SACRED HEART COLLEGE (AUTONOMOUS), THEVARA

KOCHI, KERALA, 682013

Syllabus of Courses

Under the discipline

ENVIRONMENTAL SCIENCE

(For Undergraduate(Honours) Degree Programmes)

Introduced from 2024-25 admission onwards

Prepared by

Board of Studies in Environmental Studies

Sacred Heart College (Autonomous), Thevara, Kochi.

BOARD OF STUDIES IN ENVIRONMENTAL STUDIES
Sacred Heart College (Autonomous)
Thevara, Kochi, Kerala

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1. INTRODUCTION

The National Education Policy (NEP) 2020 envisages the revision of the Choice Based Credit System (CBCS) for instilling innovation and flexibility. It emphasizes on promoting interdisciplinary studies, introducing new subjects, and providing flexibility in courses and fresh opportunities for students. It also envisages setting up of facilitative norms for issues, such as credit transfer, equivalence etc., and a criterion-based grading system that assesses student achievement based on the learning goals for each programme.

The NEP document suggests several transformative initiatives in higher education. These include:

- Introduction of holistic and multidisciplinary undergraduate education that would help develop all capacities of human beings - intellectual, aesthetic, social, physical, emotional, ethical and moral - in an integrated manner; soft skills, such as complex problem solving, critical thinking, creative thinking, communication skills; and rigorous specialization in a chosen field(s) of learning.
- Adoption of flexible curricular structures in order to enable creative combinations of disciplinary areas for study in multidisciplinary contexts in addition to rigorous specialization in a subject
- Undergraduate degree programmes of either 3 or 4-year duration.
- The students are getting a chance to determine his/her own semester-wise academic load and will be allowed to learn at his/her pace, to the extent possible.
- Increase in the number of choices of courses available to students and the students are getting an opportunity to choose the courses of their interest from all disciplines.
- Multidisciplinary and holistic education with emphasizes on research, skill development and higher order thinking,
- Promotion of innovation and employability of the student.
- Flexibility for the students to move from one institution to another as per their choice.
- Flexibility to switch to alternative modes of learning (offline, ODL, and online learning, and hybrid modes of learning).

Outcome Based Education (OBE)

Undergraduate courses in Chemistry follow the Outcome-based Education (OBE) framework. OBE is a system where all the parts and aspects of education are focused on the outcomes of the course. The students take up courses with a certain goal of developing skills or gaining knowledge and they have to complete the goal by the end of the course. Outcome-based education affirms teachers as facilitators, rather than lecturers. In this model, teachers guide the students and encourage them to develop their knowledge and skills. The undergraduate courses at the Department of Chemistry, Sacred Heart College (Autonomous), Thevara provide a learning approach in which students develop analytical ability, critical thinking and research acumen over different situations.

Programme Outcomes:

The Undergraduate Programme Outcomes (POs) are as follows:

PO 1: Critical thinking and Analytical reasoning

- Critical thinking guides the assessment and judgment of information, while analytical reasoning involves specific methods for analysis and conclusion drawing. It includes the ability to assess evidence, identify assumptions, formulate coherent arguments, understand complex relationships, and evaluate practices and theories critically. Additionally, critical sensibility involves self-awareness and reflection on personal and societal experiences.

PO 2: Scientific reasoning and Problem solving

- Capacity to interpret and draw conclusions from data, critically evaluate ideas and evidence with an open-minded perspective; ability to apply learned competencies to solve unfamiliar problems and apply knowledge to real-life situations, avoiding mere replication of curriculum content.

PO 3: Effective communication and leadership skill

- Proficiency in expressing thoughts verbally and non-verbally, utilizing appropriate communication media. Confidently sharing ideas, active listening, analytical reading and writing and presenting complex information clearly to diverse groups. Effective teamwork and leadership skills, including setting direction, inspiring vision, building and motivating teams, and guiding them efficiently towards common goals.

PO 4: Social consciousness and responsible citizenship

- Social consciousness involves an empathetic and informed perspective, extending beyond personal concerns to embrace a responsibility for the collective good in nation-building. It includes reflecting on the impact of research on conventional practices and a clear understanding of societal needs for inclusive and sustainable development. Responsible citizens contribute positively through civic engagement, environmental stewardship, and a commitment to social justice, abiding by laws and working for the advancement of society.

PO 5: Equity, Inclusiveness and Sustainability

- Promoting equity, inclusiveness, sustainability, and diversity appreciation. Developing ethical and moral reasoning with values of unity, secularism, and national integration for dignified citizenship. Understanding and appreciating diversity, managing differences, and using an inclusive approach. Emphasizing creating environments where diverse individuals feel valued, addressing present needs without compromising future generations' ability to meet their own needs, considering environmental, economic, and social factors.

PO 6: Moral and Ethical Reasoning

- Possessing the capacity to embody moral and ethical values in personal conduct, articulating positions and arguments on ethical matters from diverse perspectives, and consistently applying ethical practices in all endeavours. Proficient in recognizing and addressing ethical issues pertinent to one's work, steadfastly steering clear of any unethical behaviour.

PO 7: Networking and Collaboration

- Cultivating networking skills in education entails establishing meaningful professional connections and relationships among educators, administrators, and stakeholders. It also involves fostering cooperative efforts among individuals, institutions, and research organizations within the educational realm. These practices are indispensable for nurturing a supportive, innovative, and dynamic learning environment.

PO 8: Lifelong Learning

- Cultivating the ability to continually acquire knowledge and skills, including the art of "learning how to learn," becomes paramount for lifelong learning. This self-paced and self-directed approach serves personal development, aligns with economic, social, and cultural objectives, and facilitates adaptation to evolving workplace demands through skill development and reskilling. It equips individuals with competencies and insights, allowing them to adeptly respond to society's changing landscape and enhance their overall quality of life. Lifelong learning extends beyond formal education, embracing diverse informal and non-traditional learning experiences.

2. REGULATIONS FOR UNDERGRADUATE (HONOURS) DEGREE PROGRAMMES

PREAMBLE

Sacred Heart College (Autonomous), Thevara, Kochi is a grant-in-aid private college affiliated to Mahatma Gandhi University, Kottayam, Kerala. The College was established in 1944 as a higher educational institute for men on the basis of the minority rights. It started admitting girls in 1975 and currently serves all sections of the society without any discrimination of caste or creed.

The College was granted Autonomous Status by the University Grants Commission (UGC) in 2014.

Vision and Mission of the Institution

The vision of the College aims at the formation of holistic individuals who would champion the cause of justice, love, truth and peace. To this effect, Sacred Heart College envisions the **"Fashioning of an enlightened society founded on a relentless pursuit of excellence, a secular outlook on life, a thirst for moral values as well as an unflinching faith in God."** It seeks the creation of a world, guided by divine wisdom, governed by moral principles, inclusive by secular outlook and united by the principle of equity.

The Mission of the Institution is to provide an environment that

- facilitates the holistic development of the individual
- enables the students to play a vital role in the nation-building process and contribute to the progress of humanity
- disseminates knowledge even beyond academia
- instils in the students a feel for the frontier disciplines, and
- cultivates a concern for the environment

by setting lofty standards in the ever-evolving teacher-learner interface.

Framing of the Regulations

As part of the implementation of the National Education Policy 2020 (NEP 2020), the University Grants Commission (UGC) has issued the Curriculum and Credit Framework for Undergraduate Programmes 2023 (CCFUP) which would provide a flexible choice-based credit system, multidisciplinary approach, multiple entry and exit options, and establish three Broad Pathways, (a) 3-year UG Degree, (b) 4-year UG Degree (Honours), and (c) 4-year UG Degree (Honours with Research).

The Kerala Higher Education Reforms Commission has recommended a comprehensive reform in the undergraduate curriculum for the 2023-24 academic year, adopting 4-year undergraduate programmes to bring Kerala's undergraduate education at par with well acclaimed universities across the globe.

The Kerala State Curriculum Committee for Higher Education has been constituted, and have proposed a model Kerala State Higher Education Curriculum Framework (KSHECF) for Undergraduate Education.

Further, an Academic Committee and various sub committees were constituted for the implementation of the Regulations. The Academic Committee submitted the draft regulations on 15-03-2024, namely**: THE SACRED HEART COLLEGE (AUTONOMOUS) UNDERGRADUATE PROGRAMMES (HONOURS) REGULATIONS, 2024 {SHC-UGP (Honours)}** under the New Curriculum and Credit Framework, 2024.

REGULATIONS

Short Title and Commencement

i. These Regulations may be called THE SACRED HEART COLLEGE (AUTONOMOUS) UNDERGRADUATE PROGRAMMES (HONOURS) REGULATIONS, 2024 {SHC-UGP (Honours)} under the New Curriculum and Credit Framework 2024.
ii. These Regulations will come into effect from the academic year 2024-2025 and will have prospective effect.

Scope and Application

i. These Regulations shall apply to all Undergraduate programmes under various Faculties conducted by THE SACRED HEART COLLEGE (AUTONOMOUS) for the admissions commencing in the academic year 2024-2025.
ii. Every programme conducted under the SHC-UGP shall be monitored by an SHC-UGP Academic Committee comprising members nominated by the Principal.

Definitions

Unless used in a context otherwise specified,

i. College means THE SACRED HEART COLLEGE (Autonomous), a grant-in-aid private college affiliated to Mahatma Gandhi University, Kottayam, Kerala.
ii. 'University' means the MAHATMA GANDHI University which is the affiliating University of Sacred Heart College (Autonomous).
iii. FYUGP means Four Year Undergraduate Programme.
iv. Academic Year: Two consecutive (one odd and one even) semesters followed by a vacation in one academic year.
v. Academic Coordinator/Nodal Officer: Academic Coordinator/Nodal Officer is a faculty nominated by the college council to co-ordinate the effective conduct of the FYUGP including Continuous Comprehensive Assessment (CCA) undertaken by various departments within the college. She/ he/ they shall be the convenor for the College level Academic Committee.
vi. Academic Week: A unit of five working days in which the distribution of work is organized, with at least five contact hours of one-hour duration on each day.
vii. Academic Credit: A unit by which the course work is measured. It determines the number of hours of instructions required per week in a semester. It is defined both in terms of student efforts and teacher's efforts. A course which includes one hour of lecture or tutorial or minimum 2 hours of lab work/ practical work/ field work per week is given one credit hour. Accordingly, one credit is equivalent to one hour of lecture or tutorial or two hours of lab work/ practical work/ field work/ practicum and learner engagement in terms of

course related activities (such as seminars preparation, submitting assignments, group discussion, recognized club-related activities etc.) per week. Generally, a one credit course in a semester should be designed for 15 hours Lecture/ tutorials or 30 hours of practical/ field work/ practicum and 30 hours learner engagement.

viii. Academic Bank of Credits (ABC): An academic service mechanism as a digital/ virtual entity established and managed by Government of India to facilitate the learner to become its academic account holder and facilitating seamless learner mobility, between or within degree-granting Higher Education Institutions (HEIs) through a formal system of credit recognition, credit accumulation, credit transfers and credit redemption to promote distributed and flexible process of teaching and learning. This will facilitate the learner to choose their own learning path to attain a Degree/ Diploma/ Certificate, working on the principle of multiple entry and exit, keeping to the doctrine of anytime, anywhere, and any level of learning.

ix. Credit Accumulation: The facility created by ABC in the Academic Credit Bank Account (ABA) opened by the learner across the country in order to transfer and consolidate the credits earned by them by undergoing courses in any of the eligible HEIs.

x. Credit Recognition: The credits earned through eligible/ partnering HEIs and transferred directly to the ABC by the HEIs concerned.

xi. Credit Redemption: The process of commuting the accrued credits in the ABC of the learner for the purpose of fulfilling the credits requirements for the award of various degrees. Total credits necessary to fulfil the criteria to get a degree shall be debited and deleted from the account concerned upon collecting a degree by the learner.

xii. Credit Transfer: The mechanism by which the eligible HEIs registered with ABC are able to receive or provide prescribed credits to individual's registered with ABA in adherence to the UGC credit norms for the course(s) registered by the learner in any HEIs within India.

xiii. Credit Cap: Maximum number of credits that a student can take per semester, which is restricted to 30.

xiv. Continuous Comprehensive Assessment (CCA): The mechanism of evaluating the learner by the course faculty at the institutional level.

xv. End Semester Evaluation (ESE): The mechanism of evaluating the learner at the end of each semester.

xvi. Audit Course: a course that the learner can register without earning credits, and is not mandatory for completing the SHC-UGP. The student has the option not to take part in the CCA and ESE of the Audit Course. If the student has 75% attendance in an Audit Course, he/she/they is eligible for a pass in that course, without any credit (zero-credit).

xvii. Courses: refer to the papers which are taught and evaluated within a programme, which include lectures, tutorials, laboratory work, studio activity, field work, project work, vocational training, viva, seminars, term papers, presentations, assignments, self-study, group discussion, internship, etc., or a combination of some of these elements.

xviii. Choice Based Credit System (CBCS) means the system wherein students have the option to select courses from the prescribed list of courses.

xix. College-level Academic Committee: Is a committee constituted for the FYUGP at the college level comprising the Principal as the Chairperson, the Academic Co-ordinator/ Nodal Officer as its convenor.

xx. Academic Co-ordinator/ Nodal Officer: A senior faculty member nominated by the college council.

xxi. Course Faculty: A faculty member nominated by the Head of the Department shall be in charge of offering a particular course in a particular semester of FYUGP.

xxii. Department means any teaching department in a college offering a course of study approved by the College as per the regulations of the college and it includes a Department, Centre, or School of Teaching and Research conducted directly by the College.

xxiii. Board of Studies (BoS) means the academic body duly constituted to frame the syllabus of each department.

xxiv. Senior Faculty Advisor (SFA) is a faculty nominated by a Department Council to co-ordinate all the necessary work related to FYUGP undertaken in that department, including the continuous comprehensive assessment.

xxv. Department Council means the body of all teachers of a department in a college.

xxvi. Faculty Adviser (FA) means a teacher from the parent department nominated by the Department Council to advise students in academic matters.

xxvii. Graduate Attributes means the qualities and characteristics to be obtained by the graduates of a programme of study at the College, which include the learning outcomes related to the disciplinary areas in the chosen field of learning and generic learning outcomes. The College will specify graduate attributes for its programmes.

xxviii. Programme means the entire duration of the educational process including the evaluation leading to the award of a degree.

xxix. Programme Pathway: Combination of courses that can be chosen by a student that give options to pursue interesting and unconventional combinations of courses drawn from different disciplinary areas, like the sciences and the social sciences/ humanities. The pathways could be in terms of major- minor options with different complementary/ allied disciplines.

xxx. Regulatory Body means University Grants Commission (UGC), All India Council for Technical Education (AICTE), National Assessment and Accreditation Council (NAAC) and National Board of Accreditation (NBA) etc.

xxxi. Signature Courses: Signature courses are the specialized Discipline Specific Elective courses or skill-based courses designed and offered by the regular/ ad hoc/ visiting/ emeritus/ adjunct faculty member of a particular college with the prior recommendation of the BoS and the approval of Academic Council of the College.

xxxii. Letter Grade or simply 'Grade' in a course is a letter symbol (O, A+, A, B+, B, C, P, F, and Ab). Grade shall mean the prescribed alphabetical grade awarded to a student based on their performance in various examinations. The Letter grade that corresponds to a range of CGPA.

xxxiii. Grade Point: Each letter grade is assigned a 'Grade point' (G) which is an integer indicating the numerical equivalent of the broad level of performance of a student in each course. Grade Point means point given to a letter grade on 10-point scale.

xxxiv. Semester Grade Point Average (SGPA) is the value obtained by dividing the sum of credit points obtained by a student in the various courses taken in a semester by the total number of credits in that semester. SGPA shall be rounded off to two decimal places. SGPA determines the overall performance of a student at the end of a semester.

xxxv. Credit Point (P) of a course is the value obtained by multiplying the grade point (G) by the credit (C) of the course: P = G x C

xxxvi. Cumulative Grade Point Average (CGPA) is the value obtained by dividing the sum of credit points in all the semesters earned by the student for the entire programme by the total number of credits in the entire programme and shall be rounded off to two decimal places.

xxxvii. Grade Card means the printed record of students' performance, awarded to them.

xxxviii. Words and expressions used and not defined in this regulation, but defined in the Mahatma Gandhi University Act and Statutes, being the Act and Statues of Sacred Heart College (Autonomous)'s affiliating University shall have the meaning assigned to them in the Act and Statutes.

Features and Objectives of SHC-UGP

The features and objectives of the SHC-UGP shall be:

i. The features, meaning, and purpose of FYUGP shall be as stipulated by the UGC and as adapted by the Kerala State Higher Education Curriculum Framework (KSHECF) for undergraduate education.

ii. The practice of lateral entry of students to various semesters exists, but an exit with a Degree shall be awarded only upon successful completion of 133 credits as per the conditions stipulated in this regulation.

iii. FYUGP shall have three Broad Pathways, (a) 3-year UG Degree, (b) 4-year UG Degree (Honours), and (c) 4-year UG Degree (Honours with Research).

iv. Students who choose to exit after 3 years shall be awarded UG Degree in their respective Discipline/ Disciplines after the successful completion of the required minimum Courses with 133 credits.

v. A 4-year UG Degree (Honours) in the Discipline/ Disciplines shall be awarded to those who complete the FYUGP with a specific number of Courses with 177 credits including 8 credits from a graduate project/ dissertation in their major discipline.

vi. Students who acquire minimum 75% in their graduation (upto 6th semester) are eligible for Honours with Research Programme. However if necessary, College may conduct screening test for the honours with research programme in accordance with College Regulations from time to time.

vii. 4-year UG Degree (Honours with Research): Students who aspire to pursue research as a career may opt for 4-year UG Degree Honours with Research stream under FYUGP with a specific number of Courses with 177 credits including 12 credits from a research project in their major discipline.

viii. The recognized research departments or departments with at least two faculty members having PhD shall offer the Honours with Research programme. Minimum 2 students (mentees) should be allotted to a faculty member (Mentor).

ix. Students who have chosen the honours with research stream shall do their entire fourth year under the mentorship of a mentor.

x. The mentor shall prescribe suitable advanced level/capstone level courses for a minimum of 20 credits to be taken within the institutions along with the courses on research methodology, research ethics, and research topic-specific courses for a minimum of 12 credits which may be obtained either within the institution or from other recognized institutions, including online and blended modes.

xi. Students who have opted for the honours with research should successfully complete a research project under the guidance of the mentor and should submit a research report for evaluation. They need to defend successfully the research project to obtain 12 credits under a faculty member of the College. The research shall be in the Major/ allied discipline.

xii. The research outcomes of their project work may be published in peer-reviewed journals or presented at conferences or seminars or patented.

xiii. The proposed FYUGP curriculum comprises Three Broad Parts: a) Foundation Components, b) Discipline Specific Pathway components (Major/ Minor), and c) Discipline Specific Capstone Components.

xiv. The Foundation component of the FYUGP shall consist of a Set of General Foundation Courses and a Set of Discipline Specific Foundation Courses.

xv. General Foundation Courses shall be grouped into 4 major baskets as Ability Enhancement Courses (AEC), Skill Enhancement Courses (SEC), Value Addition Courses (VAC), and Multi-Disciplinary Courses (MDC).

xvi. Ability Enhancement Courses shall be designed specifically to achieve competency in English, other languages as per the student's choice with special emphasis on language and communication skills.

xvii. English or other language courses shall be designed to enable the students to acquire and demonstrate the core linguistic skills, including critical reading, academic and expository writing skills as well as the cultural and intellectual heritage of the language chosen. Separate courses will be designed for Science, Humanities and Commerce streams.

xviii. Multi-Disciplinary Courses (MDC) shall be so designed as to enable the students to broaden their intellectual experience by understanding the conceptual foundations of Science, Social Sciences, Humanities, and Liberal Arts. Students shall not be eligible to take the MDC in the same discipline that they have studied during their +2. Third semester MDC can be Kerala specific content.

xix. Skill Enhancement Courses (SEC) shall be designed to enhance 21st century workplace skills such as creativity, critical thinking, communication, and collaboration.

xx. Discipline Specific Courses shall include Discipline Specific Pathway Courses, both Major and Minor streams, enabling students to gain basic knowledge in the chosen discipline.

xxi. Discipline Specific Foundation Courses shall focus on foundational theories, concepts, perspectives, principles, methods, and critical thinking essential for taking up advanced/ Capstone Courses. Practical courses shall be included in discipline specific foundation courses.

xxii. The curriculum of the SEC should be designed in a manner that at the end of year- 1, year-2, year-3, and year-4 students are able to meet the level descriptors for levels 5, 6, 7, and 8 of the UGC Guidelines on National Skills Qualifications Framework (NSQF). The detailed descriptors of the NSQF levels is provided as **Appendix I** below.

xxiii. Value Addition Courses (VAC) shall be so designed as to empower the students with personality development, perspective building, and self-awareness.

xxiv. Discipline Specific Pathway Components (Major/ Minor) shall provide the students with an opportunity to pursue in-depth study of a particular subject or discipline and develop competency in that chosen area, which includes Discipline Specific Core (DSC) courses and Discipline Specific Elective (DSE) courses as Major and Minor courses.

xxv. Major components consist of three types: Discipline Specific Core or the Discipline Specific Elective Courses, and the research /laboratory/ fieldwork.

xxvi. Minor Courses can be selected from any discipline that may supplement or complement the Major Courses.

xxvii. Students who complete a sufficient number of Courses in a discipline or an interdisciplinary area of study other than their chosen Major shall qualify for a Minor in that discipline or in a chosen interdisciplinary area of study.

xxviii. Major Components shall be the main focus of study. By selecting a Major, the student shall be provided with an opportunity to pursue an in-depth study of a particular discipline.

xxix. Each Board of Studies (BoS) shall identify specific Courses or baskets of Courses towards Minor Course credits. Students shall have the option to choose Courses from disciplinary/ interdisciplinary minors and skill-based courses related to a chosen programme.

xxx. Students can opt for a change of Major at the end of the second semester to any Minor discipline studied among the foundation level courses. Students also can opt for a change of Major at the end of the second semester to any MDC.

xxxi. Students should opt their 5th and 6th semester VAC and SEC from their Major disciplines only.

xxxii. Course cum Credits Certificate: After the successful completion of a semester as proof for re-entry to another institution this certificate is essential. This will help the learner for preserving the credits in the Academic Bank of Credits.

xxxiii. The Advanced Level/ Capstone Level Courses shall be designed in such a manner as to enable students to demonstrate their cumulative knowledge in their main field of study, which shall include advanced thematic specialization or internships or community engagement or services, vocational or professional training, or other kinds of work experience.

xxxiv. Advanced/ Capstone level Major Specialization shall include Courses focused on a specific area of study attached to a specific Major, which could be an Elective Course. They shall include research methodology as well.

xxxv. The student has the option to register for and attend a course without taking part in the CCA and ESE of that course. Such a course is called the Audit Course. If the student has 75% attendance in an Audit Course, he/she/they is/are eligible for a pass in that course, without any credit (zero-credit). The Audit Course will be recorded in the final grade card of the student.

xxxvi. All students shall undergo Summer Internship or Apprenticeship in a Firm, Industry or Organization; or Training in labs with faculty and researchers or other Higher Education Institutions (HEIs) or Research Institutions. The College will adhere to the guidelines on internship published by the University.

xxxvii. Students will be provided the opportunities for internships with local industries, business organizations, agriculture, health and allied sectors, Local Government institutions (such as panchayats, municipalities), State Planning Board, State Councils/ Boards, Research Institutions, Research Labs, Library, elected representatives to the parliament/ state assembly/ panchayat, media organizations, artists, crafts persons etc. These opportunities will enable the students to actively engage with the practical aspects of their learning and to improve their employability.

xxxviii. The College will provide opportunities for field-based learning/minor projects enabling them to understand the different socio-economic and development-related issues in rural and urban settings. The College will provide the students with opportunities for Community engagement and services, exposing them to socio-economic issues to facilitate theoretical learning in real-life contexts.

xxxix. Additional Credits will be awarded for those who actively participating in Social Activities, which may include participation in National Service Scheme (NSS), Sports and Games, Arts, participation in College union related activities (for respective elected/ nominated members), National Cadet Corps (NCC), adult education/ literacy initiatives, mentoring school students, and engaging in similar social service organizations that deemed appropriate to the College.

xl. Grace marks shall be awarded to a student for meritorious achievements in co-curricular activities (in Sports/ Arts/ NSS/ NCC etc.). Such a benefit is applicable in the same academic year spreading over two semesters, in which the said meritorious achievements are earned. The Academic Council will decide from time to time the eligibility and other rules of awarding the grace marks.

xli. Options will be made available for students to earn credit by completing quality- assured remote learning modes, including Online programmes offered on the Study Webs of Active-Learning for Young Aspiring Minds (SWAYAM) or other Online Educational Platforms approved by the competent body/university from time to time.

xlii. Students shall be entitled to gain credits from courses offered by other recognized institutions directly as well as through distance learning.

xliii. For the effective operation of the FYUGP, a system of flexible academic transaction timings shall be implemented for the students and teachers.

Eligibility for Admission and Reservation of Seats

i. The eligibility for admissions and reservation of seats for various FYUG Degree Programmes shall be in accordance with the norms/ rules made by the Government/ University from time to time.

ii. No student shall be eligible for admission to FYUG Degree Programmes in any of the disciplines unless he/she/they has successfully completed the examination conducted by a Board/University at the +2 level of schooling or its equivalent.

iii. Students shall be admitted and enrolled in the respective programmes solely based on the availability of the academic and physical facilities within the institution. The College shall provide all students with a brochure detailing the Courses offered by the various departments under the various Programmes and the number of seats sanctioned by the University for each Programme.

iv. During the time of admission each student may be provided with a unique higher education student ID which may be linked with the Aadhar number of the student so that this ID can be transferred if required to other higher education institutions as well.

v. The students at the end of second semester may be permitted to change their major programme of study to any course/ institution/ university across the state. Based on the availability of seats and other facilities, the students may be permitted to opt any discipline which he/she/they had studied during the first two semesters as Discipline Specific

Foundation courses/ Multidisciplinary Foundation courses. If ranking is required it will be in the order of the highest-grade points secured in the discipline to which the switching of Major is sought.

vi. Students shall be allowed to change their major programmes, if required, to a maximum of 10% of the sanctioned strength of that particular programmes depending upon the academic and infrastructural facilities available in the Institution.

vii. Depending upon the availability of academic and infrastructural facilities, the College may also admit a certain number of students who are registered for particular programmes in each semester by transfer method, if required, from other Institutions subject to conditions as may be issued by the University.

viii. A student who has already successfully completed a First-Degree Programme and is desirous of and academically capable of pursuing another First-Degree Programme may also be admitted with the prior approval of the University as per the conditions regarding programme requirements specified by the University.

ix. A Student can also be admitted for an additional major/ second major/ additional minor and on completion of the required credits he/she/they can be awarded a second major/ additional major/ minor. He/she/they may be exempted from minor pathway and general foundation course requirement.

x. The College can also enroll students in certain courses as per their choice depending upon the availability of infrastructure and other academic facilities from other recognized HEIs who are already registered for a particular programme there either through regular/ online/ distance mode irrespective of the nature of programme (Govt./ Aided/ Self- finance/ Autonomous). On successful completion of the course the credits may be transferred through the Academic Bank of Credit.

Academic Monitoring and Student Support

The academic monitoring and student support shall be in the following manner, namely

i. The College shall appoint a Senior Faculty member as Academic Co-ordinator/ Nodal officer for the smooth conduct of FYUGP.

ii. Advisory System: There shall be one Senior Faculty Advisor (SFA) for each department and one Faculty Advisor (FA) for 20 to 30 students of the class to provide advice in all relevant matters. The Head of the Department, in consultation with the SFA, shall assign FA for each student.

iii. The documents regarding all academic activities of students in a class shall be kept under the custody of the FA/ SFA.

iv. All requests/ applications from a student or parent to higher offices are to be forwarded/ recommended by FA/ SFA.

v. Students shall first approach their FA/ SFA for all kinds of advice, clarifications, and permissions on academic matters.

vi. It is the official responsibility of the institution to provide the required guidance, clarifications, and advice to the students and parents strictly based on the prevailing academic regulations.

vii. The SFA shall arrange separate or combined meetings with FA, faculty members, parents, and students as and when required and discuss the academic progress of students.

viii. The FA/ SFA shall also offer guidance and help to solve the issues on academic and non-academic matters, including personal issues of the students.

ix. Regular advisory meetings shall be convened immediately after the commencement of the semester and immediately after announcing the marks of the Continuous Comprehensive Assessment (CCA).

x. The CCA related results shall be displayed on the department notice board/ other official digital platforms of the college at least for two working days.

a. Any concern raised by the students regarding CCA shall be looked into in the combined meetings of advisors, HOD, course faculty, and the students concerned.

b. If the concerns are not resolved at the advisor's level, the same can be referred to the properly constituted college-level grievance redressal committees as per the existing UGC/ University/ Government norms.

c. The Principal/ HOD shall ensure the proper redressal of the concerns raised by the students regarding CCA.

d. If the students raise further concerns about the issue, the principal shall refer the issue to the appropriate authorities with proper documents and minutes of all the committees.

xi. The FA/ SFA shall be the custodian of the minutes and action taken reports of the advisory meetings. The SFA shall get the minutes and action taken reports of advisory meetings approved by the Head of Department and the Principal.

xii. The Principal shall inform/forward all regulations, guidelines, communications, announcements, etc. regarding student academic and other matters to the HODs/ SFA for information and timely action.

xiii. It shall be the official responsibility of the Principal to extend the required administrative and financial support to the HODs, SFAs and FAs to arrange necessary orientation programmes for students regarding student counselling, the prevailing norms, regulations, guidelines and procedures on all academic and other related matters.

xiv. An integrated educational planning and administration software will be made available by the College to manage the academic information of all students including student admissions and registration, managing students' personal and academic information, course registrations, attendance management, all process related to assessments including regular & online examinations, grading, publishing of results, supplementary examinations, LMS, stakeholders' feedback, etc.

xv. Faculty, staff, students, and parents shall be allowed to access this software system over a highly secure authenticated mechanism from within the campus.

Course Registration

i. Each department shall publish well in advance the relevant details of courses offered, such as the name, academic level, expected outcomes, time slot, and course faculty members.

ii. Students shall be allowed to visit and interact with respective faculty members during the first week of each semester, to gather more information about the courses and the availability of seats.

iii. Based on consultations and advice from the faculty adviser, each student shall complete course registration within one week from the commencement of each semester.

iv. The number of credits that a student can take in a semester is governed by the provisions in these Regulations, subject to a minimum of 16 and a maximum of 30 Credits.

v. A student can opt out of a Course or Courses registered, subject to the minimum Credit/ Course requirement, if he/she/they feels that he/she/they has registered for more Courses than he/she/they can handle, within 30 days from the commencement of the semester.
vi. The college shall publish a list of the students registered for each course including audit course, if any, along with the chosen Programmes, repeat/ reappearance courses, if any.
vii. The higher education institutions shall admit candidates not only for programmes, but also for courses.

Re-admission and Scheme Migration

i. Students who opt out before the completion of the third year shall be provided with a 'Course cum Credits Certificate' after the successful completion of a semester as proof for re-entry to another institution.
ii. Students who have successfully completed a particular programme pathway may be permitted to take an additional minor or second major.
iii. Those students who are opting for a second major are eligible for getting certain credit transfer/ credit exemption from their previous minor programs of study, subject to the prior recommendation of the BoS that, those credits are relevant for the present major programme of study.

Duration of Programme, Credits, Requirements and Options

i. Students will be offered the opportunity to take breaks during the programme and resume after the break, but the total duration for completing the FYUG programme shall not exceed 7 years.
ii. Students who wish to complete the undergraduate programmes faster may do so by completing different courses equivalent to the required number of credits and fulfilling all other requirements in N-1 semesters, where N is the number of semesters in the FYUGP.
iii. Provided further that the students may complete the undergraduate programme in slower pace, they may pursue the three years or six semester programme in 4 to 5 years (8 to 10 semesters), and four years, or eight semester programme in 5 to 6 years (10 to 12 semesters) without obtaining readmission.
iv. For students who crossed 6 semesters at a slower space, the requirement of 16 credits per semester from the institutions where they enrolled may be relaxed.

Credit Structure

The proposed number of credits per course and the credit distribution of them for the FYUG Programmes are given below:

i. An academic year shall consist of 200 working days; one semester consists of 90 working days; and an academic year consists of two semesters.
ii. Ten working days in a semester shall be used for extracurricular activities. One semester consists of 18 weeks with 5 working days per week. In each semester, 15 days (3 weeks) should be kept aside for End Semester Evaluation (ESE) and CCA.
iii. The maximum number of available weeks for curriculum transactions should be fixed at 15 in each semester. A minimum of 5 teaching or tutorial hours could be made available for a day in a 5-day week.
iv. A course that includes one hour of lecture/ tutorial or two hours of lab work/ practical work/ field work/ practicum per week is given one credit hour.
v. One credit in a semester should be designed for 15 hours of lectures/ tutorials or 30 hours of lab work/ practical work/ field work/ practicum and 30 hours of learner engagement in terms of course-related activities such as seminar preparation, submitting assignments, etc.
vi. A one-credit seminar or internship or studio activities or field work/ projects or community engagement and service will have two-hour engagements per week (30 hours of engagement per semester).
vii. A course can have a combination of lecture credits, tutorial credits, and practicum credits.

viii. Minimum credit for one Course should be 2 (Two), and the maximum credit should be 4 (Four).
ix. All Discipline Specific Major/ Minor Courses shall be of 4 (Four) credits.
x. For all Discipline Specific Major/ Minor Courses, there may be practical/ practicum of two or four hours per week.
xi. All Courses under the Multi-Disciplinary, Ability Enhancement, Value Addition and Skill Enhancement categories are of 3 credits.
xii. Summer Internship, Apprenticeship, Community outreach activities, etc. may require sixty hours (or as appropriate) of engagement for acquiring one credit.
xiii. A student shall be able to opt for a certain number of extra credits over and above the requirements for the award of a degree.
xiv. Maximum number of credits that a student can earn per semester shall be restricted to 30. Hence, a student shall have the option of acquiring credits to a maximum of 180 credits for a 6-semester UG programmes and 240 credits for a 4-year (8-semester) programmes.
xv. Each faculty member shall offer a maximum of 16 credits per semester. However, those who are offering both practical and theory courses shall offer a maximum of 12-16 credits per semester.
xvi. For a four-credit theory course, 60 hours of lecture/ tutorial class shall be assured as a mandatory requirement for the completion of that course.

Course Structure of the SHC-UGP Programme

The SHC-UGP consists of the following categories of courses and the minimum credit requirements for pathway option-one shall be as follows;

Sl. No.	Categorization of Courses for all Programme	Minimum Number of Credit Required	
1.	Major	68	88
2.	Minor	24	24+12*
3.	Multi-Disciplinary Courses (MDC)	9	9
4.	Skill Enhancement Courses (SEC)	9	9
5.	Ability Enhancement Courses (AEC)	12	12
6.	Value Addition Courses (VAC)	9	9
7.	Summer Internship, field basedlearning etc.	2	2
8.	Research Project / Dissertation		12/8**

* The students can acquire advanced/ capstone level courses with 12 credits from their DSC/ DSE/ Minor courses depending up on their pathway choice. The Minor courses can be of level 300 or above.

** The students pursuing the 4-year honours with research have to complete a project with 12 credits and for the 4-year honours degree students have to complete a project with 8 credits and DSC/ DSE capstone/ advanced level course in the 8th semester.

i. 20% syllabus of each course will be prepared by the teacher as 'Teacher Specific Content' and will be evaluated under CCA.
ii. In case of MDC, SEC, VAC courses coming under 3rd & 4th semester, college should make necessary arrangements to give adequate preference to courses designed by language departments. MDC in the 3rd semester can be Kerala Specific Content.

Academic Levels of Pathway Courses

Semester	Difficulty level	Nature of Course
1 & 2	100-199	Foundation-level or introductory courses
3 & 4	200-299	Intermediate level courses
5 & 6	300-399	Higher level courses
7 & 8	400-499	Advanced/Capstone level courses

Signature Courses

i. With a prior recommendation of BoS and the approval of academic council, each faculty member can design and offer at least one signature course in every semester, which may be offered as DSE /SEC/ VAC.
ii. The College will publish a list of signature courses in DSE/ SEC/ VAC offered by the faculty members with a prior recommendation of BoS and the approval of academic council.
iii. The College may empanel distinguished individuals who have excelled in their field of specialization like science and technology, industry, commerce, social research, media, literature, fine arts, civil services etc. as adjunct faculty as per the UGC guidelines with the approval of the College. With a prior recommendation of BoS and the approval of academic council, the adjunct faculty can offer SEC/VAC as signature course.
iv. Ad hoc/ Guest faculty/ Visiting faculty/ Visiting Scholars can also offer DSE/ SEC/ VAC as signature courses with a prior recommendation of BoS and the approval of academic council.
v. The faculty concerned may design the particular course and it should be forwarded to the concerned BoS after the approval of the Academic Committees formed as part of this regulations.
vi. The examinations and evaluation of the signature courses designed by the faculty shall be conducted by the faculty themselves and an external expert faculty chosen by the college from a panel of experts submitted by the faculty and recommend by the BoS concerned.

Programme Pathways and Curriculum Structure

Students who have joined for any programme under these regulations shall have the option to choose the following pathways for their UG degree and Honours programme.

i. **Degree with single Major**: A student pursuing the FYUG programme in a specific discipline shall be awarded a Major degree if he secures at least 50% of the total credits in the specific discipline required for the award of the Degree in that Discipline. Example: Physics Major/ Economics Major/ Commerce Major
ii. **Degree Major with Minor**: If a student pursuing the FYUG Programme is awarded a Major Degree in a particular discipline, he/she/they are eligible to be awarded a Minor in another discipline of his choice, if he earns a minimum of 32 credits (approximately 25% of credit required for the three-year programme) from 8 pathway courses in that discipline. Example: Physics Major with Chemistry Minor/ Chemistry Major with English Minor/ Commerce Major with Economics Minor/ English Major with Functional English Minor/ Hindi Major with Malayalam Minor etc.

iii. **Major with Multiple Disciplines** of Study: This pathway is recommended for students who wish to develop core competencies in multiple disciplines of study. In this case, the credits for the minor pathway shall be distributed among the constituent disciplines/ subjects. If a student pursuing FYUG Degree Programme is awarded a major Degree in a particular discipline, he/she/they are eligible to get mentioned his core competencies in other disciplines of his choice if he has earned 12 credits from the pathway courses of that discipline. Example: Physics Major with Minors in Chemistry and Mathematics, Economics Major with Minors in History and English, Commerce Major with Minors in Economics and Statistics.

iv. **Interdisciplinary Major**: For these programme pathways, the credits for the major and minor pathways shall be distributed among the constituent disciplines/subjects to attain core competence in the interdisciplinary programme. Example: Econometrics Major, Global Studies Major, Biostatistics Major.

v. **Multi-Disciplinary Major**: For multidisciplinary major pathways, the credits for the major and minor pathways will be distributed among the broad disciplines such as Life Sciences, Physical Sciences, Mathematical and Computer Sciences, Data Analysis, Social Sciences, Humanities, etc. Example: Life Science, Data Science, Nano Science.

vi. **Degree with Double Major**: A student who secures a minimum of 50% credits from the first major will be awarded a second major in another discipline if he could secure 40% of credit from that discipline for the 3-year/ 4-year UG degree to be awarded a double major degree. Example: Physics and Chemistry Major, Economics and History Major, Economics and History Major, Commerce and Management Major.

Pathway Option 1 - Degree Major or Major with Multiple Disciplines of Study

Course Components	No. of Courses											
	Semester 1	Semester 2	Semester 3	Semester 4	Internship of 2 Credits	Semester 5#	Semester 6#	Total	Remarks	Semester 7	Semester 8	Total
DSC A (4 Credit /Course)	1(P)	1(P)	3 (2P)	3 (2P)		5	4	17	7 Out of 17 can be opted as DSE	3	2	22
DSC B & C (4 Credit /Course)	2(P)	2(P)	1(P) (B or C)	1(P) (C or B)				6		3		9
Multidisciplinary Courses (MDC) (3 Credit /Course)	1(P)	1(P)	1*					3	*Recommended that the course offered be related to Indian Knowledge Systems or allied areas.			3
Ability Enhancement Courses (AEC) (3 Credit /Course)	1 (English) 1 (OL)	1 (English) 1 (OL)						4				4
Skill Enhancement Courses (SEC) (3 Credit /Course)				1*		1**	1**	3	*Recommended that the course may be offered by the English Department ** From DSC Aonly			3
Value Addition Courses (VAC) (3 Credit /Course)			1*	1*			1**	3	*Recommended that one VAC be offered by the English Department and one by Other Languages Department ** From DSC Aonly			3
Project/ Dissertation 12 credits for Honours with Research & 8 for Honours											**12/8 (1 DSC / DSE for Honours**	
Total Courses	**6**	**6**	**6**	**6**		**6**	**6**	**36**		**6**	**2+1**	
Total Credits	**21**	**21**	**22**	**22**	**2**	**23**	**22**		**Total Credits 133**	**24**	**20**	**Total Credits 177**
Total Hours per Week	**25**	**25**	**25**	**25**		**25**	**25**		**Exit option available**	**25**	**25**	

BoS can include 2 practical courses in 5th semester and 3 practical courses in 6th semester in any of the 6 courses distributed in each semester.

Pathway Option 2 - Major with Minor

Course Components	No. of Courses											
	Semester 1	Semester 2	Semester 3	Semester 4		Semester 5#	Semester 6#	Total	Remarks	Semester 7	Semester 8	Total
DSC A (4 Credit /Course)	1(P)	1(P)	3 (2P)	3 (2P)		4	3	15	7 Out of 15 can be opted as DSE	3	2	20
DSC B (4 Credit /Course)	2(P)	2(P)	1(P)	1(P)		1	1	8	1 Out of 8 can be opted as DSE	3		11
Multidisciplinary Courses (MDC)/ (3 Credit /Course)	1(P)	1(P)	1*					3	*Recommended that the course offered be related to Indian Knowledge Systems or allied areas.			3
Ability Enhancement Courses (AEC) (3 Credit /Course)	1 (English) 1 (OL)	1 (English) 1 (OL)						4				4
Skill Enhancement Courses (SEC) (3 Credit /Course)				1*		1**	1**	3	*Recommended that the course may be offered by the English Department ** From DSC A only			3
Value Addition Courses (VAC) (3 Credit /Course)			1*	1*			1**	3	*Recommended that one VAC be offered by the English Department and one by Other Languages Department ** From DSC Aonly			3
Project/ Dissertation 12 credits for Honours with Research & 8 for Honours											**12/8 (1 DSC/ DSE for Honours**	
Total Courses	**6**	**6**	**6**	**6**		**6**	**6**	**36**		**6**	**2+1**	
Total Credits	**21**	**21**	**22**	**22**	**2**	**23**	**22**		**Total Credits 133**	**24**	**20**	**Total Credits 177**
Total Hours per Week	**25**	**25**	**25**	**25**		**25**	**25**		**Exit option available**	**25**	**25**	

Internship of 2 Credits

BoS can include 2 practical courses in 5th semester and 3 practical courses in 6th semester in any of the 6 courses distributed in each semester.

Pathway Option 3 - Double Major

Course Components	No. of Courses											
	Semester 1	Semester 2	Semester 3	Semester 4	Internship of 2 Credits	Semester 5#	Semester 6#	Total	Remarks	Semester 7	Semester 8	Total
DSC A (4 Credit /Course)	1(P)	1 (P)	2(2P)	2(1P)		4	3	13	7 Out of 13 can be opted as DSE	3	2	18
DSC B (4 Credit /Course)	2(P)	2(P)	2(1P)	2(2P)		1	1	10	2 Out of 10 can be opted as DSE	3		13
Multidisciplinary Courses (MDC) (3 Credit /Course)	1(P)	1(P)	1*					3	*Recommended that the course offered be related to Indian Knowledge Systems or allied areas.			3
Ability Enhancement Courses (AEC) (3 Credit /Course)	1 (English) 1 (OL)	1 (English) 1 (OL)						4				4
Skill Enhancement Courses (SEC) (3 Credit /Course)				1*		1	1	3	*Recommended that the course may be offered by the English Department			3
Value Addition Courses (VAC) (3 Credit /Course)			1*	1*			1	3	*Recommended that one VAC be offered by the English Department and one by Other Languages Department			3
Project/ Dissertation 12 credits for Honours with Research & 8 for Honours											**12/8 (1 DSC/ DSE for Honours**	
Total Courses	**6**	**6**	**6**	**6**		**6**	**6**	**36**		**6**	**2+1**	
Total Credits	**21**	**21**	**22**	**22**	**2**	**23**	**22**		**Total Credits 133**	**24**	**20**	**Total Credits 177**
Total Hours per Week	**25**	**25**	**25**	**25**		**25**	**25**		**Exit option available**	**25**	**25**	

BoS can include 2 practical courses in 5th semester and 3 practical courses in 6th semester in any of the 6 courses distributed in each semester.

Note: In all the above 3 tables "(P)" means courses with practical

Guidelines for Acquiring Credit from Other Institutions/Online/Distance Mode

i. A student shall register to a minimum of 16 credit per semester from the college/ department where he/she/they officially admitted for a particular programme. However, students enrolled for a particular programme in one institution can simultaneously enroll for additional credits from other HEIs within the University or outside University subject to a maximum of 30 credits per semester including the 16 institutional credits.
ii. The College shall publish a list of courses that are open for admission for students from other institutions well in advance before the commencement of each semester.
iii. Each BoS shall prepare and publish a list of online courses at different levels before the commencement of each semester offered in various online educational platforms recognized by the Academic Council of the college, which can be opted by the students for acquiring additional credits.
iv. BoS shall prepare and publish a list of allied/ relevant pathway courses before the commencement of each semester offered by other Board of Studies that can be considered as pathway course for major/ minor for their disciplines at different levels.
v. At the end of each semester the college will include the credit acquired by the student through online courses in their semester grade card subject to a maximum of 30 credits.

Attendance

i. A student shall be permitted to register for the end-semester evaluation of a specific course to acquire the credits only if he has completed 75% of the prescribed classroom activities in physical, online, or blended modes, including any makeup activities as specified by the course faculty of that particular course.
ii. A student is eligible for attendance as per the existing university and government orders which includes participation in a meeting, or events organized by the college or the university, a regularly scheduled curricular or extracurricular activity prescribed by the college or the university. Due to unavoidable or other legitimate circumstances such as illness, injury, family emergency, care-related responsibilities, bad or severe weather conditions, academic or career-related interviews students are eligible for authorized absence. Apart from this, all other eligible leaves such as maternity leave, and menstrual leave shall also be treated as authorized absences.
iii. The condonation facility can be availed as per the university norms.

Workload

i. The workload of a faculty who offers only lecture courses during an academic year shall be 32 credits.
ii. The workload of a faculty offering both practical courses and theory courses may be between 24-32 credits per academic year.
iii. An academic year shall consist of two semesters.
iv. To protect the existing language workload, college should make necessary arrangements to give adequate preference to those courses designed by language departments coming under MDC, SEC and VAC of 3rd & 4th semester. It is recommended that the MDC offered in the third semester shall be based on Indian Knowledge Systems or Nation-specific topics and may be offered by the Other Languages department or any other department as may be seen fit. Additionally, the SEC in the fourth semester may be offered by the English Department and of the VACs in the third and fourth semesters, one may be offered by the Other Languages Department and the other may be offered by the English Department. These recommendations may be modified as per the recommendations of the SHC-UGP Academic Monitoring Committee.

v. Programme wise workload calculation will be as per the FYUGP workload ordinance 2024.
vi. The teachers given the administrative responsibilities in the department and college level may give a relaxation in their work load as specified in the UGC regulations 2018.

Credit Transfer and Credit Accumulation

i. The college will establish a digital storage (DIGILOCKER) of academic credits for the credit accumulation and transfer in line with ABC.

ii. The validity of credits earned shall be for a maximum period of seven (7) years or as specified in the university/ UGC regulations.The students shall be required to earn at least 50% of the credits from the College.

iii. Students shall be required to earn the required number of credits as per any of the pathway structure specified in this regulation for the award of the degree.

Outcome Based Approach

The curriculum will be designed based on Outcome Based Education (OBE) practices. The Graduate Attributes (GA) and Programme Outcomes (PO) will be defined and specified in the syllabus of each programme.

Assessment and Evaluation

i. The assessment shall be a combination of Continuous Comprehensive Assessment (CCA) and an End Semester Evaluation (ESE).

ii. 30% weightage shall be given for CCA. The remaining 70% weight shall be for the ESE.

iii. Teacher Specific Content will be evaluated under CCA.

iv. CCA will have two subcomponents Formative Assessment (FA) and Summative Assessment (SA). Each of these components will have equal weightage and to be conducted by the course faculty/ course coordinator offering the course.

v. FA refers to a wide variety of methods that teachers use to conduct in-process evaluations of student comprehension, learning needs, and academic progress during a lesson, unit, module or course. FA is to encourage students to build on their strengths rather than fixate or dwell on their deficits. FA can help to clarify and calibrate learning expectations for both students. FA will help students become more aware of their learning needs, strengths, and interests so they can take greater responsibility over their own educational growth. FA will be prerogative of the course faculty/ course coordinator based on specific requirement of the student.

vi. Suggestive methods of FA are as follows: (anyone or in combinations as decided by the course faculty/ course coordinator)

a. Practical assignment
b. Observation of practical skills
c. Viva voce
d. Quiz
e. Interview
f. Oral presentations
g. Computerized adaptive testing
h. In-class discussions

i. Group tutorial work
j. Reflection writing assignments
k. Home assignments
l. Self and peer Assessments
m. Any other method as may be required for specific course/ student by the course faculty/ course coordinator.

vii. Summative Assessments (SA) are used to evaluate student learning, skill acquisition, and academic achievement at the conclusion of a defined instructional period- typically at the end of a project, unit, module, course or semester. SA may be a class tests, assignments, or project, used to determine whether students have learned what they were expected to learn. It will be based on evidence, collected using single or multiple ways of assessment. The systematically collected evidences should be kept in record by course faculty/ course coordinator and the marks should be displayed on the college notice board/ other official digital platforms of the college before the End Semester Evaluations.

viii. The method of SA will be as follows: (any one as decided by the course faculty/ course coordinator)
a. Written test
b. Open book test
c. Laboratory report
d. Problem based assignments
e. Individual project report
f. Case study report
g. Team project report
h. Literature survey
i. Standardized test
j. Any other pedagogic approach specifically designed for a particular course by the course faculty/ course coordinator.

ix. A student may repeat SA only if for any compulsive reason due to which the student could not attend the assessment.

x. The prerogative of arranging a CCA lies with the course faculty/ course coordinator with the approval of SHC-UGP Academic Committee based on justified reasons.

xi. The course faculty/ course coordinator shall be responsible for evaluating all the components of CCA. However, the college may involve any other person (External or Internal) for evaluation of any or all the components as decided by the Principal/Controller of Examinations from time to time in case any grievances are raised.

xii. Written tests shall be precisely designed using a variety of tools and processes (e.g., constructed responses, open-ended items, multiple-choice), and the students should be informed about the evaluation modalities before the commencement of the course.

xiii. The course faculty may provide options for students to improve their performance through continuous assessment mechanism.

xiv. There shall be theory and practical examinations at the end of each semester.

xv. Regarding evaluation, one credit may be evaluated for 25 marks in a semester; thus, a 4-credit course will be evaluated for 100 marks; 3-credit courses for 75 marks and 2-credit courses for 50 marks.

xvi. All examinations will be conducted by the College and will be evaluated at the College itself.

xvii. Individual Learning Plans (ILPs) and/ or specific assessment arrangements may be put in place for differently abled students. Suitable evaluation strategies including technology

assisted examinations/ alternate examination strategies will be designed and implemented for differently abled students.

Practical Examination

i. The end semester practical examination will be conducted and evaluated by the institution.

ii. There shall be a CCA for practical courses conducted by the course faculty/ course coordinator.

iii. The scheme of evaluation of practical courses will be as given below:

Components for the Evaluation of Practical Courses	Weightage
CCA of practical/practicum.	30%
ESE of practical/practicum.	70%

iv. Those who have completed the CCA alone will be permitted to appear for the ESE.

v. For grievance redressal purpose, the university shall have the right to call for all the records of CCA.

vi. Duration of Examination: Questions shall be set as per the defined Outcome .The duration of the examinations shall be as follows.

Mode	Time (in Hours)
Written Examination	2
Multiple Choice	1.5
Open Book	2
Any Other Mode	2

Evaluation of Project/Dissertation

The evaluation of project work shall be CCA with 30% and ESE 70%. The scheme of evaluation of the Project is given below:

Project type	Maximum Marks	CCA	ESE
Research Project of Honours with Research (12 credits)	200	60	140
Project of Honours (8 credits)	100	30	70

Evaluation of Internship

The evaluation of internship shall be done by a committee constituted by the Department Council. The scheme of CCA and ESE is given below:

Components of Evaluation of Internship	Weightage	Marks for Internship2 Credits/ 50 Marks
CCA	30%	15
ESE	70%	35

The department council may decide any mode for the completion of the Internship. If in case evaluation is not specified in any of the selected internship programme, institution can adopt a proper evaluation method as per the weightage specified in the table above.

Letter Grades and Grade Points

Mark system is followed for evaluating each question. For each course in the semester, letter grade and grade point are introduced in 10-point indirect grading system as per guidelines given below,

i. The Semester Grade Point Average (SGPA) is computed from the grades as a measure of the student's performance in a given semester. The SGPA is based on the grades of the current term, while the Cumulative Grade Point Average (CGPA) is based on the grades in all courses taken after joining the programme of study.

ii. Based on the marks obtained, the weighted grade point will be mentioned in the student's grade cards.

Letter Grade	**Grade Point**	**Percentage of Marks (Both Internal & External Marks put together)**	**Class**
O (Outstanding)	10	95% and above	First Class with Distinction
A+ (Excellent)	9	85% and above but below 95%	
A (Very good)	8	75% and above but below 85%	
B+ (Good)	7	65% and above but below 75%	First Class
B (Above average)	6	55% and above but below 65%	
C (Average)	5	45% and above but below 55%	Second Class
P (Pass)	4	35% and above below 45% Aggregate (external and internal put together) with a minimum of 30% in external	Third Class
F (Fail)	0	Below an aggregate of 35%or below 30% in external evaluation	Fail
Ab (Absent)	0		Fail

iii. When students take audit courses, they may be given pass (P) or fail (F) grade without any credits.

Computation of SGPA and CGPA

The following method is recommended to compute the Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

iv. The SGPA is the ratio of the sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits of all the courses undergone by a student in the semester, i.e.

SGPA (Si) = Σ(Ci x Gi) / ΣCi

Where Si is the SGPA in the i^{th} semester, Ci is the number of credits of the i^{th} course and Gi is the grade point scored by the student in the i^{th} course.

$$\textbf{SGPA} = \frac{\text{Sum of the credit points of all courses in a semester}}{\text{Total Credits in that Semester}}$$

Illustration – Computation of SGPA

Semester	**Course**	**Credit**	**Letter Grade**	**Grade point**	**Credit Point** (Credit x Grade)
I	DSC A	4	A	8	4 x 8 = 32
I	DSC B	4	B+	7	4 x 7 = 28
I	DSC C	4	B	6	4 x 6 = 24

I	MDC	3	B	6	3 x 6 = 18
I	AEC 1	3	O	10	3 x 10 = 30
I	AEC 2	3	C	5	3 x 5 = 15
	Total	21			147
	SGPA				147/21 = 7

The CGPA is also calculated in the same manner considering all the courses undergone by a student over all the semesters of a programme, i.e.

$$\textbf{CGPA} = \frac{\text{Sum of the credit points of all courses in six or eight semesters}}{\text{Total Credits in Six (133) or Eight (177) semesters}}$$

v. The SGPA and CGPA shall be rounded off to 2 decimal points and reported in the transcripts.

Implementation and Monitoring of SHC-UGP

i. The implementation and monitoring of SHC-UGP will be carried out by duly appointed bodies/committees of the college such as the Academic Council, the various Boards of Studies and the Academic Monitoring Committee.

ii. Academic Council

Among its other functions, the Academic Council of the College shall:

i. Scrutinize and approve all the proposals submitted by the Board of Studies of each Department with regard to the SHC-UGP details such as, academic pathways, allowed syllabi enrichment/ updating, details of elective courses, Online courses, blended teaching, courses offering to the students of other HEIs, panel of examiners, summative and formative evaluation tools proposed by the course faculty concerned, new courses and syllabus proposed by the faculty members as signature courses etc.
ii. The Academic Council can differ on any proposal and it shall have the right to return the matter for reconsideration to the Board of Studies concerned or reject it, after giving sufficient reasons to do so.
iii. Undertake the scrutiny of all documents related to Teacher Specific Content.
iv. Recommend to the College Governing Council for starting innovative programmes using the flexibility and holistic nature of the SHC-UGP curriculum frame work.

iii. Board of Studies

Among its other functions, the Board of Studies of each Department shall:

i. Prepare teacher specific content of syllabi for various courses keeping in view the objectives of the SHC-UGP and submit the same for the approval of the Academic Council.
ii. Scrutinize the signature course content and its evaluation techniques.
iii. Suggest methodologies for innovative teaching and evaluation techniques.
iv. Suggest panel of examiners to the Office of the Controller of Examinations.
v. Coordinate research, teaching, extension and other academic activities in the department.

iv. SHC-UGP Academic Monitoring Committee

The SHC-UGP Academic Monitoring Committee shall be constituted under the Chairmanship of the Principal, with the Academic Coordinator as the Convenor, shall

be entrusted to oversee the implementation and monitoring of the SHC-UG programme.

i. The Academic Monitoring Committee will collect and whet the proposals submitted by the Board of Studies of each Department with regard to the SHC-UGP and duly forward them to the Academic Council.
ii. It will oversee and coordinate the activities undertaken for the successful implementation of SHC-UGP in the College and will function as an advisory body in such matters.

Power to Remove Difficulties

If any difficulty arises in giving effect to the provisions of these Regulations, the Principal may by order make such provisions which appears to him/her to be necessary or expedient for removing the difficulty. Every order made under this rule shall be subject to ratification by the appropriate authorities.

Modifications to the Regulations

Notwithstanding anything contained in these Regulations, any amendments or modifications issued or notified by the University Grants Commission or the State Government or the Mahatma Gandhi University from time to time, shall be incorporated into these Regulations by the appropriate regulatory bodies of the College and shall constitute an integral part thereof.

3. SYLLABUS INDEX

SEM	Course Code	Course Title	Course Level	Credit	Hours per Week	
					Theory	*Practical*
DISCIPLINE SPECIFIC COURSES (DSC)						
I	24UEVSDSC101	Remote Sensing and GIS	100-199	4	3	2
II	24UEVSDSC102	Green Chemistry	100-199	4	3	2
III	24UEVSDSC201	Water Resource Management	200-299	4	3	2
V	24UEVSDSC301	Disaster Management	300-399	4	3	2
	24UEVSDSC302	Environmental Pollution and Monitoring	300-399	4	4	0
VI	24UEVSDSC303	Environmental Impact Assessment	300-399	4	4	0
MULTIDISCIPLINARY COURSES (MDC)						
I/II	24UEVSMDC101	Fundamentals of Environmental Science	100-199	3	2	2

4. SYLLABUS FOR DISCIPLINE SPECIFIC COURSES IN CHEMISTRY

DSC - 01

Discipline	Environmental Science
Semester	I
Type of Course	Discipline Specific Course (DSC)
Course Code	24UEVSDSC101
Course Title	REMOTE SENSING AND GIS
Course Level	100-199
Course Summary	Geomatics technologies are essential in modern days for sustainable development and effective management of land, water, air and socio-economic environment. Geographic Information System together with Remote Sensing technology enhances and integrates many different databases making a common geospatial platform to view and analysis this information.More than 80% of information that is generated and consumed has some sort of spatial component to it and this data is stored in spatial database. GIS and Image Analysis techniques can be used as one of the best research tools to provide scientific and technological prescriptions on matters related to Natural Resources, Environmental Impact Assessment and Disaster monitoring. This offer judicious plans for sustainable development, management and environmental governance.
Hours	75 (Lecture/Tutorial – 45, Practical – 30)
Credits	4

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PO
1	Understand GIS principles, applications, and related technologies.	Analyse	PO1,PO2,PO3,PO4,PO5
2	Develop skills in data acquisition, management, and spatial analysis.	Apply	PO1,PO2,PO3,PO4,PO5
3	Recognize the significance of GIS and modeling tools across diverse domains.	Remember, Understand	PO1,PO2,PO3,PO4,PO5
4	Communicate global aspects of geographical information utilization and management.	Understand	PO1,PO2,PO3,PO4,PO5
5	Proficiently manipulate vector and raster spatial data to address local, state, and national issues.	Apply	PO1,PO2,PO3,PO4,PO5

6	Apply GIS in practical scenarios, contributing to advancements in various fields, including land use management and disaster management.	Apply	PO1,PO2,PO3,PO4,PO5
Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)			

COURSE CONTENT

Module	Units	Course description	Hrs	Unit Outcomes	CO Nos
1- **Fundamentals of Environmental Appraisal Tools**	**Fundamentals of Environmental Appraisal Tools : 20 hrs**				
	1.1	Introduction to Scales- Definition,types of scales, representation and conversion	2hrs PPT/ Lecture	Students will grasp the fundamentals of scales, including their definition, types, and representation. The focus will be on understanding how to convert between different types of scales, providing a foundational knowledge essential for accurate map interpretation and creation.	CO3
	1.2	Maps-Definition and classification**,** Map conversions (Grids, Contours, Isobars, etc.)**,**Measurements of area and distance (Square and Plannimeter Methods)	4 hrs, PPT/ Lecture	Students will learn about various map conversions, including Grids, Contours, and Isobars. Additionally, the unit covers methods for measuring area and distance using both the Square and Planimeter Methods, ensuring proficiency in quantitative aspects of cartography.	CO3
	1.3	Topographical Maps, Cadastral maps, Toposheets (Interpretation and studies)	2 hrs, PPT/ Lecture	Students will be able to understand and analyze toposheets, to extract valuable information for various purposes.	CO3
	1.4	Surveying-Definition and classification, Survey instruments (Introduction to Compass, Theodolite, Clinometer, Abeny Level, Cartographic equipments)	3hrs, PPT/ Lecture	Students will learn the concept and classification of surveying, providing an overview of essential survey instruments such as the compass, theodolite, clinometer, abney level, and cartographic equipment. Students will acquire a foundational understanding of surveying techniques, setting the stage for more advanced applications.	CO1, CO3
	1.5	Preparation of maps (Basics of cartography)	3hrs, PPT/ Lecture	Students will learn key principles and techniques involved in map creation, ensuring they are equipped to produce accurate and	CO1, CO3

				informative cartographic representations.	
	1.6	Photogrammetry- Definition and types (Aerial and terrestrial photographs)	3hrs, PPT/ Lecture	Explores the types of photogrammetry, including both aerial and terrestrial photographs. Students will gain an understanding of the principles behind photogrammetry and its applications in map creation and interpretation.	CO1, CO3
	1.7	Method and equipments used in Aerial Photo Interpretation (Introduction only)	3hrs, PPT/ Lecture	Students will understand the essential concepts and tools for interpreting aerial photographs, setting the stage for more in-depth exploration in advanced courses.	CO1, CO3
2- Remote Sensing	**Remote Sensing:15 hrs**				
	2.1	Definition, History and Scope of Remote Sensing; Principles and concepts of Remote Sensing	3hrs, PPT/ Lecture	Students will have a comprehensive understanding of the definition, historical development, and scope of remote sensing, along with a grasp of the principles and concepts that form the foundation of remote sensing technologies.	CO1, CO2
	2.2	Scope of remote Sensing, Indian Remote sensing Programmes	3hrs, PPT/ Lecture	Students will gain insight into the vast scope of remote sensing applications, understanding its relevance in various fields. Additionally, they will be familiarized with Indian Remote Sensing Programmes, enhancing their knowledge of national initiatives in the remote sensing domain.	CO1
	2.3	Electromagnetic Spectrum-Electromagnetic spectrum in remote sensing,Spectral characteristics of surface features (rocks, soils, vegetations, water)	3hrs, PPT/Lecture	Students will comprehend the electromagnetic spectrum's role in remote sensing, focusing on the spectral characteristics of surface features such as rocks, soils, vegetation, and water. This knowledge will form the basis for interpreting remote sensing data based on spectral signatures.	CO1
	2.4	Sensors and Platforms-Sensors in remote sensing, Satellites and their sensors.	3hrs, PPT/Lecture	Students will explore sensors used in remote sensing and various satellites along with their sensors in this unit. This understanding will enable students to appreciate the technological aspects of data	CO1, CO2

				acquisition from space and airborne platforms in the realm of remote sensing.	
	2.5	Types of platforms, Scanners and data products Image processing; Applications of remote Sesing	3hrs, PPT/Lecture	Students will be equipped with knowledge about different platforms, scanners, and data products in remote sensing. They will also gain proficiency in image processing techniques and understand diverse applications of remote sensing across fields such as environmental monitoring, agriculture, urban planning, and disaster management.	CO1, CO2
	Remote Sensing Applications:20 hrs				
3-Remote Sensing Applications	3.1	Photogrammetry - Definition and types (Aerial and terrestrial photographs)	3hrs, PPT/Lecture	Gain a clear understanding of photogrammetry, encompassing its definition and the differentiation between aerial and terrestrial photographs.	CO2, CO6
	3.2	Method and equipments used in Aerial Photo Interpretation (Introduction only)	2hrs, PPT/Lecture	Introduce students to the methods and equipment used in aerial photo interpretation, providing a foundational overview for subsequent in-depth exploration	CO2, CO6
	3.3	Image-interpretation -Space Imaging Landsat, SPOT, IRS, NOAA, Seasat, ERS, RADARSAT, INSAT	3hrs, PPT/Lecture	Familiarize students with various space imaging platforms such as Landsat, SPOT, IRS, NOAA, Seasat, ERS, RADARSAT, and INSAT, developing their ability to recognize and analyze different satellite imagery.	CO3, CO4
	3.4	Indian Remote sensing Programmes	2hrs, PPT/Lecture	Acquire knowledge about Indian remote sensing programs, understanding their objectives, contributions, and the role they play in addressing diverse applications and challenges.	CO3, CO4
	3.5	Digital image processing technique-Image statistical analysis,Image restoration, Image enhancement	5hrs, PPT/Lecture	Develop proficiency in digital image processing techniques, including statistical analysis, restoration, and enhancement, enabling students to manipulate and improve the quality of remote sensing imagery.	CO3, CO4
	3.6	Information extraction (Image classification: Supervised and unsupervised), Image manipulation, Accuracy assessment	5hrs, PPT/Lecture	Master the techniques of information extraction, covering image classification (both supervised and unsupervised), manipulation, and accuracy assessment, ensuring	CO3, CO4

				competence in deriving meaningful information from remote sensing data.	
4-**Geographic Information System**	**Geographic Information System(GIS):25 hrs**				
	4.1	Fundamentals of Computing GIS	2hrs, PPT/Lecture	Students will gain proficiency in basic gis computing, including data input/output, database management, and understanding the essential computational processes involved in gis.	CO5, CO6
	4.2	Theory of GIS Spatial Data Concepts: Raster and Vector Data	2hrs, PPT/Lecture	This topic focuses on imparting a solid theoretical foundation in gis, covering key spatial data concepts such as raster and vector data, ensuring students understand the principles that underlie gis technologies.	CO5, CO6
	4.3	Topology Creation in GIS	1hrs, PPT/Lecture	Students will develop the ability to create and manage topological relationships within gis datasets, ensuring accurate spatial representation and analysis.	CO5, CO6
	4.4	Overlay Analysis Techniques	1 hrs, PPT/Lecture	This topic equips students with skills in overlay analysis, enabling them to integrate and analyze multiple spatial datasets to derive meaningful information and insights.	CO5, CO6
	4.5	Software Utilized in GIS	1hrs, PPT/Lecture	Students will become familiar with various gis software tools, gaining practical experience in using these tools for spatial analysis, mapping, and data visualization.	CO5, CO6
	4.6	Surveying Techniques in GIS, including Leveling, Triangulation, and Geodetic Survey	2hrs, PPT/Lecture	This topic introduces surveying techniques within the gis context, covering leveling, triangulation, and geodetic survey methods, preparing students for spatial data collection and integration.	CO5, CO6
	4.7	Geographical Analysis in GIS	2 hrs, PPT/Lecture	Students will develop advanced skills in geographical analysis within gis, including spatial modeling and simulation, allowing them to perform in-depth spatial analyses for various applications.	CO5, CO6
	4.8	Applications of GIS	2hrs, PPT/Lecture	This topic focuses on applying gis skills to real-world scenarios, exposing students to diverse applications such as urban planning, environmental	CO5, CO6

				management, and disaster response, fostering practical problem-solving abilities.	
	4.9		7 hrs Demonstration using QGIS		
		Practical :-Georeferencing,Creation of Shapefiles,Digitizing and editing of shapefiles,Image Interpretation,Topology checking,Reprojecting the shapefile,Map Creation			
5-	**Global Positioning System (GPS):10 hrs**				
	5.1	Introduction to GPS	2hrs, PPT/Lecture	Students will gain a foundational understanding of gps, including its historical development, principles, and applications, enabling them to comprehend its role in various fields.	CO1
	5.2	Components and Technology	2hrs, PPT/Lecture	Students will be proficient in identifying and explaining the key components of gps systems, understanding the technology behind gps, and discerning how signals are acquired and processed.	CO1
	5.3	Data collection and Processing	3hrs, PPT/Lecture	Equips students with the skills to effectively collect and process gps data, providing them with hands-on experience in utilizing gps technology for accurate and reliable location information.	CO1
	5.4	Applications to environmental studies	3hrs, PPT/Lecture	Students will explore the diverse applications of gps in environmental studies, gaining insights into how gps technology contributes to research, monitoring, and management in the environmental sciences.	CO1

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** Interactive lectures, Lecture-based Learning, Experiential Learning.

Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **Theory:** Quiz, Oral Presentation, Written test, Problem-based assignment, or *any other method as may be required by the course faculty*. **Practical:** Observation of practical skills, Laboratory records, and *any other method as may be required by the course faculty*. **B. End Semester Evaluation (ESE)** **Theory:** Written-test **Practical:** Practical-based assessment, Record, and *any other method as may be required by the course faculty*.

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DSC - 02

Discipline	Environmental Science
Semester	II
Type of Course	Discipline Specific Course (DSC)
Course Code	24UEVSDSC102
Course Title	GREEN CHEMISTRY
Course Level	100-199
Course Summary	It provides prospective students, educators, and stakeholders with a brief understanding. It should be capable to incorporate Objectives, Structure, Core Topics, Prerequisites, Methods of Instruction, Assessment Methods, Duration, Unique Features, cutting-edge research components, practical applications etc in a sentence or two. Eg: - The course in accounting offers a comprehensive curriculum for third semester, designed to equip students with a strong foundation in accounting principles and financial reporting, utilizing diverse teaching methods and assessment tools, with opportunities for practical experiences, and a focus on preparing graduates for successful careers in finance and accounting.
Hours	75 (Lecture/Tutorial – 45, Practical – 30)
Credits	4

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PO
1	Understand the fundamentals and historical evolution of green chemistry	Understand	PO1,PO2, PO3,PO4, PO5
2	Apply green chemistry principles to design industrial processes for minimal environmental impact and optimal resource efficiency.	Apply	PO1,PO2, PO3,PO4, PO5
3	Analyze pollution prevention and propose green alternatives in manufacturing.	Analyze	PO1,PO2, PO3,PO4, PO5
4	Relate green chemistry to sustainability, emphasizing the sustainable use of resources and quantifying environmental impact.	Evaluate	PO1,PO2, PO3,PO4, PO5
5	Explore emerging green technologies and alternative energy sources in the context of green chemistry.	Evaluate	PO1,PO2, PO3,PO4, PO5
6	Apply green chemistry to real-world scenarios in areas like land use management, agriculture, and disaster management.	Apply,Evaluate	PO1,PO2, PO3,PO4, PO5
Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)			

COURSE CONTENT

Module	Units	Course description	Hrs	Unit Outcomes	CO Nos
1(**Introduction to Green Chemistry**)	**Introduction to Green Chemistry:15 hrs**				
	1.1.	Introduction to green chemistry and general chemistry	2hrs PPT/ Lecture	Understand green chemistry and its significance in sustainability, coupled with a foundational knowledge of general chemistry concepts.	CO1
	1.2.	History of green chemistry	2hrs PPT/ Lecture	Students will gain insights into the historical evolution of green chemistry and develop an understanding of the chemical composition of the environment, encompassing air, water, and soil.	CO1
	1.3	Chemical composition of the environment (air, water, and soil).	3hrs PPT/ Lecture	students will demonstrate an understanding of the diverse components and interactions within these environmental matrices, as well as the potential impact of human activities on their composition.	CO2
	1.4	The fate of chemicals in the environment: Plastics (petroleum and biopolymers),Pesticides, heavy metals,pharmaceuticals and personal care products	5hrs PPT/ Lecture	Students will understand the environmental fate of chemicals, including pesticides, heavy metals, pharmaceuticals, and personal care products, gaining insights into their impact and methods for mitigation.	CO2, CO3
	1.5	Prevention of chemical accidents	3hrs PPT/ Lecture	Students will be equipped with the knowledge and strategies for preventing chemical accidents, emphasizing safety measures and sustainable practices in chemical industries.	CO3
2(**Green Chemistry and Industrial Processes**)	**Green Chemistry and Industrial Processes:20 hrs**				
	2.1	Principles of green chemistry	3hrs PPT/ Lecture	Students will have a solid understanding of the principles underlying green chemistry, focusing on environmentally friendly practices and minimizing the impact of chemical processes on ecosystems.	CO1
	2.2	Effects of chemistry on the environment	2hrs PPT/ Lecture	Students will gain insights into the environmental implications of chemistry, including waste production. They will learn strategies for addressing environmental problems caused	CO2

				by chemical processes and explore preventive measures.	
	2.3	Waste production, problems, and prevention	4hrs PPT/ Lecture	Students will comprehend the environmental impact of waste production, identify associated problems, and develop strategies for waste prevention in alignment with principles of green chemistry	CO2
	2.4	Sustainable Industrial Chemistry	2hrs PPT/ Lecture	Students will comprehend the principles and practices of environmentally conscious industrial processes, emphasizing sustainability, renewable resources, and the integration of green chemistry principles to minimize environmental impact.	CO4
	2.4.1	Renewable resources	3hrs PPT/ Lecture	Students will explore sustainable practices in industrial chemistry, with a focus on utilizing renewable resources. The unit aims to develop an understanding of sustainable resource management and its application in industrial processes.	CO4
	2.4.2	Emerging Green Technologies & Alternative Energy Sources	3hrs PPT/ Lecture	This topic introduces students to innovative green technologies and alternative energy sources, providing insights into cutting-edge developments in the field and fostering an awareness of sustainable solutions for energy needs.	CO4, CO5
	2.4.3	Sustainable Industrial Chemistry- Bio-diesel.	3hrs PPT/ Lecture	Students will delve into the sustainable production of bio-diesel, gaining practical knowledge of how bio-based fuels contribute to sustainable industrial practices and reduced environmental impact	CO4
3(**Pollution Prevention and Green Engineering**)	**Pollution Prevention and Green Engineering:20 hrs**				
	3.1	Key concepts related to pollution prevention	2hrs PPT/ Lecture	Students will gain an understanding of fundamental concepts related to pollution prevention, equipping them with knowledge to identify and address environmental challenges through preventive measures.	CO1, CO6
	3.2	Properties and fates of environmental contaminants	2hrs PPT/ Lecture	This topic focuses on the properties and fates of environmental contaminants, enabling students to analyze and	CO1, CO6

				predict the behavior of pollutants in various environmental contexts.	
	3.3	Human Induced Pollution	1hrs PPT/ Lecture	students will understand the anthropogenic sources and types of pollution, as well as gain insights into green alternatives for manufacturing processes, contributing to a comprehensive awareness of human impact on the environment.	CO1, CO6
	3.3.1	Human interference - Industrial activity and the environment;	2hrs PPT/ Lecture	Students will explore the relationship between human activities, industrial processes, and environmental impacts, including an in-depth study of types of pollutants produced by humans through real-world case studies.	CO1, CO6
	3.3.2	Types of pollutants produced by humans with case study	2hrs PPT/ Lecture	students will demonstrate an understanding of various pollutants (e.g., air, water, soil contaminants) through a case study analysis, gaining insights into the environmental impact of human activities.	CO1, CO6
	3.3.3	Green alternatives to manufacturing, economic perspectives on pollution prevention	2hrs PPT/ Lecture	This topic introduces green alternatives to manufacturing processes and provides an economic perspective on pollution prevention, fostering an understanding of sustainable practices in industrial settings.	CO2, CO6
	3.4	Sustainability and Recycling	1hrs PPT/ Lecture	students will understand the principles of sustainable practices in chemical processes and gain insights into effective recycling strategies, contributing to environmentally conscious and responsible resource management.	CO3, CO4
	3.4.1	Water Pollution - Sources of Water Pollution - Types of Contaminants - Treatment Techniques	2hrs PPT/ Lecture	Students will delve into sustainability and recycling principles, with a focus on water pollution, including sources, types of contaminants, and treatment techniques, preparing them to address water-related environmental challenges.	CO3, CO4
	3.4.2	Air Pollution - Sources of Air Pollution - Acidic Aerosols and the Ozone Hole	2hrs PPT/ Lecture	This topic covers sources of air pollution, the impact of acidic aerosols and the ozone hole, and the relationship between industrial activities and climate change, enhancing students' awareness of air quality issues.	CO3, CO4

		- Climate Change and Global Warming			
	3.4.3	Energy Pollution - Types of Energy Sources and Their Environmental Impact - Treatment of Energy Production Waste	2hrs PPT/ Lecture	Students will examine types of energy sources, their environmental impact, and explore treatment methods for energy production waste, fostering an understanding of the environmental considerations in energy generation.	CO3, CO4
	3.4.4	Addressing Pollution in Agriculture - Fertilizers and Pesticides - Green Alternatives for Fertilization and Pest Control	2hrs PPT/ Lecture	This topic addresses pollution in agriculture, particularly from fertilizers and pesticides, while exploring green alternatives for fertilization and pest control, promoting sustainable agricultural practices.	CO3, CO4
4(Green Chemistry and Sustainability)	**Green Chemistry and Sustainability:17hrs**				
	4.1	Green Chemistry as an Expression of Environmental Ethics	3hrs PPT/ Lecture	Students will understand how ethical considerations influence chemical practices, fostering a commitment to environmentally responsible decision-making in the field of chemistry. They will articulate the fundamental principles of green chemistry within an ethical framework, emphasizing the importance of sustainable and eco-friendly approaches in chemical processes.	CO1
	4.2	Concept of Sustainability	2hrs PPT/ Lecture	Students will be able to demonstrate a comprehensive understanding of sustainability principles and practices.Apply the concept of sustainability to assess and address environmental, social, and economic challenges.	CO2
	4.3	Transition from Green to Sustainable Chemistry	3hrs PPT/ Lecture	Students will comprehend the transition from green to sustainable chemistry, gaining insights into the evolution of environmentally conscious practices in chemical processes, and understanding the principles guiding the shift towards holistic and enduring solutions for global sustainability.	CO4

	4.4	Sustainable Use of Chemical Feedstock, Water, and Energy	3hrs PPT/ Lecture	students will be able to demonstrate an understanding of eco-friendly practices, optimizing the use of chemical resources, water, and energy to contribute to sustainable and environmentally responsible chemical processes. Additionally, they will acquire the skills to assess and implement strategies for minimizing environmental impact in chemical production.	CO4, CO6
	4.5	Quantifying Greenness of a Chemical Reaction - Mass-based Metrics - Energy Metrics - Environmental Metrics	3hrs PPT/ Lecture	This topic emphasizes sustainable practices in chemical processes, covering the judicious use of feedstock, water, and energy. Students will learn how to quantify the environmental impact of chemical reactions using metrics such as mass-based, energy, and environmental metrics.	CO4
	4.6	Designing greener processes and life cycle assessment	3hrs PPT/ Lecture	Students will be able to design environmentally friendly processes and conduct life cycle assessments to evaluate the environmental impact of chemical reactions and products.	CO4
5 (Green Chemistry Technologies and Alternate Energy Sources)	**Green Chemistry Technologies and Alternate Energy Sources:18hrs**				
	5.1	Design for energy efficiency, photochemical reactions advantages of and challenge	3hrs PPT/ Lecture	Students will understand the principles of designing processes for energy efficiency, exploring advantages and challenges associated with photochemical reactions in the context of sustainable chemical processes.	CO1, CO2
	5.2	Alternate Energy sources	2hrs PPT/ Lecture	students will demonstrate an understanding of diverse renewable energy options, their advantages, and challenges, contributing to informed decision-making for sustainable energy solutions.	CO2, CO3
	5.2.1	Microwaves as energy source in chemistry, properties of microwaves, microwave heating (effects)	4hrs PPT/ Lecture	This topic focuses on the properties of microwaves, their use as an energy source, and the effects of microwave heating in chemical reactions, providing students with insights into innovative and efficient heating methods.	CO2, CO3

	5.2.2	Renewable sources of energy-solar energy, wind power, geothermal Solution, hydropower, sources, merits and difficulties in widespread applications	5hrs PPT/ Lecture	Students will gain knowledge about various renewable energy sources, including solar energy, wind power, geothermal solutions, and hydropower, examining their merits and challenges for widespread applications in sustainable energy systems.	CO2, CO3, CO4
	5.2.3	Indian energy scenario	2hrs PPT/ Lecture	This topic aims to equip students with an understanding of the current energy landscape in India, covering the sources, consumption patterns, and challenges faced in meeting the country's energy needs.	CO2, CO3
	5.2.4	Energy Conservation Act (2001), features.	2hrs PPT/ Lecture	Students will explore the features of the Energy Conservation Act , gaining insights into the regulatory framework designed to promote energy efficiency and conservation in India, fostering a deeper understanding of policy mechanisms in the energy sector.	CO2, CO3, CO4

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** Interactive lectures, Lecture-based Learning, Experiential Learning.
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **Theory:** Quiz, Oral Presentation, Written test, Problem-based assignment, or *any other method as may be required by the course faculty*. **Practical:** Observation of practical skills, Laboratory records, and *any other method as may be required by the course faculty*. **B. End Semester Evaluation (ESE)** **Theory:** Written-test **Practical:** Practical-based assessment, Record, and *any other method as may be required by the course faculty*.

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DSC - 03

Discipline	Environmental Science
Semester	II
Type of Course	Discipline Specific Course (DSC)
Course Code	24UEVSDSC201
Course Title	WATER RESOURCE MANAGEMENT
Course Level	200-299
Course Summary	The objective of this course is to impart the knowledge of hydrology that deals with the occurrence, distribution, movement and properties of water on the earth.
Hours	75 (Lecture/Tutorial – 45, Practical – 30)
Credits	4

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PO
1	Identify various sources of water. Assess the potential ground and surface water resources.	U	
2	Address the issues related to planning and management of water resources.	An	
3	Values of conservation of water resources. Threat to fresh water ecosystem. Techniques of conservation.	U	
4	Impacts of climate change on water resources. The global water balance.	An	
5	Know how to implement IWRM in different regions. Select the method for water harvesting based on the area. water quantity management, Surface water storage requirements and management. Understand the legal issues of water policy.	E	
Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)			

Module	Units	Course description	Hrs	Unit Outcomes	CO Nos
	MODULE I –Introduction to Water Resources - 10 hrs				
	1.1	Identify various sources of water. Water resources and humanities	1Hrs-PPT		CO 1
	1.2	Classification-Ground water and Surface Water Resources	2Hrs-PPT/Lecture		CO 1

1- Introduction to Water Resources -	1.3	Hydrologic Cycle; Types of Aquifers	2Hrs-PPT/Lecture		CO 1
	1.3	Watershed; Groundwater Flow; Groundwater as a Storage Medium	2Hrs-PPT/Lecture		CO 1
	1.4	Available Renewable Water Resources	1Hrs-PPT/Lecture		CO 1
	1.5	Water Scarcity and its impacts	2Hrs-PPT/Lecture		CO 1
2 - Water Resources Management	**MODULE II Water Resources Management -15 hrs**				
	2.1	Water Resources Management- Concepts, definitions and aim	3 Hrs-PPT/Lecture		CO1,CO2
	2.2	Scientific Framework for Water Resources Policy and Watershed Management	2 Hrs-PPT/Lecture		CO1,CO2
	2.3	Water Resources Policy at the Federal Level - Clean Water Act/Safe Drinking Water Act	3 Hrs-PPT/Lecture		CO 2
	2.4	Evaluation of Water Resources Management Options in India.	2 Hrs-PPT/Lecture/E-resource		CO 2
	2.5	Case Study in Water Resources Management and Policy	5Hrs-PPT/Lecture/Videos		CO 2
3- Water Resources Management – Ground water, Freshwater and coastal water	**MODULE III Water Resources Management – Ground water, Freshwater and coastal water- 15hrs**				
	3.1	Groundwater: Groundwater Management - Basics and Principles	1Hrs-PPT/Lecture/E-resource		CO 1,CO3
	3.2	Ground water supply/demand; capacity and contamination	1Hrs-PPT/Lecture		CO1,CO3
	3.3	Techniques for ground water (wellhead) protection.	2Hrs-PPT/Lecture		CO1,CO3
	3.4	Freshwater : Values and functions of lakes, rivers and streams; interrelationships between lake ecosystems and their watersheds	3Hrs-PPT/Lecture		CO1,CO3
	3.5	Threats to freshwater ecosystem and management techniques.	2Hrs-PPT/Lecture		CO1,CO3
	3.6	Coastal Waters: coastal water quality issues; coastal management techniques	3Hrs-PPT/Lecture		CO1,CO3
	3.7	CRZ; Wetlands-its importance and conservation.	3Hrs-PPT/Lecture		CO1,CO3
4- Climate	**MODULE IV Climate Change and Water Resources -25 hrs**				

Change and Water Resources	4.1	Introduction to Global climate change	2Hrs-PPT/Lecture		CO3, C04
	4.2	Global Water Balance-fresh water sources, precipitation, ice caps and ground water.	5Hrs-PPT/Lecture		CO3, C04
	4.3	Socio-economic impact of climate change	5Hrs-PPT/Lecture		CO3, C04
	4.4	Carbon foot print and environmental protection	2Hrs-PPT/Lecture		CO3, C04
	4.5	Local/regional climate change impacts the hydrological cycle.	5 Hrs-PPT/Lecture		
	4.6	Prevention and control of climate change	2Hrs-PPT/Lecture		CO3, C04
	4.7	Changes affecting water resources	1Hrs-PPT/Lecture		CO3, C04
	4.8	Floodplain areas	1Hrs-PPT/Lecture		CO3, C04
	4.9	Loss of drinking water supplies	1Hrs-PPT/Lecture		CO3, C04
	4.10	Migration of wetlands.	1Hrs-PPT/Lecture		CO3, C04
Module V Integrated Water Resources system Planning and Management (IWRM) - 25 Hrs					
5-Integrated Water Resources system Planning and Management (IWRM)	5.1	Definition of IWRM, IWRM Principles, How to Implement IWRM	2Hrs PPT/Lecture		CO1, CO3, C04
	5.2	Legislative and Organizational Framework	1Hrs PPT/Lecture		CO1, CO3, C04
	5.3	Water Harvesting and Conservation- Water harvesting and conservation Techniques	2Hrs PPT/Lecture		CO1, CO3, C04
	5.4	Rain water Harvesting-various techniques related to Rural and Urban area. Ground water recharge	2Hrs PPT/Lecture		CO1, CO3, C04, CO5
	5.5	Economic Analysis of Water Resources System: Time Value of Money, , Discounting Techniques, Economic and Financial Evaluation, Socio-Economic Analysis	5Hrs PPT/Lecture		CO3, C04, CO5
	5.6	Capital, Interest and Interest Rates.	2Hrs PPT/Lecture		CO4, CO5
	5.7	Time Value of Money, Depreciation, Benefit Cost Evaluation	1Hrs PPT/Lecture		CO5
	5.8	Water Quantity Management: Surface Water Storage Requirements,	5Hrs PPT/Lecture		CO5
	5.9	Water Quality Control Models	2Hrs PPT/Lecture		CO5

	5.10	Principles of Law applied to Water Rights and Water Allocation, Water Laws, Environmental Protection Law, Environmental Constraints on water Resources Development.	3Hrs PPT/Lecture		CO5

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** Interactive lectures, Lecture-based Learning, Experiential Learning.
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **Theory:** Quiz, Oral Presentation, Written test, Problem-based assignment, or *any other method as may be required by the course faculty*. **Practical:** Observation of practical skills, Laboratory records, and *any other method as may be required by the course faculty*. **B. End Semester Evaluation (ESE)** **Theory:** Written-test **Practical:** Practical-based assessment, Record, and *any other method as may be required by the course faculty*.

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DSC - 04

Discipline	Environmental Science
Semester	V/VI
Type of Course	Discipline Specific Course (DSC)
Course Code	24UEVSDSC301
Course Title	DISASTER MANAGEMENT
Course Level	300-399
Course Summary	Possessing a critical understanding of the significance of environment for the sustenance of the planet earth, the factors affecting the environment and a passion to protect and conserve it. The use of various tools and techniques for assessing the environment. Identifying issues affecting the environment and developing strategies for effective intervention and mitigation. Having a basic understanding of environmental disasters and the ability to devise strategies to mitigate them.
Hours	75 (Lecture/Tutorial – 45, Practical – 30)
Credits	4

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PO
1	Define terms disaster management, its components and structure and relate to manage the Public Health aspects of the disasters.	U	
2	Demonstrate to describe, analyze and evaluate the environmental, social, cultural, economic, legal and organizational aspects influencing vulnerabilities and capacities to face disasters	An	
3	Choose to design and perform research on the different aspects of the emergencies and disaster events while demonstrating insight into the potential and limitations of science.	C	
4	Categorize the various pathways, tools and entry points for integrating CCA-DRR and sustainability concerns into developmental planning across sectors, national.	E	
5	Adapt the Sustainable Development Goals (SDG) for disaster risk reduction	An	
Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)			

Module	Units	Course description	Hrs	Unit Outcomes	CO Nos
	MODULE I Introduction - 5 hrs				
	1.1	Introduction to Disaster Management	1Hrs-		CO 1

1- Introduction -		Distinguishing between an emergency and a disaster situation	PPT		
	1.2	Types of disasters (Geological, Hydro-meteorological, Biological, Technological and Man - made Disaster	1Hrs-PPT/Lecture		CO 1
	1.3	Global Disaster Trends - Emerging Risks of Disaster,Climate Change and Urban Disasters	1Hrs-PPT/Lecture		CO 1
	1.4	Implications of disasters on environment	1Hrs-PPT/Lecture		CO 1
	1.5	Environmental Planning and management for environmental hazards	1Hrs-PPT/Lecture		CO 1
2 - Disaster Management Cycle	**MODULE II Disaster Management Cycle -15 hrs**				
	2.1	Introduction, Disaster Management Cycle	3 Hrs-PPT/Lecture		CO1,CO 2
	2.2	Disaster Mitigation, Mitigation strategies	2 Hrs-PPT/Lecture		CO1,CO 2
	2.3	Disaster Risk Reduction (DRR)	3 Hrs-PPT/Lecture		CO 2
	2.4	Emergency Operation Plan (EOP)	2 Hrs PPT/Lecture/E-resource		CO 2
	2.5	Modern methods of disaster response	3Hrs-PPT/Lecture/Videos		CO 2
	2.6	Disaster Management Act (2005) and Policy (2009)	1 Hrs-PPT/Lecture/E-resource		CO 2
	2.7	Organisational framework for disaster management in India	1Hrs-PPT/Lecture/E-resource		CO 2
3- Hazard Mitigation-	**MODULE III Hazard Mitigation- 5 hrs**				
	3.1	Identification of hazard prone belts, hazard zonation and risk assessment	1Hrs-PPT/Lecture/E-resource		CO 1,CO3
	3.2	Identification of hazard prone belts, hazard zonation and risk assessment	1Hrs-PPT/Lecture		CO1,CO3
	3.3	Risk reduction in vulnerable areas, developing warning systems	1Hrs-PPT/Lecture		CO1,CO3
	3.4	Emergency preparedness, education and training activities	1Hrs-PPT/Lecture		CO1,CO3

	3.5	planning for rescue and relief works	1Hrs-PPT/Lecture		CO1,CO3
4- Disaster Education and Public Awareness	**MODULE IV Disaster Education and Public Awareness -25 hrs**				
	4.1	Community-based Initiatives	1Hrs-PPT/Lecture		CO3, C04
	4.2	Stakeholders' Roles and Responsibilities	1Hrs-PPT/Lecture		CO3, C04
	4.3	Categories of stakeholders Government	1Hrs-PPT/Lecture		CO3, C04
	4.4	Non-Government Organisations (NGOs)	1Hrs-PPT/Lecture		CO3, C04
	4.5	Regional and International Organizations	1Hrs-PPT/Lecture		CO3, C04
	4.6	Donor Agencies	1Hrs-PPT/Lecture		CO3, C04
	4.7	Island Councils / Local Government	1Hrs-PPT/Lecture		CO3, C04
	4.8	Community Workers	1Hrs-PPT/Lecture		CO3, C04
	4.9	National and Local Disaster Managers	1Hrs-PPT/Lecture		CO3, C04
	4.10	Trainers, Policy Makers and Grass-roots people	1Hrs-PPT/Lecture		CO3, C04
	4.11	Advantages and Disadvantages of the Community-Based Approach	1Hrs-PPT/Lecture		CO3, C04
	4.12	Pre-Disaster Mitigation Plan	1Hrs-PPT/Lecture		CO3, C04
	4.13	Hazardous Materials	1Hrs-PPT/Lecture		CO3, C04
	4.14	Ways of storing and safely handling hazardous materials	1Hrs-PPT/Lecture		CO3, C04
	4.15	Ways of storing and safely handling hazardous materials	1Hrs-PPT/Lecture		CO3, C04
	4.16	Opportunities and regional planning for hazard management	1Hrs-PPT/Lecture		CO3, C04
	4.17	Opportunities and regional planning for hazard management	1Hrs-PPT/Lecture		CO3, C04
	4.18	Hazardous Materials	1Hrs-PPT/Lecture		CO3, C04
	4.18	Ways of storing and safely handling hazardous materials	1Hrs-PPT/Lecture		CO3, C04
	4.19	Opportunities and regional planning for hazard management	1Hrs-PPT/Lecture		CO3, C04
	4.20	Opportunities and regional planning for hazard management	1Hrs-PPT/Lecture		CO3, C04
	4.25	Empowerment through Disaster Risk management	1Hrs-PPT/Lecture		CO3, C04

5- The Role of Technology in Disaster Management	**Module V The Role of Technology in Disaster Management -10 hrs**				
	5.1	Introduction to various ecosystem based tools and approaches for reducing DR (RS,GIS, GPS and RS)	1Hrs-PPT/Lecture		CO3, C04
	5.2	Introduction to various ecosystem based tools and approaches for reducing DR (RS,GIS, GPS and RS)	1Hrs-PPT/Lecture		CO3, C04
	5.3	Disaster Communication System (Early Warning and Its Dissemination	1Hrs-PPT/Lecture		CO3, C04
	5.4	Integrated Water Resources Management	1Hrs-PPT/Lecture		CO3, C04
	5.5	River basin Management	1Hrs-PPT/Lecture		CO3, C04
	5.6	Coastal Zone Management	1Hrs-PPT/Lecture		CO3, C04
	5.7	Managing ecosystems for urban risk reduction	1Hrs-PPT/Lecture		CO3, C04
	5.8	Community-based Ecosystem and Disaster Risk Management	1Hrs-PPT/Lecture		
	5.9	Community-based Ecosystem and Disaster Risk Management	1Hrs-PPT/Lecture		
	5.10	The Role of Media in Disaster Management	1Hrs-PPT/Lecture		
Module VI Physical and Socio-Economic Impacts of Disasters- 20 Hrs					
6- Physical and Socio-Economic Impacts of Disasters	6.1	Physical and Socio-economic Impacts of Disasters	PPT/Lecture		CO1, CO3, C04
	6.2	Disaster Associated Health Issues	PPT/Lecture		CO1, CO3, C04
	6.3	Emergency Health Services in Disasters	PPT/Lecture		CO1, CO3, C04
	6.4	Infrastructure and procedures in accessing emergency situations	PPT/Lecture		CO1, CO3, C04
	6.5	Communicable diseases common in disaster situations	PPT/Lecture		CO1, CO3, C04
	6.6	Physical and Socio-economic Impacts of Disasters	PPT/Lecture		CO1, CO3, C04
	6.7	Monitoring and Evaluation of Communicable Diseases Control	PPT/Lecture		CO1, CO3, C04
	6.8	Programme Disaster and Development	PPT/Lecture		CO1, CO3, C04
	6.9	The impact of disasters on development programmes	PPT/Lecture		CO1, CO3, C04

	6.10	Vulnerabilities caused by development	PPT/Lecture		CO1, CO3, C04
	6.11	Macroeconomic effects of natural and man-made disasters	PPT/Lecture		CO1, CO3, C04
	6.12	Economics for disaster recovery and reconstruction	PPT/Lecture		CO1, CO3, C04
	6.13	Investing in natural disaster risk reduction	PPT/Lecture		CO1, CO3, C04
MODULE VII Disaster Preparedness Plan and DRR Case Studies- 10 hrs					
7- Disaster Preparedness Plan and DRR Case Studies	7.1	Preparing disaster preparedness plans for an ecosystem-based project for increasing resilience and reducing DRR	PPT/Lecture		CO1, CO3, CO4
	7.2	Hazard mapping of vulnerable areas	PPT/Lecture		CO1, CO3, CO4
		Vulnerability assessment (physical, social, organizational, economical and technological)	PPT/Lecture		CO1, CO3, CO4
	7.3	Risk mitigation planning for vulnerable areas	PPT/Lecture		CO1, CO3, CO4
	7.4	Different case studies and its impact on gender	PPT/Lecture		CO1, CO3, CO4
	7.5	Bhopal Disaster: Industrial/Chemical Disaster	PPT/Lecture		CO1, CO3, CO4
	7.6	Disaster Risks	PPT/Lecture		CO1, CO3, CO4
	7.7	Preparing disaster preparedness plans for an ecosystem-based project for increasing resilience and reducing DRR	PPT/Lecture		CO1, CO3, CO4
	7.8	Risk mitigation planning for vulnerable areas	PPT/Lecture		CO1, CO3, CO4
	7.9	Different case studies and its impact on gender	PPT/Lecture		CO1, CO3, CO4
	7.10	Tsunami: With no warning, the Indian Ocean was exposed	PPT/Lecture		CO1, CO3, CO4
	7.11	Disaster Communication	PPT/Lecture		CO1, CO3, CO4

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** Interactive lectures, Lecture-based Learning, Experiential Learning.

Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **Theory:** Quiz, Oral Presentation, Written test, Problem-based assignment, or *any other method as may be required by the course faculty*. **Practical:** Observation of practical skills, Laboratory records, and *any other method as may be required by the course faculty*. **B. End Semester Evaluation (ESE)** **Theory:** Written-test **Practical:** Practical-based assessment, Record, and *any other method as may be required by the course faculty*.

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DSC - 05

Discipline	Environmental Science
Semester	V/VI
Type of Course	Discipline Specific Course (DSC)
Course Code	24UEVSDSC302
Course Title	ENVIRONMENTAL POLLUTION AND MONITORING
Course Level	300-399
Course Summary	The course give exposure to the students to the pollution problems, science of interaction of chemical ingredients and molecules in the natural and industrial (man-made) environment, the need of regulation, directive approaches and statutory guidelines for prevention and control for abatement. Methodology to be followed for monitoring and reporting to decision making authorities in the capacity of Environmental Experts for organizations, departments and judiciary. Students will get an overall basis for originating innovative thoughts to link environmental analytics with legal jurisprudence to support industry, pollution control boards, courts and tribunals.
Hours	75 (Lecture/Tutorial – 45, Practical – 30)
Credits	4

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PO
1	Demonstrate Understanding of Environmental Pollution	Understand	PO1, PO2, PO3, PO4, PO5
2	Apply Monitoring Techniques	Apply	PO1, PO2, PO3, PO4, PO5
3	Analyze Environmental Data	Analyse	PO1, PO2, PO3, PO4, PO5
4	Evaluate Pollution Control Measures	Evaluate	PO1, PO2, PO3, PO4, PO5
5	Propose Solutions for Environmental Challenges	Create	PO1, PO2, PO3, PO4, PO5
Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)			

COURSE CONTENT

Content for Classroom transaction (Units) * *More units enhance learning by enabling diverse assessments, flexible learning design, efficient resource management, and thorough blueprint coverage.*

Module	Units	Course description	Hrs	Unit Outcomes	CO Nos
	1. Air Pollution - 14 Hrs				

1	1.1	Definition and Sources - Natural and anthropogenic	1Hr PPT/Lecture	Differentiate between natural and anthropogenic definitions and sources of environmental phenomena	CO1
	1.2	Types of Pollutants- Primary and Secondary	1Hr PPT/Lecture	Distinguish between primary and secondary pollutants and identify their respective types in environmental contexts	CO1
	1.3	Acid rain, Smog-Photochemical and Classical	1Hr PPT/Lecture	Understand of the mechanisms behind acid rain formation, as well as the distinctions between photochemical and classical smog	CO1, CO3
	1.4	Ozone depletion	1Hr PPT/Lecture	Analyze the causes and consequences of ozone depletion	CO1, CO3
	1.5	Factors affecting air pollution, Transport and diffusion of pollutants	2Hrs PPT/Lecture	Analyze the various factors influencing air pollution and comprehend the mechanisms involved in the transportation and diffusion of pollutants within the atmosphere	CO1, CO3
	1.6	Gas laws governing the behaviour of pollutants in the atmosphere	1Hr PPT/Lecture	Elucidate the dynamics of pollutant dispersion and transformation in atmospheric conditions, empowering them to devise effective pollution management strategies	CO1, CO3
	1.7	Indoor air pollution – Types and sources of pollutants	1Hr PPT/Lecture	Identify various types and sources of indoor air pollutants	CO1

	1.8	Effects of pollutants on human beings, plants, animals, materials and on climate	3 Hrs PPT/Lecture	Analyze and evaluate the diverse impacts of pollutants on human health, plant and animal life, materials, and the climate	CO1
	1.9	Air pollution control	1Hr PPT/Lecture	Comprehensive understanding of general air pollution control techniques	CO4
	1.10	Noise Pollution and control: Characteristics of noise, sources	2Hrs PPT/Lecture	Identify the characteristics of noise pollution, recognizing its sources, and proposing effective control measures	CO1, CO4
	2. Water Pollution – 18 Hrs				
	2.1	Definition, Types -surface and ground water	1 Hr PPT/Lecture	Distinguish between surface and groundwater, understand their distinct characteristics and roles within the hydrological cycle	CO1
	2.2	Surface water pollution: Sources – point and nonpoint	1 Hr PPT/Lecture	identify common examples of each, and analyze their respective contributions to water quality degradation	CO1
	2.3	Types of pollutants – chemical, physical and biological	3 Hrs PPT/Lecture	Understand their unique characteristics and interactions within aquatic ecosystems, and evaluating their impacts on water quality and environmental health	CO1
	2.4	Ground water pollution – sources and types of pollutants, Geological and anthropogenic pollutants in ground water	2 Hrs PPT/Lecture	Identify and analyze the sources of ground water pollution	CO1, CO3

	2.5	Movements of contaminants in ground water	1 Hr PPT/Lecture	Analyze and predict the movements of contaminants in groundwater	CO1, CO3
	2.6	Coastal and Marine pollution -Oil spills	2 Hrs PPT/Lecture	Analyze the complexities of oil spills in coastal and marine environment	CO1
	2.7	Thermal Pollution - Sources, Heat Islands, causes and consequences	2 Hrs PPT/Lecture	dentifying sources of thermal pollution, understanding the concept of heat islands, analyzing the causes, and evaluating the consequences of thermal pollution on aquatic ecosystems and urban environments, facilitating the development of effective mitigation strategies.	CO1, CO3
	2.8	Heavy metals and other POPs in aquatic systems - cycling and interactions	2 Hrs PPT/Lecture	Understand of the cycling and interactions of heavy metals and other Persistent Organic Pollutants (POPs) in aquatic systems, including their sources, pathways, transformations, and ecological impacts	CO1, CO3
	2.9	Fate and transport of pollutants- factors affecting, Global oceanic transport of pollutant	2 Hrs PPT/Lecture	Understand how pollutants move and spread in the environment, including their transport across the world's oceans	CO1, CO3
	2.10	Management of point and non-point sources of water pollution, water pollution control	2 Hrs PPT/Lecture	Devise effective strategies for managing both point and non-point sources of water pollution, as well as implementing appropriate water pollution control	CO4

				measures to safeguard aquatic ecosystems and ensure water quality for human use	
3	3. **Soil Pollution – 11 Hrs**				
	3.1	Definition, sources of soil/sediment pollution	2Hrs PPT/Lecture	Define soil/sediment pollution and identify its various sources	CO1
	3.2	Soil/sediment quality parameters: Physico-chemical, biological properties of soil (texture, structure, inorganic and organic components)	3Hrs PPT/Lecture	Evaluate the interrelationships between various physico-chemical and biological properties of soil/sediment, facilitating a holistic understanding of soil/sediment quality and its implications for ecosystem health	CO1, CO3
	3.3	Sedimentation rate and contamination profile, sediment pollution indices	2Hr PPT/Lecture	Quantify sedimentation rates and contamination profiles, interpret sediment pollution indices, and apply this knowledge to evaluate the severity and extent of sediment pollution in aquatic ecosystems	CO1, CO3
	3.4	Industrial waste effluents and heavy metals, their interactions with soil components	2Hrs PPT/Lecture	Assess the environmental implications of industrial pollution and devise effective strategies for soil remediation and pollution control	CO1, CO3
	3.5	Soil Pollution Control	2Hrs PPT/Lecture	Understand the concepts involved in pollution control technologies	CO4
4	**4. Environmental Pollution Monitoring – 17 Hrs**				

	4.1	Environmental sampling and analysis – stages (sampling, treatment, detection and interpretation), scope and criteria	2Hrs PPT/Lecture	Understand how to collect samples, treat them, detect pollutants, and interpret results accurately for effective environmental analysis	CO2, CO4
	4.2	Sampling – water, air and soil, equipment for air, water and soil sampling.	3Hrs PPT/Lecture	Learn how to collect samples from water, air, and soil, using the appropriate equipment for each type of sampling	CO2, CO4
	4.3	Certified reference materials	1Hr PPT/Lecture	demonstrate proficiency in sampling certified reference materials, ensuring accurate and reliable calibration of analytical instruments and validation of measurement techniques in environmental analysis	CO2, CO4
	4.4	Water quality parameters-physical, chemical and biological analysis	2Hrs PPT/Lecture	Assess the health of aquatic ecosystems	CO2
	4.5	Water quality standards	2Hrs PPT/Lecture	Assess the health of aquatic ecosystems and make informed decisions regarding water resource management and pollution control	CO2, CO3
	4.6	Air quality Standards-ambient and emission	2Hrs PPT/Lecture	Evaluate atmospheric conditions, assess compliance with regulatory requirements	CO2, CO3
	4.7	Methods of monitoring and control of air pollution SO2, NO, CO, CO2, Ozone, SPM-PM2.5 & PM 10	3Hrs PPT/Lecture	Monitor and control air pollution by studying methods specific to pollutants	CO2, CO4
	4.8	Noise measurement		Assess noise levels in various environments and	

			2Hrs PPT/Lecture	contribute to noise pollution management efforts	CO2
5	**5. Radioactive Pollution and Emerging contaminants – 11 Hrs**				
	5.1	Radioactivity in the environment	1Hr PPT/Lecture	Understand the presence and effects of radioactivity in the environment	CO1
	5.2	Radioactive Pollution: Radionuclides- sources, types of radiation, Radioactive fallout	2Hrs PPT/Lecture	Identify sources of radioactive pollution, differentiate between types of radiation emitted by radionuclides, and analyze the impacts of radioactive fallout on the environment and human health	CO1, CO3
	5.3	Ecological risks from radiation, effects on humans, exposure standards.	2 Hrs PPT/Lecture	Assess ecological risks associated with radiation exposure, comprehending its effects on human health, and understanding exposure standards.	CO1, CO3
	5.4	Control measures: radioactive waste treatment	1Hr PPT/Lecture	Evaluate and implementing control measures for the treatment of radioactive waste	CO4
	5.5	Emerging contaminants – definition, types and sources, health impacts	3Hrs PPT/Lecture	Understand what emerging contaminants are, where they come from, and how they can impact human health	CO1
	5.6	Plastics pollution in the freshwater and marine ecosystems	1Hr PPT/Lecture	assess the impacts of plastic pollution on freshwater and marine ecosystems	CO1
	5.7	Natural disasters and Pollution	1Hr PPT/Lecture	Analyze the interactions between natural disasters and pollution	CO1

6	**6. Solid Waste Management – 19 Hrs**				
	6.1	Municipal solid wastes (MSW) - quantities and characteristics	1Hr PPT/Lecture	Understand of the quantities and diverse characteristics of municipal solid waste	CO1
	6.2	Waste collection and transport, waste processing and resources recovery and recycling	2Hrs PPT/Lecture	plan and implement effective waste collection, transportation, processing, and recycling strategies, fostering environmental stewardship and resource conservation in waste management practices	CO5
	6.3	Aerobic and anaerobic systems	1Hr PPT/Lecture	Understand the principles and applications of aerobic and anaerobic systems in waste treatment	CO5
	6.4	Composting, vermicomposting	1Hr PPT/Lecture	Understand how to compost organic waste and use worms for composting in vermicomposting	CO5
	6.5	Biodigesters (Biogas plants)	1Hr PPT/Lecture	Understand the principles and operation of biodigesters	CO5
	6.6	Incineration, pyrolysis, plasma pyrolysis	1Hr PPT/Lecture	Understand the principles and applications	CO5
	6.7	Sanitary landfills and open dumping yards	1Hr PPT/Lecture	Comprehend the principles and practices of sanitary landfill management and open dumping yards	CO5
	6.8	Management of plastic and e-waste	1Hr PPT/Lecture	Address the growing challenges	CO5

				of plastic and e-waste pollution	
	6.9	Better management strategies (any two model case studies)	3Hrs PPT/Lecture	Analyze and apply better waste management strategies through the examination of two model case studies	CO4, CO5
	6.10	Treatment process for unsegregated waste	1Hr PPT/Lecture	Assess the environmental impacts of various treatment options and develop integrated waste management strategies	CO5
	6.11	Fixation of hazardous solid waste prior to disposal	1Hr PPT/Lecture	Understand and implement fixation techniques for hazardous solid waste prior to disposal	CO5
	6.12	Hazardous waste in land fill	1Hr PPT/Lecture	Analyze the risks and impacts associated with disposing of hazardous waste in landfills	CO5
	6.13	Hazardous waste (Management and Handling) Rules 1989, The Manufacture Storage and Import of Hazardous Chemicals Rules 1989, Biomedical Waste (Management and Handling) Rules 1998, Plastic Act 1999, Extended producer responsibility	4Hrs PPT/Lecture	Analyze these regulations, identify their key provisions, and apply them effectively in managing hazardous waste, ensuring compliance with legal requirements and promoting environmental sustainability	CO4, CO5

Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **Theory:** Quiz, Oral Presentation, Written test, Problem-based assignment, or *any other method as may be required by the course faculty*. **Practical:** Observation of practical skills, Laboratory records, and *any other method as may be required by the course faculty*. **B. End Semester Evaluation (ESE)** **Theory:** Written-test **Practical:** Practical-based assessment, Record, and *any other method as may be required by the course faculty*.

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DSC - 06

Discipline	Environmental Science
Semester	V/VI
Type of Course	Discipline Specific Course (DSC)
Course Code	24UEVSDSC303
Course Title	ENVIRONMENTAL IMPACT ASSESSMENT
Course Level	300-399
Course Summary	The course elucidates the purpose and role of Environmental Impact Assessment (EIA) within the decision-making process for development projects. It delves into the strengths and limitations of environmental management, facilitates the identification of crucial impacts that developmental projects may have on both people and the environment, assists in the analysis of developmental projects to evaluate their effects on diverse environmental aspects, evaluates the potential of environmental audits as tools for Impact Assessment to address environmental concerns, and concentrates on the implications of existing jurisdictional and institutional arrangements concerning environmental impact assessment.
Hours	75 (Lecture/Tutorial – 45, Practical – 30)
Credits	4

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PO
1	Define the purpose and role of EIA in assessing environmental damage consequent to development project	Analyse	PO1, PO2, PO3, PO4, PO5
2	Understand the role of EIA in decision making process related to development project	Understand	PO1, PO2, PO3, PO4, PO5
3	Critically evaluate the social & environmental impacts of developmental projects & suggest alternative measures	Evaluate	PO1, PO2, PO3, PO4, PO5

4	Analyse imbibes incites on environmental audit as a tool for EIA	Analyse	PO1, PO2, PO3, PO4, PO5
5	Practice EIA independently	Apply	PO1, PO2, PO3, PO4, PO5
Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)			

COURSE CONTENT

Module	Units	Course description	Hrs	Unit Outcomes	CO Nos
1	**Introduction – 10 Hrs**				
	1.1	Definition, Purpose and characteristics of EIA	1Hr PPT/Lecture	Demonstrate a thorough understanding of the meaning and objectives of EIA, including its key features and the role it plays in decision-making processes.	CO1
	1.2	Global evolution of EIA	1Hr PPT/Lecture	Analyze and describe the historical development, key milestones, and variations in EIA practices across different regions	CO1
	1.3	Participants in EIA process	1Hr PPT/Lecture	Identify, analyze, and comprehend the roles, responsibilities, and interactions of diverse stakeholders involved in EIA	CO1
	1.4	Stages of EIA	2 Hrs PPT/Lecture	Systematically describe, analyze, and apply the distinct stages of the EIA process, demonstrating a comprehensive understanding of the sequential steps involved in evaluating potential environmental impacts.	CO1
	1.5	Types of EIA	1Hr PPT/Lecture	Categorize and analyze various forms of EIA, demonstrating a nuanced understanding of their distinct purposes and applications in	CO1

				environmental management..	
	1.6	Risk Assessment v/s Environmental Impact Assessment	1Hr PPT/Lecture	Differentiate between these two processes, comprehending their distinct methodologies, objectives, and applications in evaluating potential hazards and environmental consequences associated with projects or activities..	CO1
	1.7	Life cycle Assessment	1Hr PPT/Lecture	Apply the principles and methodologies of life cycle thinking to assess and analyze the environmental impacts of a product or process throughout its entire life cycle	CO1
	1.8	Environmental Impact Statement (EIS) and Environmental Management Plan (EMP)	2 Hrs PPT/Lecture	Outline a strategic plan for effective environmental management throughout the project lifecycle	CO1, CO2
	Environmental Impacts – 10 Hrs				
	2.1	Positive and negative Impacts, Primary and Secondary Impacts, Cumulative Impacts, Ecosystem Function Impacts	4 Hrs PPT/Lecture	Identify, analyze, and assess the diverse impacts associated with development projects, recognize the intricacies of primary and secondary effects, cumulative consequences, and the broader implications on ecosystem functions.	CO3
	2.2	Baseline evaluation	2 Hrs PPT/Lecture	Collecting analyze, and interpret data related to the existing environmental conditions of a specific area, provide a foundation for comprehensive environmental impact	CO3

				assessments in various projects.	
	2.3	Alternatives and mitigation measures in EIA	2 Hrs PPT/Lecture	Evaluate and propose effective alternative project options and mitigation strategies, showcasing a comprehensive understanding of their significance in minimizing adverse environmental impacts.	CO4
	2.4	Terms of reference	2 Hrs PPT/Lecture	Formulate comprehensive and precise guidelines for conducting EIA	CO4
3	**Methodology – 12 Hrs**				
	3.1	Essential broad characteristics of EIA methods	1Hr PPT/Lecture	Identify, evaluate, and apply key features and approaches within various EIA	CO3, CO4
	3.2	Task specific EIA methods	1Hr PPT/Lecture	Select, apply, and critically assess specialized Environmental Impact Assessment methodologies tailored to specific project types	CO3, CO4
	3.3	Criteria for selection of EIA methodology	1Hr PPT/Lecture	Evaluate and apply relevant criteria, demonstrating a proficiency in selecting appropriate EIA methodologies based on project characteristics, environmental considerations, and regulatory requirements.	CO3, CO4
	3.4	Ad hoc method, Checklist method, Matrix method, Network method, Overlay method	5Hrs PPT/Lecture	Analyze and apply these diverse EIA methods, demonstrating a comprehensive understanding of their respective strengths, limitations, and suitability for different project contexts.	CO3, CO4

	3.5	Geographic Information System for EIA	1Hr PPT/Lecture	Practical understanding of how geospatial technology enhances decision-making processes in environmental management	CO3, CO4
	3.6	Task specific Computer Modelling, Expert Systems, Cost Benefit analysis, Predictive models	3Hrs PPT/Lecture	Apply these tools for understanding of their roles in EIA and their ability to enhance decision-making processes in diverse project scenarios	CO3, CO4
4	**Environmental Policies – 15 Hrs**				
	4.1	Key Policy Initiatives	1Hr PPT/Lecture	Discuss the implications of current jurisdictional and institutional arrangements in relation to environmental impact assessment	CO2, CO4
	4.2	Environment Protection Act	1Hr PPT/Lecture	Understanding of the Act's key provisions, regulatory frameworks, and enforcement mechanisms	CO2, CO4
	4.3	Air (Prevention and Control of Pollution) Act, Water (Prevention and Control of Pollution) Act	1Hr PPT/Lecture	Understanding of the Act's key provisions, regulatory frameworks, and enforcement mechanisms	CO2, CO4
	4.4	CPCB, SPCB	1Hr PPT/Lecture	Understanding of the Act's key provisions, regulatory frameworks, and enforcement mechanisms	CO2, CO4
	4.5	Wildlife Protection Act	1Hr PPT/Lecture	Understanding of the Act's key provisions, regulatory frameworks, and enforcement mechanisms	CO2, CO4
	4.6	Forest (Conservation Act)	1Hr PPT/Lecture	Understanding of the Act's key provisions, regulatory frameworks, and enforcement mechanisms	CO2, CO4
	4.7	Municipal Solid Wastes (Management and Handling) Rules	2Hrs PPT/Lecture	Understanding of the Act's key provisions,	CO2, CO4

				regulatory frameworks, and enforcement mechanisms	
	4.8	Biomedical Waste Management and Handling Rules	1Hr PPT/Lecture	Understanding of the Act's key provisions, regulatory frameworks, and enforcement mechanisms	CO2, CO4
	4.9	Hazardous Waste Management and Handling Rules	1Hr PPT/Lecture	Understanding of the Act's key provisions, regulatory frameworks, and enforcement mechanisms	CO2, CO4
	4.10	EIA notification	1Hr PPT/Lecture	Understanding of the Act's key provisions, regulatory frameworks, and enforcement mechanisms	CO2, CO4
	4.11	Biodiversity Act	2Hrs PPT/Lecture	Understanding of the Act's key provisions, regulatory frameworks, and enforcement mechanisms	CO2, CO4
	4.12	Coastal regulation Zone Rules	2Hrs PPT/Lecture	Understanding of the Act's key provisions, regulatory frameworks, and enforcement mechanisms	CO2, CO4
5	**EIA Practice in India – 24 Hrs**				
	5.1	Dimensions of Environment	1Hr PPT/Lecture	Understand diverse ecological, social, economic, and cultural dimensions that contribute to the complexity of environmental issues, facilitating their ability to assess and address multifaceted challenges in environmental management	CO4
	5.2	Categorisation of Projects	1Hr PPT/Lecture	Understand the criteria and processes involved in project classification for effective EIA	CO4
	5.3	Constitution of Committees (EAC, SEAC, SEIACC)	1Hr PPT/Lecture	Discuss the implications of current jurisdictional and institutional	CO4

				arrangements in relation to EIA	
	5.4	Project Cycle and Management	2Hrs PPT/Lecture	Evaluate projects with a focus on efficiency, effectiveness, and sustainability within the broader context of the project life cycle.	CO4
	5.5	Prior Environmental Clearance (EC) Process	3Hrs PPT/Lecture	Understand the regulatory requirements, procedures, and documentation involved in obtaining environmental clearances for projects	CO4
	5.6	Project Screening Process	1Hr PPT/Lecture	Apply screening criteria to identify projects with significant environmental impacts, and making informed decisions on whether a detailed EIA is required	CO4
	5.7	Project Scoping Process	2Hrs PPT/Lecture	Identify relevant environmental issues, stakeholders, and potential impacts, and proposing appropriate study methodologies for a comprehensive assessment	CO4
	5.8	Appraisal of an Application	1Hr PPT/Lecture	Determining the environmental suitability of proposed projects.	CO4
	5.9	Soil and Ground Water Impact Assessment	2Hrs PPT/Lecture	Understand the methodologies, tools, and regulatory frameworks involved in evaluating and managing environmental impacts related to soil and groundwater in the context of development projects.	CO3
	5.10	Surface Water Impact Assessment	2Hrs PPT/Lecture	Understand the methodologies, tools, and regulatory frameworks involved in evaluating and managing environmental	CO3

				impacts related to surfacewater in the context of development projects.	
	5.11	Assessment of Impacts on Biological Environment	2Hrs PPT/Lecture	Understanding the methods, tools, and regulatory considerations in conducting effective biological impact assessments within the context of EIA.	CO3
	5.12	Assessment of Impacts on Air Environment	2Hrs PPT/Lecture	Evaluate of potential air quality impacts associated with development projects	CO3
	5.13	Assessment of Impacts on Noise on the Environment	2Hrs PPT/Lecture	Evaluate and mitigate potential noise impacts associated with development projects	CO3
	5.14	Assessment of Socio- Economic and Human Health Impacts	2Hrs PPT/Lecture	Analyze and evaluate the social, economic, and human health consequences of development projects	CO3
6	**EIA – Case Studies – 19Hrs**				
	6.1	EIA of Industrial Projects	2Hrs PPT/Lecture /Group Discussion	Understand of the challenges, methodologies, and solutions associated with EIA in the industrial sector.	CO5
	6.2	EIA for Land Clearing Projects	2Hrs PPT/Lecture /Group Discussion	Evaluate the environmental impacts associated with land clearing	CO5
	6.3	EIA for Highway Projects	2Hrs PPT/Lecture /Group Discussion	Understand of the challenges, methodologies, and solutions associated with EIA in the context of highway projects	CO5
	6.4	EIA for Irrigation Projects	2Hrs PPT/Lecture /Group Discussion	Understand assessment methodologies, water resource considerations, and mitigation strategies within the context of EIA	CO5

	6.5	EIA for Dam Construction	2Hrs PPT/Lecture /Group Discussion	Analyze and assess the environmental impacts associated with dam construction projects	CO5
	6.6	EIA for Thermal Power Plants	2Hrs PPT/Lecture /Group Discussion	Assess and evaluate the environmental impacts associated with thermal power plant projects	CO5
	6.7	EIA for Nuclear Power Plants	2Hrs PPT/Lecture /Group Discussion	Understand the assessment methodologies, radiological considerations, waste management, and safety measures within the context of EIA	CO5
	6.8	EIA for Oil and Gas based power plants	2Hrs PPT/Lecture /Group Discussion	Understand the assessment methodologies, air and water pollution considerations, and mitigation strategies within the context of EIA for oil and gas based power projects	CO5
	6.9	EIA for Mines	2Hrs PPT/Lecture /Group Discussion	Understand the challenges, methodologies, and solutions associated with EIA in the context of mining projects.	CO5
	6.10	EIA for Aquaculture	1Hr PT/Lecture/ Group Discussion	Understand the assessment methodologies, water quality considerations, ecological impacts, and sustainable practices within the context of EIA associated with aquaculture projects	CO5

Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **Theory:** Quiz, Oral Presentation, Written test, Problem-based assignment, or *any other m* **Practical:** Observation of practical skills, Laboratory records, and *any other method as m* **B. End Semester Evaluation (ESE)** **Theory:** Written-test **Practical:** Practical-based assessment, Record, and *any other method as may be required*

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5. SYLLABUS FOR MULTIDISCIPLINARY COURSES (MDC)

MDC - 01

Discipline	Environmental Science
Semester	I
Type of Course	Multi Disciplinary Course (DSC)
Course Code	24UEVSMDC303
Course Title	FUNDAMENTALS OF ENVIRONMENTAL SCIENCE
Course Level	100-199
Course Summary	The course give overview of the sources, impacts, and management strategies associated with pollution in various environmental compartments. Students will gain a thorough understanding of air, water, and soil pollution, exploring the major pollutants, their origins, and the potential consequences on ecosystems and human health. The course covers key principles and methodologies for monitoring and assessing pollution levels, as well as regulatory frameworks and policies aimed at pollution prevention and control. Additionally, students will examine case studies to apply theoretical knowledge to real-world pollution scenarios, fostering critical thinking and problem-solving skills. Throughout the

	course, an emphasis is placed on sustainable practices, technological innovations, and interdisciplinary approaches to address the multifaceted challenges posed by environmental pollution.
Hours	60 (Lecture/Tutorial – 30, Practical – 30)
Credits	4

COURSE OUTCOMES (CO)

CO No.	Expected Course Outcome	Learning Domains	PO
1	Understand of key concepts and the interconnected nature of environment.	U	
2	Apply ecological principles to analyze ecosystem dynamics, showcasing the ability to comprehend factors influencing ecosystem stability, resilience, and response to disturbances	A, An	
3	Develop a comprehensive understanding of natural resources, demonstrating knowledge of their types, characteristics, and significance in supporting ecosystems and human societies	Cr	
4	Analyze threats to biodiversity and their impacts on species and ecosystems	An	
5	Understand the causes, effects, and management of various types of pollution, demonstrating the ability to propose effective control measures and sustainable practices for pollution prevention	U, An	
6	Create awareness of social issues related to the environment and develop skills in policy advocacy	C	
Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)			

COURSE CONTENT

Module	Units	Course description	Hrs	CO No.
1	**Introduction (1 Hour)**			
	1.1	Definition, scope and importance		CO 1
	1.2	Need for public awareness		CO 1
2	**Environment (11 Hours)**			
	2.1	Concept of an ecosystem		CO 2
	2.2	Structure and function of an ecosystem		CO 2
	2.3	Producers, consumers and decomposers		CO 2
	2.4	Energy flow in the ecosystem		CO 2
	2.5	Ecological succession		CO 2

	2.6	Food chains, food webs and ecological pyramids		CO 2
	2.7	Introduction, types, characteristic features, structure and function of ecosystem: Forest, Grassland, Desert, Fresh water and Marine ecosystems		CO 2
3	**3. Natural Resources (9 Hours)**			
	3.1	Renewable and non-renewable resources		CO 3
	3.1.1	Forest resources: Use and over-exploitation, deforestation, mining, dams and their effects on forest and tribal people		CO 3
	3.1.2	Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems		CO 3
	3.1.3	Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources		CO 3
	3.1.4	Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity		CO 3
	3.1.5	Energy resources: renewable and non renewable energy sources, use of alternate energy sources		CO 3
	3.1.6	Land resources: land degradation, man induced landslides, soil erosion and desertification		CO 3
	3.2	Role of an individual in conservation of natural resources		CO 3
4	**Biodiversity and its conservation (9 Hours)**			
	4.1	Introduction – Definition: genetic, species and ecosystem diversity		CO 4
	4.2	Biogeographical classification of India		CO 4
	4.3	Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values		CO 4
	4.4	Biodiversity at global, National and local levels		CO 4
	4.5	India as a mega-diversity nation		CO 4
	4.6	Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflict		CO 4
	4.7	Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity		CO 4
5	**Environmental Pollution (9 Hours)**			
	5.1	Definition, cause, effects and control measures of: Air, Water, Soil, Marine, Noise, Thermal pollution		CO 5

	5.2	Nuclear hazards		CO 5
	5.3	Solid waste Management: Causes, effects and control measures of urban and industrial wastes		CO 5
6	**Social Issues and the Environment (6 Hours)**			
	6.1	Environmental ethics: Issues and possible solutions		CO 6
	6.2	Climate change, global warming, acid rain, ozone layer depletion		CO 6
	6.3	Wasteland reclamation		
	6.4	Environmental Laws: Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act		CO 6
7		**Teacher-specific course components**		

Teaching and Learning Approach	**Classroom Procedure (Mode of transaction)** Interactive lectures, Lecture-based Learning, Experiential Learning.
Assessment Types	**MODE OF ASSESSMENT** **A. Continuous Comprehensive Assessment (CCA)** **Theory:** Quiz, Oral Presentation, Written test, Problem-based assignment, or *any other method as may be required by the course faculty*. **Practical:** Observation of practical skills, Laboratory records, and *any other method as may be required by the course faculty*. **B. End Semester Evaluation (ESE)** **Theory:** Written-test **Practical:** Practical-based assessment, Record, and *any other method as may be required by the course faculty*.

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