

1.3.2. Number of courses that include experiential learning through project work/field work/internship during the year

I. M.Sc. Botany Syllabus

SYLLABUS for M. Sc. BOTANY
Choice Based Credit System (Semester Pattern)
Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
Effective from 2018-2019

Candidates opting for this course are advised to go through the direction relating to the course "DIRECTION RELATING TO THE EXAMINATION LEADING TO THE DEGREE OF MASTER OF SCIENCE, SEMESTER PATTERN (CHOICE BASED CREDIT SYSTEM) AND DEGREE OF MASTER OF SCIENCE AND TECHNOLOGY (APPLIED GEOLOGY), SEMESTER PATTERN, (CHOICE BASED CREDIT SYSTEM) (FACULTY OF SCIENCE & TECHNOLOGY)" which is available on R. T. M. Nagpur University website.

The direction will provide details on admission criteria, rules for ATKT, scheme of examination, absorption scheme for CBS students into CBCS pattern, elective papers, foundation course papers, subject centric papers, coding pattern, pattern of question papers, practicals, distribution of marks, seminars, project work, internal assessment, calculation of SGPA and CGPA, etc.

Scheme of teaching and examination under semester pattern Choice Based Credit System (CBCS) for M.Sc. Program in Botany

M. Sc. Botany Semester I												
Code	Theory / Practical	Teaching scheme (Hours / Week)				Credits	Duration in hrs	Max. Marks			Minimum Passing Marks	
		Theory	Practical	Total	External Marks			Internal Ass	Total Marks	Theory	Practical	
Core 1 (IT1)	Paper 1 - Microbiology, Algae and Fungi	4	-	4	4	3	80	20	100	40		
Core 2 (IT2)	Paper 2 - Bryophytes & Pteridophytes	4	-	4	4	3	80	20	100	40		
Core 3 (IT3)	Paper 3 - Paleobotany and Gymnosperms	4	-	4	4	3	80	20	100	40		
Core 4 (IT4)	Paper 4 - Cytology and Genetics	4	-	4	4	3	80	20	100	40		
Pract Core 1 & 2 (IP1)	Practical 1- Algae, fungi, Bryophytes	-	8	8	4	6	100	-	100		40	
Pract Core 3 & 4 (IP2)	Practical 2- Pteridophytes, Gymnosperms,	-	8	8	4	6	100	-	100		40	

M. Sc. Botany Semester IV											
Code	Theory / Practical	Teaching scheme (Hours / Week)				Credits	Examination Scheme				
		Theory	Practical	Total	Duration in hrs.		Max. Marks		Total Marks	Minimum Passing Marks	
							External Marks	Internal Ass		Theory	Practical
Core 11 (4T1)	Paper 13 – Cell and Molecular Biology-II	4	-	4	4	3	80	20	100	40	
Core 12 (4T2)	Paper 14 - Plant Biotechnology and Plant Breeding	4	-	4	4	3	80	20	100	40	
Core Elective 2 (4T3)	Paper 15 - Elective II	4	-	4	4	3	80	20	100	40	
Foundation Course 2 / Core Subject Centric 2 (4T4)	Paper 16 - Foundation II / Subject Centric I	4	-	4	4	3	80	20	100	40	
Pract Core 11, 12 & Elective 2 (4P1)	Practical 7- Cell and Molecular Biology-II, Plant Biotechnology and Plant Breeding	-	8	8	4	6	100	-	100		40
Project (4 PROJ 1)	Practical 8 - Project	-	8	8	4	6	100	-	100		40
Seminar 4 (4S1)	Seminar 4	2	-	2	1			25	25	10	
TOTAL		18	16	34	25		520	105	625	170	80

Scheme of Examination for Choice Based Credit Systems M.Sc. (Chemistry) w. e. f. from**Session 2015-16****Semester I**

CH-101: Paper I (Inorganic Chemistry)	80+20 Marks	4 Credits
CH-102: Paper II (Organic Chemistry)	80+20 Marks	4 Credits
CH-103: Paper III (Physical Chemistry)	80+20 Marks	4 Credits
CH-104: Paper IV (Analytical Chemistry)	80+20 Marks	4 Credits
CH-105: Practical-I (Inorganic Chemistry)	100 Marks	4 Credits
CH-106: Practical-II (Physical Chemistry)	100 Marks	4 Credits
CH-107: Seminar-I	25 Marks	1 Credits
Total:	625 Marks	25Credits

Semester II

CH-201: Paper V (Inorganic Chemistry)	80+20 Marks	4 Credits
CH-202: Paper VI (Organic Chemistry)	80+20 Marks	4 Credits
CH-203: Paper VII (Physical Chemistry)	80+20 Marks	4 Credits
CH-204: Paper VIII (Analytical Chemistry)	80+20 Marks	4 Credits
CH-205: Practical-III (Organic Chemistry)	100 Marks	4 Credits
CH-206: Practical-IV (Analytical Chemistry)	100 Marks	4 Credits
CH-207: Seminar-II	25 Marks	1 Credits
Total:	625 Marks	25Credits

Semester III

CH-301: Paper IX (Special I-Inorganic /Organic/ Physical/Analytical)	80+20 Marks	4 Credits
CH-302: Paper X (Special II-Inorganic /Organic/ Physical/Analytical)	80+20 Marks	4 Credits
CH-303: Paper XI (Elective- Applied Analytical/ Nuclear/ Environmental /Polymer/Medicinal)	80+20 Marks	4 Credits
CH-304: Paper XII (Foundation -I/ Instrumental Methods of Analysis-I)	80+20 Marks	4 Credits
CH-305: Practical V- Special (Inorganic /Organic/ Physical/Analytical)	100 Marks	4 Credits
CH-306: Practical VI-Elective (Applied Analytical/ Nuclear/ Environmental /Polymer/Medicinal)	100 Marks	4 Credits
CH-307: Seminar-III	25 Marks	1 Credits
Total:	625Marks	25 Credits

Semester IV

CH-401: Paper XIII (Special I-Inorganic /Organic/ Physical/Analytical)	80+20 Marks	4 Credits
--	-------------	-----------

CH-402: Paper XIV (Special II-Inorganic /Organic/ Physical/Analytical)	80+20 Marks	4 Credits
CH-403: Paper XV (Elective- Applied Analytical/ Nuclear/ Environmental /Polymer/Medicinal)	80+20 Marks	4 Credits
CH-404: Paper XVI (Foundation -I/ Instrumental Methods of Analysis-II)	80+20 Marks	4 Credits
CH-405: Paper XVII (Special II-Organic /Organic/ Physical/Analytical)	80+20 Marks	4 Credits
CH-406: Project	100 Marks	4 Credits
CH-407: Seminar-IV	25 Marks	1 Credits
Total:	625 Marks	25Credits

General scheme for distribution of marks in practical examination

Time : 8-9 h (One day Examination) Marks : 100

Exercise-1	- 30 Marks	- Evaluated jointly by Internal and External Examiner
Exercise-2	- 30 Marks	- Evaluated jointly by Internal and External Examiner
Record	-20 Marks	- Evaluated by Internal
Viva-Voce	-20 Marks	- Evaluated by External

Total: 100

III. M.Sc. Physics Syllabus

SYLLABUS for M. Sc. Physics
Choice Based Credit System (Semester Pattern)
Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
With effect from 2018-19

Candidates opting for this course are advised to go through the direction relating to the course "DIRECTION RELATING TO THE EXAMINATION LEADING TO THE DEGREE OF MASTER OF SCIENCE, SEMESTER PATTERN (CHOICE BASED CREDIT SYSTEM) AND DEGREE OF MASTER OF SCIENCE AND TECHNOLOGY (APPLIED GEOLOGY), SEMESTER PATTERN, (CHOICE BASED CREDIT SYSTEM) (FACULTY OF SCIENCE & TECHNOLOGY)" which is available on R. T. M. Nagpur University website.

The direction will provide details on admission criteria, rules for AIKI, scheme of examination, absorption scheme for CBS students into CBCS pattern, elective papers, foundation course papers, subject centric papers, coding pattern, pattern of question papers, practicals, distribution of marks, seminars, project work, internal assessment, calculation of SGPA and CGPA, etc.

Table of Contents

Revised Syllabus to be implemented from 2015-16 Choice Based Credit System(CBCS).....	2
Semester I Paper 1 (Core 1) 1T1 Mathematical Physics	3
Semester I Paper 2 (Core 2) 1T2 Complex Analysis and Numerical Methods	4
Semester I Paper 3 (Core 3) 1T3 Electronics.....	5
Semester I Paper 4 (Core 4) 1T4 Electrodynamics I.....	6
Semester I Practical 1P1 and 1P2.....	7
Semester II Paper 5 (Core 5) 2T1 Quantum Mechanics I.....	8
Semester II Paper 6 (Core 6) 2T2 Statistical Physics.....	9
Semester II Paper 7 (Core 7) 2T3 Classical Mechanics.....	10
Semester II Paper 8 (Core 8) 2T4 Electrodynamics II.....	11
Semester II Practical 2P1 and 2P2.....	12
Semester III Paper 9 (Core 9) 3T1 Quantum Mechanics II.....	13
Semester III Paper 10 (Core 10) 3T2 Solid State Physics and Spectroscopy.....	14
Semester III Practical 3P1.....	15
Semester III Paper 11 (Core Elective E1.1) 3T3 Materials Science I.....	16
Semester III Paper 11 (Core Elective E1.2) 3T3 X-ray I.....	18
Semester III Paper 11 (Core Elective E1.3) 3T3 Nanoscience and Nanotechnology I.....	19
Semester III Paper 11 (Core Elective E1.4) 3T3 Atomic and Molecular Physics I.....	20
Semester III Paper 11 (Core Elective E1.5) 3T3 Applied Electronics I.....	21
Semester III Paper 12 (Foundation course F1.1) 3T4 Physics I.....	23
Semester III Practical 3P2 for elective papers.....	24
Semester III (Subject Centric Core Course S1.2) 3T4 Nanoscience and Nanotechnology.....	27
Semester III (Subject Centric Core Course S1.3) 3T4 Quantum Computing.....	28
Semester III (Subject Centric Core Course S1.4) 3T4 Digital Electronics and Microprocessor.....	29
Semester IV Paper 13 (Core 11) 4T1 Nuclear and Particle Physics.....	30
Semester IV Paper 14 (Core 12) 4T2 Solid State Physics.....	31
Semester IV Practical 4P1 for core papers.....	32
Semester IV Paper 15 (Core Elective E2.1) 4T3 Materials Science II.....	33
Semester IV Paper 15 (Core Elective E2.2) 4T3 X-ray II.....	35
Semester IV Paper 15 (Core Elective E2.3) 4T3 NanoScience and Nanotechnology II.....	36
Semester IV Paper 15 (Core Elective E2.4) 4T3 Atomic and Molecular Physics II.....	38
Semester IV Paper 15 (Core Elective E2.5) 4T3 Applied Electronics II.....	39
Semester IV Paper 16 (Foundation course F2.1) 4T4 Physics II.....	40
Semester IV (Subject Centric Core Course S 2.2) 4T4 Experimental Techniques in Physics.....	41
Semester IV (Subject Centric Core Course S 2.3) 4T4 Communication electronics.....	42
Semester IV (Subject Centric Core Course S 2.4) 4T4 ElectroAcoustics.....	43

IV. M.Sc. Zoology Syllabus

SYLLABUS for M. Sc. Zoology
Choice Based Credit System (Semester Pattern)
Rashtrasant Tukadoji Maharaj Nagpur University, Nagpur
With effect from 2018-19

Candidates opting for this course are advised to go through the direction relating to the course "DIRECTION RELATING TO THE EXAMINATION LEADING TO THE DEGREE OF MASTER OF SCIENCE, SEMESTER PATTERN (CHOICE BASED CREDIT SYSTEM) AND DEGREE OF MASTER OF SCIENCE AND TECHNOLOGY (APPLIED GEOLOGY), SEMESTER PATTERN, (CHOICE BASED CREDIT SYSTEM) (FACULTY OF SCIENCE & TECHNOLOGY)" which is available on R. T. M. Nagpur University website.

The direction will provide details on admission criteria, rules for ATKT, scheme of examination, absorption scheme for CBS students into CBCS pattern, elective papers, foundation course papers, subject centric papers, coding pattern, pattern of question papers, practicals, distribution of marks, seminars, project work, internal assessment, calculation of SGPA and CGPA, etc.

Syllabus for M. Sc. Zoology (Semester with credit based Pattern) w e f 2018-19 Academic session

Scheme of teaching and examination under semester pattern Choice Based Credit System (CBCS) for M.Sc. Program in Zoology

M. Sc. Zoology Semester I											
Code	Theory / Practical	Teaching scheme (Hours / Week)			Credits	Examination Scheme					
		Th	Pract	Total		Duration in hrs	Max. Marks		Total Marks	Minimum Passing Marks	
							Exte mal	Inter nal		Th	Prac
Core 1	Paper 1T ₁ : Structure and Function of Invertebrates	4	-	4	4	3	80	20	100	40	
Core 2	Paper 1T ₂ : General Physiology	4	-	4	4	3	80	20	100	40	
Core 3	Paper 1T ₃ : Cell Biology and Genetics	4	-	4	4	3	80	20	100	40	
Core 4	Paper 1T ₄ : Advanced Reproductive Biology	4	-	4	4	3	80	20	100	40	
Pract. Core 1 & 2	Practical 1P ₁ : Based on theory Paper 1T ₁ & 1T ₂	-	8	8	4	3-8*	100*	-	100		40
Pract. Core 3 & 4	Practical 1P ₂ : Based on	-	8	8	4	3-8*	100*	-	100		40

)	Biology										
Pract. Core 9	Practical 3P ₁ : Based on theory of 3T ₁	-	8	8	4	3-8*	100*	-	100		40
Pract. Core Elective 1 and 2	Practical 3P ₂ : Based on theory of 3T ₂ and 3T ₃	-	8	8	4	3-8*	100*	-	100		40
Seminar 3	Seminar -3S ₃	2	-	2	1			25	25	10	
	TOTAL	18	16	34	25		520	105	625	170	80

M. Sc. Zoology Semester IV											
Code	Theory / Practical	Teaching scheme (Hours / Week)				Credits	Examination Scheme				
		Th	Pract	Total	Duration in Sem		Max. Marks		Total Marks	Minimum Passing Marks	
							Ext ern	Int ern		Th	Pra
Core 11	Paper 4T₁: Biotechnique, Biostatistics, Ethology, Toxicology and Bioinformatics	4	-	4	4	3	80	20	100	40	
Core 12	Paper 4T₂: Special Group- Paper 4T ₂ • Entomology • Fish and Fisheries • Mammalian Reproductive Physiology (MRP) • Animal Physiology • Environmental Biology	4	-	4	4	3	80	20	100	40	
Core	Paper 4T₃:	4	-	4	4	3	80	20	100	40	

Elective 2	Special Group- Paper 4T ₃ • Entomology • Fish and Fisheries • Mammalian Reproductive Physiology (MRP) • Animal Physiology • Environmental Biology											
Foundation Course 2 (NOTE: Only for students of other M. Sc. Subjects)	Paper 4T ₄ : Foundation- II • Applied and Industrial Entomology / • Core (Subject Centric)-II Radiation and Chronobiology	4	-	4	4	3	80	20	100	40		
Pract. Core 11, 12 & Elective 2	Practical 4P ₁ : Based on theory of 4T ₂ and 4T ₃	-	8	8	4	3-8*	100*	-	100			40
Project	Project -Pro	-	8	8	4	3-8*	100*	-	100			40
Seminar 4	Seminar- 4S ₄	2	-	2	1			25	25	10		
	TOTAL	18	16	34	25		520	105	625	170		80

Note: Th = Theory; Pr = Practical/lab, * = If required, for two days.

** = The Practical and Project shall be evaluated by both the External and Internal Examiner in the respective Department / Center / Affiliated College.

Changes in practical curriculum as per UGC Notification No. F.14-6/2014 (CPP-II) Dated 1st August 2014 (w.e.f. academic session 2015-16)

Important Instructions

- I. Use of animals for dissection for practical purpose in the curriculum is banned by UGC vide its notification No. F.14-6/2014 (CPP-II) dated 1st August 2014. It is now essential to use necessary alternatives to stop dissection and promote and orient students towards the knowledge component rather than skill development using ICT and available resources without disturbing natural habitat. To understand anatomy of

Geology Semester IV

Paper I

(Palaeontology)

Unit I

Definition and scope of Palaeontology. Processes of fossilization. Preservation potential of organisms. Elementary ideas about origin of life, evolution and fossil record. Application of palaeontological data in economic geology, palaeoecology, evolution, stratigraphy, palaeogeographic & palaeoclimatic reconstructions. Basic ideas about micropalaeontology and microfossils.

Unit II

Classification, diagnostic morphological characters, environment and geological distribution of Brachiopoda, Mollusca (Bivalvia, gastropoda and cephalopoda)

Unit III

Classification, diagnostic morphological characters, environment and geological distribution of Foraminifera, Graptoloidea, and Anthozoa.

Unit IV

Classification, diagnostic morphological characters, environment and geological distribution of the following: Echinoidea and Trilobita. Plants of Gondwana Period.

Books recommended:

1. Clarkson: Invertebrate Palaeontology and evolution.
2. Swinnerton: Fossils.
3. Shrock and Twenhofel: Principles of Palaeontology.
4. Woods: Invertebrate Palaeontology.
5. Moore, Lalicker and Fisher: Invertebrate fossils
6. Stearn and Carroll: Palaeontology the record of Life.
7. Arnold: An introduction to Palaeobotany.
8. Black: Elements of Invertebrate Palaeontology.
9. Koregave: Fundamentals of Invertebrate Palaeontology.

10. Lahi: Field Geology.
11. Gokhale: Guide to Field Geology.
12. Butler and Bell: Interpretation of Geological Maps.
13. Phillips: The use of Stereographic projections in Structural Geology.
14. Roberts: Introduction to Geological maps and structures.
15. Ragan: Structural Geology: An introduction to geometric techniques.
16. Bolton: Geological Maps: Their solution and interpretation.

Practicals:

Palaeontology:

Morphological characters, identification, age and sketches of the following fossils:

Rhynchonella, Terebratula, Productus, Spirifer, Pecten, Ostrea, Trigonina, Cerithium, Conus, Turritella, Physa, Ceratites, Orthoceras, Nautilus and Belemnites, Nummulites, Monograptus, Cidaris, Hemiaster, Paradoxide, Calymene, Zaphrentis, Cyathophyllum, Calceola, Alethopteris, Lepidodendron, Calamites, Glossopteris, Gangamopteris, Vertebraria, Cordaites and Philophyllum.

Structural Geology:

Reading a geological map and the symbols used. Exercises on geological maps showing bedding, unconformities, folds, faults and intrusive. Completion of outcrop maps (minimum of 15 maps). Problems based on true dip and apparent dip, three point problems, and determination of thickness and depth of the beds. Stereographic projections of structural data. Drawing of geological sections and interpretation of geology and geological history (10 to 15 maps)

Field work:

Every student should attend field work for a short duration and submit field diary, geological specimen and a report.

Geology Semester VI
Paper I
(Elements of Remote Sensing and Environmental Geology)

Unit I

Definition of Remote Sensing. Scope and aim of Remote Sensing in Geology. Remote Sensing from aerial heights (Aerial photography), Remote Sensing from space heights (Satellite imagery), Aerial photography, Aerial camera, Types of aerial photographs, (black & white, colour and infra-red), Flights for obtaining aerial photos. Methods of studying aerial photos in the form of mosaics and stereopairs. Pocket and Mirror stereoscope.

Unit II

Recognition elements in the study of aerial photos- tone, texture, pattern, shape, size, form, shadow, drainage, vegetation, and landforms. Photographic expressions of various geological features on aerial photos and factors affecting such expressions (climate, vegetal cover, soil, type of weathering *vis-à-vis* nature and composition of rocks). Importance of concept of convergence of evidence in photo-interpretation. Guidelines for lithologic, structural and geomorphic interpretation.

Unit III

Definition and concept of Environmental Geology. Natural hazards such as earthquakes, floods, volcanic activity, coastal erosion, desertification and their impact on environment. Soil types, soil degradation and mitigation, soil pollution.

Unit IV

Concepts of natural ecosystems on the earth and their mutual interrelations and interactions (atmosphere, hydrosphere, lithosphere and biosphere). Environmental changes due to human dominated environment over nature dominated system. Environmental considerations in the constructions of large dams, reservoirs, and tunnels. Pollution: its effect on natural ecosystem and anti- pollutional measures (water and air)

Books recommended:

Remote Sensing:

1. Pande: Principles and applications of Photogeology.
2. Sabins: Remote sensing Principles and interpretations.

Books recommended:

Hydrogeology:

1. Todd: Ground water Hydrology
2. Karanth: Hydrogeology
3. Nagabhushaniah : Groundwater in Hydrosphere (Groundwater hydrology)

Geomorphology:

1. Savindrasingh (1998): Geomorphology, Prayag Pushpak Bhavan, Allahabad.
2. Thornbury William D.: Principles of Geomorphology, Wiley Eastern Reprint 1984.
3. Negi B.S.: Geomorphology, Kedarnath Ramnath, Meerut.
4. Sharma V.K.: Geomorphology, Earth processes and forms, Tata McGraw Hill Publishing Co., New Delhi.
5. Worcester P.G.: Text book of Geomorphology.

Practicals:

Remote Sensing:

Test of stereoscopic vision. Handling of aerial photographs. Aerial photo index. Orientation of stereopairs. Stereoviewing on aerial photos in conjunction with relevant toposheets. Significance of scale and resolution factors. Study of aerial photo expression of structural, geomorphic and lithologic features on stereopairs.

Geomorphology:

Reading of topographic maps. Scheme of numbering of topographic maps. Data provided on topographic maps. Drainage patterns and their relationship to lithology and structure. Computation of gradient of a stream. Contour patterns related to different topographic forms such as valleys, ridges (mesa, cuesta, homoclinal ridge, hogback), scarps, domes, basins, waterfalls, slopes, plains, gorges, plateaus, sand dunes. Contour patterns related to structures such as horizontal, dipping and folded beds, plunging folds. Contour patterns of igneous, sedimentary and metamorphic rocks.

Field work:

Every student should attend field work for a short duration and submit field diary, geological specimen and a report.

VI. B.Sc. with Zoology syllabus

RASHTRASANT TUKADOJI MAHARAJ, NAGPUR UNIVERSITY, NAGPUR
SYLLABUS FOR B.Sc. ZOOLOGY (SEMESTER PATTERN)
 (With effect from the academic year 2013-2014)

The semester pattern syllabus for B.Sc. Three Year Degree Course in the Subject - Zoology comprises of six semesters. Each semester is based on six theory periods and six practical periods per week. The examination of each semester shall comprise of two theory papers each of three hours duration and carries 50 marks each and a practical of 4 hours duration carries 30 marks. Internal assessment for each semester based on two theory papers of 10 marks each and shall be conducted by university approved teachers. Internal assessment marks should be submitted to the university one month prior to the final examination. Candidates are expected to pass separately in theory, internal assessment and practical examination.

The Structure of Syllabus for B.Sc. Zoology (Semester Pattern) along with distribution of marks is also displayed in the following Table

Semester	Semesterwise Theory Papers and Practicals	Marks			Total Marks
		Theory	Internal Assessment*	Practical	
Semester - I	Theory Paper – I : Life and Diversity of Animals-Nonchordates (Protozoa to Annelida)	50	10		150
	Paper -II : Environment Biology	50	10		
	Practical - I (Based on Paper I & II)			30	
Semester- II	Theory Paper - III : Life and Diversity of Animals- Nonchordates (Arthropoda to Hemichordata)	50	10		150
	Paper - IV : Cell Biology	50	10		
	Practical - II (Based on Paper III & IV)			30	
Semester- III	Theory Paper - V : Life and Diversity of Animals-Chordates (Protochordata to Amphibia)	50	10		150
	Paper - VI : Genetics	50	10		
	Practical - III (Based on Paper V & VI)			30	
Semester - IV	Theory Paper - VII : Life and Diversity of Animals-Chordates (Reptilia, Aves and Mammals)	50	10		150

Contd. on Pg. 2

	Paper - VIII : Molecular Biology and Immunology	50	10		
	Practical - IV (Based on Paper VII & VIII)			30	
Semester - V	Theory Paper - IX : General Mammalian Physiology I	50	10		150
	Paper - X : Applied Zoology I (Aquaculture and Economic Entomology)	50	10		
	Practical - V (Based on Paper IX & X)			30	
Semester - VI	Theory Paper - XI : General Mammalian Physiology II	50	10		150
	Paper - XII : Applied Zoology II (Biotechniques, Microtechnique, Biotechnology, Bioinformatics and Biostatistics)	50	10		
	Practical - VI (Based on Paper XI & XII)			30	
		Grand total			900

*Internal assessment –

- (For Semester I to IV) Based on students attendance and the performance during Unit test exam. and field work
- (For Semester V & VI) Based on students attendance and the performance during Unit test exam., field work and seminar

Semester - I

Paper – I : Life and Diversity of Animals - Nonchordates
(Protozoa to Annelida)

Unit – I (9 Periods)

- 1.1 Protozoa : General characters and classification up to classes
- 1.2 *Paramecium* : Structure and reproduction
- 1.3 *Plasmodium* : Structure and life cycle
- 1.4 Parasitic Protozoans of Man : *Entamoeba*, *Trypanosoma*, *Giardia* and *Leishmania* - Mode of infection and its control

Unit – II (9 Periods)

- 2.1 Porifera : General characters and classification up to classes
- 2.2 *Sycon* : Structure, reproduction and development, Canal system in sponges
- 2.3 Coelenterata : General characters and classification up to classes
- 2.4 *Obelia* : Structure and life cycle, corals and coral reef formation

VII. B.Sc. with Botany (Semester III to VI) syllabus

RTM, NAGPUR UNIVERSITY, PROPOSED SYLLABUS OF B.Sc. (SEMESTER PATTERN) IN BOTANY

RTM, NAGPUR UNIVERSITY, NAGPUR.

SEMESTER PATTERN SYLLABUS

FOR B.Sc. BOTANY

B.Sc. SEMESTER-I

PAPER-I Viruses, Prokaryotes & Algae

PAPER-II Fungi, Lichen, Plant-Pathology & Bryophyta

B.Sc. SEMESTER-II

PAPER-I Pteridophyta & Gymnosperms

PAPER-II Palaeobotany & Morphology of Angiosperms

B.Sc. SEMESTER-III

PAPER-I Angiosperm Taxonomy

PAPER-II Cell Biology, Plant Breeding & Evolution

B.Sc. SEMESTER-IV

PAPER-I Angiosperm Anatomy & Embryology

PAPER-II Genetics & Molecular Biology

B.Sc. SEMESTER-V

PAPER-I Biochemistry & Plant Physiology-I

PAPER-II Plant Ecology I

B.Sc. SEMESTER-VI

PAPER-I Plant Physiology- II & Biotechnology

PAPER-II Plant Ecology- II, Techniques & Utilization of Plants.

SEMESTER – III
PAPER – I
ANGIOSPERM TAXONOMY

Unit I

Origin of Angiosperms (Benettitalean theory). Phylogeny of Angiosperm: Homology, monophyly, polyphyly, Clads.

Fossil Angiosperms: Flower (*Sahianthus*).

Angiosperm Taxonomy: Floras, Herbarium, keys (Indented and Bracketed), Holotype, Lectotype, Neotype.

Botanical Nomenclature: Principles (rank and ending of taxa, principle of priority),

Unit II

Classification of angiosperms: Natural, Artificial, Phylogenetic system of classification.

Systems of classification: Bentham & Hooker and Engler & Prantl (along with merits and demerits),

Modern trends in Taxonomy : Cytotaxonomy (Karyotype), Phytochemistry (Proteins, flavonoids, Betalains) , Taximetrics to taxonomy.

Unit III

Study of Families (Dicot): Malvaceae, Brassicaceae, Fabaceae (Papilionoideae, Caesalpinioideae, Mimosoideae)

Unit IV

Study of Families (Dicot): Asteraceae, Asclepiadaceae, Euphorbiaceae

Study of Families (Monocot): Poaceae

List of Practicals

Study of Families covered in the theory portion.

Study of fossil Angiosperms micropreparation and specimens: *Sahianthus*,
Enigmocarpon

Botanical Excursions (Two short or One long out of the state is compulsory).

SEMESTER – IV

PAPER – I

ANATOMY AND EMBRYOLOGY OF ANGIOSPERMS

Unit I

Basic body plan & Modular type of Growth.

Meristems :Classification of meristems based on origin and position.

Permanent tissue and their functions: Simple tissue (parenchyma, collenchyma, sclerenchyma), Complex tissue (xylem and phloem).

Unit II

Apical meristem of Root and Shoot: Apical cell theory, tunica-carpus theory, Types of root apex according to Newman.

Primary structure of root in dicot (Sunflower) and monocot (Maize)

Primary structure of stem in dicot (Sunflower) and monocot (Maize)

Types of vascular bundles- dicots and monocots

Cambium (structure, types, function)

Unit III

Periderm, growth ring, sap wood, heart wood

Secondary growth (Sunflower stem) and anomalous secondary growth in *Bignonia* and *Dracena* stem.

Anatomy of leaf: Dicot (*Nerium*), monocot (Maize).

Senescence and abscission of leaves.

Unit IV

Pollination: Types and adaptation, significance

Structure of anther, Microsporogenesis, male gametophyte

Types of ovules, structure of anatropous ovule

Megasporogenesis and female gametophyte (polygonum type)

Double fertilization and triple fusion, endosperms and its types, Structure of dicot (*Onagad*) and monocot embryo.

List of practicals

Study of simple tissue, complex tissue and secretory tissue from permanent slides

Study of types of vascular bundles

Study of internal structure of dicot and monocot root using hand section and prepare temporary mounts -Sunflower, Maize

Study of internal structure of dicot and monocot stem using hand section and prepare temporary mounts -Sunflower, Maize

Study the growth ring in woods-Teak wood

Study of internal structure of secondary growth and anomalous secondary growth using hand section and prepare permanent micropreparations - *Bignonia* stem and *Dracena* stem.

Study of internal structure of leaves- *Nerium*, Maize

Study of types of ovules, anther structure, pollen grains, adaptations for pollination

To calculate the percent pollen germination in the given specimen

Botanical Excursions (One short tour is compulsory).

SEMESTER – V
PAPER – II
PLANT ECOLOGY - I

Unit I

Ecology: definition, branches and significance of ecology

Climatic Factors: Atmospheric (Gaseous composition), Light & Temperature (effect on vegetation).

Edaphic Factor :Pedogenesis, Soil profile, Soil properties (physical and chemical)

Unit II

Physiographic factor- Biotic Factor: Interactions between plants and animals and human, Interaction between plants growing in a community, Interactions between plants and soil microorganisms. Biogeochemical Cycles: Nitrogen, phosphorous

Unit III

Ecosystem: Biotic and Abiotic components, Food chain, Food web, Ecological pyramids

Autecology (definition, importance), ecad, ecotype- characteristics and importance

Synecology (or community ecology)- Study of community: analytical (quantitative- frequency, density, abundance; qualitative- Life forms, Raunkier's Biological spectrum) and synthetic characters (presence, fidelity, dominance)

Unit IV

Principles of Phytogeography, Distribution (wides, endemics, discontinuous species), Theories (Landbridge and continental drift), Climatic regions of India, Phytogeographic regions of India (Chatterjee 1962; Name, distribution area, typical vegetation)

List of practicals:

To determine frequency, density, abundance of the community by quadrat method.

To determine the homogeneity of vegetation by Raunkier's frequency diagram.

To determine the water holding capacity of the given soil samples.

RTM, NAGPUR UNIVERSITY, PROPOSED SYLLABUS OF B.Sc. (SEMESTER PATTERN) IN BOTANY

To determine the water holding capacity of the given soil samples.

To determine the soil moisture of the given samples.

Botanical Excursions (One short tour is compulsory).

Semester V Practical examination

Question Paper

Time : 5 hrs

Marks : 30

Q. 1) To perform given Physiology Experiment [A] & report the findings	06
Q. 2) To perform the given Biochemical Experiment [B] & report the findings	04
Q. 3) To perform the given Ecological Experiment [C] & report the findings	05
Q. 4) To perform the given microchemical test [D] & report the findings	03
Q. 5) Spotting :	04
E - Plant Physiology	
F -Plant Physiology	
G - Ecology (Component of aquatic ecosystems)	
H - Ecology(Component of terrestrial ecosystems)	
Q. 6) Viva Voice	03
Q. 7) Practical Record & Excursion Report	05

SEMESTER – VI

PAPER – II

PLANT ECOLOGY, TECHNIQUES & UTILIZATION OF PLANTS

Unit I

Plant succession: Definition, Causes of succession, Hydrosere, Xerosere

Plant adaptations: Morphological, Anatomical & Physiological responses of Hydrophytes, Xerophytes, Halophytes (with one example)

Unit II

Environmental Pollution: Agricultural, noise and thermal pollution, Control of environmental pollution, Environmental management

Natural resources- types (renewable and non-renewable), factors for depletion; conservation of forest and water resources

Unit III

Principle, types and application of: microscopy (Light, fluorescent, SEM, TEM), centrifugation, electrophoresis (SDS-PAGE and Agarose), spectroscopy (UV-Vis), chromatography (Paper chromatography, Thin layer chromatography)

Unit IV

Utilization of Plants: Morphology, Utilization and Important chemical constituents of :-

Food: Wheat; Oil: Ground nut; Fibre: Cotton; Spices: Clove; Beverages: Coffee; Medicinal: Neem; and Rubber.

Ethnobotany: Introduction, definition, branches & importance of ethnobotany

List of Practicals

To study the morphological and anatomical characteristics of any one hydrophyte and xerophyte.

To study the morphological characteristics of cladode, phylloclade, phyllode and pneumatophores.

RTM, NAGPUR UNIVERSITY, PROPOSED SYLLABUS OF B.Sc. (SEMESTER PATTERN)

Principle and working of: spectrophotometer, microscope etc.

To determine the DO of water samples

different sources.

To study the dust holding capacity of leaves.

To estimate transparency, pH and temperature of different water bodies

To estimate salinity (chlorides) of different water samples.

To determine the percent leaf-area injury of different leaf samples collected

sites.

Utilization of **Plants**: Morphology, Utilization and Important chemical constituents mentioned in theory. To study the plants of ethnobotanical importance.

Microchemical Tests: Lipid, Proteins, starch, Lignin, Carbohydrates, Cellulose.

Electrophoretic /chromatographic separation of amino acids carbohydrates

Botanical Excursions (One short tour is compulsory).



Jivan
Principal
S.M.M. College of Science
Nagpur