Voce	-	05
7.	Sessional and Record	-	10
	Total -		50

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