SEMESTER III

CODE	COURSE TITLE
18BOPC307	TAXONOMY AND BIOSYSTEMATICS

Category	CIA	ESE	L	T	P	Credit
Core	25	75	70	5	-	4

Preamble

To conserve the biodiversity.

To identify the locally available plants.

To understand the relationship of Taxonomy with other fields of Biological science.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Describe and classify plant diversity and understand the major features and evolutionary origins of vascular plants.	K1,K2
CO2	Learn the vocabulary of plant description and identify the plants using dichotomous keys	K3
CO3	Be aware of the importance of taxonomic relationships in plant systematics and to understand the causes for selection and variation in plant characteristics	K3, K4
CO4	Recognize some important angiosperm families and gain knowledge of their diagnostic characters	K3
CO5	Understand the systematics, diagnostic characters and to know where the food plants come from	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	M	M
CO2	S	S	M	M	M
CO3	M	M	M	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT- I **(15hrs.)**

Major Systems of classification- Artificial – Linnaeus - Natural – Bentham and Hooker Phylogenetic – Engler and Prantl – Outline of APG –III Plant classification - Hierarchy of characters in Plant Taxonomy-Species- Genus- Family and other categories- concept of species and intraspecific categories-subspecies- varieties and forms.

UNIT- II **(15hrs.)**

Plant Nomenclature-ICBN with reference to IAPT- Typification - Principles of priority and their limitations. Effective and valid publications - citation-retention - choice and rejection of names – Taxonomic literature- Flora-Monograph - Revision – Key- Indented- Bracketed- Botanical Gardens.

UNIT- III **(15hrs.)**

Taxonomic evidences- External morphology - Anatomy-Embryology-Palynology- Cytology-Modern trends in Taxonomy- Chemotaxonomy- Numerical taxonomy-Molecular taxonomy-Biosystematics-Phenotypic plasticity- Turreson's experiment.

UNIT-IV **(15hrs.)**

Polypetalae - Systematics– Diagnostic characters and economic uses of the following families-Menispermaceae – Polygalaceae – Caryophyllaceae – Meliaceae –Vitaceae – Rhamnaceae – Sapindaceae - Fabaceae – Rosaceae – Combretaceae - Onagraceae –Lythraceae- Aizoaceae.

UNIT-V **(15hrs.)**

Gamopetalae - Oleaceae – Gentianaceae – Apocynaceae - Solanaceae– Boraginaceae – Bignoniaceae – Pedaliaceae–Monochlamydeae- Nyctaginaceae – Aristolochiaceae - Loranthaceae–Monocotyledons- Scitamineae- Commelinaceae - Aroideae –Cyperaceae.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Taxonomy of Angiosperms	Pandey S.N and Misra S.P.	Anne Books, India	2008, Revised Edition
2.	Plant Taxonomy	Saxena N.B. and ShamindraSaxena	Pragati Prakashan , India	2001 3rd Edition
3.	Taxonomy of Angiosperms	Singh V.K. and Jain,D.K	Rastogi Publications	2012, 8th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Lawrence H.M.	Taxonomy of Vascular plants	Mac Millan& Co	1979, 1st Edition
2.	Heslop J. Harrison	New concepts in flowering plants taxonomy	Heinemann EducationalBooks, India	1970, Revised Edition
3.	Davis P.H. and HeywoodV.H.D.	Principles of Angiosperm Taxonomy	Oliver and Boyd, London	1963, 1st Edition

Web Resource

www.biologydiscussion.com/plants/classifications/system-of...classification-3.../30330
www.biologydiscussion.com/.../plant-nomenclature/essay...nomenclature...plants.../77.
https://www.slideshare.net/nasira55/evidences-of-anatomy-cytology-and-chemistry-to-plant-taxonomy
https://en.wikipedia.org/wiki/Polypetalae
https://en.wikipedia.org/wiki/Gamopetalae
https://en.wikipedia.org/wiki/Monochlamydeae
https://en.wikipedia.org/wiki/Monocotyledon

Pedagogy

Lecture- Chalk & Talk, PPT, Quiz, Assignment, Seminar, Plant collection, Micro preparation Herbarium Techniques, Field visit.

SEMESTER III

CODE	COURSE TITLE
18BOPC308	PLANT PHYSIOLOGY AND PHYTOCHEMISTRY

Category	CIA	ESE	L	T	P	Credit
Core	25	75	85	5	-	4

Preamble

To understand the movement of water and solute.

To learn the metabolic and biochemical reactions in plants.

To understand the mechanism of organic matter production.

To study the role of metabolites and growth hormones in physiological effects.

To understand the interactions among the cells, tissues and organs within a plant

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge on physiological processes between plants and their environment	K1
CO2	Understand and analyse the metabolic and physiological process unique to plants	K2,K3
CO3	Understand physiological mechanisms of plants and to apply for crop improvement	K3, K4
CO4	Develop entrepreneurial skills in using the hormones on plant propagation	K4
CO5	Understand the functions of molecules and metabolites which serves as the foundation for advances in agriculture, horticulture and forestry	K3

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	M	M	S	S
CO2	S	S	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **18Hrs.**

Water – Properties, Biological significance – Water relationships of the plants -Water potential. Absorption of water- Ascent of sap, Absorption of solutes – Translocation of solutes - Translocation of assimilates**.** Transpiration - Kinds of transpiration, Mechanism of stomatal transpiration - factors affecting transpiration.

UNIT II **18 Hrs.**

Photosynthesis- Photosynthetic pigments- Mechanism of Photosynthesis: Light reaction - Electron carriers- photophosphorylation - Carbon fixation in C_3 and C_4 plants- CAM pathway. Photorespiration and glycolate- metabolism.

UNIT III **18 Hrs.**

Respiration- Aerobic and anaerobic respiration -Glycolysis - Pyruvate metabolism. TCA cycle- Electron transport system coupled with Oxidative phosphorylation- Metabolism of storage protein – Gluconeogenesis - fat to carbohydrates - HMP pathway**.**

UNIT IV **18 Hrs.**

Phytochemistry- Enzyme: Classification, Properties and mechanism of enzyme action, factors affecting enzyme activity- Growth hormones-General account of Auxin- Gibberellins- Cytokinins- Ethylene - Abscissic acid- Senescence- Phytochrome- Photoperiodism- Vernalisation- Circadian rhythm and Biological clock.

UNIT V **18 Hrs.**

Phytochemistry – Classification, structure and properties of carbohydrates- amino acids- proteins - lipids - Secondary metabolites - Classification, role of Terpenoids, Alkaloids, Polyphenolics, Biosynthesis of secondary metabolites- Free radicals : Types, causes of free radicals- General account on antioxidant activity.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Jain, J.L	Fundamentals of Biochemistry	S. Chand and Company PVT., LTD., New Delhi	2002, 7th Edition
2.	Robert M. Devlin and Francis H. William,	Plant Physiology	CBS Publishers & Distributors, New Delhi	1972,4th Edition
3.	Meirion Thomas,S., Ranson and RichardsonJ.A.	Plant Physiology	Longman group limited, London.	1973, 5th Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Albert L. Lehninger	Principles of Biochemistry	CBS Publishers & Distributors, PVT Ltd., New Delhi.	1987, 4th Edition
2.	Frank B. Salisbury and Cleon W. Ross	Plant Physiology	CBS Publishers, New Delhi.	1974, 9th Edition
3.	Geoffrey Zubay	Biochemistry	Addison Wesley Publishing Company, Sydney.	1984, 4th Edition

Web Resource

https://www.google.com/search?q=water+relation+in+plant+physiology

https://www.google.com/search?q=photosynthesis+in+plants

https://www.google.com/search?q=respiration+in+plants

https://www.google.com/search?q=respiration+in+plants

https://www.google.com/search?q=secondary+metabolites+in+plants

https://www.google.com/search?q=primary+metabolites+in+plants

Pedagogy

Lecture- Chalk & Talk, PPT, Quiz, Assignment, Seminar, Physiological experiments and phytochemical analysis

SEMESTER III

CODE	COURSE TITLE
18BOPC309	BIOINFORMATICS

Category	CIA	ESE	L	T	P	Credit
Core	25	75	70	5	-	4

Preamble

To understand the current concepts in gene organization, transcription, translation and regulation of gene

To analyze the structure and sequence of biomolecules using new technology

To develop the skill for analyzing various software applications

To understand the importance of bioinformatics tools and apply it in life science research

Course Outcomes

On the successful completion of the course, students will be able to

CO s	CO Statement	Knowledge Level
CO1	Acquire knowledge on different computational tools to find DNA sequences and to predict genes	K1,K2
CO2	Understand and apply different approaches and models for phylogenetic analysis and tree construction	K2,K3
CO3	Use appropriate knowledge and recognize problem-solving skill to develop new algorithms	K3,K4
CO4	Analyse biological data using a variety of bioinformatics tools accessible on the network	K3
CO5	Apply various visualization tools and techniques for visualizing biomolecular structures	K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	S	M	S	S
CO2	S	S	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	M	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **15 Hrs.**

Introduction to internet-Usage of World Wide Web through Internet Explorer - internet server – URL - HTML – HTTP - Scope - Fields related to Bioinformatics - Application of Bioinformatics – Human. **genome.**

UNIT II **15 Hrs.**

Molecular biology - General account of Nucleic acid – structure and chemistry of DNA – RNA - Genes - gene Expression - Genetic code - Protein synthesis.

UNIT III **15 Hrs.**

Introduction to Data base - Biological data bases - Objectives of Biological Databases - Types – Sequence data bases - NCBI – EMBL - DDBJ - Swiss Prot. PIR-PRF - Structural data bases – PDB - Carbohydrate database - Literature databases - Pub Med - Agricola.

UNIT IV **15 Hrs.**

Sequence Analysis - Data mining - Sequence alignment - CLUSTAL W, Gene Finding - Protein secondary structure prediction and tools. Phylogenetic analysis - Construction of phylogenetic tree and its uses.

UNIT V **15 Hrs.**

Gene finding - Proteomics – Genomics - Metabolomics- Drug designing **–** Biomolecular Visualization tools.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Arthur, M. Lesk	Introduction to Bioinformatics	Oxford University Press, New York.	2003, 1st Edition
2.	Mani, L. and Vijayaraj,N	Bioinformatics for beginners	Kalai Kathir Achagam, Coimbatore.	2002, 1st Edition
3.	Sundar Rajan, S. and Balaji, R.	Introduction to Bioinformatics	Himalaya Publishing House, Mumbai.	2005, Revised Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Andreas, D., Baxevanis, and B.F., Francis	Ouelletle Bioinformatics	John Wiley Sons Inc., PVT., LTD., Singapore	2002, 1st Edition
2.	Rajadurai, M.	Bioinformatics	PBS Book Enterprises, Chennai	2010, 1st Edition
3	Attwood,T.K	Bioinformatics	Benjamin Cummings Publishing Company.	2007, 1st Edition
4.	Shanmugavel,P. & Wadhwa G.	Praticals in Bioinformatics	Pointer Publishers,Jaipur, India	2012, Revised Edition

Web Resources

https://www.techopedia.com/definition/1660/email-server-email

https://en.wikipedia.org/wiki/Gene_expression

https://www.khanacademy.org › ... › Central dogma and the genetic code

https://en.wikipedia.org/wiki/Biological_database

https://www.slideshare.net/pscad123/phylogenetic-analysis

https://www.expasy.org/resources/.../keywords:secondary%20structure%20prediction

Pedagogy

Lecture-Chalk & Talk, PPT, Quiz, Assignment, Group Discussion, Seminar, Gene finding

SEMESTER IV

CODE	COURSE TITLE
18BOPC410	GENETIC ENGINEERING AND BIOTECHNOLOGY

Category	CIA	ESE	L	T	P	Credit
Core	25	75	85	5	-	4

Preamble

To understand the transgenic technology in plants.

To study the microbial production of organic acids and organic manure.

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Acquire knowledge on the molecular tools of gene cloning technique	K1,K2
CO2	Understand and analyse the trangenic plants and to apply the technique in crop improvement	K2,K3
CO3	Apply the techniques in genetics and molecular biology	K3, K4
CO4	Develop entrepreneurial skill in mining and protect environment	K4
CO5	Apply nanoparticles in the biological systems to create and use material structures, devices for potential benefits	K5

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	S	M	M	S	S
CO2	S	S	M	M	S
CO3	S	S	S	S	S
CO4	S	S	S	S	S
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT I **18 Hrs.**

Genetic Engineering- Scope of genetic engineering –Molecular Tools for genetic engineering- Enzymes-vectors -Methods of Gene cloning – Polymerase chain reaction-Gene Libraries - Application of Genetic engineering.

UNIT II **18 Hrs.**

Transgenic plants and Nitrogen fixation - Gene transfer methods -Marker genes and uses –applications of transgenic plants- resistance to biotic and abiotic stresses- improvement of crop yield – transgenic plants as bioreactors- mehanism of nitrogen fixation –Genetic manipulations for nitrogen fixation **-** Nif-Hup- Nod genes.

UNIT III **18 Hrs.**

Molecular markers and Gene therapy- Types of Molecular markers and its application- RFLP- RAPD-VNTRs-Diagnosis of genetic diseases-Gene therapy methods-methods of gene drug delivery-Vaccines-Genetic counseling- Biosafety.

UNIT IV **18 Hrs.**

Environmental Biotechnology: Biomining –bioleaching-removal of metals from water- microbial enhancement of oil recovery –Bioremediation – Phytoremediation –naturally occurring plants for phytoremediation-transgenic plants for phytoremediation- Biodegradation of Xenobiotics

UNIT V **18 Hrs.**

NanoBiotechnology – Nanoparticles as building block**s,** Drug delivery systems – Prostheses and Implants – Microarrays **–** Gene Chip –Nano technology in agriculture and food.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Gupta ,P.K.	Plant biotechnology	Rastogi publications, Meerat	2010 1st Edition
2.	Dubey, R.C	A text book of Biotechnology	S. Chand & Company	2006, 4th Revised Edition
3.	Subbiah Balaji	Nanobiotechnology	MPJ Publishers	2010, 1st Edition
4.	Satyanarayana.U	Biotechnology	Uppala Author-Publisher Interlinks	2008 Revised Edition

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Glazer, A.N. and Nikaids, H	Microbial Biotechnology	W.H. Freeman & Company, New York	1995, 1st edition
2.	Kumar, H.D.	Modern Concepts of Biotechnology	Vikas publishing house Pvt. Ltd	2014, Revised Edition

Web Resource

https://explorebiotech.com/7-important-molecular-tools-genetic-engineering/

https://www.sciencedaily.com/terms/transgenic_plants.html https://www.nibib.nih.gov/science-education/science-topics/drug-delivery-systems

https://www.sciencedirect.com/topics/earth-and-planetary-sciences/phytoremediation

https://www.nanowerk.com/nanotechnology/.../introduction_to_nanotechnology_1.ph.

Pedagogy

Lecture-Chalk & Talk, PPT, Quiz, Assignment, Group Discussion, Seminar

SEMESTER – IV

CODE	COURSE TITLE
18BOPC411	ECOLOGY AND CONSERVATION BIOLOGY

Category	CIA	ESE	L	T	P	Credit
Core	25	75	70	5	-	4

Preamble

To know the exclusivity of the varying habitats in the biosphere

To acquire the knowledge about the structure and functions of different ecosystems

To create awareness on environmental protection and conserve biodiversity for future generation

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Understand the various habitats and their vegetation	K2,K3
CO2	Know the concept of succession and concepts of biogeochemical cycles	K2,K3
CO3	Aware of different types of pollutions and recent problems concerning with global warming, ozone depletion and effect of green house	K2,K4
CO4	Know-how the methods of environmental audits and environmental impact	K4
CO5	Understand the conservation problems, analyze the causes behind the vulnerability and extinction risks of populations	K2,K3

Mapping with Programme Outcomes

Cos	PO1	PO2	PO3	PO4	PO5
CO1	M	M	S	S	M
CO2	S	M	S	S	M
CO3	S	S	S	M	M
CO4	M	S	S	S	M
CO5	S	S	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT- I **(15 Hrs.)**

Ecosystem - Structure and function - Basic Concept of Population ecology, speciation, characteristics of population, Inter and Intra- specific relations among populations, positive and negative interactions – Synecology – classification - structure methods of studying plant Communities- Phytogeographical regions of India.

UNIT-II **(15 Hrs.)**

Plant Succession- Causes of succession - Climax concept - Types of succession – Hydrosere – Xerosere – Lithosere. Biogeochemical cycles - Hydrological cycle - Nitrogen - oxygen – Sulphur – Carbon - Phosphorus.

UNIT- III **(15 Hrs.)**

Environmental problems and Management - Types – Soil – Water – Air - Radiation and Noise Pollution and Management - El-nino and La-nino - Green house effect - Global warming - Impact of Pollution on vegetation – Ecological indicators.

UNIT-IV **(15 Hrs.)**

Natural Resources - Types – Depletion – Conservation –Disaster management and Rehabilitation. Awareness Programmes on Environmental Days (World Environmental day, World Wetlands day, World Forestry day, World Water day, International day for Biological Diversity). Conservation: Afforestation – Chipko movement - Biosensors – application of remote sensing.

UNIT-V **(15 Hrs.)**

Biodiversity conservation - Genetic, species and ecosystem biodiversity- importance – Degeneration – Conservation strategies for plant genetic resources: *In-situ* conservation: National parks, Wildlife Sanctuaries, Biosphere reserves – *Ex-situ* conservation: Botanical and herbal gardens, zoological parks, seed orchards and gene banks. IUCN Classification – Red data Book. Social Forestry - Man – Wild life conflicts – Causes – Remedial measures.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Ambhast, R.S	A text book of plant ecology	Students, Friends & Co, Varanasi	1988, 15th Edition
2.	Asthana D.K. and Meera Asthana	A Text book of Environmental studies.	S. Chand & Co. New Delhi	2006, 1st Edition
3.	Pandey, S.N. and Misra, S.P.	Environment and Ecology	Ane Book Pvt. Ltd., New Delhi.	2011, 3rd Edition
4.	Sharma, P.D.	Ecology and Environment	Rastogi Publications, Meerut	2005, 7th Edition (Reprint)

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Bhatia, A.L. and Kohli, K.S.	Environmental Biology	Ramesh book depot, Jaipur, New Delhi.	2005,Revised Edition
2.	Prabhu,P.C., Udayasoorian, C. and Balasubramanian, G.	An Introduction to Ecology and Environmental Science	Avinash Paperbacks, Delhi.	2009, 2nd Edition
3.	Babar,M.D.	Environmental changes- Natural Disasters	New India Publishing Agencies, New Delhi	2007, 1st Edition
4.	Trivedi, P.R. and Gurudeep Raj.	Environmental Wildlife and Plant Conservation	Akashdeep Publications. Hojuse, Newdelhi	1992, 1st Edition

Web Resource

https://www.britannica.com/science/autecology
https://notes.tyrocity.com/introduction-and-process-of-plant-succession/
https://sciencing.com › Science › Nature › Environment
https://kids.britannica.com/kids/article/natural-resource/399553
https://en.wikipedia.org/wiki/IUCN_Red_List

Pedagogy

Lecture - Chalk & Talk, PPT, Quiz, Assignment, Group Discussion, Seminar, Vegetational Analysis

SEMESTER - IV

CODE	COURSE TITLE
18BOPC412	RESEARCH METHODOLOGY

Category	CIA	ESE	L	T	P	Credit
Core	25	75	70	5	-	4

Preamble

To understand some basic concepts of research and its methodologies

To study the methods of writing research articles

Course Outcomes

On the successful completion of the course, students will be able to

CO Number	CO Statement	Knowledge Level
CO1	Evoke the information about various principles, methodology and uses of instruments.	K1,K2
CO2	Acquire the knowledge of basic to advance microscopes.	K2,K3
CO3	Attain the statistical knowledge and their role.	K3, K4
CO4	Develop skill to select and define appropriate research problem and parameters	K3, K4
CO5	Enhance the skill to write a research report, thesis and proposal	K3,K4

Mapping with Programme Outcomes

COs	PO1	PO2	PO3	PO4	PO5
CO1	M	S	S	S	M
CO2	M	S	S	S	S
CO3	M	S	M	S	M
CO4	S	M	M	S	S
CO5	S	M	S	S	S

S- Strong; M-Medium; L-Low

Syllabus

UNIT - I **(15 hrs.)**

Lab techniques - Principles, methodology and uses of Spectroscopy - Infrared, Visible and NMR. Electrophoresis - Agarose gel - Blotting techniques - Microscopy – SEM - TEM and Fluorescent - Chromatography - HPLC.

UNIT - II **(15 hrs.)**

Lab techniques - Extraction – isolation – characterization, identification and quantification of secondary metabolites - Alkaloid – Flavonoids - Terpenoids and Glycosides.

UNIT - III **(15 hrs.)**

Biostatistics - Collection of data – Primary data – Secondary data. Presentation of data - Tabulation - graph. Measures of central tendency - Mean (only arithmetic) - Median - Mode. Measures of dispersion – Range - Standard deviation- Standard error. Probability – Theorems of probability. Student's't' Test. Chi-square test - Analysis of variance (ANOVA - Theory only).

UNIT - IV **(15 hrs.)**

Research Methodology - Objectives of research - Types of Research- Significance of Research Process - Research Problems - Research Design – Sampling Design- Measurement and scaling techniques

UNIT - V **(15 hrs.)**

Interpretation and Report writing – Review of literature - Steps in writing report - layout of the report - Types of report - Mechanics of writing. Manuscript for publication and proof correction. Citation index, impact factor, h – index and plagiarism.

Text Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Kothari, C.R.	Research Methodology - Methods and Techniques	New Age International Publishers	2011, 2nd Edition.
2.	Veerakumari, L.	Bio instrumentation	MJP Publishers, Chennai	2009, 1st Edition.
3.	Saravanavel, P.	Research Methodology	Kitav mahal, New Delhi.	2010, 3rd Edition.

Reference Books

Sl.No.	Author Name	Title of the Book	Publisher	Year and Edition
1.	Misra,R.P.	Research Methodology- A Hand Book	Concept Publg Company , New Delhi.	2000, 1st Edition.
2.	Zar, J.K.	Biostatistical analysis	Prentice-Hall Internatioinal, INC, Engleword chiffs, New Jersey.	1984, 5th Edition.
3.	Vijay upagade and Arvind Shende	Research Methodology,	Chand & Co., New Delhi.	2010, 1st Edition.
4.	Kaur, H.Pragati	Instrumental methods of chemical analysis,	Prakashan, Meerut.	2001, 6th Edition.

Web Resource

https://serc.carleton.edu/research_education/geochemsheets/techniques/SEM.html

https://www.sciencedirect.com/topics/biochemistry-genetics-and.../secondary-metabolite

udel.edu/~mcdonald/HandbookBioStat.pdf

https://www.qualtrics.com/blog/research-problem/

https://researchguides.uic.edu/c.php?g=252299&p=1683205

Pedagogy

Lecture - Chalk & Talk, PPT, Quiz, Assignment, Group Discussion, Seminar, collection of data.