

Detailed Course Scheme
Doctor of Philosophy
(Ph.D.)

(2022-2023)

DOC202208170004



RNB GLOBAL UNIVERSITY

RNB Global City, Ganganagar Road,
Bikaner, Rajasthan 334601

OVERVIEW

RNB Global University follows the UGC Guidelines 2016, for Course Work for Ph.D.

The Ph.D. Course Work shall be of six months duration July to December and January to June in each academic year.

All research Scholars must complete the course work requirements within a period of 1 year maximum, in order to continue with their research.

The Program Scheme & Syllabus for Course Work Program along with examination pattern is as follows:

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S. No	Subject Code	Course Name	L	T	P	Credits
1.	77000100	Research Methodology	2	0	2	3
2.	77000200	Research Problem, Interpretation & Report Writing	2	0	2	3
3.	77000600	Research and Publication Ethics	2	0	0	2
4.	-	Subject Specific-I**	2	0	4	4
4.	-	Subject Specific - II** (Only for Interdisciplinary Research work)	2	0	0	2
5.	77000300	One Published Article	-	-	-	2
6.	77000400	Two Seminars or One Workshop of Minimum three days	-	-	-	2
7.	77000500	One Online Certificate Course on Subject Specific of your Research from any national or international MOOC platform, 3 or 4 credits.				3 or 4
Total Credits			5	0	9	19/20
Total Credits (For Interdisciplinary Research work)			7	0	9	21/22

** : Subject Specific papers will be added as & when required in discussions with SRC & approval of Dean Research

Subject Specifics shall be as follows:

Discipline	Subject Code	Subject Name
Management	11018400	Research Methodology in Marketing Management
Law	16006800	Legal Research Methodology
Science	13006400	Research Methodology in Sciences
English	12000600	Contemporary Literary and Critical Approaches
Commerce	11019500	Finance and Commerce
Science	13028400	Botany

EVALUATION SCHEME

The evaluation of the Course Work for Ph.D. Program would be based on Internal and External Assessments. Internal Assessment (in form of continuous assessments) would consist of 50% of the marks (50 marks) and external assessment (in form of End Term Exam) would consist of remaining 50% marks (50 marks).

The passing criteria in each subject will be 50% & the course work must be completed within 1 year with a minimum CGPA of 6.0

Grade points & Letter grade would be the same as followed in UG & PG courses run by RNBGU

The completion of Ph.D. course work shall be essential for synopsis submission.

Detailed scheme of Internal and External Assessments as follows:

Internal Assessment

Type	Details	Marks
Mid Term	One Mid-term Sessional (to be held along with the 2 nd Sessional exams)	15
Marks obtained in various Tests, Assignments, Presentations, Quiz, Tutorials, etc.	Average of marks obtained	30
Attendance	80%+ : 5 marks	5
TOTAL	50	

External Assessment

Type	Marks
Theory	50

N.B: The passing mark is 50% in each paper in the course work in order to be eligible to continue in the program and submit the dissertation/thesis. If a student is not able to pass a course with 50% marks, the student shall be allowed to reappear only once in the examination in the subsequent semester.

CURRICULUM

Course Name: Research Methodology

Course Code:77000100

Course Outline

Unit I -Research Methodology: An Introduction

- (a) Meaning of Research
- (b) Objectives of Research
- (c) Motivation in Research
- (d) Types of Research
- (e) Research Approaches
- (f) Significance of Research
- (g) Research Methods versus Methodology
- (h) Research Topic

Unit II- Research Design

- (a) Meaning of Research Design
- (b) Need for Research Design
- (c) Features of a Good Design
- (d) Important Concepts relating to Research Design
- (e) Different Research Designs
- (f) Basic Principles of Experimental Designs

Unit III- Methods of Data Collection

- (a) Collection of Primary Data
- (b) Observation Method

- (c) Interview Method
- (d) Collection of Data through Questionnaires
- (e) Collection of Data through Schedules
- (f) Difference between Questionnaires and Schedules
- (g) Some Other Methods of Data Collection
- (h) Collection of Secondary Data

Unit IV- Processing and Analysis of Data

- (a) Processing Operations
- (b) Elements/Types of Analysis
- (c) Statistics in Research
- (d) Measures of Central Tendency
- (e) Measures of Dispersion
- (f) Measures of Asymmetry
- (g) Measures of Relationship
- (h) Simple Regression Analysis
- (i) Multiple Correlation and Regression
- (j) Partial Correlation
- (k) Association in Case of Attribute

Unit V- Practical Training for Research

- (a) Observations
- (b) Questionnaires
- (c) Interviews

Unit VI- Research ethics

Unit VII- Review of published research in the relevant field

Unit VIII- Availability of books at various Libraries

Course Name: Research Problem, Interpretation and Report Writing

Course Code:77000200

Course Outline

Unit I- Defining the Research Problem

- (a) What is a Research Problem?
- (b) Selecting the Problem
- (c) Necessity of Defining the Problem
- (d) Technique Involved in Defining a Problem
- (e) Framing of Hypothesis

Unit II- Testing of Hypotheses

- (a) What is a Hypothesis?
- (b) Basic Concepts Concerning Testing of Hypotheses

- (c) Procedure for Hypothesis Testing
- (d) Flow Diagram for Hypothesis Testing
- (e) Measuring the Power of a Hypothesis Test
- (f) Tests of Hypotheses
- (g) Important Parametric Tests
- (h) Limitations of the Tests of Hypotheses
- (i) Quantitative methods

Unit III- Interpretation

- (a) Meaning of Interpretation
- (b) Technique of Interpretation
- (c) Precaution in Interpretation

Unit IV- Report Writing

- (a) Significance of Report Writing
- (b) Different Steps in Writing Report
- (c) Layout of the Research Report
- (d) Types of Reports
- (e) Oral Presentation
- (f) Mechanics of Writing a Research Report
- (g) Precautions for Writing Research Reports
- (h) Presentation of Thesis
 - i. Preliminaries
 - ii. The text
 - a. Setting of the text
 - b. Style of text
 - c. The Footnote
 - d. Conclusions and Suggestions
 - e. **Summary**
 - iii. The end matter

Unit V- Computer applications

- (a) Introduction
- (b) Computer Applications
- (c) Computers and Researcher
- (d) Digital materials for research
- (e) Collection of data from inter net
- (f) Concept of Public domain
- (g) Use of material available on internet

Unit VI- Style sheet

Style of the Text

Words, spellings, usages

Non-English words, phrases, including Indian words

Punctuation

A full stop (.)

A colon (:)
A semicolon (;)
A comma (,)
Quotation marks (“ ”)
Round brackets ()
Square brackets []
Dash (—)
Hyphen (-)
Conclusion

Research and Publication Ethics

Course Code:77000600

Course Outline

RPE 01: Philosophy and Ethics (3 Hours)

1. Introduction to Philosophy: definition, nature and scope, concept, branches
2. Ethics: definition, moral philosophy, nature of moral judgments and reactions

RPE 02: Scientific Conduct (5 Hours)

1. Ethics with respect to science and research
2. Intellectual honesty and research integrity
3. Scientific misconduct: Falsification, Fabrication and Plagiarism (FFP)
4. Redundant Publications: duplicate and overlapping publications, salami slicing
5. Selective reporting and misrepresentation of data

RPE 03: Publication Ethics (7 Hours)

1. Publication ethics: definition, introduction and importance
2. Best practices/standards settings initiatives and guidelines: COPE, WAME, etc.
3. Conflicts of interests
4. Publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types
5. Violation of publication ethics, authorship and contributorship
6. Identification of publication misconduct, complaints and appeals
7. Predatory publishers and journals

RPE 04: Open Access Publishing (4 Hours)

1. Open access publications and initiatives
2. SHERPA/RoMEO online resource to check publisher copyright & self-archiving policies

3. Software tool to identify predatory publications developed by SPPU
4. Journal finder/journal suggestion tools viz. JANE, Elsevier Journal Finder, Springer Journal Suggester, etc.

RPE 05: Publication Misconduct (4 Hours)

A. Group Discussions (2Hours)

1. Subject specific ethical issues, FFP, authorship
2. Conflicts of interests
3. Complaints and appeals: examples and fraud from India and abroad

B. Software tools (2Hours)

Use of plagiarism software like Turnitin, Urkund and other open source tools

RPE 06: Databases and Research Metrics (7Hours)

A. Databases (4 Hours)

1. Indexing databases
2. Citation databases: Web of Science, Scopus etc.

B. Research Metrics (3 Hours)

1. Impact Factor of journal as per Journal Citation Report, SNIP, SJR, IPP, Cite Score
2. Metrics: h-index, g-index, i10 index, altmetrics

Course Name: Research Methodology in Marketing Management

Course Code:11018400

Course Outline

Unit I: Nature and Domain of Marketing

Understanding marketing: A critical review of alternate definitions; Marketing theory, early schools of marketing thought and research streams, Modern schools of marketing thoughts and research agenda.

Unit II: Dynamics of Consumer Behavior

Basics of consumer decision-making: Personal and interpersonal determinants of consumer behavior, Consumer Buying Behavior: Theories and Models , Segmentation, Targeting and Positioning concepts

Unit III: Marketing Research

Applications of Marketing Research in areas of Consumer , Business-to-Business, Product , Pricing , Motivational , Distribution , Advertising , Media , Sales Analysis and Forecasting, ,

Lifestyle ,Social Marketing, Rural Marketing , Services Marketing , Marketing Information System and Research, Online Marketing Research

Unit IV: Advances in Marketing

Service quality,Gaps Model for improving the Quality of Service.Emerging Trends in Retailing, Factors Behind the change of Indian Retail Industry, Retail MerchandisingRural Market VS Urban Market, e-rural marketing, Rural Marketing Information System , Marketing Channels in rural marketing.

Unit V: Developments and Emerging Issues in Marketing

Components of e-marketing, Impact of e-Marketing onmarketing Strategy. Green Marketing, Holistic Marketing, Network Marketing,Event Marketing, Nucleus Marketing.

Suggested Readings

1. Kotler Philip & Armstrong, G., Principles of Marketing, Prentice-Hall of India, , 2008.
2. Kotler Philip, Marketing Management, Prentice-Hall of India, 2007.
3. Kotler Philip & Keller, Principles of Marketing, Prentice-Hall of India, 2007.
4. SaxenaRajan, Marketing Management, Tata McGraw-Hill Publishing Co. Ltd., 3rd Edition.
5. Schiffman, L.G. and Kanuk, L.L., Consumer Behaviour, New Delhi, PHI.
6. Belch, G.E. & Belch, M.A., Introduction to Advertising and Promotion, Chicago, Irwin.
7. Porter, M.E., Competitive Advantage : Creating, Sustaining Superior Performance, New York, Free Press.
8. Keegan, W., Global Marketing Management, Englewood Cliffs, New Jersey, PHI.
9. Levy, M & Barton, A.W., Retailing Management, Irwin, London.

Course Name: Legal Research Methodology

Course Code:16006800

Course Outline

Unit I: Basic Concepts of Indian Legal System

- (a) Nature of Indian Legal System
- (b) Common Law Foundations
- (c) Rule of Law
- (d) Separation of Powers
- (e) Principle of Natural Justice and Rule of equity
- (f) Indian Constitution: Salient Features
- (g) Judicial System in India
 - (i) Hierarchy of Courts
 - (ii) Jurisdiction of the Courts

Unit II: Legal Writing

- (a) Legal Materials:
 - (i) Statutes
 - (ii) Reports
 - (iii) Journals
 - (iv) Manuals
 - (v) Bill, Act
- (b) Case Analysis

Unit III: Indian Judicial System and Legal Remedies

- (a) Supreme Court
- (b) High Court
- (c) Subordinate civil judiciary
- (d) NyayaPanchayats
- (e) Administrative justice
- (f) Legal Remedies

Unit IV: Legal cases studies and practices

- (a) Method of citation of legal cases
- (b) Precedent
- (c) Authority of precedent
- (d) Doctrine of *Stare Decisis*
- (e) Decisions *per incurim*
- (f) *Ratio decendi*

- (g) *Obiter dicta*
- (h) Preparation of Briefs - Practice

Suggested Readings:

1. A. T. H. Smith, *Glanville Willaim's Learning the Law*, Sweet & Maxwell, 15thed, 2013
2. A.V. Dicey, *Law and Public Opinion in England*, Macmillan, London, 1962.
3. M.C. Setalvad, *The Common Law in India*, Stevens, London, 1968.
4. John WiliamSalmond, *Jurisprudence*, Sweet & Maxwell, 12th ed., 1966
5. Joseph Minattur, *Indian Legal System*, Indian Law Institute, 2nd ed., 2006
6. M.P. Jain, *Indian Constitutional Law*, 3rdEd.Tripathi, Bombay, 1978
7. M.P. Jain, *Outlines of Indian Legal History*, 3rd ed., 1972.
8. N.C. Sen-Gupta, *Evolution f Ancient Indian Law*.
9. O.W. Holmes, *The Common Law*, Light & Life, New Delhi, 1975.
10. PriyanathSen, *Jeneral Principles of Hindu Jurisprudence*, University of Calcutta, 1980.
11. R. Kushawaha, *Working of NyayaPanchayat in India*, 1977.
12. S. K. Verma& M. AfzalWani (ed.), *Legal Research and Methodology*, ILI, Delhi 2001
13. The Law Commission of India, *Fourteenth Report*, 1958. ``Access : Access
14. UpendraBaxi, ``Access, Development and Distributive Justice : Access Problems of the 'Rural' Population,`` 18 JILI, 1976, p. 375.

Course Name: Research Methodology in Sciences

Course Code:13006400

Course Outline

Unit I: Electrodynamics

Maxwell's equations: in vacuum and in medium; electromagnetic waves; emission, absorption, and scattering of radiation; and relativistic electrodynamics and mechanics.

Unit II: Basic Electronics

Semiconductor Diodes and Applications:

p-n junction diode, Characteristics and Parameters, Diode approximations, DC load line analysis, Half-wave rectifier, Two-diode Full-wave rectifier, Bridge rectifier, Capacitor filter circuit (only qualitative approach), Zener diode voltage regulators: Regulator circuit with no load, Loaded Regulator. Numerical examples as applicable.

Unit III: Bipolar Junction Transistors:

BJT operation, BJT Voltages and Currents, BJT amplification, Common Base, Common Emitter and Common Collector Characteristics, Numerical examples as applicable.

Unit IV: Simulation code: XOOPIIC/ LPIC/ MATLAB/ FORTRAN

Student will have to choose one of the XOOPIIC/ LPIC/ MATLAB/ FORTRAN. In any simulation basics and a few programming regarding solution of linear differential equation, second degree differential equations and second degree-second order differential equations are to be learnt.

Unit V : Availability of Research material for Scientific Research in General

- a) Scientific Research Literature
- b) National Scientific Institutions in various Disciplines in India
- c) Significance of data available of internet.
- d) Interpretation of scientific data
- e) Patents and Specifications for patents

Course Name: Contemporary Literary and Critical Approaches

Course Code:12000600

Unit I: Approaches to the study of literature

- a) Post Modernism (Habermos, Lyotard, Baudrillard)
- b) Psychoanalytic Criticism (LacanFrend, Kristeva)
- c) Social Discourse (Foucault, Bakhtin School)
- d) Narratology (Aristotle, Propp, Genette)

Unit II: Postcolonial Theory and Diaspora Literature

- a) Postcolonial Theory and Literature
- b) Diaspora Theory and Literature

Unit III: Dalit and Tribal Literature

- a) Dalit Literature and Aesthetics
- b) Tribal Literature from North-East: *The Legends of Pensam*

Unit IV: Introduction to Translation Studies and Comparative Literature

- a) Translation Studies: Introduction, nature, meaning and function; theories of translation; types, process, problems and limitations of translation; translation and transliteration
- b) Comparative Literature: Theoretical concepts, Scope and Relevance, Different Schools of Thought and Comparative Indian Literature

Unit V: Inter-Disciplinary and Cultural Studies

- a) Inter-Disciplinary, Multi-Disciplinary and Inter-textual Studies: A Postmodern Perspective
- b) Cultural Studies: Tradition of Performance, Cinema and Soap Opera
- c) Ecocriticism: Postcolonial Perspective

Suggested Readings:

1. Ahmad, Imtiaz and Upadhyay. Dalit Assertion in Society, Literature and History. Hyderabad: Orient Blackswan, 2010.
2. Ambedkar, B.R. "Annihilation of Caste". Valerian Rodrigues. Ed. The Essential Writings of B.R. Ambedkar. New Delhi: Oxford University Press, 2002. 263-305.
3. Arnold, Matthew. Culture and Anarchy. Courier Corporation, 2014.
4. Ashcroft, Bill, et al. eds. Key Concepts in Post-Colonial Studies. London: Routledge, 2004.
5. Ashcroft, Bill, et al. The Empire Writes Back: Theory and Practice in Post-Colonial Literatures. Routledge, 2002.
6. Baldwin, E. Introducing Cultural Studies. New York: Pearson/Prentice Hall, 2004.
7. Baral, Kailash C. Earth Songs: Stories from Northeast India. Delhi: SahityaAkademi, 2005.
8. Bassnett, Susan. Comparative Literature: An Introduction. Blackwell, 1993.
9. Bassnett, Susan, Translation Studies: An Introduction. Routledge, 2002.
10. Cao, Shunqing. The Variation Theory of Comparative Literature. London: Springer, 2013.
11. Catford, J. C. A Linguistic Theory of Translation. London: OUP, 1994.
12. Chari, V.K. Sanskrit Criticism. New Delhi: MotilalBanarsidass, 1993.
13. Dai, Mamang. The Legends of Pensam. New Delhi: Penguin Publications, 2006.
14. Dev, Amiya. The Idea of Comparative Literature in India. Calcutta: Papyrus, 1984.

15. During, S. *Cultural Studies: A Critical Introduction*. London; New York: Routledge, 2005.
16. Gifford, Henry. *Comparative Literature: Concepts of Literature*. Routledge, 1969.
17. Glover, David and Cora Kaplan. Eds. *Genders*. Routledge, 2008.
18. Guerin, Wilfred L. et. al. *A Handbook of Critical Approaches to Literature*. Delhi: OUP, 2010.
19. Habib, M.A.R. *A History of Literary Criticism and Theory: From Plato to the Present*. London: Wiley-Blackwell, 2012.
20. Huggan, Graham and Helen Tiffin. *Post-Colonial Ecocriticism: Literature, Animals, Environment*. Routledge, 2009.
21. Hutcheon, Linda and Siobhan O'Flynn. *A Theory of Adaptation*. Routledge, 2012.
22. Kumar, Raj. *Dalit Personal Narratives: Reading Caste, Nation and Identity*. Hyderabad: Orient Blackswan, 2011.
23. Kene, P.V. *History of Sanskrit Poetics*. New Delhi: MotilalBanarsidass, 1961 (reprint 2015).
24. Limbale, Sharankumar. *Towards an Aesthetics of Dalit Literature*. Hyderabad: Orient Blackswan, 2004.
25. Misra, Tilottoma. *The Oxford Anthology of Writings from North-East India: Poetry and Essays. Vol I & II*. New Delhi: Oxford University Press, 2011.
26. Misra, Tilottoma., *The Oxford Anthology of Writings from North-East India: Fiction*. New Delhi: Oxford University Press, 2011.
27. Naipaul, V.S. *A House for Mr. Biswas*. Rev. Ed. Delhi: Picador, 2011.
28. Munday, Jeremy. *Introducing Translation Studies: Theories and Applications*. Routledge, 2008.
29. ParanjapeMakarand. In *Diaspora: Histories, Texts, Theories*. Delhi: Indialog, 2002.
30. Pollock, Sheldon. "Introduction." *Literary Cultures in History: Reconstructions form South Asia*. Berkely: University of California Press, 2003. 1-37.
31. Valmiki, Omprakash. *Dalit SahityakaSaundrayaShastra*. New Delhi: RadhaKrishanPrakashan, 2005.
32. Vatsayan, Kapila. *Bharata: The Natyashastra*. New Delhi: SahityaAkademi, 1996.
33. Venuti, Lawrence Ed. *The Translation Studies Reader*. London and New York: Routledge, 2000.
34. Williams, Raymond. *Culture and Society*. Columbia University Press, 1983.
35. Zama, Margaret Ch. *Emerging Literatures from North-east India: The Dynamics of Culture, Society and Identity*. New Delhi: Sage Publications, 2013.

Course Name: Finance and Accounts

Course Code-11019500

Objective

To familiarize students with the mechanics of accounting standard of financial statements, understanding corporate finance, Ratio, Capital Budgeting Decisions and their analysis and interpretation.

Unit-I

Accounting Standards and Guidance: Notes on various accounting aspects issued and

Standard setting process--- Accounting Principles, GAAP Development and Study of Accounting Standards. Study of Indian Accounting Standards and International Accounting Standards issued.

Unit - II

Corporate Financial Reporting - issues and problems with special reference to published

financial statements. Financial reporting in respect of various kinds of financial institutions like mutual funds, non-banking finance companies, merchant bankers, stock brokers.

Unit - III

Financial Management-Nature, Objectives and Scope, Financial Decision-Making and Types of Financial Decisions, Role of a Finance Manager in a Firm and Agency Problem. Capital Budgeting Decisions: Nature and Kinds of Capital Budgeting Decisions, Techniques of Evaluating Capital Budgeting Decisions.

Unit - IV

Ratios- Liquidity Ratios - Current ratio- Quick ratio- Absolute Liquid Ratio Profitability Ratios - Gross Profit Ratio- Net Profit Ratio- Operating ratio- Operating Profit ratio- Return on Investment- Return on capital Employed Ratio- Earning per share Ratio Dividend Yield Ratio- Price earnings Ratio- Net profit to Net Worth ratio Efficiency /Turnover Ratios - Stock turnover ratio - Debtors turnover ratio- Debt collection period ratio- Creditor turnover ratio- Average payment period- Working capital turnover ratio-Fixed assets turnover ratio- Capital turnover ratio.

Suggested Readings: Readings for the course to be suggested by the concerned Faculty Keeping in view the relevance contemporariness and research trends.

REFERENCE

BOOKS.

1. Corporate Accounting, Dr. S. N. Maheshwari, Viakas Publishing House Pvt. Ltd. New Delhi
2. Advanced Accounting, Dr. Ashok Sehgal & Dr. Deepak Sehgal: Taxmann, New Delhi. Fundamentals of Cost Accounting and financial accounting - S N Maheshwari – Sultan Chand & Sons, New Delhi.
3. Financial Management - Ravi M Kishor –Taxmann
4. Financial Management – M. Y. Khan,, P. K. Jain- Tata McGraw Hill.
5. Capital Budgeting: Theory and Practice- Pamela P. Peterson, Frank J. Fabozzi

Course Structure For Ph.D. in Botany

Course Code : 3028400

Unit I:

1. **Classification of Kingdoms and Bacteria:** Criteria (according to Mayr, the seven kingdoms of living organisms); Introduction to different branches of botany (conventional and recent) Bacteria ultrastructure and economic importance; Thallus organization and reproductive methods in the following types: *Nostoc*, *Pseudomonas*, *Rhizobium*, *Rivularia*, *Spirulina* (including Cyanobacteria): Group characters, Occurrence, morphological forms,
2. **Algae:** General characters, classification and economic importance, important features and life history of:
Chlorophyceae: *Volvox*, *Ulothrix*
Xanthophyceae: *Diatoms*
Phaeophyceae: *Sargassum*
Rhodophyceae:
Batrachospermum
3. **Fungi:** General characters, classification and economic importance; important

features and life history of

Mastigomycotina:

Phytophthora **Zygomycotina:**

Mucor **Ascomycotina:**

Eurotium

Basidiomycotina: *Puccinia, Agaricus*

Unit II:

4. **Angiosperm Morphology and Taxonomy:** Different regions and general functions, types of root systems. Stem: Various parts, normal functions (Different types of buds, vegetative and reproductive), forms of stem. Leaf: Structure and normal functions. Simple and compound leaves Seed: Definition, structure and types Bracts, peduncle and inflorescence: Flower: Structure of a typical flower, definition and examples of different types of flowers. Introduction to the floral whorls Fruits: Definitions of true, false and parthenocarpic fruits. Major types of fruits.
5. **Angiosperms:** Unique features of angiosperms and diversity; identification, nomenclature and classification (Bentham & Hooker's system); primitive and advanced features; the international code of botanical nomenclature. Families: Major angiosperm families, detailed account of Malvaceae, Fabaceae, Solanaceae and Lamiaceae
6. **Cell Biology:** Structure and function of cells and intracellular organelles (of both prokaryotes and eukaryotes), Mechanism of cell division including (mitosis and meiosis) and cell differentiation; Cell-cell interaction, Malignant growth, Immune response : Dosage compensation and mechanism of sex determination.
7. **Tissue systems:** Epidermal tissues: general organization, cuticle, trichomes and stomatal types Secretory tissues: gum and resin ducts, laticifers, hydathodes, floral and extrafloral nectaries Vascular tissue: Secondary xylem (basic structure of wood). Secondary phloem. Secondary growth: Normal and anomalous secondary growth in different Angiosperms. Periderm and lenticel - structure and development

8. **Organisation of the higher plant body:** The shoot and root systems; variation in habit and longevity; environmental influences Meristems and development: Shoot apical meristem, root apical meristem, lateral meristems and their functions. Nodal Anatomy: Leaf trace, leaf gap

Unit III:

9. **Plant Ecology:** Concept and structure of ecosystem, Food chain, food web, Ecological pyramids, Basic ideas about ecosystem functioning, energy flow, organic reduction, biogeochemical cycles and ecological instruments. Ecological classifications of plants, Adaptations in hydrophytes, mesophytes, xerophytes, halophytes and epiphytes Air, water and land pollution, causes and control measures
10. **Instrumentation:** Principle and working of pH meter, spectrophotometer, conductivity meter, turbidity meter and centrifuge
11. **Biostatistics:** Introduction, sampling methods in biological experiments and applications, Methods of presentation of data: Tables, graphs, diagrams and frequency distribution. Measures of central tendency – Mean median and mode for raw and grouped data

Unit IV:

12. **Environmental biology:** Concept and dynamics of ecosystem, components, food chain and energy flow, productivity and biogeochemical cycles, Types of ecosystems, Population ecology and biological control, Community structure and organisation, Environmental pollution, Sustainable development, Economic importance of microbes, plants and animals.
13. **Ecosystem and Conservation:** Ecosystem dynamics and management : Stability and complexity of ecosystems, Speciation and extinction, Environmental impact assessment, Principles of conservation, Conservation strategies, Sustainable development. Physico-chemical properties of water, Kinds of aquatic habitats (fresh

water and marine), Distribution of and impact of environmental factors on the aquatic biota, Productivity, mineral cycles and biodegradation in different aquatic ecosystems, Fish and Fisheries of India with respect to the management of estuarine, coastal water systems and man-made reservoirs, Biology and ecology of reservoirs.

14. Economic Botany and Domestication of Plants: Origin of cultivated plants,

Vavilov's centre of origin, primary and secondary centers of diversity, plant introductions. A general account of major food crops, cereals, pulses, vegetables, nuts and fruits. Their source, botanical name, family, morphological value and use.

Fodder legumes- a brief account. Vegetable and essential oil sources: Mustard, Sesame, Groundnut, Cotton, Soybean and Coconut – a brief account.

15. Ethnobotany: Plant fibers: Cotton, jute and coir- A brief account and its uses.

Timber and firewood species: Identification and uses of five major species in India. Medicinal Plants: A brief account of ten important plant drugs and their chief constituents used in indigenous / allopathic systems of medicine. Natural rubber, insecticides and dyes: A concise account. Ornamental Plants: Major ornamental plants (Trees, shrubs and herbs) in India.

Note: The review of Syllabus happens on periodic basis for the benefit of the students. In case there are changes in curriculum due to review, students would be intimated in writing.

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