

Multi-Disciplinary Course

SEMESTER-III

Paper-I: Programming C++ (Mathematics/Computer Science)

Course Objective:

The objective of the course is to learn the basics about C++ programming language such as variables, data types, arrays, pointers, functions and classes etc. On successful completion this course, students will acquire a good understanding about the concept of object-oriented programming using C++ and be able to write and read basic C++ code.

Learning Outcome: On the completion of this course, students will be able to

- Learn to understand different types of data by C++ language.
- Learn different symbols used in the programming language representing the text variables and constants.
- Learn to develop various operators, loops and nested control statements.
- Learn to generate functions, local and global variables, 1D and 2D array in C++ programme.

UNIT-I

Introduction to structured programming: data types- simple data types, floating data types, character data types, string data types, arithmetic operators and operator's precedence.

UNIT-II

Variables and constant declarations, expressions, input using the extraction operator >> and cin, output using the insertion operator << and cout, preprocessor directives, increment (++) and decrement (--) operations.

UNIT-III

Creating a C++ program, input output, relational operators, logical operators and logical expressions, if and if-else statement, switch and break statements, for, while and do-while loops, continue statement, nested control statement.

UNIT-IV Functions, value returning functions, value versus reference parameters, local and global variables, one dimensional array, two dimensional array, pointer data and pointer variables.

Books Recommended

- *D. S. Malik: C++ Programming Language, Course Technology, Cengage Learning, India Edition, 2009.*
- *E. Balaguruswami: Object oriented programming with C++, fifth edition, Tata Mc Graw Hill Education Pvt. Ltd., 2008*

Books For Reference

- *R. Johnsonbaugh and M. Kalin-Applications Programming in ANSI C, Pearson Education.*
- *S. B. Lippman and J. Lajoie, C++ Primer, 3rd Ed., Addison Wesley, 2000.*
- *Bjarne Stroustrup , The C++ Programming Language, 3rd Ed., Addison Welsley, 2010.*
- *Suggested digital platform: NPTEL/SWAYAM/MOOCs*
- *e-Learning Source <http://ndl.iitkgp.ac.in> ; <http://ocw.mit.edu> ; <http://mathforum.org>*

Paper-II: Introduction to Spectroscopy (Physics)

CO- I : Basic understanding of atomic models and its spectroscopy nature

CO-2: Conceptual understanding of Spectra of Alkali elements

CO-3: Understanding the basic of X-ray and its applications
CO-4 : Understanding molecular spectroscopy

UNIT- 1:

Vector Atomic Model: Inadequacies of Bohr and Bohr-Sommerfeld atomic models w.r.t. spectrum of Hydrogen atom (fine structure of H-alpha line). Modification is due to the finite mass of the nucleus and the Deuteron spectrum. Vector atomic model (Stern-Gerlach experiment included) and physical & geometrical interpretations of various quantum numbers for single & many valence electron systems. LS & JJ couplings, spectroscopic notation for energy states, selection rules for transition of electrons and intensity rules for spectral lines. Fine structure of I-I- alpha line based on vector atomic model.

UNIT-11:

Spectra of Alkali & Alkaline Elements: Spectra of alkali elements: Screening constants for s, p, d & f orbitals; sharp, principle, diffuse & fundamental Series; doublet structure of spectra and fine structure of Sodium D line.' Spectra of alkaline elements: Singlet and triplet structure of spectra.

UNIT-111:

X-rays & X-Ray Spectra: Nature & production, Continuous X-ray spectrum & Duane-Hunt's law, Characteristic X-ray spectrum & Mosley's law, Fine structure of Characteristic X-ray spectrum, and X-ray absorption spectrum.

UNIT-IV:

Molecular Spectra: Discrete set of a molecule's electronic, vibrational and rotational energies. Quantization of vibrational energies, transition rules and pure vibrational spectra. Quantization of rotational energies, transition rules, pure rotational spectra and determination of inter nuclear distance. Basics of UV Visible & photoluminescence spectroscopy

Reference Books:

1. H.E. White, " Introduction to Atomic Spectra ", McGraw Hill, 1934 8.
2. C.N. Banwell, E.M. Mc. Cash, " Fundamentals of Molecular Spectroscopy ", Mc. Graw Hill, 2017, 4e 9.

3. R Murugesan, Kiruthiga Sivaprasath, "Modern Physics & quot;, S. Chand Publishing, 2019, 18e 10.
4. S.L. Gupta, V. Kumar, R.C. Sharma, "Elements of Spectroscopy & quot;, Pragati Prakashan, Meerut, 2015, 27

Paper-III: Indian Knowledge System

Paper-IV: Human Rights (Political Science)

Course Objectives:

The course on Human Rights aims to provide a comprehensive understanding of the concept, evolution, and theoretical foundations of human rights, emphasizing their significance in contemporary society. It explores the historical development of human rights and examines various theories, including Natural, Legal, Utilitarian, and Marxist perspectives, to enable students to make broad examination of issues and policies taking into account diverse perspectives. The course delves into the universality of human rights amidst cultural diversity and assesses key international human rights instruments such as the Universal Declaration of Human Rights and subsequent international covenants and protocols. The course seeks to enable students to critically analyse the role of major international institutions like the UN, UNHRC, and UNOHCHR and their functions in promoting and protecting human rights. The course addresses contemporary issues and multidimensional threats to human rights to sensitize students on human rights issues in the local contexts. In the Indian context, it highlights the foundational principles of human rights, the institutional frame works along with the role of NGOs and civil society in human rights movements. Through this course, students will gain critical insights and analytical skills necessary to understand and address human rights challenges globally and within India.

Expected Learning Outcome:

After the completion of this course, the students would be competent in following skills and acquire adequate knowledge on the issues of Human Rights.

Unit I: They would understand the significance of human rights and its evolution over the period of time. Also, they would learn different human right theories and connotation of human rights across cultures.

Unit II: This unit would make them familiarise with international covenants on Human rights; the changing dynamics of state and role of global organisations working for the cause of Human Rights.

Unit III: After learning this unit, they would be aware about the multidimensional nature of human rights violation.

Unit IV: This unit would enlighten the students on Indian perspective of Human rights drawing upon ancient philosophy, Human rights issues in contemporary India, the institutional framework to address the human rights issues.

Unit I: Understanding Human Rights

- a) Connotation of 'Rights'; Meaning, Nature and Significance of Human Rights. Evolution and Historical Development of Human Rights.
- b) Theories of Human Rights: Natural, Legal, Utilitarian and Marxist;
- c) Universality of Human Rights and cultural diversity.

Unit II: International Human Rights

- a) International Covenants on Human Rights: Universal Declaration of Human Rights; International Covenants: Civil and Political Rights-1966, Economic, Social and Cultural Rights 1966; Optional Protocols-1976 and 1989, World Conference on Human Rights: Tehran 1968 and Vienna 1993.
- b) Institutional Framework: UN, UN Human Rights Council (UNHRC), UN office of the High Commissioner for Human Rights (UNOHCHR).
- c) State sovereignty and Human Rights; Human rights activism and role of Global Human Rights Organisations.

Unit III: Contemporary issues and Multidimensional aspect of threats to Human Rights.

- a) Atrocities against Women, Children, SCs, STs, Minorities, Differently abled people.
- b) Impact of Globalisation on Human Rights; Environment and Human rights issue.
- c) Refugee crisis and Migrations, Displacement, Bonded Labour, Custodial abuse, War crimes.

Unit III: Human Rights in India

- a) Underlying Human Rights Principles of Indian society: Dharma, Nyaya, Neeti, Ahimsa.
- b) Institutional Framework: Constitutional provisions, NHRC, SHRC; Judicial Activism.
- c) Human Rights Movements in India: Engagement of NGOs and Civil society in Protecting Human Rights.

Essential Readings:

1. Alan, B. (2017). Human rights and the environment: where next? In *Challenges in International Human Rights Law* (pp. 765-794). Routledge.
2. Barkin, J. S. (1998). The evolution of the constitution of sovereignty and the emergence of human rights norms. *Millennium*, 27(2), 229-252.
3. Beitz, C. R. (2009). *The idea of human rights*. OUP Oxford.
4. Cerna, C. M. (1994). Universality of human rights and cultural diversity: Implementation of human rights in different socio-cultural contexts. *Hum. Rts. Q.*, 16, 740.
5. Das, A. K., & Mohanty, P. K. (2007). *Human rights in India*. Sarup & Sons.
6. Donnelly, J., & Whelan, D. J. (2020). *International human rights*. Routledge.
7. Freeman, M. (2022). *Human rights*. John Wiley & Sons.
8. Gready, P. (2004). Conceptualising globalisation and human rights: boomerangs and borders. *The International Journal of Human Rights*, 8(3), 345-354.
9. Gudavarthy, A. (2008). Human rights movements in India: State, civil society and beyond. *Contributions to Indian Sociology*, 42(1), 29-57.
10. Henkin, L. (1989). The universality of the concept of human rights. *The Annals of the American Academy of Political and Social Science*, 506(1), 10-16.
11. Henkin, L. (1995). Human rights and state sovereignty. *Ga. J. Int'l & Comp. L.*, 25, 31.
12. Ishay, M. (2008). *The history of human rights: From ancient times to the globalization era*. Univ of California Press.

13. Kennedy, D. (2002). International human rights movement: Part of the problem?. *Harv. Hum. Rts. J.*, 15, 101.
14. Kurki, M. (2011). Human Rights and Democracy Promotion: reflections on the contestation in, and the politico-economic dynamics of, rights promotion. *Third World Quarterly*, 32(9), 1573-1587.
15. Langlois, A. J. (2002). Human rights: the globalisation and fragmentation of moral discourse. *Review of International Studies*, 28(3), 479-496.
16. Merry, S. E. (2009). *Human rights and gender violence: Translating international law into local justice*. University of Chicago Press.
17. Ray, A. K. (2003). Human rights movement in India: A historical perspective. *Economic and Political Weekly*, 3409-3415.
18. Shelton, D. (2006). Human rights and the environment: what specific environmental rights have been recognized. *Denv. J. Int'l L. & Pol'y*, 35, 129.
19. Sripathi, V. (2000). India's National Human Rights Commission: A Shackled Commission. *BU Int'l LJ*, 18, 1.

Additional Readings:

1. Cole, W. M. (2005). Sovereignty relinquished? Explaining commitment to the international human rights covenants, 1966-1999. *American sociological review*, 70(3), 472-495.
2. Nyamu, C. I. (2000). How should human rights and development respond to cultural legitimization of gender hierarchy in developing countries. *Harv. Int'l LJ*, 41, 381.
3. Oestreich, J. E. (2017). *Development and Human Rights: rhetoric and reality in India*. Oxford University Press.
4. Schmitz, H. P. (2014). Non-state actors in human rights promotion. *The SAGE Handbook of Human Rights*, 1, 352-71.

Internet Sources

1. Human Rights Course study materials in MA Political science.
<https://www.distanceeducationju.in/pdf/404%20HUMAN%20RIGHTS.pdf>
2. International Human Rights document, charters etc available at <https://csometer.info/international-human-rights-documents>
3. Defining Human Rights: Harper Lecture, The University of Chicago.
<https://youtu.be/2nYdTV9wuGI?si=EbZBuZvHR5gg4Ql5>
4. Reflections on the Origins of Human Rights (Talal Asad Lecture), Berkeley Centre <https://youtu.be/Vd7P6bUKAWs?si=KleG2rwRqvgxjCh6>

Activities to Do

1. Students should be encouraged and facilitated to visit NHRC or SHRC office to learn the functioning of the commission.
2. Conduct lecture on contemporary issues on Human rights in India.
3. Arrange a movie session for the students on issues of Human Rights. Movies like 13th (2016), The Whistleblower (2010), Mandela: Long Walk to Freedom (2013), Jai Bhim (2021).
4. Conduct community outreach programmes to spread awareness on Human Rights Day.

Paper-V: Environmental Issue and Challenges (Sociology)

Course Outcomes:

On successful completion of this course students will be:

1. Able to value nature and its multiple components, and appreciate nature as a dynamic system with interdependent components
2. Able to understand the impacts of ongoing economic model, lifestyle and personal choices on the environment
3. Able to contribute as informed citizens to public discourses on common environmental issues.

Unit I: Introduction to environmental studies

- Meanings of environment, multiple ways of seeing it, multiple ways of diagnosing the 'environmental problem' and hence different solution
- Evolution of the concept
- Scope of sustainable development and sustainable consumption.

Unit II: Ecosystems

- Concept and types of ecosystems, their functions (ecosystem services) and interdependence especially in Indian context.
- National and international policies, treaties and politics of ecosystems management including Payment for Ecosystem services, Millennium Ecosystem Services, Convention of Biological Diversity, CITES, Ramsar Convention etc.
- Social and economic importance of various ecosystems for specific socio-economic groups; top-down and bottom-up conservation policies; and how these impact on equity across class, caste and other social hierarchies with reference to different ecosystems like forests, grasslands and wetlands.

Unit III: Biodiversity Conservation

- Concept of biodiversity, biodiversity resources of India (biodiversity hotspots), and endangered and endemic species.
- Threats to biodiversity from habitat loss, poaching, and unsustainable lifestyle/consumerism.

- Human-wildlife conflict, State-led conservation, community driven conservation, restoration ecology, international and national laws, policies and Institutions of Conservation.

Reading List:

1. Lélé, S. (2006, August). Thinking about ecological sustainability. In SEMINAR-NEW DELHI- (Vol. 564, p. 48). MALYIKA SINGH.

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2. Marten, G. G. (2010). Human ecology: Basic concepts for sustainable development, Routledge.
3. McNeill, J. R. (2001). Something new under the sun: An environmental history of the twentieth-century world (the global century series). WW Norton & Company.
4. Agarwal, B. (2009). Environmental issues in India: a reader. Pearson Education India.
5. Agrawal, A., & Saberwal, V. (2007). South Asian pastoralism: The environmental question. Delhi: Pearson/Longman.
6. Gadgil, M., & Guha, R. (1993). This fissured land: an ecological history of India. Univ of california Press.
7. Mitsch, W. J., Bernal, B., & Hernandez, M. E. (2015). Ecosystem services of wetlands. International Journal of Biodiversity Science, Ecosystem Services & Management, 11(1), 1-4.
8. Odum, E. P. (1971). Fundamentals of ecology. Printing Company Ltd.
9. Cheryl Colopy, Dirty, Sacred Rivers: Confronting South Asia's Water Crisis, Delhi, 2012.
10. Praveen Singh (2006), 'Bridging the Ganga Action Plan: Monitoring failure at Kanpur', Economic and Political Weekly, February 18, pp. 590-592.
11. Pepper, I. L, Gerb, C. P. & Brusseau, ML. (2011), Environmental and Pollution Science. Academic Press.

12. Patwardhan A (2007) Global warming in India in Rangarajan, M (edited) (2007) Introduction in Environmental Issues in India: A Reader. Pearson. pp 550-558
13. Dubash, Navroz K. (2009) Climate Politics in India. Policy Brief. Centre for Policy Research. New Delhi
14. Baviskar, Amita (2006), 'Red in Tooth and Claw? Looking for Class in Struggles over Nature' in Raka Ray & Mary F. Katzenstein (eds.), Social Movements in India: Poverty, Power and Politics, OUP, 2006.
15. Gadgil, M., & Guha, R. (2008). 'Ecological Conflict and the Environmental Movement in India' in Mahesh Rangarajan (ed.). Environmental Issues in India: A reader, New Delhi: Dorling Kindersley Pvt. Ltd. (pp.385-428).

Paper-VI: Entrepreneurship Development and Strat-up (Commerce)

Course Objectives:

- The course aims to define CSR and explore its significance, theoretical foundations, and role in promoting sustainable business practices.
- By integrating CSR into organizational operations, students will develop strategic skills to implement sustainable practices that create value for both the organization and society.

Learning Outcomes:

- By exploring CSR's ethical, social, and economic implications, students will develop a holistic understanding of its importance in fostering corporate responsibility and long-term business success.
- By implementing CSR initiatives that create shared value for the organization and society, students will develop leadership abilities and contribute to building sustainable, resilient businesses.

Unit 1:

Introduction to Corporate Social Responsibility: Definition and Concept of Corporate Social Responsibility (CSR), Historical Evolution of CSR, Importance and Benefits of CSR for Businesses.

Unit 2:

CSR Strategy and Implementation in Organisation: Developing a CSR Strategy: Setting Goals and Objectives, Stakeholder Engagement and Management in CSR, Integration of CSR into Business Operations, Corporate Governance and Ethics in CSR **Unit 3:**

CSR Initiatives and Best Practices: Environmental Sustainability Initiatives (e.g., Sustainable sourcing, Renewable energy adoption), Social Impact Initiatives (e.g., Community development programs, Employee volunteering), Ethical Business Practices (e.g., Fair labour practices, Anti-corruption measures), Corporate Philanthropy and Charitable Giving

Unit 4:

CSR Reporting and Accountability: Transparency and Disclosure in CSR Reporting, Global Reporting Initiatives (GRI) Standards, Assurance and Verification of CSR Reports, Stakeholder Communication and Engagement through CSR Reporting

Books recommended

- ✓ **"Corporate Social Responsibility: Indian Perspectives"** by Sanjay K. Agarwal
- ✓ **"Corporate Social Responsibility in India: Cases and Developments After the Legal Mandate"** by Pushpa Sundar
- **"Corporate Social Responsibility in India: An Evaluation"** by C. B. Mamoria and Preeti Mamoria
- **"Corporate Social Responsibility: A Case Study Approach"** by Satya Ranjan Acharya and Gauri Shankar Gupta
- **"Corporate Social Responsibility: Strategy, Communication, Governance"** by André Habisch, Jan Jonker, and Martina Wegner
- **"Strategic Corporate Social Responsibility: Sustainable Value Creation"** by David Chandler and William B. Werther Jr.
- **"Corporate Social Responsibility: Readings and Cases in a Global Context"** edited by Andrew Crane and Dirk Matten

"Business Ethics and Corporate Governance" by A.C. Fernando

Paper-VII: Health Psychology (Psychology)

Introduction:

Health psychology is a specialty area that focuses on how biology, psychology, behavior and social factors influence health and illness. This course is designed to provide help students to understand how Health Psychology as a specialty within psychology addresses the role of behavioral factors in health and illness. Basic theories, models and applications are also included.

Course Outcomes:

- To help the students understand the issues of Health Psychology and how to address them by the biopsychosocial model of health and illness.
- To help the students to describe behavioral factors that influence health and illness.
- To guide the students, understand about health enhancing behaviors including coping with illness.

UNIT-I: Introduction

- (i) Meaning & Goals of Health Psychology, mind body relationship, Bio medical model vs. biopsychosocial model of health and illness,
- (ii) Nature of stress, cognitive appraisal of stressors, causes and effects of stress, management and coping of stress

Learning Outcomes

- Know the basics of health and illness from the Bio-psychosocial perspectives.

UNIT- II: Health promoting and compromising behaviour

- (i) Health promotion, health habit, role of behavioural factors in disease; yoga, meditation, diet, exercise, prevention strategies (primary, secondary, tertiary)
- (ii) Health compromising behaviour- causes and treatment of obesity, eating disorder, alcohol and smoking. Management of illness: diabetes, heart disease, AIDS, cancer

Learning Outcomes

- Understand the significance of behavioral and psychological correlates of health and illness.
- Understand the importance of health enhancing behavior.

Practical:

- (i) **Coping Strategies:** To assess of the Coping Strategies of 4 college students by Tobin's Coping Strategy Inventory (TCSI)

- (ii) **Sleep Quality:** To assess the Sleep Quality of 4 college students using the Pittsburgh Sleep Quality Index (PSQI)

Text Books:

- *Taylor, S.E. (2006). Health Psychology (6th Ed.). New York: Tata McGraw Hill ✓*
- *Brannon and Feist. Health Psychology.*
- *Swain, S. Applied Psychology, New Vishal Publications, New Delhi*

Reference Books:

- *Mohanty, N., Varadwaj, K. & Mishra, H.C. (2014). Explorations of Human Nature and Strength: Practicals in Psychology, Divya Prakashani, Samantarapur, Bhubaneswar.*
- ✓ *Ogden, J. (2007). Essentials of Health Psychology. McGraw Hill*

Paper-VIII: Philosophy of Bhagavad Gita (Sanskrit)

Introduction:

This course on the philosophy of the Bhagavad Gita will offer a comprehensive exploration of the profound philosophical and spiritual teachings found within this ancient Indian text, and provide its applications in Modern life situations, particularly when guidance is required for very many problems in life.

Course Outcomes:

- Understanding of the ideal of dharma and its role in a civilized society,
- Understanding of the role and importance of knowledge, action, and devotion in life.
- Knowledge of leading life with a sense of detachment.

Learning Outcome

- **Unit-I** Yoga is to purify our actions, Yoga is to control the mind and senses and Yoga is to link oneself to Supreme with devotion. Yoga is the path of selfless actions without expecting the consequences or results. the spiritual seeker acts according to Dharma (righteousness).
- **Unit-II** An important philosophical concept in Karma yoga, it means to act unselfishly, or without personal gain in mind. When acting out of Nishkama Karma, an individual is acting or acting without any expectation that good will be returned to him/her or without attachment to its fruits.
- **Unit-III** Jnana yoga encourages its adepts to think and speak of themselves in the third person as a way to distance themselves from the Ego and detach their eternal self (atman) from the body-related one (*māyā*).
- **Unit-IV** the Bhagavad Gita places great emphasis on devotion to God. Through devotion, an individual can attain the ultimate truth and realize their unity with the divine. This path of devotion is accessible to all, irrespective of their social standing or spiritual knowledge.

Unit-I:

Dharma:-Varnadharma, Svabhava, Sadharma- Paradharma

Unit-II:

Karma:-Classification of Karma; Sense of Agency, Nişkāma Karma, Lokasamgraha, Relation between Karma Yoga and Jñāna yoga.

Unit-III:

Jnana:- Distinction between Jnana and Vijñāna. Criteria of True Knowledge (Buddhi Yoga & JñānaYoga), Kṣetra,

Kṣetrājña, Puruṣottama.Sāttvika, Rājasika and Tāmasika Jñāna

Unit-IV:

Bhakti Yoga:- Four kinds of devotees, Characteristics of Ideal Bhakti- Saraṇāgati & Prapattikrupa (grace);

Relation between Bhakti Yoga & Jñāna Yoga

Prescribed Books

- *S. Radha krishnan, the Bhagavad Gītā (Trs.&Ed.)*
- *S. C. Panigrahi, the Concept of Yoga in the Gita, Prajnaloka, Puri*

Reference Books

- *K. M. Munshi & R. R. Diwakar, Bhagavad Gītā & Modern Life*
- *Basanta Kumar Dash, Philosophy of Isopanisd and the Gita, Gyanajuga Publication, Bhubaneswar*
- *G. K. Warrier, Śrīmad Bhagavad Gītā Bhāṣya of Sri Sankarāchārya: (Trs), Advaita Ashram, Ramakrishna Math.*
- *P. N. Srinivasachari, the Ethical Philosophy of Gītā.*
- *Pandita Nilakantha Das, Srimad Bhagavad Gītā, New Students Store Binod Vihari, Cuttack.*
- *Viharilal Pandits ed., Śrīmad Bhagavad Gītā, (Odia) DharmaGrantha Store, Cuttack..*

E- Recourses

1. <https://youtu.be/bedsn7xln0w?si=VW5iQdLgDu5UDhA6>
2. https://anubooks.com/uploads/session_pdf/16623612876.pdf
3. <https://ijcrt.org/papers/IJCRT2101218.pdf>

4. <https://youtu.be/HHIv6qjIRjI?si=MML5aslZRwUvE1Rl>
5. https://en.wikipedia.org/wiki/Jnana-Vijnana_Yoga
6. https://en.wikipedia.org/wiki/Bhakti_yoga

Sample Questions: 1 for Part- I Objective; Part- II Very Short Type (in 50 Words); Par-III Short Type (in 250 Words); Par-IV Long Type (in 800 Words);

Unit – I

1. Dharma Literally Means_____?
2. What Is Sreya?
3. What Is Varna Dharma?
4. What Is the Meaning of Dharma in the Bhagavad Gita? Discuss.

Unit – II

1. _____ is the Vikarma?
2. Distinguish Between Karma, Vikarma, and Akarma.
3. Who Is Fit to Follow the Path of Jnana?
4. Discuss the Concept of Bondage and Liberation In the Bhagavad Gita

Unit – III

1. _____ Is Called Ksetra?
2. State the Characteristics of Tamasika Jnana.
3. State the Characteristics of Sattvika Jnana.
4. Explain the Jnana of the Bhagavad Gita and illustrate its Significance.

Unit – IV

1. _____ Is the Highest State of Bhakti?
2. How Jnana and Bhakti Are Related?
3. How Can One Attain the Highest State Niskama Bhakti?
4. What Are the Characteristics of A True Devotee? Discuss.

Paper-IX: Herbarium Preparation (Botany)

Objectives:

- To introduce the basics of herbaria and herbarium specimens.
- To educate on the methods for preparation and handling of specimens and materials.
- To know the methods of collection, processing and storage of herbarium specimens.
- To learn about the range of application of herbaria in plant taxonomy.

Course Outcomes:

- The students shall have a basic knowledge on the herbaria and herbarium specimens.
- The students shall get the opportunities to learn the basics specimen processing and proper storage for use.
- The students shall be able to understand the range of application of the herbaria and herbarium specimens.
- The students would be able to learn the application of modern tools for information collection, storage and sharing.

Unit-I: LO: The learners shall gain knowledge on the importance of herbarium in plant taxonomy.

- Herbaria: Introduction, history and objectives; Types of herbaria; role of herbaria in teaching, and research; important herbaria of India and the world.
- Herbarium specimen - types and diversity- loose seeds, dried and bulky fruits, algae, fungi, wood sections, pollen, microscope slides, silica-stored materials, DNA extractions, and fluid-preserved flowers or fruits; use of specimens. Plant collections and maintenance of live specimen.

Unit-II: LO: The learners shall gain knowledge and skills on the preparation and processing of herbarium specimens.

Herbarium methodology: Collection, field notes; Processing of specimen-poisoning, pressing, drying, mounting, stitching, identification and arrangement. Methods to address specimen diversity - Algae, fungi, and bryophytes; methods of their collection, processing and preservation.

Unit-III: LO: The students shall be able to understand the long-term storage, and use of specimen as well as on the procedure for data and knowledge sharing in the field.

Maintenance and curing of specimen, materials and illustrations-moisture management, heating, chemical treatments, fumigation. Handling of Specimen; library and special collections; exchange of specimens. Use of computer, databases and webs - Local and global databases; Herbaria for outreach activities - services, education, plant identification and conservation.

Practical:

1. Field survey and collection of plant materials
2. Methods of pressing and drying
3. Drying of materials by using chemicals- alcohol, glycerol, formaldehyde, FAA
4. Preservation of materials-moist and dried
5. Mounting, labelling and cataloguing of herbarium specimen
6. Use of computers for herbarium cataloguing and management
7. Seed collection and storage

Text book:

- *E. Amodu (2017). Field Herbarium Techniques, Lambert Academic Publishers.*

Reference Book:

- Specimen preparation guide-University of Florida Herbarium –(FLAS)-2023
- Sanwal et al. (2020). Introduction to procedures for preparation of herbarium specimen, NBPGR, - New Delhi
- Victor J, et al (2004). Herbarium essentials – The southern African herbarium user manual. SABD Network Report.